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Improving Service Delivering of Telecommunication Industry: A Panacea to Economic Challenges Facing Nigeria

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Abstract

Telecommunication is an important part of modern society as its role on economic and social development cannot be over emphasized. In order to improve its service to the citizenry, licenses were issued to network provider in year 2000 to complement the effort of NITEL. This action thus, has led to the increase in revenue generation of the nation, creation of more job for its citizenry, improvement in educational sector; as distance learning is now possible and cost effective, it has also facilitated long distance consultation; easing the cost of providing medical care throughout the nation. Data were collected online to assess the operational performance of the four major network providers in Nigeria which includes: Mtn-Ng, Glo Ng, Airtel, and Etisalat. It was observed, that, most of the network are using High Speed Packet Access (HSPA) which uses Code Division Multiple Access (CDMA) technologies which has led to improved Quality of Service (QoS) delivering and with over loading of the cell capacity being the major causes of network failures experienced in some of the networks. It was suggested that for better performance, the network providers should upgrade their cells capacity to 4th Generation Long Term Evolution (4G LTE.).

Keywords: *CDMA, Telecommunication, Economics, Quality of Service, Network Provider, EDGE*

1. Introduction

We communicate when we talk to another person and exchange information, for instance, transferring information from a sender to a receiver through a medium in which the communicated information is understood; by both the sender and the receiver, (Kolawole, Adegboyega and Temikotan, 2012). Regardless of how communication is conveyed and viewed, content and form make messages that are sent towards a destination; hence Quality of Service (QoS) is very essential in communication.

Encompassing definition of telecommunication by Kolawole, (2009) as cited in Kolawole et'al, (2012) is any transmission, emission, or reception of signs, signals, writings, images, sound or information of any nature by wire, radio, visual or other electromagnetic systems. Telecommunication is an important part of modern society. In 2006, estimates placed the telecommunication industry's revenue at $1.2 trillion (USD) or just under 3% of the Gross World Product as reported by Igbokwe, (2009).

Its importance on economic and social development cannot be underestimated. Its direct effect according to Igbokwe, (2009) includes:

- Modern telecommunication provide a cost effective and time efficient medium for accessing and diffusion of new ideas and knowledge which has been identified by economists as key elements for stimulating economic growth rate.

- Availability of telecommunication services help to improve information flow between rural and urban regions and help reduce the gap of economic development between them.

- While telecommunication services to some extent a low cost substitute for handling, they can help business by increasing the productivity of traditional inputs such as capital, production, labour and materials and thus increasing the efficiency of entire production process. Besides its direct contribution to end users, telecommunication network and their use generate significant spillover effects in other sectors of the economy. Once the telecommunication infrastructure is built in any nation, it is available to all sectors of economy and some of its benefits includes; the lowering of transaction costs, the ability to search widely or the ability to control a greater pan of production and organization activities.

Apart from its positive impact on the nation's economy, telecommunication also facilitates emergency medical assistance; long distance consultation; and quality assurance to remote locations; easing the cost of providing medical care throughout the nation. Improvement in educational sector has also been recorded, with the advent of information communication technology (ICT); making distance learning possible and cost effective.

Despite its positive impact on the citizenry, resulting from its recent boom; telecommunication industry is still faced with the problem of high tariffs, poor quality of service which includes dropped calls, poor voice signal quality and lack of adequate interconnectivity, (Ekejiuba,

Adebayo and Adeoye, 2015). These problems are due to network congestion resulting from inadequacies of time division multiple access (TDMA) and frequency division multiple access (FDMA) which was used, whereas Code Division Multiple Access (CDMA) allows several users to share a band of frequencies without undue interference between the users by employing spread spectrum technology and a special coding scheme(where each transmitter is assigned a code).

For decades the telecommunication market in Nigeria was dominated by, Nigeria telecommunications (NITEL), a government monopoly which began operations in 1985 when the Nigerian external telecommunications and the telecommunications division of the post and telegraphs (P&T) department were merged, (Igbokwe, 2009).

Although deregulation of the telecommunication sector in Nigeria began in the late 1990s with 11 companies given license to provide fixed-line services to end consumers (so called "last mile service"), it was not until the arrival of mobile phone operators in 2000 that the Nigeria telecommunications market took off, (Igbokwe, 2009).

At a time the number of mobile phone subscribers surpassed the number of fixed lines and year – on – year growth of over 40% saw the Nigerian telecommunications market emerge as the most vibrant in Africa in 2008 with close to 60 million digital mobile subscribers and just under active 1.5 million fixed lines (Igbokwe, 2009). Industry statistics as at January 2015 shows that the figure of connected lines on GSM networks has jumped to 138 million, (IT & Telecom Digest, 2015). Nigerian Communications Commission, (2015), has the total number of the subscribers as of October, 2015 as 146,486,786.

The Nigerian telecommunication sector is one of the better performing sectors of the Nigerian economy and one of the fastest growing employers of labour in the country. As of 2004, the sector had an impact of creating 5000 jobs directly and more than 400,000 indirectly. Its rapid growth has seen some project that the industry is worth 10 billion US$ in 2010, (Igbokwe, 2009).

However, Pasi and Kimmo, (2006), according to Ekejiuba, *et'al* (2015) stated that improving the network coverage tends to diminish the network capacity, considering the fact that most valuable and limited resources of the GSM is the available frequency spectrum which limits the system capacity.

Global system for mobile communication (GSM) operation in Nigeria has many network failures and this is due to the competition among operators to acquire more subscribers (Ekejiuba, *et' al*, 2015). In Nigeria for instance, MTN provides network coverage to 88.8% of Nigeria land mass, (MTN, 2014). The individual network subscribers are as follows: Mtn 62,813,111; Glo 31,256,677; Airtel with 29,564,766 and Etisalat having 22,853,232 giving a total of 146,486,786 subscribers in Nigeria (Nigerian Communications Commission, 2015). Through different marketing strategies, more subscribers are being added to the different networks without considerations to the available infrastructures. Consequently, on the part of the subscribers, the euphoria of owing a phone and accessing the internet is gradually giving way to complaints associated with network failures which includes: drop calls, blocked calls, poor voice clarity, call jamming and network congestions, (Ekejiuba, *etal.* 2015).

Since invention of telephone, there has been attempts to get rid of the long outstanding problem of network dropped calls and busy tone signals which are marks of congestions in telecommunication traffic (Okereke, Akinsanya and Alake, 2007). Efforts continued, but in vain, due to the natural disability of the time and frequency sharing existing technologies, until the invention of CDMA in 1996. CDMA uses spread-spectrum technology to minimize the problem.

Using spread-spectrum technology allows for the signals to be transmitted over a wide spectrum
of the electromagnetic spectrum, (Mobile Device Investigations Program, 2015).

CDMA is a channel access method used by various radio communication technologies. CDMA is an example of multiple access where several transmitters can send information simultaneously over a single communication channel, thus allowing several users to share a band of frequencies without undue interference.

CDMA is used as the access method in many mobile phone standards such as cdmaOne, CDMA2000 (the 3G evolution of cdmaOne), and WCDMA (3G standard used by GSM carriers), which are often referred to as simply CDMA .

Area of Applications of CDMA

- One of the early applications for code division multiplexing is in the Global Positioning System (GPS). This predates and is distinct from its use in mobile phones

- The Qualcomm standard IS – 95, marketed as cdmaOne

- The Qualcomm standard IS – 2000, known as CDMA2000, is used by several mobile phone companies, including the Globalstar satellite phone network

- The UMTS 3G mobile phone standard, which uses W – CDMA

- CDMA has been used in the OmniTracs satellite system for transportation logistics.

Network Types Used by Various Cellular Network Providers

EGDE: Enhanced Data (tares for) GSM Evolution. EGDE is an enhancement to 2nd generation (2G and 2.5G) GSM software upgrade allowing for data transfer and web browsing at near 3G speeds,(Acronyms demystified, 2015).

UTMS: Universal Mobile Telecommunication System, UTMS is 3rd Generation (3G) technology that is commonly called W-CDMA (Wideband CDMA). UTMS delivers faster data rates than EGDE due to how the data is coded and the spectral bandwidth used.

HSPA: High Speed Packet Access. HSPA is another 3rd generation (3G) technology based on UTMS standards offering faster data download speeds at the cost upload speeds. The HSPA family of technologies is quite large, covering High Speed Download Packet Access (HSDPA), High Speed Uplink Packet Access (HSUPA), and Evolved High Speed Packet Access (HSPA+)

HSPA+: Evolved High Speed Packet Access, HSPA+ works like a turbo boost for UTMS/HSDPA devices that help them reach 4th Generation (4G) technology speeds.

LTE: Long-Term Evolution, LTE is a member of the family of 4th Generation. LTE networks are fast-providing peak speed of 300Mbps deployed in U.S.A. by Verizon and AT&T and in Canada.

GPRS: General Packet Radio Service

CDMA a Veritable Solution to Network Failure

Military applications including guidance and communication systems were designed using spread spectrum because of its security and resistance to jamming. Asynchronous CDMA has some level of privacy built in because the signal is spread using a pseudo-random code, this code makes the spread spectrum signals appear random or have noise-like properties. A receiver cannot demodulate this transmission without knowledge of the pseudo-random sequence used to encode the data. CDMA is also resistant to jamming. The jammer can either spread its energy over the entire bandwidth of the signal or jam only part of the entire signal (code division multiple access, Wikipedia, the free encyclopedia, 2015).

CDMA Bandwidth

Bandwidth is extremely limited, scarce and expensive thus a great impediment to data communications. In spread spectrum techniques, the frequency is spread; more bandwidths are created as such more transmitted bits per second hertz are enhanced. CDMA can also effectively reject narrow band interference. Since narrow band interference affects only a small portion of the spread spectrum signal, it can easily be removed through notch filtering without much loss of information. Convolution encoding and interleaving can be used to assist in recovering this lost data. CDMA signals are also resistant to multipath fading. Since the spread spectrum signal occupies a large bandwidth only a small portion of this will undergo fading due to multipath at any given time.

Furthermore, the invention of high Speed Packet Access (HSPA) has increased the downlink and uplink speeds, the use of this application and other activities especially where data is shared between users. As the applications continued to rollout, the already existing ones has made CDMA very attractive in commercial applications forming strong base for the future generation communication.

Rake Receiver

Some CDMA devices use a rake receiver, which exploits multipath delay components to improve the performance of the system. A rake receiver combines the information from several correlators, each one tuned to a different path delay, producing a stronger version of the signal than a simple receiver with a single correlation tuned to the path delay of the strongest signal.

Frequency Reuse

Frequency reuse is the ability to reuse the same radio frequency at other cell sites with a cellular system. In the FDMA and TDMA systems, frequency planning is an important consideration. The frequencies used in different cells must be planned carefully to ensure signals from different cell do not interfere with each other. In a CDMA system, the same frequency can be used in every cell, because channelization is done using the pseudo-random codes. Reusing the same frequency in every cell eliminates the need for frequency planning in a CDMA system.

CDMA also exhibits roaming ability, that is, the ability of a signal to move long distance for a long time even through other networks interconnecting users or accessing its destinations thereby allowing wider coverage. CDMA has no in- built limit in coverage; hence its capacity is not comparable with FDMA and TDMA.

Hand Off

Since adjacent cells use the same frequencies, CDMA systems have the ability to perform soft hand offs. Soft hand offs allow the mobile telephone to communicate simultaneously with two or more cells. The best signal quality is selected until the hand off is complete. This is different from hard hand offs utilized in other cellular systems. In a hard hand off situation, as the mobile telephone approaches a hand off, signal strength may vary abruptly. In contrast, CDMA systems use the soft hand off, which is undetectable and provides a more reliable and high quality signals.

In CDMA also, it is possible for the power to be controlled from the base station and this is an added advantage. The flexibility to borrow capacity from neighboring cells is beneficial for good traffic management.

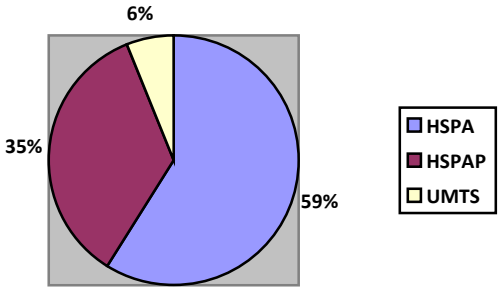
2. Research Methodology

In this study, online data was collected to evaluate the operational performances of Mtn – Ng, GloNg, Airtel and Etisalat which are the major cellular networks in Nigeria. The parameters assessed were average download speed, average upload speed, average latency, network reliability and the network types used by each cellular network

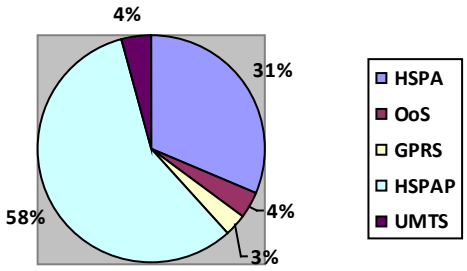
Table 1: Download Speed for the Cellular Networks.

S/N	Network	Average Download Speed (Mb/s)	Average Upload Speed (Mb/s)	Average Latency (mS)	Network Reliability (%)
1.	Mtn- Ng	0.9	0.2	633	83
2.	GloNg	0.6	0.3	703	85
3.	Airtel	0.8	0.3	702	77
4.	Etisalat	2.1	0.3	609	86

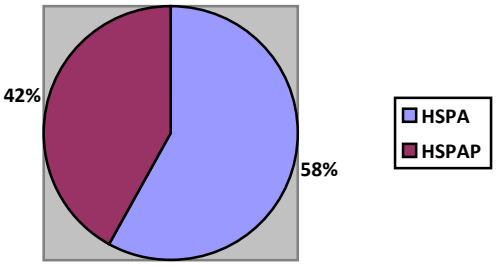
Source: opensignal, 2015



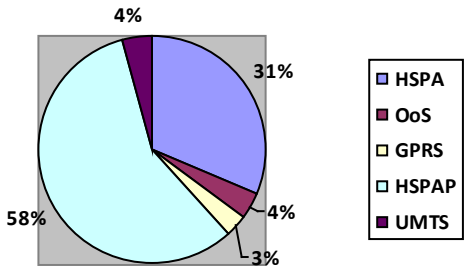
1a: Network Type Used by MTN



1b: Network Type Used by Glo



1c: Network Type Used by Airtel



1d: Network Type Used by Etisalat

Fig 1.0 Pie Chart showing network types; Source: Opensignal, 2015

Table 2; The Best Network in Nigeria

S/N	Cellular Network	No. of Votes	Percentage Votes
1.	Mtn Ng	53	13.8
2.	Glo Ng	80	20.8
3.	Airtel	69	17.9
4.	Etisalat	148	38.4
5.	None	35	9

Source: Nairaland, 2015

3. Result and Discussion

Table 1 shows the download speed of the four major network provider in Nigeria. It is observed that the average download speed of three of the network providers have an average 3G download speed which is worse than the global average of 1.8Mb/s with exception of Etisalat whose average download speed is greater than the global average down load speed. This is because the number of Etisalat subscribers, are within its cells capacity unlike the other networks whose cells capacity is overloaded.

Excellent network reliability was recorded by all the networks, as shown in table 1. The reason being that, the "3G GSM" used by these networks is actually a CDMA technology called WCDMA (Wideband CDMA) or UMTS as shown in figure 1. WCDMA requires wider channels than older CDMA systems, but it has more data capacity,

The opinion poll sourced from Nairaland,(2015),as shown in table 2 shows that Etisalat is considered to be the best network polling a total of 148 votes out of 385 opinions received which is 38.4% of the total opinion and with Mtn Ng coming last with 53 votes, which represents 13.8% of the total opinions . This is as a result of outburst of its subscribers.

4. Conclusion

CDMA tolerates other technologies as interface for more enhanced performance and signal security is one of its leading characteristics over other technologies. Just as the first generation revolutionized the way we communicate by providing mobile voice service, also with 3G making use of CDMA provides sufficient bandwidth for better QoS, thus improving the economic and social development of the nation.

5. Recommendation

Based on the findings in this aer it is therefore recommended, that for better performance in terms of QoS the network providers should upgrade their systems to 4G LTE. Also, the government and NCC should create enabling framework for more network investors so as to reduce the tariff and more income generation.

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