e-Learning System Integrity and Human Development: Tackling Observed Spectrum of Doubts in National Development

Intégrité du système d'apprentissage en ligne et développement humain : s'attaquer à la palette de doutes relevés dans le développement national

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Abstract

ICT has become the bedrock of the much-anticipated accelerated development of people and nation across the globe. Viewing the role of ICT and human development as key components and catalysts of national development, this paper interrogates barriers that pertains to e-learning system integrity that are capable of making the attainment of the promised gains on national development an impossible task It is a common knowledge that in advanced countries with well-developed infrastructures, these promises are already becoming realities. Specifically, in the education and human development sector, much advancement has been procured that moved education beyond the Face to Face model with dual-mode institutions becoming commonplace. It is also a fact that while such gains can be replicated in all human communities worldwide, there are limitations that serve as obstacles to such aspiration in some climes. Deploying both content analysis and survey methods to assess the experience of citizens and users focusing on the infrastructural correlates of the ICT wonders, it was realized that some developing countries are already aspiring to develop complete online mode as alternate model to the traditional method. But, despite the level of knowledge available and availability of global assistance in development of expertise and frameworks, there still exist some spectrum of doubts about this optimism in Nigeria. It is noticed that while the stakes are high, infrastructural and systemic challenges posing serious doubts about realization of this aspiration are ever-increasing. This paper therefore submits that unless certain observed drawbacks, which largely bothers on power and internet service infrastructure, local technological expertise and costs as components of the wide spectrum of national development are addressed as compliments of the ODL/OERs development, attainment of

*human development by e-learning as catalyst of national development will be
an impossible task.*

Keywords: e-Learning, human development, system integrity, national
development, Nigeria

Résumé

*Les TIC sont désormais au cœur du développement accéléré tant attendu des
peuples et des nations à travers le monde. Partant de l'hypothèse du rôle
incontournable des TICs et du développement humain comme catalyseurs de
développement national, le présent article s'interroge sur les obstacles à
l'intégrité des systèmes d'enseignement en ligne, obstacles capables de freiner
la réalisation des gains promis en matière de développement national. On sait
que dans les pays avancés dotés d'infrastructures bien développées, ces
promesses sont en passe de devenir réalité. Plus précisément, dans le secteur
de l'éducation et du développement humain, suffisamment de progrès a été
réalisés pour permettre de dépasser le modèle en face-à-face, avec pour
conséquence la multiplication d'établissements où l'enseignement bimodal est
la norme. On sait aussi que si ces avancées peuvent potentiellement être
reproduites dans toutes les communautés humaines, il existe des limitations
pouvant faire obstacle à une telle aspiration dans certains pays. A l'aide de
méthodes d'analyse de contenu et de sondage, la présente étude a cherché à
évaluer les expériences des citoyens et utilisateurs et, en se focalisant sur les
corrélats infrastructurels des merveilles des TICs, a pu observer que certains
pays en développement aspiraient déjà à l'enseignement en ligne intégral pour
remplacer le mode en face-à-face. Or, en dépit de l'existence d'un certain
niveau de savoir-faire en la matière et de la disponibilité d'une assistance
mondiale pour le développement du savoir-faire et des cadres nécessaires, des
doutes persistent au Nigéria quant à cet optimisme. On constate que si les
enjeux sont de taille, les défis infrastructurels et systémiques qui font douter de
la possibilité de cette aspiration ne cessent d'augmenter. Le présent article
soutient par conséquent qu'à moins de s'attaquer d'abord aux obstacles
observés qui concernent le manque d'infrastructure énergétique et de réseau
internet, le manque de savoir-faire technologique local, les coûts de la
connexion internet trop onéreux   qui sont partie intégrante du large éventail
du développement national, de les traiter comme des compliments au
développement des FOAD/REO l'objectif d'un développement humain par
l'enseignement en ligne comme catalyseur du développement national risque
de demeurer mission impossible.*

Mots-clés : enseignement en ligne, développement humain, intégrité des
systèmes, développement national, Nigéria

Introduction

From the rationalist optimism, technology generally, and computer in particular, was credited with so much hope on the possibility of aiding human intellect and efforts to advance human and societal development. The increasing revolution and advancement in computer and its ICT supplements therefore represents a turning point in societal development. With ICT, almost all facets of life have become globalised. Knowledge, in particular, has become widespread. Challenges faced by human societies have also become varied and diverse with solutions constantly brewed from every parts of the globe. Developmental problems and solutions are no longer localized. Events and advancement in different part of the globe have become household knowledge in every part of the world.

More importantly, with opportunities for Open Distance Learning (ODL) and Open Educational Resources (OERs), universalism of knowledge is at its peak at no other time than now. Knowledge is offered and consumed by all irrespective of time and location. Barriers issuing from economic and social status are increasingly giving way. The world is at an age when information and education is now commonly available to all, transiting from the traditional mode of face2face education to virtual or online education. Specific hours are now dedicated on radio and television to inform and educate. Other social media are not spared as platforms for offering and receiving new ideas and knowledge. Half a century before now, no one could think an iota of these achievements can be possible; but ICT wonders have availed them. According to Conole (2004), the learning forms and models have been changing during the years. Miller (2004) identified four models of such educational platforms: 1. correspondence study model, 2. telecourse model, 3. open university model, and 4. classroom model; while US **National Center for Education Statistics** (2000) have enlisted varied generation of distance learning in which learning materials are differentiated according to their material base (or means) on which they function.

On development of Open Education in Pakistan, (Shah, Saman and Rehman, 2017) citing and drawing inferences from other studies, attest to the growing opportunity for virtual education. These among others include:

(a) the "ICT in Education Master Plan– 2007" defining the strategies for using ICT in improving student learning, expanding educational opportunities, and developing capacity at all levels (HEC, 2015).

(b) the e-Learning initiatives in Pakistan in the territory level of educational stream include; Virtual University of Pakistan (Sherazi and Ikram 2002, Toor

2005).

(c) Virtual Campus of COMSAT (VCOMSAT, 2015) and

(d) E-Learning stream of Allama Iqbal University (Shah and Saman 2016).

It is on this stance that ICT have now come to occupy pride of place in the task to ensure further enhancement of human capacity as an index of national development. Across the globe, nations are moving from classroom mode of education to dual-mode and some have even completed, to some extent, the transition to online education at the tertiary level. There are now Online Universities across the globe.

These achievements in other part of the globe have not failed to impact upon the desire of researchers and students in sub-Saharan Africa, generally and Nigeria in particular. However, there are diverse limitations bordering on integrity and reliability of components of the ICT wonders which still constitute major cause for concern in the move towards virtual education. The goal of this research therefore is to assess how these streams of limitations impact on human development efforts in Nigeria, focusing as a pilot study the experience of students in one of the campuses of Osun State University, Osogbo, Nigeria.

Literature Review

e-Learning has become a ubiquitous phenomenon of our dispensation. e-Learning is defined as the use of information and communications technology (ICT) in support of educational processes (Kalinga, 2010:7-33). The concern on application of ICT as aid to learning and human development has been on the increase in recent times, with "a lot of results in the field of software engineering concerning how to represent systems and how to build a base for communication between the developer and the user of a software system (Walker et al., 1998). Part of this concern is the development of Learning Management System aimed at assessing the rate of success in the intercourse between technology, education and manpower development. Studies have focused on benefits, risks and cost effectiveness of deploring new technology and media to aid education (Kalinga 2010). To ensure effectiveness, it is necessary to elicit the needs and concerns of users who are expected to deplore ICT as they strive to enhance their manpower skills and education generally. There are studies that examined the context of knowledge production. Gibbons et al. (1994) identified the major changes in the way knowledge is being produced in science and technology, the social sciences and humanities, but in greater depth in science and technology. This study particularly noticed the transition towards multi-disciplinary approach to course content from the single disciplinary approach.

In a model that captures the major stakeholders in deployment of ICT to education, Walsh (2001), in "triple helix" model captures industrial, academic and governmental communities as partners, and recognizes the differing goals and stakeholder communities of the three groups, but stresses the common interest of those groups to provide value to the communities in which they reside. The triple helix concept realizes that the loose links among these three parties needed to be tightened for success. Going by *Figure 1* (Perris 2018), unless these critical stakeholders work in harmony, efforts may not yield desired result no matter how well-meaning.
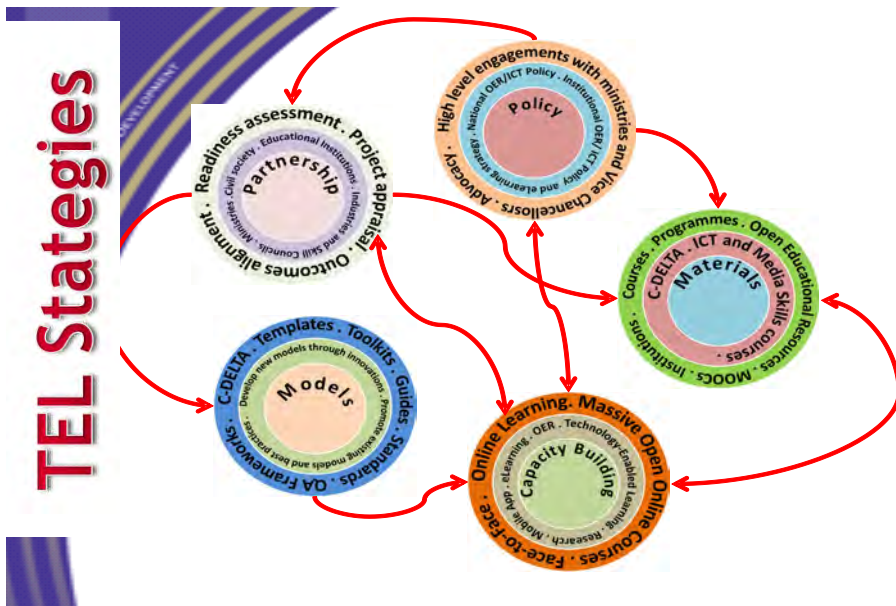

Figure 1: Nexus between Government, ISP Providers,
Quality of Materials and Users
Source: Kirk Perris (2018) TEL-ODL Workshop, under the auspices of
COL-RETRIDAL-NOUN held at Abuja on 11-12 April.

Human development

Concept of human development is not entirely new. It has achieved enormous success among international institutions and western governments (Černetić and Dobrnjič, 2008). Conceptualized as human capital, to economists it is seen as "stock of knowledge", which can be economically evaluated. In a broader definition of human development, Černetić and Dobrnjič (2008) sees it as embracing many trumps, which can be enforced by individual in the market of labor and shown to employee as potential sources of, for example: appearance, good manners, way of thinking and life or health condition. According to OECD, the idea of human capital comprises of knowledge, qualifications, competences and individual characteristics that depicts the creation of personal, social and economic welfare. In some instance, it is seen as capturing physical appearance, good manners, way of life and state of mind or even good medical condition (Černetić and Dobrnjič, 2008).

Applauding the nexus between ICT and education, Černetić et al (2008) noted: it seems that globalization of online education opens fairly big market to firms that offers educational products. World market of online higher educational system in the years between 1996 and 2002 has passed over from 97 million dollars to 3.9 billions of dollars; the market of educational computer programs in the period 1996 to 2000 has passed from 2.3 to 6.2 billion dollars; number of educational CD-ROMs has tripled in the period between 1998 and 2000; and prevailing doctrine in pedagogy and education today has a focus in the theories of human capital or human development. According to Ortiz, Sosa and Diaz (2015), several studies, (Topel 1999, Temple 2001, Krueger and Lindahl 2001, Sianesi and Reenen 2003, Aghion et al. 2009, Pegtas 2014) have all indicated that the nexus between educational pursuit and ICT will manifolds of mutual positive effects leading to development of people and nations. Organisation for Economic Cooperation and Development (2012), World Bank (2012) and World Economic Forum (2013) all have laid emphasis on the role that ICT will assume in education and development in decades to come. It can only be that the new education initiatives by UNESCO **(see UNESCO** https://unesdoc.unesco.org/ark:/48223/pf0000245656 **)** as envisaged by World Education Forum 19 – 22 May 2015 in Incheon, Republic of Korea, will ultimately compel an unprecedent increase in the role that ICT will continue to play in education and development (see Agbu 2019)
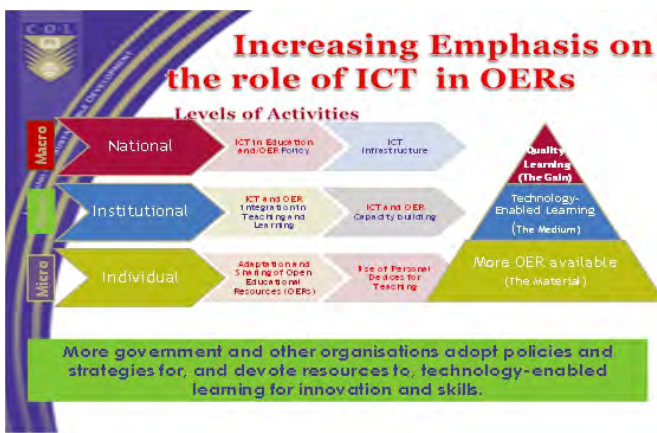

Figure 2: ICT and Open Educational Resource

Sourced and adapted from: Kirk Perris (2018) TEL-ODL Workshop, under the auspices of COL-RETRIDAL-NOUN held at Abuja on 11-12 April.

System Integrity

System integrity as a concept concatenates two terms- system and integrity. System refers to a "collection of organized things or a way of organizing or planning, or a whole composed of relationship among the members". Integrity is defined as "system's state where its intended functions are being performed without degradation or being impaired by other changes or disruptions to its environments" (The Law Dictionary Online, 1910). According to IGI Global (1988-2018), the integrity of a system refers to the capability of performing correctly according to the original specification of the system under various adversarial conditions. *Figures 1 - 4* adapted from Perris (2018) reflects the network of relationship between ICT and education for human and national development. *Figure 1* shows the critical conceptual elements of ODL/OERs. *Figure 2* emphasizes the role of ICT; *Figure 3* reflects the synergy between technology, government policy and stakeholders' capacity; while *Figure 4* depicts the world of ICT, Open Education and National Development. Insights into these *Figures* reflect the need for integrity assessment and accuracy of stakeholders' role in education and national development via technology.

Figure 3: The Place of Technology, Government Policy and Stakeholders' Capacity
Source: Kirk Perris (2018) TEL-ODL Workshop, under the auspices of COL-RETRIDAL-NOUN held at Abuja on 11-12 April.

e-Learning, System Integrity, Human Development and National Development

e-Learning has been adjudged a credible strategy for promoting human development as dynamic agent of national development. How much that can be achieved however depends on the extent of underlining system integrity by which the entire empirical relationship is defined. e-Learning has proved its efficacy in several countries both developed and underdeveloped. In Africa, South Africa and Tanzania are among the countries that have moved ahead in deploring ICT to universalize education and human development. With the emergence of National Open University (NOUN), Abuja in Nigeria, and the efforts it is making in conjunction with Commonwealth of Learning (COL), Canada to ensure capacity development across Nigerian Universities, it is hoped that ICT and ODL will, in no distant future, be able to make remarkable impact in national development. However, a number of factors have been identified to constitute big challenge to attainment of set goals.

Figure 4: The World of Open Educational Resource
Sourced and adapted from: Kirk Perris (2018) TEL-ODL Workshop, under the auspices of COL-RETRIDAL-NOUN held at Abuja on 11-12 April.

In their analysis, Sajko, Rabuzin and Hutinski (nd) to ensure success, there is the need for:

Better time use, decrease of educational costs, more effective learning and learning management from the user's side stimulate the changes in transmission of knowledge and learning, ... the project for developing an e-learning system started in accordance with the user (student) demands and teaching process.

In particular, Sajko et al (nd), identified the benchmarks for deployment of ICT in education to include the following:

1. ability to transmit the existing digital contents (learning materials, student evidences) on the new system (importing from standard MS Windows data)
2. ability to form and manage the learning programs
3. ability to follow promotion of the attendants
4. existence of some specific forms of reports
5. setting up hierarchy of users with determined authority for work on the system
6. support for the different communication forms between mentors and attendants
7. ability to adjust system interfaces and postulates for each user
8. on-line learning performance control from the side of users (self-guided learning)
9. ability to search and examine the learning contents
10. self-checking knowledge ability and examination of the attendants from the side of a mentor

No doubt, if these and other challenges are to be resolved, the extent to which ICT can be regarded as possessing the requisite system integrity to discharge its mandate in education, manpower improvement and national development will remain a factor. However, the above listed benchmarks, as comprehensive as it appears, appeals only to the software component of the ICT-education nexus. It lays little or no emphasis on hardware, equipment, human and environmental factors which are the fulcrum of this research. In certain places, including the area of this study, many of these benchmarks of e-Learning and OERs deployment still remain a debilitating challenge.

Methodology

The methodology covered research design indicating area of study and sampling technique, method of data collection and analysis. The research is meant to assess the integrity of ICT as a major driver of human and national development. This integrity assesses the manner and extent to which ICT supplements are deployed as reliable platform for promotion of formal

education and human development. The components covered in this research include: availability, efficacy, economy, and reliability of **ICT equipment:** <u>mobile phones</u> (though there are others like: television, interactive board and projectors etc, but the emphasis here is on mobile phone handset); **services:** <u>world-wide-web services</u>, **stakeholders**: There are numerous stakeholders accounting for effective functioning of the ICT system- internet service providers, electricity service providers, hardware engineers/servicemen, software programmers, curriculum developers and administrators, network administrators, programme assessors and facilitators. But this study, as a micro attempt, examined the impact of three (3) having direct impact on users- **I**<u>nternet service providers</u>**,** <u>electricity service providers</u>**, and** <u>hardware engineers/servicemen</u>. The research adopted both primary and secondary methods of data collection. The primary data were gathered using purposive random sampling. The method of analysis is descriptive, covering both qualitative and quantitative analysis. However, at this level of investigation, no attempt is made at rigorous generalization until a wider and more in-depth scope is covered.

Area of study, sample population and data collection

As a pilot study aimed at eliciting information from a micromorph segment of the larger consumers of virtual education, with the use of questionnaires, responses were elicited from purposive randomly selected respondents. Secondary data were sourced from extant literature in print and the Internet. As a micro level study, the research population was restricted largely to the community of students, resident within the precinct of non-residential Osun State University, Osogbo, Nigeria, (aka UNIOSUN) (Okuku Campus). The University is a non-residential state-owned University, having six campuses located across the three senatorial districts of the state that is located in the South West Zone of Nigeria. Within the country, this region is regarded as one of the leading regions in education and manpower development. It was the first to have a National University, in the name of University College now University of Ibadan, the Nigerian premier university; first to have a polytechnic, Yaba College of Technology, and the first to have a regional University, University of Ife, now Obafemi Awolowo University, Ile-Ife. Osun state is one of the few States in Nigeria that owned two Universities (one UNIOSUN is fully owned; the other, Ladoke Akintola University, Ogbomoso with its Teaching Hospital located in Osogbo, is jointly owned with a sister state –Oyo state. Aside the main campus of UNIOSUN, the other five campuses are located in suburb towns within the state but each not too far from capital cities of adjoining states: Okuku Campus on the way to Ilorin (Kwara state); Ipetu Ijesha Campus on the way to Akure, the Capital of Ondo State; Ikire Campus on the way to Ibadan, the Capital of Oyo state; these being some of the States with which Osun state shares boundaries. The sites of these mini-

campuses are therefore not entirely without the presence of major urban artifacts/infrastructures. Okuku, the chosen campus for this research is, of all the six campuses, the closest to the State Capital, Osogbo and not too far from the second largest town in Kwara state, Offa, that houses a polytechnic that is now becoming a degree awarding institution in addition to about two (2) other private universities, a college of education, and a college of health technology in nearby towns. It is not too far from two other major towns- one, Iree, having an Osun state owned polytechnic, and another town, Ila-Orangun having a state-owned degree-awarding College of Education. Osun state has one of the highest concentration of private universities in Nigeria: Redeemer University, Fountain University, Adeleke University, Bowen University, Joseph Ayodele Babalola University, Kings University, Oduduwa University, and lately Omidiran University. Osun state parades the necessary index for provision and consumption of higher education and human capital development and therefore exhibits features that attest to some moderately high consumption of ICT services. Aside the state capital, any choice of institution of higher education for a study such as this very well represents the reality of the situation in public-owned universities. The choice of using public owned non-residential university campus for this study was meant to reflect the extant realities defining educational environment of average student or researcher within the state. Across the entire state, educational life and learning confront and reflect the same realities. The Okuku Campus of the Osun State University has a population of about 4,500. As a pilot study, random sample of 100 students are selected for the research. The research is carried out out-of-class and out-of-campus but within the nearby vicinity to avoid pair influence in responses. As a micro study, that is aimed to be replicated at a large scale later, the limit of 100 respondents was considered convenient and reasonable as the study was aimed to elicit views of stand-alone students to avoid peer influence on response to pertinent social-status related questions such as size of monthly stipend/allowance, type of phone used, ways of coping with financial difficulties, and so on.

Going by the study in 2010 of Tanzania by Kelinga (2010:37), the knowledge of how ICT and its application can improve the social and economic lives of people generally is very limited. But, between then and now, much of this knowledge gap has been covered. However, from Kalinga's study, millions of users may have and been in contact with computers, but this does "not mean that they really understand the impact that ICT, if used effectively, could have on improving performance. This research sought to elicit information from those who unavoidably needed to deploy ICT in their search for knowledge. The emphasis on participatory research methodology is that the introduction of technology into education and organizations accompanies learning and generates a specific form of knowledge and responses from users. This research captures the feelings of users about deployment of ICT in education as an index of national development.

Data Presentation, Analysis and Discussion of Findings

This presentation in this section of the research deals with presentation and analysis of data elicited from the respondents relating to their experience in deployment of ICT towards education for development, as well as the discussion of the findings.

Institutional Affiliation of Respondents

Of the 95 respondents, 69 representing 73 percent were UNIOSUN students. 15 respondents representing 16 percent were from nearly Polytechnics possibly visiting student colleagues from their nearby Campuses. Three (3) percent were from nearby Universities- OAU and BOWEN, thus, confirming the fact that Osun state generally, is an education state where students visits and interactions across institutions and campuses are considered normal, thus enabling them to share experience and knowledge.

Internet Usage by Respondents

Ninety-two (92) percent of a total of 95 respondents indicated that they had cause to resort to using Internet to meet their information and education needs; while 6 percent indicated NO, and 2 percent were indifferent about the use of Internet. Of the people that claimed to resort to online sources to meet their needs, 46 percent were online daily; 20 percent went online weekly; 25 percent randomly when necessary; 9 percent rarely. There were no respondents who had never used Internet. This indicates that there was a high demand for internet and ICT services among student population in Osun state and elsewhere.

Choice of Internet Service Provider

Forty-five (45) respondents (46%) of the respondents made use of MTN; 28 respondents (29%) patronized AIRTEL. Only 19 respondents (20%) used GLO while 4 respondents (5%) made use of 9MOBILE. This shows that MTN services were more popular among the students of Osun State University, Okuku Campus.

Level of satisfaction with ISPs service across providers

Table 1: Level of Respondents' Satisfaction with Internet Service Provision by Providers

RES PONSE	OVERALL NO OF RESPONDENT	%	MTN		GLO		AIRTEL		9MOBILE	
			No of Res	%	No of Res	%	No of Res	%	No of Res	%
YES	52	54	30	67	8	42	11	39	3	60
NO	7	7	3	7	1	5	3	11	-	-
SOMEHOW	31	32	11	24	9	47	10	36	1	20
NO INDICATION	7	7	1	2	1	5	4	14	1	20
	97	100	45	46	19	20	28	29	5	5

Source: 2018 September Survey by Researcher

A total of 97 respondents indicated their choice of ISP providers. Of these 97 respondents, 45 (46%) were MTN subscribers, 19 were GLO, 28 uses AIRTEL, and the remaining 5 had 9MOBILE. Of this 45 MTN subscribers 30 (67%) said they were satisfied with MTN services. Only 8 (42%) of the GLO subscribers considered the GLO services to be satisfactory. 11 (39%) of AIRTEL customers considered the services of the ISP satisfactory, while 60% of the 9MOBILE customers had satisfactory experience. On the whole, as indicated within this level of micro study, MTN recording 45 (46%) of the respondents is the most subscribed ISP service provider. AIRTEL comes next with 28 subscribers representing 29 percent of respondents preferring this network to others. GLO has 20 percent and 9MOBILE 5 percent of the subscribers. Twenty-five 25 percent of GLO users, 14 percent of AIRTEL, 40 percent of 9MOBILE users also considered MTN as the best Internet Service Provider. Therefore, among all the network providers in Nigeria, including those using other ISPs, MTN is considered to be the best Internet Service Provider. Also, only 63 percent of those who uses GLO prefer it to others; while 40 percent of those who use 9MOBILE would prefer to use MTN internet service.

Internet Service Providers Offering the Cheapest and Most Effective Service?
The rating of respondents on Internet service providers offering the cheapest and most effective service appears to be within the same bracket as the three leading Internet providers closely trailed one another. MTN had 27 percent; GLO 26 percent and AIRTEL 22 percent. No doubt, the regulatory impact of the Nigerian Communication Commission (NCC), the body regulating provision of Internet service in Nigeria appeared effective in maintaining somewhat similarity of service and cost.

Level of Satisfaction Derived from Sourcing Materials from the Internet?
Of the respondents sourcing educational materials from the internet,18 percent were highly satisfied; 50 percent ticked satisfied; 9 percent were not satisfied. 4 percent were indifferent about rating. However, none of the respondent ticked highly unsatisfied. From this pilot study, it can be tentatively stated that while not all users were satisfied with services provided by ISPs, by their services, ISP providers seemed not to be disappointing majority (59 percent) of respondents who were either highly satisfied or satisfied. Nevertheless, there appeared so much room for improvement in deploying Internet as avenue for sourcing educational materials.

Determining Respondents' Choice of Handsets (Phones)
The commonest medium through which most students access online material is handset, otherwise known as mobile phone. The table below reflects the

preferences of the respondents for certain brands of handset (mobile phone) over another. Among factors that determine their preferences are: affordability, durability, efficiency of signal receiver and maintenance.

Table 2: Respondent Choice of Handset (Phones)

PHONE BRAND	NO OF RESPONDENT THAT PREFER PARTICULAR BRAND	Percentage	Choice of ISP			
			MTN	GLO	AIRTEL	9MOBILE
TECNO	25	26	16	5	5	-
SAMSUNG	23	24	10	5	5	2
NOKIA	14	15	5	3	5	1
INFINIX	14	15	6	2	6	1
ITEL	2	2	1	1	-	-
LENOVO	5	5	1	1	3	-
APPLE	12	13	5	2	4	1
	95	**100**	**44**	**19**	**28**	**5**

Source: 2018 September Survey by Researcher

Twenty-five respondents (26%) considered TECNO as the best handset. This rating possibly resulted from respondents' view that it is the most economical of all handsets (phones). Next in rating to TECNO is SAMSUNG following closely with 23 respondents (24%). Only 14 respondents each considered NOKIA and INFINIX as the best handset. Satisfaction on type of handset seemed to be directly measured by its popularity. It can be deduced that depending on individuals' economic status, all derived satisfaction from the phone they could afford and use, and by the way they were configured, most handsets (phones) are good enough to access educational information from the Internet. Irrespective of economic status, all could manage to acquire handsets that would make it possible for them to access the Internet. Phones that are most expensive such as APPLE (10 percent) were rarely needed by Internet users to operate and access information. LENOVO and ITEL were rarely used by 5 and 2 percents respectively.

Choice of Operating Systems Mounted on Handsets
Seventy-six of the respondents (80%) considered phone with ANDROID as Operating System as 'Most Effective, while Phones mounted with WINDOW Operating System seemed the least preferred. It had (6 percent). IOS had 11 percent. Four (4) percent of the respondents did not indicate their choice of 'Operating System'.

Most Economical Handset (Phone)
A total of 36 users (37%) of respondents) considered TECNO as the most economical. ITEL was considered next economical according to 16 of the respondents. The least economical is APPLE, only 1 respondent considered it economical. LENOVO had 9 respondents, SAMSUNG and INFINIX 14 respondents each. Forty-seven (47) respondents used phones which cost ranged between N10,000 and N30,000. 74 percent uses phone which costs were not more than N50,000. Of those in elite bracket among students, only about 4 respondents claimed they used phone that costs over N100,000 while 3 respondents handles phones that costs between N200,000 and N400,000. From this, it can be deduced that majority of those having need for handset were not among the upper class of the society, hence up to 47 respondents equating 46 percent demanded that phones should be made more affordable.

Electricity Supply as an Index of System Integrity in Deployment of ICT in Education and National Development
Electricity (power) supply constitutes a major drawback to advancement of education and national development in Nigeria. Its impact is felt more in the educational sector more than any other. Student need light to read, they need electricity to recharge their laptops, phones, rechargeable lamps etc. Table 3 presents data on the number of hours per day that certain proportion of the respondents enjoyed electricity supply.

Table 3: Effects of electricity supply in provision of internet-based education in Nigeria

No. of Respondent	Percentage of Respondent	No. of Hours Respondents Enjoyed Electricity Supply per Day
4	4	1
25	26	2
44	46	5
14	14	8
7	7	12
1	1	24

Source: 2018 September Survey by Researcher

Consequent to the epileptic nature of power supply in Nigeria generally and the impact this have had on the students' ability to take full advantage of online resources, a whole 69 respondents (71%) indicated that their progress was negatively affected by poor electricity supply; thus seriously undermining the system integrity of the ICT wonders. Of this percentage 33 percent say they were badly affected, and a higher percentage of 36 percent said they were so-badly affected. Only 34 respondents (35%) claimed they had alternative source of power supply using either generating sets or inverters.

Challenges Relating to System Integrity as an Index and Means of Access to Open Education Resources

Aside the challenges enumerated in the literature review, several other challenges were uncovered from this study that cannot be easily subsumed under the categories identified in the review. Chief among these factors was the efficiency of ISPs in making it possible for students to access OER materials with limited stress, time and cost. The strong points indicated by respondents that made them prefer one internet service provider (ISP) to another are as contained in Table 4

Table 4: Factors that Determined Users' Choice of Internet Service Provider

MTN	GLO	AIRTEL	9MOBILE
1. Fastness of Connection	1. Suitability for Use	1. No Network failure	1. Cheap Service Tariff
2. Reliability of Network Service	2. Good Network Coverage	2. Granting of Bonus	2. Bonus
3. Cheapness of Data	3. Affordability	3. Fastness in connection	3. Fastness
4. Most Economical	4. Grant of Bonuses	4. Cheapness	**4.** Strong Network Coverage
5. Cost Effectiveness	5. Cheap Service Tariff	5. Secured Network Provider	
6. All time availability of network	6. Fastness in connection	6. Good Network Coverage	
7. Strong Signal	7. Reliability	**7.** Strong Signal in My Area	
8. Easy Access	**8.** Only Network Available in My Area		
9. Cheaper Service Tariff			
10. Recharge Bonuses			

Source: 2018 September Survey by Researcher

Demands by Users on Internet Service providers (ISPs) for Improved Services

Notwithstanding the level of satisfaction expressed by users of Internet services, respondents still demand for improvement in service as contained in Table 5.

Table 5: Specific Demand for Service Improvement from Internet Service Providers

MTN	GLO	AIRTEL	9MOBILE
1. Customer satisfaction 2. Lower cost of Subscription 3. Lower tariff 4. Special Tariff Plan for students 5. Improvement in signal strength	1. Improve Network Coverage 2. Reduction of Data Tariff 3. Improved Customer Service 4. Need for adequate National Coverage of Signal 5. Stable Network at Night 6. Proper Monitoring and Enhancement of Service at rural area 7. Need to Improve Network in Okuku	1. Improvement of Network Coverage 2. Should be available at all time 3. Reduced tariff 4. Improvement in Customer Service 5. Longer spillover for Unused data 6. Remove bottleneck in recharging on credit 7. Bonus to subscribers	1. Need to improve poor Network Coverage 2. Need to revise High charges for borrowed or loaned credit

Source: 2018 September Survey by Researcher

While respondents were generally not totally dissatisfied with the services of the ISP, they nevertheless demanded to see improvements in service. A synthesis of the respondents' views produced the above thematic areas of concern for each of the ISPs. For MTN 5 areas of improvement as listed were considered important. But, giving the fact that MTN is most popular, having fewer complaints still reinforces the fact that, it still stands the best among all the ISPs. GLO and AIRTEL which closely ranked one another in terms of subscription and usage equally had almost similar degree of complaints, though varying in contents in some instances. 9MOBILE that was also the least patronized had fewer complaints.

Recommendation for Government and Service Providers towards Improving Internet Service

Towards improved system integrity of ICT in human capacity enhancement and national development, from the views expressed by respondents, there are areas in which users of ICT, as an aid to education, desired to see some positive changes from both government, Internet service providers and other stakeholders. Among those identified are:

1. Need for cost effective policy
2. More supportive teaching and learning environment
3. Increased provision of standard online reading materials in form of OERs
4. Provision of free Internet access on campus
5. Establishment of E-library
6. Faster Internet connection
7. Granting of recharge and data bonuses
8. More effective regulation of service operation
9. Better enlightenment of people on the use of Internet
10. Constant power supply
11. Improvement on technical services
12. Ensuring healthy competition among service providers
13. All time availability of stronger network signal and better national coverage
14. Extension of durability period of data account surplus
15. Constant servicing of ISPs' Masts
16. Wider and stronger coverage of Internet service in rural communities
17. Monitoring and prohibition of illegal charges

Areas Requiring Improvement from Phone Handset Makers (Phone Brand Owners)

Mobile phone devices remained the best medium for all time access to Internet and learning materials. It is advised that phone manufacturers (brand owners) pay attention to the following observed flaws for better service.

1. New features of their products should be available even to their more economical versions/models
2. Improved features on handsets that will be more user friendly
3. Strong and longer battery lifespan
4. Improved signal receiver
5. Improvement in product durability
6. Opportunity for easy repair of handsets when faulty
7. Price reduction to be more economical to promote affordability for those not so rich
8. Increase storage capacity
9. Improved camera quality

10.   Durability and warranty of phone products should be genuine
11.   Good sound system
12.   Easy access to spare parts
13.   Improved features and specifications
14.   Introduction of less expensive and more protective features
15.   Handsets and Operating Systems to be made more user friendly
        in terms of cost and durability.

Conclusion
Education for human development is a sine-qua-non for societies seeking improvement in national development. One best, easy, most accessible and cheap means of achieving this is through online facilities made available through enhanced contribution of ICT. The students around the area of study have appreciably high knowledge of the use and challenges confronting deployment of ICT in education. No doubt, giving the competition among ISPs, there are clear evidence of striving to ensure that services meet required standard. However, for better impact, improvement is sought to further guarantee availability and reliability of network by Internet service providers, Just as users expect to see further enhancement in the quality and deployment of relevant ODL platforms and OERs facilities across the country. Greater attention is needed for better coverage and service particularly in rural areas. Anticipating that producers of Open Educational Resource will continue to update and maintain quality assurance, the need for constant supply of electricity and enhancement of network coverage and speed are among the critical areas demanding urgent attention so as to save on the time spent downloading online materials. Producers of handset (phone brands) are equally expected to be more user friendly in terms of cost, efficiency, durability and adaptability across models or versions. If the improvements here canvassed are properly engineered, there is no doubt that the ICT component of education will be better enhanced to make the needed contribution for the gain of human and national development.

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