BROADBAND CAPACITY AND SERVICE DELIVERY OF TELECOMMUNICATION FIRMS IN PORT HARCOURT

OZURU, H. N., PhD.
Department of marketing, Faculty of Management Sciences
University of Port Harcourt
Choba, Port Harcourt.

And

OSHO O. O.
Oshland Integrated Concept, Uniport Shopping Complex
Choba, Port Harcourt

Abstract

This study investigated the relationship between broadband capacity and effective service delivery of telecommunication firms in Rivers State. The objective of the study was to investigate the influence of broadband capacity and effective service delivery of telecommunication firms in Rivers State. The study adopted the survey research design. Eighty (80) copies were distributed. Seventy six (76) copies were retrieved after data cleaning. These copies were analyzed and the hypotheses were tested using the Spearman Rank Correlation. The result revealed that; there was a significant relationship between broadband capacity and effective service delivery. The study concluded with recommendations amongst others that the problems of interconnectivity needs to be addressed because operators, especially those with large market share are using it as advantage to monopolize the market either by restricting calls from other network providers or increase the cost of accessing them.

Keywords: Broadband Capacity, service delivery, ubiquitous connectivity, high speed network, effective internet access

Introduction

The telecommunications industry and related verticals will continue to evolve dynamically over the next five years. Boundaries will blur among product categories as a range of industry actors shape customer demand scenarios. The recent release of the National Broadband Plan by the Nigerian Communications Commission (NCC) has focused the attention of policymakers, industry leaders, academics, and ordinary citizens on the importance of having sufficient bandwidth available anytime and anyplace to support a growing array of broadband services. Broadband services include both wireline and wireless access to the Internet and the delivery of high-definition, even 3-D, television. As popular as these two terms bandwidth and broadband have become, and as important as they are to our future as a nation, they are not always well understood.

According to the Managing Director and Chief Executive Officer (MD/CEO) of NIGCOMSAT LTD; Engr. Timasaniyu Ahmed-Rufai (2012). Broadband has the potential to facilitate and boost entire new industries, improve the education system, deliver and enhance health care, enhance farming, monitor and ensure public safety and engage with government. Increasingly, broadband is used to access, organize and disseminate knowledge, increase market productivity, facilitate the generation of new jobs and improve the quality of life through e-Government, distance learning, e-

Commerce, e-Banking, e-Village, e-Agriculture and national Security amongst others. The Organization for Economic Co-operation and Development (OECD) which defines broadband as a service (not a technology) that can provide an Internet speed or data transmission rate at 256 kilobits per seconds (kbps) in at least one direction (Agustin, 2009).

Okonji (2016), stated that as telecoms operators in Nigeria make efforts to deepen broadband penetration in the country, they are faced with lots of challenges, which most times, impede the speed of broadband rollout in the country. Challenges common to operators in the telecoms sector have been identified as: the high costs of right of way resulting in the high cost of leasing transmission infrastructure; long delays in the processing of permits; multiple taxation at federal, state, and local government levels and having to deal with multiple regulatory bodies; damage to existing fibre infrastructure as a result of cable theft, road works and other operations; and the lack of reliable, clean grid electricity.

Another major challenge impeding broadband penetration in the country is the inability of operators to transmit broadband capacities from the shores of the country to the hinterlands, where the services are most needed. There are appreciable number of submarine cable landings on the shores of the country providing over 9 Tbit/s of combined capacity. However there is a growing concern about the fact that all the landings are in Lagos and that access to other parts of the country is choked due to the limitations of distribution infrastructure to the rest of the country.

As part of economic gains, it is believed that easy access to broadband will allow Nigerians employ themselves on the back of the immense opportunities the Internet is capable of offering. Availability of robust Internet service, according to analysts, is also expected to allow skilled diaspora Nigerians contribute to national development. Besides, they have also posited that broadband will lower the cost of real estate as people will be able to work from anywhere, without necessarily converging in urban areas and needing to commute. Ideally, the Broadband revolution which kicked off in Nigeria about five years ago with the arrival of fibre optic cables with huge bandwidth capacity ought to have yielded positive results in broadband access for many Nigerians. Unfortunately, the country's broadband penetration is still put at less than 10 per cent.

Perhaps the most unfortunate part of the situation is the fact that the country has huge bandwidth capacity and has left it unused or underutilized for the past five years, yet continues to clamour for broadband. On different occasions, investors in these cable systems lying fallow on the shore of country had lamented and cried out to government to do the necessary to take this capacity to the hinterland. Specifically, the Managing director of Main One, Mrs Funke, has been vociferous about this, and this came with her recent revelation that only less than 10 per cent of the total broadband capacities from the all the cable operators present in Nigeria was being utilised. http://www.ittelecomdigest.com/nigerias-race-to-broadband-revolution/)

One major obstacle to broadband spread in Nigeria has been the inability of of various operators with bandwidth capacity to take such to areas beyond the landing shores. Absence of a national backbone infrastructure has made this practically impossible, yet, with extra efforts, the operators are making some headway trying to lay some cables to extend their services. Unfortunately, another obstacle stands on their way, which is the issue of Right of Way that has become the major headache of any operator willing to lay cable in the country. (ITTELECOMDIGEST, 2015). Not underestimating the far-reaching achievements in the telecoms industry, Subscribers are faced with some challenges which impede them from getting maximum returns from the use of their mobile telephones, ranging from call tariff to poor quality services. After more than 10 years of the liberalization of the mobile ICT sub-sector, it is currently facing some challenges of worsening quality of service which needs to be addressed in order to achieve pervasive service availability and

ultimately, improved quality of service (Juwah, 2012). This paper therefore seeks to investigate the broadband capacity influence on the media transmission of telecoms industry in Port Harcourt. Based on the facts above, this paper intends to empirically study the influence of broadband capacity on effective media transmission of telecommunication firms in Rivers State.

Functional Relationships and Model Specifications

Functional Relationships:

This study established a functional relationship between two dimensions of independent variables which are high speed network and ubiquitous connectivity and the two measures of service delivery which is effective internet access. For this study we are developing a model/specification. The two functional relationships involved are as follows:

Premised on the research variables, the study is expressed in the functional relationship as follows:

BC = f(SD) - - - - functions 1
SD = EIA, - - - - functions 2
BC = HSN, UC, - - - - functions 3

Where:

SD = Service Delivery
BC = Broadband Capacity
HSN = High Speed Network
UC = Ubiquitous Connectivity
EIA = Effective Internet Access

Operational Framework

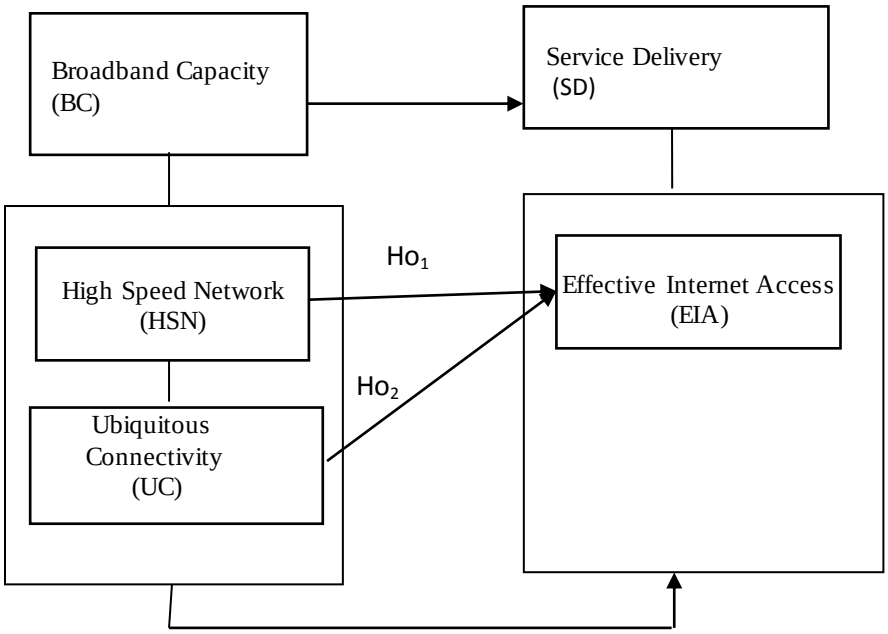

Figure 1: Operational Conceptual Framework of the Relationship between Broadband Capacity and Service Delivery of Telecommunication Firms in Rivers State

Source: Survey Data, 2017

Research Hypotheses

Based on our research framework, the below hypotheses are formulated:

$H0_1$: There is no significant relationship between high speed network and effective internet access

$H0_2$: There is no significant relationship between ubiquitous connectivity and effective internet access

Review of Relevant Literature

Theoretical Framework

The Information Technology (IT) Revolution which was well underway by the end of the 1980's began to have a direct impact on how we learn, where and when we work, how we communicate, how we take our recreation, how we market, buy and sell things and how we organize our lives. This period of dramatic change also featured the emergence of new industries and organizations and the demise of many traditional organizational structures. None of us understood all the implications at the time but we were experiencing a very basic paradigm shift; from market place to market space, from passive media to interactive media and from closed networks to an internet-worked world. (TAT Cables World Telecommunication Development Report 1997).

By the early 1990's the quality of Telecommunications Infrastructure had been identified as one of the critical criteria determining where and when corporations made decisions about relocating business activities or simply investing in new operations. Usually, making such decisions were determined by issues such as political stability, availability of skilled workforce, availability of raw materials, transport infrastructure and the cost of labour. Gallop Group (1994), in a survey of global corporations, the quality of Telecommunications Infrastructure appeared on this list for the first time (Bryce, 2010). It was deemed to be the third most significant factor after political stability and skilled workforce. Economists were at the same time beginning to expand the sacred list of the factors of production to include Information. The reality was emerging that plentiful supplies of land, labour, capital and enterprise would not guarantee global competitiveness if information services were second rate.

The basis of the now famous IT Revolution of the 1980's was a matter of speed, cost reductions, energy requirements, miniaturization and reliability. The speed of calculation and recall improved at a phenomenal rate. Cost reductions were quite extraordinary and made it possible for small businesses, schools and householders to own computers (Bryce, 2010).

Before the arrival of the Internet and Packet-Switching Technology, which allows voice to ride over Internet Protocol systems (VoIP) designed for data networks; speech, telegraph, paging and fax systems were run on legacy systems and networks which were basically narrow-band systems. The arrival of Packet-switching techniques and the Internet resulted in a sharp and continuous increase in demand for converging data networks supporting data, voice, fax and video services, which led to the development of broadband technologies in both satellites and terrestrially based networks (i.e DSL over legacy telephone networks and fiber-based networks, which led to the introduction of multi-core fibres).

Broadband is widely used to describe high-speed access supports today's converged networks of not only voice or data as well as multimedia traffic of high-quality voice, data, graphics, streamed videos and video conferencing. High speed mobile technologies are becoming increasingly important particularly as services and applications in broadband delivery.

However, second generation mobile technologies and their improved versions such as GSM and GPRS (2.5G), cannot be considered broadband, when their download rates reach only 60 to 80 kbps, well short of the OECD threshold. EDGE/Evolved EDGE, W-CDMA (UMTS), CDMA-2000 3G, TD-SCDMA (Chinese National Standard), HSPA and LTE mobile technologies can deliver well above the 256 kbps OECD threshold with higher speed throughputs. Hence, governments of Developing countries and their communication regulators should encourage mobile operators to roll out 3G networks rather than investing huge capital sums to upgrade 2G systems. (Lawal, Ahmed, Rufai, Chatwin, Young, 2013)

Broadband Capacity in Nigeria

Broadband has different meanings for different people depending on whether their focus is in terms of capability, capacity, speed, etc. The acceptable baseline for broadband all over the world is the definition of broadband given by The Organization for Economic Co-operation and Development (OECD, 2009) which defines broadband as a service (not a technology) that can provide an Internet speed or data transmission rate at least 256 kilobits per seconds (kbps) in at least one direction (Agustin, 2009). According to Singer (2003), broadband should have sufficient two-way transmission capacity and speed to allow interactive high-quality full-motion video, data and voice applications simultaneously via one "pipe."

The national broadband plan in Nigeria was developed to promote pervasive broadband deployment, increase broadband adoption and usage, and ensure availability of broadband services at affordable rates. These are aimed at maximizing the socio-political and economic benefits of broadband to the people. The national broadband plan was also targeted at achieving a fivefold increase in internet and broadband penetration (Okonji, 2016).

It is for these reasons that the federal government inaugurated the presidential committee on broadband, having widely acknowledged that broadband is an essential right and basic utility for societal transformation and development and that prioritizing the rapid spread of mobile broadband will ensure that all Nigerian citizens enjoy world class wireless broadband as a basic access medium for broadband.

Aside the listed benefits, broadband, if well implemented, can stimulate growth of Small and Medium Enterprises (SME's) and cooperatives, and it could enhance both backward and forward economic linkages. In the area of employment generation, broadband networks have been shown to have a direct impact on employment. It is however the use of these networks towards growing economic activity and enhancing social development, that unlocks the potential increase in employment.

The operators have done well to heavily finance their submarine cable for broadband connectivity from Europe to the shores of Nigeria, but government is yet to build a national backbone infrastructure that will transmit broadband capacity from the shores to the hinterland, thus putting unnecessary burden on the cable operators to begin to seek alternative means at their own expense, to transmit broadband capacity, a situation that has resulted in slow broadband penetration in the country (https://www.thisdaylive.com/index.php/2016/04/14/entrenching-broadband-policy-in-nigerian-telecoms-sector/).

MTN for instance, had since 2012, berthed its MTN WACS submarine cable at the shores of Lagos, which has 14 landing points, with 12 along the western coast of Africa and two in

Europe (Portugal and England). It also has bandwidth capacity of over 5.12 Tbps and spans 14,530 km. The cable is made up of four fibre pairs and is 14,530 km in length, linking from Yzerfontein in the Western Cape of South Africa to London in the United Kingdom. The landing points are South Africa, Western Cape, Namibia, Swakopmund, Angola, Sangano near Luanda, Democratic Republic of Congo, Muanda, Republic of Congo, Matombi, Cameroon, Limbe, Nigeria, Togo, Ghana, among others (https://www.thisdaylive.com/index.php/2016/04/14/entrenching-broadband-policy-in nigerian-telecoms-sector/).

Main One submarine cable, which was launched in Lagos on July 22, 2010, completed its upgrade and has boosted its capacity to 100G wavelength on its submarine cable network between Nigeria, Ghana and Portugal. In 2015, it completed connectivity between Nigeria and Cameroon and the submarine cable currently delivers high speed bandwidth of 1.92 Tbps and has been proven to provide capacity of at least 4.96 Tbps. The Glo 1 submarine cable is a 9,800 km long cable from Lagos to UK, connecting 17 African and European countries to UK. It has landing points in Nigeria, London, Senegal, Morocco, Spain, Bude, UK and Lisbon in Portugal. It also has 16 branching units to connect countries in West Africa. The submarine cable has a minimum capacity of 640 Gbit/s and total capacity of 2.5 Tbit/s. What MTN and other cable operators need, is a national backbone infrastructure, which must be provided by government to transmit broadband capacity from the shores of the country to the hinterlands.

Service Delivery

In essence, service effectiveness is described as the capability of producing a specific, desired effect, or in other words "getting the right things done" (Druker, 2004). In a services management context, service delivery system is defined as "the structure (facilities, equipment, etc.), infrastructure (job design, skills, etc.) and processes for delivering a service" (Goldstein et al. 2002). From these definitions it becomes apparent that SDS effectiveness is related to the degree to which a system's objectives have been achieved and therefore, an effective SDS is the one that is capable of delivering the outcomes for which it was originally designed and developed (Kingman-Brundage, 1991). Service delivery systems normally should be able to produce several positive outcomes, ranging from reduced costs, increased availability of efficient operations, improved service quality and optimum customer experience (Walley and Amin, 1994).

Notably, many scholars have argued that the main aim of a service delivery system is to bridge the gap between customer expectations and customer experience (e.g. Lovelock, 1984; Armistead, 1990). The SDS is in fact the medium through which service employees attempt to meet the quality standards set by the management, in order to close the third gap of services quality, which refers to the gap between service quality specifications and the actual service delivery (Parasuraman et al, 1985). Therefore, an effective SDS must lead to high levels of service quality both in terms of actual technical quality and it terms of customers' perceptions, since customers are far more likely to evaluate a service positively when the company effectively provides the value promised to them (Zeithaml et al, 1988; Parasuraman et al, 1991).

In looking at what has been achieved with broadband services in the Nigerian telecom sector today, the modest success recorded so far has been with several initiatives that rode on the back of the success of the digital mobile services in Nigeria. These have encouraged huge

investment and subsequent landing of several high bandwidth capacity submarine cable systems (Bassey, Okoro, and Okon, 2016; Bassey, Okon, & Umunnah, 2016). However, ineffective distribution and transmission of the available broadband Internet access at more affordable end-users' prices have been a major challenge and a barrier to faster realization of the desired broadband boom in Nigeria

Measures of Service Delivery

Effective Internet Access

Internet access is the process that enables individuals and organizations to connect to the Internet using computer terminals, computers, mobile devices, sometimes via computer networks. Once connected to the Internet, users can access Internet services, such as email and the World Wide Web. Internet service providers (ISPs) offer Internet access through various technologies that offer a wide range of data signaling rates (speeds).

Consumer use of the Internet first became popular through dial-up Internet access in the 1990s. By the first decade of the 21st century, many consumers in developed nations used faster, broadband Internet access technologies. By 2014 this was almost ubiquitous worldwide, with a global average connection speed exceeding 4 Mbit/s. "Akamai Releases Second Quarter 2014 'State of the Internet' Report".

Broadband Capacity and Service Delivery

Broadband networks are widely considered to be the foundation of the digital economy. Often described as the infrastructure of the 21st century, broadband connectivity is understood to be central in enabling individuals to engage in an information society, and in contributing to economic productivity. The Broadband Commission for Digital Development goes so far as to say that broadband connectivity is becoming 'the foundation of public services and social progress' in developed and developing nations (Broadband Commission for Digital Development 2010a).

The wide super-speed Internet service of Airtel has generated some goodwill for the company and as reported by PREMIUM TIMES, the Nigerian Communications Commission (NCC) on Wednesday, April 17, 2013 said Airtel Nigeria Limited met all targets in Key Performance Indicator (KPI) measurements carried out last December on all telecommunication network operators in the country. This is great news but the company should put more effort in extending its coverage to remote areas because many villages are yet to enjoy full Internet coverage of the network.

Moreover, other major network operators like Globacom and MTN should put more efforts in expanding their coverage. Globacom, the only network owned by a Nigerian is trying at its capacity but more efforts are needed. Many won't be surprised if I say MTN is the worst telecom operator in terms of service delivery. No wonder the Nigerian Communications Commission recently fined the company for failing to meet the required standard. Despite the fact that MTN seems to have the largest number of subscribers, the company has failed to improve its services. Rather, it has continued to bombard its customers with unimaginable promos like 'Win an Aeroplane' among others.

High Speed Network and Service Delivery

The term, high-speed, associated with networking, requires qqualification. In any two networks that utilize the same media, even if one is labelled high-speed while the other labelled low-speed, the actual speed with which the bits are transmitted, is identical and it equals the speed o propagation of EM transmission in that medium, including electrical, electronic, or

optical signals. However, a network may set a limit on the frequency with which a user may insert bits into the network. Thus, contrary to ordinary perception, the term, high-speed, does not refer to the actual speed of a single bit, rather to the time elapsed for a collection of bits, viewed as an atomic unit and referred to as a frame, packet or cell, between its launch at the source point and the eventual arrival at the destination (Pillalamarri, 2005).

The residents of Port Harcourt, the capital of Nigeria's treasure Base, Rivers State, can now browse the internet at the fastest speed available, as Nigeria's foremost Internet Service Provider, Spectranet, launched and activated the 4G Long-Term Evolution (4G LTE), a service that promises to redefine the life style of residents and business owners in the state. With the launch of the 4G LTE, a standard that defines wireless communication of high-speed data for mobile phones and data terminals, Spectranet has provided Port Harcourt business owners and residents faster, reliable and affordable internet service that could lift them above current challenges caused by infrastructure deficits. Speaking on the launch of the service in the Rivers State capital, Chief Executive Officer (CEO), Spectranet 4G LTE, David Venn, said: "Today marks another milestone in our service delivery, as we bring faster, reliable and affordable internet service closer to you for a better browsing experience (Spectranet Nigeria, 2016). Also, according to their media campaigns the Airtel network now supports HSPA+ with a capacity of up to 42Mbps download speed. This is superfast internet to enable you access broadband services for seamless video streaming, watching web TV, fast internet downloads, gaming, and web 2.0 internet browsing (Okafor, 2016).

Consider the following example. Although, at birth in the late 1970s, the Arpanet was viewed as a high-speed network, its present day incarnation, the Internet, is no longer considered high-speed. Introspection reveals that since the 1970s, while the average distance over which users communicate has increased, the number of users and the traffic volume and diversity have increased dramatically. Logically, therefore, the distance and the number and nature of users must play a role in determining the high-speediness of a network (Pillalamarri, 2005).

Ubiquitous Connectivity and Service Delivery

Achieving ubiquitous mobile broadband coverage is currently seen as not feasible by major mobile operators as direct investment in local infrastructure may be uneconomic. For e.g. in the UK, the major telecom operators claim there is 90% or more 3G coverage (Retrieved from http://www.bbc.co.uk/news/business-14574816, August 2011), however the recent BBC conducted crowd-sourcing survey from 44,600 volunteers showed that 3G coverage is far more patchy than mobile operator coverage maps indicating that there are still many 'not-spots' – this ironically includes major towns and cities. Current wireless and mobile access networks have been developed in a fragmented way. In the future a great deal of flexibility is needed in terms of how networks are constructed and operated, how spectrum is used most efficiently between several operators and technologies for managing such flexibility. Such advances can help users with cellular coverage to attain higher speeds, but do not extend coverage.

Achieving ubiquitous coverage requires policy changes within telecom regulators to mandate the need for providing 100% mobile broadband coverage in return for selling 4G spectrum licences to mobile operators – Ofcom in the UK has a mandatory coverage obligation policy for 4G operators to provide coverage to least 98% of the UK population by the end of

2017 (Assessment of future mobile competition and award of 800 MHz and 2.6 GHz, Ofcom, 2012). The workshop discussed resource pooling as a potential remedy until the notion of 100% coverage becomes a reality.

Methodological Perspectives

The objective of the study was to investigate on the relationship between broadband capacity and service delivery of telecommunication firms in Rivers State. This study adopted quantitative research design using a survey method. The accessible population of the study consists of management staff (Operations, managers & supervisors) of the 4 prominent telecommunication firms in Port Harcourt which includes (MTN, GLO, ETISALAT, AIRTEL). A total of 20 questionnaire were purposively sampled to each of the 4 selected telecommunication firms for convenient reasons. In other words, sampling was not needed. A total of eighty (80) copies of the questionnaire were administered to the respondents, and after retrieval and data cleaning, seventy-six (76) copies were used for analysis. The Spearman Rank Correlation statistical tool was used to analyze the raw data with the aid of Statistical Package for Social Sciences (SPSS). In this study, broadband capacity is our independent variable with its dimension as high speed network and ubiquitous connectivity by Singer (2003), while our dependent variable is service delivery which was proposed by (Druker, 2004) with its measures as effective internet access. The collected raw data were tabulated and evaluated with the application of the 5-point Likert scale (Walton, 1975).

Analysis and Results

The study data was analyzed based on its aim, to examine if there is a significant relationship between these dimensions of broadband capacity cost and the measures of effective service delivery, and the variation of such relationship. The data from the analysis is showed below -while conclusion was made based on the findings.

Hypothesis One

$H0_1$: There is no significant relationship between high speed network and effective internet access

Table 1: Statistical Analysis for Hypothesis One

SPEARMAN CORRELATION SHOWING RELATIONSHIP BETWEEN HIGH SPEED NETWORK AND EFFECTIVE INTERNET ACCESS

			High Speed Network	Effective Internet Access
Spearman's rho	High Speed Network	Correlation Coefficient	1.000	.766**
		Sig. (2-tailed)	.	.
		N	76	76
	Effective Internet Access	Correlation Coefficient	.766**	1.000
		Sig. (2-tailed)	.	.
		N	76	76

**. Correlation is significant at the 0.01 level (2-tailed).

The research hypothesis one states that there is no significant relationship between high speed network and effective internet access. As shown in the statistical testing of hypothesis one, a significant relationship was revealed to exist between high speed network and effective internet access, this is shown in the correlation (r) value of 0.76 (76%). The null hypothesis one was therefore rejected and the alternative hypothesis one accepted. Thus, there is a significant relationship between high speed network and effective internet access. This implies that the higher the speed of the network the more accessible and effective the internet can be reached by the consumers. In submission of Cidon et al. (1995) claim that the new high-speed networks will possess higher transmission and switching speeds since they will be hardware-based, compared to the current software-based processing times. They propose new models for distributed algorithms that will differentiate between switching and processing times, thereby isolating the hardware and software functions.

Hypothesis Two

$H0_2$: There is no significant relationship between ubiquitous connectivity and effective internet access

Table 2: Statistical Analysis for Hypothesis Two
Spearman's Correlation Showing Relationship Between Effective Internet Access

			Quality Control	Profitability
Spearman's rho	Ubiquitous Connectivity	Correlation Coefficient	1.000	.883**
		Sig. (2-tailed)	.	.
		N	76	76
	Effective Internet Access	Correlation Coefficient	.883**	1.000
		Sig. (2-tailed)	.	.
		N	76	76

**. Correlation is significant at the 0.01 level (2-tailed).

The research hypothesis two states that, there is no significant relationship between ubiquitous connectivity and effective internet access. As shown in the statistical testing of hypothesis two (see appendix B), a significant relationship was revealed to exist between ubiquitous connectivity and effective internet access, this is shown in the positive correlation (r) value of 0.88 (88%). The null hypothesis two was thus rejected and the alternative hypothesis two accepted. Therefore there is a significant relationship between ubiquitous connectivity and effective internet access. This implies that the level of internet accessibility and stability is determined by the capacity of the bandwidth in terms ubiquitous connectivity. For access to the Web a consumer needs a computer or TV with an Internet connection and knowledge of surfing the Internet. Li, Kuo, and Russel (1999) showed that perceived accessibility has a positive impact on online buying behavior.

Conclusion and Recommendations

Broadband penetration is a core driver of economic development, driving innovation, directly impacting on all sectors of the economy/businesses, enabling the establishment of more SMEs, and creating social advancement. It also directly empowers young entrepreneurs by increasing their access to information and eliminating frustrations associated with Internet access. The telecommunication subscribers will continue to be satisfied as long as the internet service provided is effective and of high quality standard. The high-speediness value may constitute a desirable, target network operating point, which the network provider may choose to sustain during network operation by imposing suitable controls. The fundamental attributes represent a holistic view of network, revealing the most important issues and how they are linked to each other. Also, having a widespread internet connectivity that covers a wider range of network service to boost the data consumption

Recommendations

Consequent on the following conclusions above, the researcher therefore recommends that;

i. The problems of interconnectivity needs to be addressed because operators, especially those with large market share are using it as advantage to monopolize the market either by restricting calls from other network providers or increase the cost of accessing them.
ii. The government, at all levels and their agencies, need to see telecommunications operators as partners in progress, and the National Assembly should also pay attention to stakeholders' call for telecommunications infrastructures to be declared critical national infrastructure.
iii. It is very important that broadband becomes a universal service at very low cost to the people because of its impact on education and health. Cheaper Internet access will reduce the cost of doing business in Nigeria, thereby giving Nigerian entrepreneurs a competitive edge.
iv. Government should implement policies that will promote innovation, discourage monopoly and improve affordability

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