Issues and Challenges in the Development of Open Access Publishing and Scholarly Communications in Nigeria*[1]

Abstract

The paper notes that advances in technology have resulted in the emergence of open access publishing and scholarly communication. Open access publishing typically provides an internet based digital platform for the publication of research output with unrestricted access to the public while scholarly publication networks encompass inter linked information access to database by educational institutions. The growth of open access publishing and scholarly communication has been very remarkable in many developed countries. However, academic and research institutions in many developing countries like Nigeria are still battling to overcome many challenges in an attempt to make their research outputs openly accessible. At the same time, cross access to digital libraries is in its embryonic stages amongst research institutions. This paper identifies the challenges and their effects. Notable amongst these are:

Lack of awareness of open access publishing;

Dearth of cross linked e-libraries;

Inadequate information and communication technology infrastructure;

Inadequate and epileptic power supply;

Inadequate funding of research institutions; and

Inhibiting copyright protection regime

The paper concludes by prescribing a copyright regime that will assure researchers of intellectual property rights protection for research outputs published in digital networks.

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INTRODUCTION

As centres for intellectual and scholarly research, academic and research institutions in any given society are expected to take an interest in the creation, dissemination as well as preservation of knowledge. However, this is a very complex process, particularly in developing countries where the economic, technological and institutional structures necessary to achieve the process are not well established. Altbach (1978) has noted that knowledge dissemination is especially important in the third world context because the emergence of an independent intellectual life and some self-sufficiency in science is to some extent dependent on establishing the essential structure for dissemination of knowledge[2]

For centuries, the model of institutional libraries and scholarly publishing was the conventional model adopted in preserving and disseminating knowledge from academic and research institutions. Whereas institutional libraries housed research outputs in the form of grey literatures,[3] thus playing a greater role in terms of preservation than dissemination, scholarly publishing played a much greater role in terms of dissemination through scholarly journals. Over the past several decades, however, the economic, market, and technological foundations that sustained this symbiotic publisher-library market relationship has begun to shift.[4] This shift has resulted in what Benkler called the "networked information economy" which is gradually displacing the "industrial information economy" that typified information production from about the second half of the nineteenth century and throughout the twentieth century.[5]

[2] Altbach P. G, "Scholarly Publishing in the Third World" *Library Trends* 26:4 (1978) 489-504
[3] The term "grey literature" is used to refer to documents and ephemeral material issued in limited amounts outside the formal channels of publication and distribution.
[4] Open Society Institute: Guide to Business Planning for Converting a Subscription-based Journal to Open Access (2004) http://www.soros.org/openaccess/oajguides/business_converting.pdf
[5] Benkler Y. "The Wealth of Networks: How Social Production Transforms Markets and Freedom" 2006 Yale

Nigeria has over 92 accredited Universities, both public and private. This is more universities than any country in Sub-Saharan Africa.[6] These universities function as focal point for academic research in Nigeria. Egwunyenga (2008) has attributed this to the fact that research is made compulsory for both lecturers and students either by job description or by prescribed academic program of study. For lecturers and academics, the concept of 'publish or perish' has come to strap their subsistence and promotion within the academic environment to the volume of their research output and published works. On the part of the students (especially graduate students), the nature of their academic studies requires that they be actively engaged in research activities either in partial fulfilment of the requirements for the degree being sought or as part of terminal thesis or dissertation.[7] In the light of these requirements on the part of both lecturers and students, it is to be expected that the volume of research output originating from academic institutions and addressing local problems in Nigeria will be high.

Specialized research institutions also constitute another focal point for research activities in Nigeria. Applied scientific research by these research institutions dates back to the time when the country was still under British colonial rule. Though some of the institutions were established after the country's independence, these research institutions along with the academic institutions turn out chunk of research outputs relating to developmental issues not only in the country but also within the region. Reasonably, these research outputs addressing issues endemic to the region should be given wide circulation so that the results of the research can be applied in

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University Press

[6] Figure made available by National Universities Commission (NUC) http://www.nuc.edu.ng/pages/universities.asp. This number does not include other higher institutions like Polytechnics, as well as non-degree awarding research institutions in the country.

[7] Egwunyenga, E.J. *"Dystrophies and Associated Crises in Research and Academic Publications in Nigerian Universities"* Anthropologist, 10:4: (2008) pg 245-250 @ 245

addressing the issues that they sought to tackle. Unfortunately, these outputs gather dusts in the various departmental offices and institutional libraries without getting published. Some eventually get published in local journals that have minimal circulation due to poor distributorship, marketing or prestige. Thus after so much painstaking commitment of efforts and resources in undertaking researches, the outcome is not widely disseminated. In consequence, these research findings die at the institutional level as those who need to apply the knowledge are unable to access them.[8] This situation thus highlights the need for an effective process of knowledge dissemination from academic and research institutions in developing country.

This article studies the challenges associated with the development of open access publishing and scholarly communication in Nigeria and how the development of open access repositories could be instrumental in increasing accessibility and visibility of research output from the region.

Open Access

The development of Internet technology has provided academic and research institutions with a very high level of visibility on the web. As a result, teaching, learning and research is widely improved in the global society today. The intellectual call for knowledge and information dissemination by countless organizations and educational meetings has given birth to a terminology called *open access.* This initiative is aimed at bringing the knowledge society to a state of free access to all kinds of information and learning material using the Internet and ICT tools. The library plays an important role in sustaining the open access initiative.[9] Furthermore**,** developments in information and communication technology especially the World Wide Web have made possible an unprecedented collaboration

[8] ibid

[9]Das, A. (2008). Open access to knowledge and information: Scholarly literature and digital library initiatives – The South Asian scenario. Edited by Bimal Kanti Sen and Jocelyne Josiah. New Delhi; UNESCO.

in the production, dissemination and exchange of information by people world over irrespective of their geographical location. Open access emerged in response to increasing legal and economic barriers by commercial scholarly publishers which made access to research output and information difficult especially to people in developing countries of the world. Thus the movement seeks to promote free and open access to research output devoid of any permission barriers and unnecessary legal restraints. Open access therefore seeks to use the internet - a product of the 'networked information economy' to provide free access to research and scholarly output to people irrespective of their physical or geographical location, or their social and economic means.

Suber (2002) was of the view that open access to scientific articles means online access without charge to readers or libraries. This will imply dispensing with the financial, technical and legal barriers that are designed to limit access to scientific research articles to paying customers.[10] One of the most frequently cited definitions of open access has been that proffered by the Budapest Open Access Initiative (BOAI) which defined the concept of open access in relation to journal literature as:

> free availability on the public internet, permitting any user to read, download, copy, distribute, print, search, or link to the full texts of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. The only constraint on reproduction and distribution, and the only role for copyright in this domain, should be to give authors control over the integrity of their work and the right to be properly acknowledged and cited.[11]

The concept of open access is characterized by free availability of research output on the public

[10] Peter Suber (2002) Open access to the scientific journal literature. *Journal of Biology*, 1(1), p. 1–3.
[11] BOAI. http://www.soros.org/openaccess/read.shtml

internet granting a user the license to make legal and non-commercial use of such material subject to proper acknowledgment of the rights of the original owner. Hence the open access initiative makes it possible for researchers to make their research output like scholarly articles freely available to the public by means of any open access instruments such as open access journals or open access repositories. The result according the Lawrence is that "scientists now have almost instant access to a large and rapidly increasing amount of information that previously required trips to the library, interlibrary loan delays, or substantial effort in locating the source."[12]

The basic principle of open access is founded on the shared and equitable distribution of knowledge. Such knowledge is very essential for developing countries striving to improve the general welfare of their population. The relationship between knowledge and development cannot be overemphasized. Hence even when a country has abundance of natural resources, it must transform the resources to things it needs. This transformation involves access to knowledge and information. Ghosh and Das (2007) noted the contrast between developed and developing countries institutions in terms of generating access to knowledge as well as the relevance of knowledge to development. They observed that the developed world consists of information rich countries, enterprises and organizations that exert powerful control over valuable information resources. On the other hand the developing world is at a critical juncture where the development of technologies, economies and humanity as a whole are largely dependent on access to relevant and adequate information resources. The academic and research institutions in the developing world cannot afford to subscribe to a wide array of primary literature due to lack of resources or limited

[12] Lawrence, S. (2001) "Access to scientific literature" in *Nature Yearbook of Science and Technology*. (ed.D. Butlu) London: Macmillan. p. 86–88.

budgetary provisions. In this situation, Ghosh and Das believe the open access gains worldwide support as an alternative and sustainable model of scholarly communication.[13]

Open access to research output from developing world will help the region to judiciously utilize their limited resources by avoiding duplication of researches to common issues. The state of open access to researches in developing countries is so poor that it is much easier for a researcher in Nigeria to know what have been published on a given issue by a researcher in the United States or Britain than to locate a similar publication by a researcher in neighbouring country like Cameroun.

Types of open access

The "Gold" Road

This is synonymous with open access journal publishing which is a model of scholarly publication that makes journal articles available to the public by means of the internet "without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself."[14] The Bethesda Statement on Open Access Publishing defines an open access publication to include publications that meet the two conditions below:

• The author(s) and copyright holder(s) grant(s) to all users a free, irrevocable, worldwide, perpetual right of access to, and a license to copy, use, distribute, transmit and display the work publicly and to make and distribute derivative works, in any digital medium for any responsible purpose, subject to proper attribution of authorship, as well as the right to make small numbers of printed copies for their personal use.

[13] S.B. Ghosh and Anup Kumar Das *Open access and institutional repositories – a developing country perspective: a case study of India* IFLA Journal Volume 33 (2007) No. 3, pp. 229 - 250
[14] see BOAI *supra* note 13

• A complete version of the work and all supplemental materials, including a copy of the permission as stated above, in a suitable standard electronic format is deposited immediately upon initial publication in at least one online repository that is supported by an academic institution, scholarly society, government agency, or other well-established organization that seeks to enable open access, unrestricted distribution, interoperability, and long-term archiving (for the biomedical sciences, PubMed Central is such a repository).

The directory of open access journals[15] contains a comprehensive list of open access journals from diverse disciplines. The aim of the Directory is to increase the visibility and ease of use of open access scientific and scholarly journals thereby promoting their increased usage and impact.[16]

The "Green" Road

This is a model of scholarly publishing whereby researchers and academics make pre-print or postprint copies of their research work or publications available in open access digital repositories or archives. The archive could be the personal web page of the author, a subject or discipline-based repository[17] or an institutional repository.[18]

Institutional repository has been defined as "a digital archive of the intellectual product created by the faculty, research staff, and students of an institution and accessible to end users both within and outside the institution, with few if any barrier to access."[19] Lynch sees it as "a set of services that a university offers to the members of its community for the management and

[15] www.doaj.org
[16] http://www.doaj.org/doaj?func=loadTempl&templ=about
[17] A good example is the Electronic Research Archive (ERA) in International Health http://www.thelancet.com/journals. It allows researchers to deposit research papers of special relevance to health issues in developing countries, see also the Social Science Research Network (SSRN) www.ssrn.com
[18] see for example MIT's DSpace at http://dspace.mit.edu
[19] Raym Crow, *The Case for Institutional Repositories: A SPARC Position Paper* (Washington, DC: The Scholarly Publishing and Academic Resources Coalition, 2002), 4, <http://www.arl.org/sparc/bm~doc/ir_final_release_102.pdf.>

dissemination of digital materials created by the institution and its community members." Hence the role of an institutional repository is basically to collect, preserve and disseminate the host institution's research outputs. The research outputs could include electronic copies of pre-prints as well as post-print articles, conference and working papers, committee papers, teaching materials, thesis and dissertations, monographs, multimedia, student projects etc.

Open Access Institutional Repositories

It is now obvious to the academic and scholarly community that the traditional model of scholarly communication via subscription-based journals serves to hinder rather than expand access to research output.[20] In the light of emerging trends in digital scholarly communication, open access institutional repositories play an important role in the preservation and dissemination of institutional research outputs which in turn becomes a constituent part of a global research output. Although publication by faculty members in scholarly journals could add impact to the prestige of the institutions they are associated with, an institutional repository stands to generate greater impact by centralising research outputs generated by the institution's researchers, and thus serving as a much better and simpler metrics for gauging the quality of the institution's academic scholarship, productivity and prestige.[21] In the case of research and academic institutions in developing countries, development of institutional repository will not only boost the global visibility and utility of their research, but will also introduce a novel research culture focused on meeting international standard and values. Knowledge by a researcher that his research will be openly accessible by a global audience will have an impact on his focus and

[20] Velterop J., "Submission to the House of Commons Science and Technology Committee's Inquiry into Scientific Publications" *6 February 2004 http://www.biomedcentral.com/openaccess/inquiry/bmcsubmission.pdf***.**
[21] Crow supra note 21

standard. Anbu was of the view that the current closed access publishing model fails to portray the quality and quantity of research done in African universities and by African scholars.[22]

State of open access publishing in Nigeria

The emergence of scientific research in Nigeria could be traced back to the period of British colonial administration of Nigeria. Bulk of the research works during this period was basically restricted to agriculture and its allied products. This trend was not prompted by desire of the British administration to promote research or development in the region. Rather, the interest of the British administration in promoting scientific research in the region was borne out of the strategic role of the region in the supply of agricultural raw materials for British industries. Thus the British administration developed a policy framework to support and guarantee the production and supply of agricultural raw materials such as cocoa, palm produce, groundnuts etc to commercial industries in Britain. To this effect, agricultural research stations were set up in various cities across Nigeria and British West Africa.[23]

Academic institutions at the tertiary level are the focal points of scholarly and applied research in Nigeria. In terms of scholarly research, university-based research entered the scene with the establishment in 1948 of the University of Ibadan – the first indigenous university in Nigeria. With the passage of time, the number has grown to over 92 federal, state and private universities. The state of research publishing in local academic journals in Nigeria has been on the rise in recent times. Unfortunately, these publications are not openly accessible. A recent trend in an

[22] John Paul Anbu K. *Institutional Repositories: Time for African universities to consolidate the digital divide,* http://www.ascleiden.nl/Pdf/elecpublconfanbu.pdf @ 6

[23] See Alo, B. "University-Based Applied Research and Innovation in Nigeria" in Ogbu, Oyelaran-Oyeyinka, and Mlawa (ed.) *Technology Policy and Practice in Africa"* IDRC (1995) <http://www.idrc.ca/en/ev-9301-201-1- DO_TOPIC.html>.

attempt to make such publications widely accessible has been to list the journals in the African Journal Online database.[24] Regrettably, the database is not openly accessible and hence only details limited to the abstract of the research is openly accessible. Notwithstanding, the statistics on the database help to understand the state of research publishing in Nigeria as compared to other African countries and developed countries.

Digital Library and Open Access to Knowledge

According to Shiri[25], the Digital Library Federation defines digital library as:

"*Organizations that provide the resources, including the specialized staff, to select, structure, offer intellectual access to, interpret, distribute, preserve the integrity of, and ensure the persistence over time of collections of digital works so that they are readily available for use by a defined community or set of communities".*

Digital libraries are an emerging concept in Nigeria, though today's libraries in the developed countries are routinely providing information and services in digital form. Borgman[26] agrees with the view of Digital Library Federation[27] which states that digital libraries have unique characteristics that differ from traditional libraries and their approaches to information provision. From a traditional librarian's point of view, digital libraries present a transformative model of a large-scale, user-centric organization that is moving towards an integrated form with various components. However, the main purpose of digital libraries remains consistent with that of traditional libraries in that the purpose of digital libraries is to organize, distribute, and preserve information resources just as it is for traditional libraries.

[24] www.ajol.info

[25] Shiri, A. (2003). Digital library research: Current developments and trends. *Library Review* 52 (5): 198 - 202

[26] Borgman, C.L. (1999). What are digital libraries? Competing visions. *Information Processing & Management*, 35: 227-243

[27] Digital Library Federation (1998). A working definition of digital library. Available: http://www.diglib.org/about/dldefinition.htm

Lynch[28] posits that, "digital Libraries provide users with coherent success to a very large, organized repository of information and knowledge." According to Trivedi[29] the purpose of a digital library includes:

- To expedite the systematic development of procedures to collect, store, and organize information in digital form.
- To promote efficient delivery of information economically to all users.
- To encourage co-operative efforts in research resource, computing, and communication networks.
- To strengthen communication and collaboration between and among educational institutions.
- To take leadership role in the generation and dissemination of knowledge

Digital libraries promise new societal benefits. One is elimination of the time and space constraints of traditional "bricks-and-mortar libraries". Unlike libraries that occupy buildings accessible only to those who walk through their doors, digital libraries reside on inter-networked data storage and computing systems that can be accessed by people located anywhere in the world. When the full potential of a digital library is realized for a particular community, people shall be able to access all human knowledge hosted in that digital database from any location. Digital libraries that are accessible over the Internet provide opportunities to advance knowledge and to dramatically improve the quality of life. In Nigeria, there is dearth of cross linked e- libraries. Nigeria is slow to take advantage of the benefits offered by digital libraries.

The State of Open Access Publishing and Scholarly Communication in Nigeria

The emergence of Open Access Initiatives as well as information and communication technologies provides a veritable medium to address the problem of poor visibility of academic

[28]Lynch, C.A. (1994). *The integrity of digital information: Mechanism and definitional issues*. Silver Spring, MD: ASIS.
[29] Trivedi, M. (2010) Digital libraries: functionality, usability, and accessibility. *Library Philosophy and Practice*. Available: http://unllib.unl.edu/LPP/trivedi-diglib.htm

research information emanating from developing countries like Nigeria. The shift from the conventional print publication to the use of digital sources and internet media have provided academic and research institutions in Nigeria with an opportunity to make their grey literature and research output accessible to the outside world. However, it may be surprising to observe that academic and research institutions in the country are yet to take advantage of the benefits.[30]

Some of the issues identified by existing literatures as being responsible for the slow uptake of open access publishing and scholarly communication in Nigeria include; lack of knowledge or awareness of open access publishing, dearth of cross linked e- libraries, poor state of information and communication technology infrastructure, inadequate and epileptic power supply, inadequate advocacy for open access repositories, poor or inadequate funding, inhibiting copyright and intellectual property regime.

Lack Awareness of open access publishing

Lack of knowledge or awareness of open access publishing is not peculiar to the University of Lagos. In fact this is the situation in most developing country institutions.[31] A research carried out by Papin-Ramcharan and Dawe (2006) at the University of West Indies in Trinidad and Tobago shows that just 8% (6/79) of the academic staff members of the Institution's faculty of engineering are aware of digital repositories. None of the respondents in the survey has ever deposited a research paper in any institutional repository.[32] Ignorance or lack of knowledge of

[30] As at the time of time of writing there is no record of any functional open access institutional repository in Nigeria
[31] Christian, G.E. *Open Access Initiative and the Developing World*, African Journal of Library, Archives and Information Science, Vol. 18, No. 2, 2008 < http://ssrn.com/abstract=1304665>
[32] Jennifer Papin-Ramcharan & Richard A Dawe *The Other Side of the Coin for Open Access Publishing – A Developing Country View*, Libri 2006, vol. 56 16-27 <http://www.librijournal.org/pdf/2006-1pp16-27.pdf>

open access publishing seems to be one major issue to the development of open access publishing in developing countries. It is only when this ignorance is tackled that any meaningful progress can be made. The South Africa situation illustrates this. Although South Africa currently houses the highest number of institutional repositories in Africa, it took great deal of awareness campaign to achieve this state. Open access in South Africa was introduced in 2004 by the Electronic Information for Libraries (eIFL) in collaboration with South African Site Licensing Initiative (SASLI) – a coalition of South African Libraries Consortia. Series of workshops were organized focusing on hands-on-training on open access software and other issues related to establishment of institutional repository such as copyright, metadata, policies, populating and marketing of institutional repositories etc. Years went by after the workshops without any visible impact. Like most novel concepts which will usually take time before people begin to buy in, it took a while before librarians and institutions in South Africa started to think about open access publishing.

The effort in South Africa eventually paid off as the country now host more institutional repositories than all the other countries in Africa combined and all this happened within a period of 4 years. More research output from South Africa is now visible to the outside world than research knowledge from any other country in the continent. Similar approach has also been adopted by eILF in Nigeria, in the spring of 2008, it organized the first open access workshop for researchers and librarians in Nigeria.[33] The South African example illustrates the fact that national as well as regional workshops on open access in developing countries could go a long way in contributing to the development of open access publishing.

[33] International Workshop On Open Access Repositories: New Model For Scholarly Communication http://www.nulib.net/oai/

Inadequate ICT connectivity and infrastructure

The development of open access publishing requires fast and reliable internet connection as well as deployment of adequate information and communication technology infrastructure. The major point of internet access to students and staff at Nigerian universities is through internet cafés.[34] A study of internet usage in Nigerian universities by Jagboro (2003) shows that 45.2 percent of the respondents access the internet through internet cafés.[35] The situation is not too different at the University of Lagos. There are about seven of such commercial internet café at the University each with an average of about 20 computers. The cafés are operated by private entrepreneurs on facilities or buildings leased from the University. The average cost for using the internet facility at the café is about #200 ($1) for an hour. Although this may appear cheap, the connectivity is so slow that it may take about 15minutes to access a yahoo mail account. There is also a university local area network (LAN) that provides internet connections to the academic staff but the university's LAN is so often plagued with technical issues that even the academic staffs often do patronize the cafés for internet access. The University also owns one internet café which was funded by a mobile phone company and located at the University main library.

The University café though is fraught with too many restrictions such as prohibition of the use of external storage devices like disks or flash drives. Hence since users cannot download materials from the internet into any external drive, they only have the choice of paying to print the materials. This thus makes the café only useful for checking and replying to emails as opposed to

[34] Internet cafés are computer labs that provide commercial internet services to client on timed (usually) hourly basis.
[35] K.O. Jagboro *A study of Internet usage in Nigerian universities: A case study of Obafemi Awolowo University, Ile Ife Nigeria* First Monday, volume 8, number 2 (February 2003), <http://firstmonday.org/issues/issue8_2/jagboro/index.html

research. Students and staff who really desire access to the internet for the purpose of research are better off visiting the other commercial internet café where they have the privilege of downloading research materials into external memory devices and accessing same later from their home computers or laptops. This reduces the cost of printing volumes of research materials. Another challenge is that the number of internet café and computer equipment at the institution are quite inadequate hence it is not often surprising to find long queue of clients spending hours waiting to gain access to available computer in order to access the internet.

This problem is further compounded by the slow speed of internet connectivity. Notwithstanding the growth in internet usage in Nigeria, the speed and reliability of the internet connections still posses a great deal of challenge to most of the institutions in Nigeria. Low internet bandwidth availability in the sub-Saharan African region posses an obstacle to the development of open access publishing. It has been observed that institutional repositories require reliable and fast internet connection since the common mode of availability of materials are in the form of PDF files.[36] The high cost of internet bandwidth in developing countries makes it much difficult for academic institutions in the region to afford adequate bandwidth to host digital repositories.[37] It has been observed that bandwidth allocation in Africa is so expensive that most universities (on their own budget) cannot afford more than 1.544 Mbps[38] which is less than many home broadband users in North America have. African universities pay about $10,000 a month for

[36] Jennifer Papin-Ramcharan *supra* note 32
[37] Christian *supra* note 31
[38] Gerhard Vente (2003) *Optimising Internet Bandwidth in Developing Country Higher Education: The need for bandwidth optimization* <http://www.inasp.info/uploaded/documents/BMO-chap2.pdf>

same internet bandwidth that will cost a consumer in Europe and North America less $100 a month.[39] The problem was well described by Jensen (2006):

> Bandwidth is the life-blood of the world's knowledge economy, but it is scarcest where it is most needed – in the developing nations of Africa which require low cost communications to accelerate their socio-economic development. Few schools, libraries, universities and research centres on the continent have any internet access. For those that can afford it, their costs are usually thousands of times higher than for their counterparts in the developed world, and even Africa's most well-endowed centres of excellence have less bandwidth than a home broadband user in North America or Europe, and it must be shared amongst hundreds or even thousands of users.[40]

In 2003, the International Network for the Availability of Scientific Publications (INASP) commissioned a report which compared internet connectivity and cost in selected African universities with a British university. It was observed that several African universities in the study have an internet connection of between 512 Kbps and 1Mbps (as at May 2003). The British university (Bristol) by contrast has a 2.5 Gbps link. This is 5120 times as much as the University of Dar es Salaam, (Tanzania) has. The report further notes that whereas University of Dar es salaam has 2000 computers shared by 11000 users (i.e. an average of 5.5 person per computer), Bristol has 16,000 computers shared by 22,000 users (i.e. an average of 1.3 person per computer).[41]

Echezona and Ugwuanyi [42] narrate that the poor nature of Internet speed infringe on the usefulness of the connections and is a real barrier to using e-resources. Their work further reveals the survey of ATICS

[39] See *The Bandwidth Consortium: Opening the Power of the Internet to African Universities* <http://www.foundationpartnership. org/pubs/press/bandwidth.ph>
[40] Mike Jensen *Open Access: Lowering the costs of international bandwidth in Africa,* APC Issue Papers http://www.researchictafrica.net/images/upload/open_access_EN.pdf
[41] Vente *supra* note 32

[42] Echezona, R., & Ugwuanyi, C. (2010) African university libraries and Internet connectivity: Challenges and the way forward. *Library Philosophy and Practice*. Available: http://unllib.unl.edu/LPP/echezona-ugwuanyi.htm

in 2006, which compared the bandwidth kbps (kilobits per second) of African academic institutions and accounts that the University of Lagos, Jos and Bayero University are the only academic institutions in Nigeria listed among the first ten countries in Africa. The former has a total of 6,000 kbps uplink and downlink, while the later has only a capacity of 4,500 kbps. One of the major factors responsible for the high cost of internet bandwidth in Africa is the use of satellite bandwidth as opposed to much cheaper optic fibre infrastructure Hence as Jensen (2006) rightly observed, unless interventions are made to reduce the cost of existing international fibre links as well as to quickly develop new fibre infrastructures, the continent will be prevented from tapping its latent potential and this will further widen the digital divide.[43]

Another infrastructural problem associated with internet connectivity in Nigerian academic institutions is the problem of electricity power supply. An institutional repository should be openly accessible 24 hours a day. This will thus imply a sustained and regular electricity supply to power ICT facilities. Electricity supply is a major problem in developing countries like Nigeria. This problem has made the development of projects like an institutional repository in Nigeria much difficult and expensive. Fatunde (2008) has observed that poor electricity supply is a major impediment to the operation and growth of information and communication technology in Nigerian universities. According to him:

> "Only a trickle of daily electricity production dribbles erratically into the country's institutions, rendering ICT systems dysfunctional. Universities resort to diesel-propelled generators, but they are expensive and environmentally unfriendly."[44]

[43] Jensen *Supra* note 40
[44] Tunde Fatunde (2008) *University World News (African Edition)* "NIGERIA: Poor electricity supply hits ICT growth" http://www.universityworldnews.com/article.php?story=20080424153055598.

Nigeria produces about 2,500 megawatts a day of electricity – ten times less than its daily need. The extent to which this problem affects ICT projects in the Nigerian educational sector is self-evident. For instance, in 2001 the National University Commission (NUC) in Nigeria commenced development of the virtual library project. The need for the project was to create a central digital repository that will assist the Nigerian university system in terms of acquisition of electronic resources to supplement the resources available in the individual university libraries. In order to deal with the problem of constant shortage of electricity power supply, the server for the project had to be located in far away United Kingdom thus resulting in much higher cost of operation. Another institution that has had to deal with this problem in its effort to develop an institutional repository is the International Institute of Tropical Agriculture (IITA). The Institution which is at the final stage of developing an open access institutional repository also had to locate its server in the United Kingdom due mainly to the incessant problem of power supply in Nigeria. Various other researches has also confirmed that many institutions in developing countries face an unreliable electricity supply, poor Internet connections, as well as of lack adequate computer equipment, appropriate software, and even technological expertise.

The implication here is that there should be a sustained and regular electricity supply to power ICT facilities. Irregular and un-sustained electricity supply is a major problem in developing countries like Nigeria. Open access to knowledge is an innovative mode of scholarly communication within the digital environment. It is aimed at achieving universal access to information and knowledge. While open access helps digital inclusion of citizens in developing countries by bringing within easy reach full-text contents of scholarly works, documentary heritage collections and development-related literature, the digital

library remains a knowledge repository of such citizens, indigenous people, communities and institutions.

But regrettably, academic and research institutions in Nigeria, including the librarians, are yet to take advantage of the benefits emanating from open access initiative, giving reasons ranging from: low uptake and lack of knowledge or awareness of open access, poor and inadequate funding, poor state of ICT facilities on campus, lack of advocacy, Inadequate manpower and skilled personnel, space problems among others. It is recommended that librarians should be courageous to seek ICT skills and ceaselessly inform the university management on the need to introduce and work with information communication technologies. Echezona and Ugwuanyi's[45] view that bandwidth management should be incorporated into the institutional objectives of African universities and should be adopted.

Inadequate Funding

Lack of funding is another major problem experienced by developing country institutions in their effort to establish digital repositories. As has been stated above, the state of ICT infrastructure in academic and research institutions in developing countries like Nigeria is so low to sustain the development of institutional repositories. Hence a viable digital repository project will first require serious upgrading of the current state of ICT facilities in many academic and research institutions in Nigeria. Development of institutional repository in developing countries is much a capital intensive project than in developed countries. This is because academic and research institutions in developed country already have in place a well-established state-of-the-art ICT infrastructure to build on. But in developing countries, this infrastructure or foundation is not in place and will require huge financial resources to put them in place. Additionally, the high cost

[45] Echezona, R., & Ugwuanyi, C. (2010) supra note 42.

of internet bandwidth in developing countries further worsens the problem. It is rather curious that developing country institutions with far limited financial resources as compared to their counterparts in developed countries eventually end up paying more for same bandwidth than their counterpart in developed countries. These factors contribute to inflate the cost of establishing digital repositories in developing countries.

Most of the universities in Nigeria receive substantial part of their funding from the government's budgetary allocation. This increase in cost of developing digital repositories is even made worse by the fact that the institutions in this region continues to grapple with declining funding from budgetary allocations from the government. A typical cost for developing an institutional repository in Nigeria will cover the cost for a server, subscription for adequate bandwidth, cost for building an alternative energy source, computer staff time for running and maintaining the ICT facilities, costs of purchasing scanning equipments, library staff time in formatting documents etc.

Inadequate advocacy

One of the best ways to promote the development of open access institutional repository in developing countries is through advocacy. For such advocacy to be really effective, it must be undertaken by the stakeholders in the region. These stakeholders includes lecturers, researchers, librarian as well as students. Effective advocacy presupposes that the advocates or stakeholders are very familiar with the concept. Unfortunately, as we have seen in the course of this discuss knowledge of open access publishing is very low among the major stakeholders in the developing region. There is need for increased advocacy of open access institutional repository

in the developing countries like Nigeria. Advocacy could be undertaken through national and regional workshops and conferences as well as training of stakeholders within the region.

Copyright in Digital Content

The interaction of the Internet and copyright is an issue of particular and growing importance for developing countries. With printed media, there are provisions for "fair use" "Fair Dealing" in some jurisdiction, In Nigeria this is provided for in the Second Schedule, Section 6[46] under copyright law, and the nature of the medium lends itself to multiple use either formally through libraries or informally through borrowing and browsing. With material accessed through the Internet, the technology allows encryption and other means to exclude potential users even from browsing, unless they have paid the relevant charge. While the "philosophy" of the Internet has hitherto been about free access, increasingly sites with material of value are moving towards charging for use, or limiting access in other ways.[47]

A copyright holder has the exclusive right to make his work available to the public as well as the right to authorize others to make copies of the work. The author's right to reproduce his work includes the right to convert the work from a paper format to digital or electronic format. This right is especially important since the development of institutional repository will usually entail scanning of previously published work in paper format and converting same into digital format for uploading in the repository. Unless this is done with the permission of the copyright holder or under a statutory exception such as fair use or fair dealing, this will amount to copyright infringement. For the purpose of open access publishing, authors have to retain the copyright in their work for use in the institutional repositories. As regards copyright issues, it is highly

[46] Copyright Law Cap C28, Laws of Federation Of Nigeria
[47] Rami Olwan, Intellectual Property and Development; Op cit note 165 p.35

recommended that authors within the region should be educated on their rights in relation to their intellectual output. This is very important as these authors continue to sign away their legal right without knowledge of the legal implication of their act.

Conclusion and Recommendation

This paper has highlighted some of the issues that affect the development of open access publishing and scholarly communication in Nigeria to include lack of awareness of the open access publishing in academic and research institutions in developing countries, inadequate information and communication infrastructure, Inadequate and epileptic power supply, lack of funding as well as poor advocacy for open access. The issue relating to copyright management was also discussed. In the light of these observations, the following recommendations are proffered:

With regards to the issue of awareness and advocacy, it is highly recommended that the approach adopted in eIFL and SASLI in South Africa be applied also in Nigeria - namely: organizing series of conferences and capacity building workshops to educate and train stakeholders in academic and research institutions in Nigeria. In this way their knowledge of open access will be enriched and they will be in a better position to advocate for change in policies within their institution and at national level. This will create a conducive environment that will nurture the development and growth of open access in Nigeria. The two major issues in ICT relates to Internet bandwidth and electricity supply to power ICT infrastructure. With regards to the first, the short term solution will be to support initiatives (such the Bandwidth Consortium (BWC)) aimed at subsidizing the cost of internet bandwidth in academic and research institutions in

Nigeria. The long-term solution in this area should take the form of increased backing for international optic fibre infrastructure as well as an open access policy to the project so as to provide equal access to all bandwidth providers. To deal with the issue of electricity supply to power ICT infrastructure, there is need to fund research into development and implementation of efficient power generating alternatives to power ICT facilities used in the deployment of institutional repositories. It was also observed that the development of institutional repository in Nigeria as well as most developing countries is a capital intensive project. This issue is worsened by the diminution of budgetary allocation from government to the educational sector. There is need for increased funding from international donor agencies to help academic and research institutions in Nigeria to uplift the state of their ICT infrastructure. Other alternative sources of funding that could be researched into includes corporate entities like telecommunication companies operating in the country.[48] As regards copyright issues, it is highly recommended that authors within the region should be educated on their rights in relation to their intellectual output. There is need for researchers to retain the copyright to their research works in order to have the capability to make such works available in open access repositories. This is possible through the use of alternative publishing agreement. By means of an alternative publishing agreement, researchers are able to grant a limited right (license) to publishers to publish their work while the copyright in the work remains with the researcher or author of the work.

[48] MTN a mobile telephone company operating in most African countries as well as Zenith Bank has helped to fund the establishment of internet café at the University of Lagos

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