University of Nebraska - Lincoln
DigitalCommons@University of Nebraska - Lincoln

Library Philosophy and Practice (e-journal) | Libraries at University of Nebraska-Lincoln

9-30-2010

African University Libraries and Internet Connectivity: Challenges and the Way Forward

R.I. Echezona
University of Nigeria - Nsukka, ifeomaechzona@yahoo.com

C.F. Ugwuanyi
University of Nigeria - Nsukka

Follow this and additional works at: http://digitalcommons.unl.edu/libphilprac

Part of the Library and Information Science Commons

Echezona, R.I. and Ugwuanyi, C.F., "African University Libraries and Internet Connectivity: Challenges and the Way Forward" (2010). *Library Philosophy and Practice (e-journal)*. Paper 421.
http://digitalcommons.unl.edu/libphilprac/421

Library Philosophy and Practice 2010

ISSN 1522-0222

African University Libraries and Internet Connectivity: Challenges and the Way Forward

R.I. Echezona, PhD

C.F. Ugwuanyi

University of Nigeria, Nsukka

Introduction

Universities play an important national role in Africa. They are frequently the most effectively performing institutions in their countries. As a result, Universities are the principal reservoir of skilled human resources in most African countries. University roles in research, evaluation, information transfer, and technology development are therefore critical to social progress and economic growth. Universities in Africa perform a unique role in their societies; they serve as a principal conduit for information flow and technology transfer between the industrial world and their country. For this reason, university strategic planning should pay special attention to the challenge of accessing current scientific knowledge (through journals, books, CD-ROM, On-Line resources) at affordable cost.

University libraries are expected to be the informational hub of the campus and they should play an enhanced role in the fulfillment of the Universities' mission. The role and function of libraries within African Universities requires significant rethinking and restructuring in light of recent advances in information and communications technology (AAU, 2002). The ICT has transformed the Library into a new information unit by facilitating electronic operations of various library functions such as cataloguing, electronic acquisition and serial control, electronic inter-library loan and electronic circulation functions.

University libraries in many African countries have faced a difficult decade, with rapid erosion of funding for books and journals, staffing difficulties and perhaps a loss of the perception of the library as the centre of academic scholarship. Librarians are often portrayed negatively and there may be little understanding of their responsibility for delivering relevant information in whatever format as needed to the Academic community (AAU, 2005). They were of the opinion that access to excellent Internet connectivity can be a "make or break" for a higher Education Institution today and for instance in Africa, access to adequate Internet bandwidth presents a great challenge for University management.

Objectives of the Study

The paper explores the state of Internet connectivity in Africa in relation to higher education institutions and the corresponding libraries as a hub of the institutions. It examined various efforts by countries and organizations to link Africa to global information superhighways. The challenges posed by the lack of ICT infrastructure and low bandwidth are also discussed. It also offers recommendations for solving these problems and launching African university libraries into the global information and research interchange. African universities are pivotal to development in Africa through research and education and their libraries are the engine facilitating these developmental process. Being part of the global information environment is not negotiable.

Internet Connectivity

The Internet is a global system of interconnected computer networks including schools, governments, businesses, and other organizations. The Internet facilitates information exchange across the globe. African university libraries, as a centre of academic and research activities for development, require this connectivity to remain viable in the present ICT environment. Bandwidth, according to Alhasan and Adepoju, (2007), is the amount of data that a computer network can transfer in a certain amount of time. O'Leary, et al., (2005) define it as how much information can move across a communication channel in a given amount of time. In short, it is the capacity of a particular connection. It is measured in kilobits per second (Kbps) or megabits per second (Mbps). A kilobit is one thousand bits; a megabit is one million bits and a gigabit is more than one million bits. A dial-up telephone modem can transfer data at rates up to 56 kbps; but Digital Subscriber Line (DSL) and cable modem connection are much faster and can transfer at several mbps. The Internet connections used by business often operates at 55 mbps, and connections between routers in the heart of the Internet may operate at rates at 2,485kbps. DSL and cable modem connections are classified as wideband or broadband networks having a high capacity and operates at high speeds. Dial-up modem connections are narrowband networks, which have very low capacity and usually low speed.

The way in which information is produced, shared, and consumed is now so heavily mediated by information technology that a university depends on the quality of its connections to both the commercial Internet and the global research network. Bandwidth determines the efficiency of Internet connections, but equally important is the type of infrastructure used in the connectivity. The effectiveness of Internet connectivity depends on the speed of transmission across the networks. The greater the number of bandwidth per unit time, the greater the speed of data transmission and reception.

Internet Initiatives in Africa

Many initiatives have taken place to get Africa interconnected to the information super highway. NGOs, telecommunication companies, philanthropic organization,s and some countries of the developed world have extended their services to ICT development in Africa. The partnership for Higher Education in Africa (including the Ford, Macarthur, and Rockefeller foundations) has helped a consortium of 13 African universities to cover connecting cost.

Other Initiatives

SAT – 3/WASC/SAFE initiative has contributed to Africa's integration into the global information superhighways. September (2004) asserts that this initiative has demonstrated the ability of African and global telecommunication companies to work together to realize essential and critical telecommunications infrastructure for Africa. It has also facilitated the acquisition of international fibre optic cable connectivity for the first time in the large number of West, Southern, and Central African areas (French, English, and Portuguese speaking countries). The result of this is the migration of many countries from satellite to terrestrial connectivity. September summarizes the impact of SAT-3/WASC/SAFE to African Internet connectivity as the introduction of high-speed global optic fibre network, improved quality, reduced cost, large bandwidth, and more sophisticated communications.

The East Africa Submarine Cable System (EASSY) is an initiative born out of the desire to remove the digital marginalization of East Africa. CIPESA (2006) has noted that East Africa is one of the most "digitally excluded" regions of the world with just about 2% of the population connected to the Internet. The Internet connectivity in the region is very expensive and inefficient because of its sole dependent on satellite for communication. Essay's vision was first conceived at the first East African Business summit in Nairobi in November 2002 with business leaders from Kenya, Tanzania, and Uganda in attendance. The envisaged construction of 9,900km fibre optic system will enhance connectivity among African countries from both traditional and new broadband services and at the same time cover the cost

of connectivity. CIPESA ICT Policy Briefing (2006) states that EASSY is planned to link the Eastern and parts of South Africa to the international fibre optic system. Seventeen Southern and Eastern African countries are expected to benefit from improved communication services and lowered costs.

The Regional Information Society Network for Africa (RINAF) was initiated in 1992 (then called Regional Informatics Network for Africa) as a framework for UNESCO's support for African co-operation to promote academic and public sector computer networking. RINAF started with the support from Italy, the Netherlands and the Republic of Korea and UNESCO's Regular Programme. In may 2002, an African Regional Workshop on "Distance Education National Policy and the Role of ICT: Design, Building, Implementation and Management" was organized by the Regional Informatics Network for Africa (RINAF) at the UNESCO Regional Office for Education in Africa in Dakar (Senegal). In 2007, the Scan-ICT project for the Gambia marks another milestone in the development of the ICT sector, measuring access, usage and exploitation of ICTs in the Country by RINAF (UNESCO/RINAF, 2004).

African University Efforts

Some African countries through their universities have made appreciable efforts individually and collaboratively at establishing affordable ICT links which invariably enhances Internet connectivity. Most of the initiatives have been through the formation of National Research and Education Network (NRES), and Regional Research and Education Networks Their financial positions have limited their activities to acquisition of VSAT at affordable price through economies of scale by consortium formation. They also try to attract modern ICT infrastructure to their universities in order to offer a good higher education in quality and quantity.

The countries that have made tangible effort include Ghana through the Ghana Research Network (GARNET) which has attracted Danish Government to donate a complete VSAT connection to the University of Ghana with a speed of 128kbps uplink and 512 kbps down link.

In 1997, Tunisian National University Network was launched with a view to providing high performance technological infrastructure to help researchers as well as research and educational institutions use new information and communication technologies in the university environment. Tunisian Government encourage this effort by makingtheir services free of charge.

In Cameroon, Cameroon Inter-University Network (CIN) was also formed with similar goal to other countries networks. It provides satellite linkage to 6 states universities, offer Internet access, telephone facilities by IP and the possibilities of teleconferencing. Kyalo (2005) noted that Kenyan Education Network (KENET) was also formed with a view to providing a sustainable and high speed Internet connectivity to Education Institutions; facilitate electronic communication among them and facilitate teaching and learning over the Internet. To achieve this, 22 institutions were selected and connected to the Internet to serve as point of presence (POP) to serve other institutions in the environs. They were connected directly to a national backbone (Jumbonet) using kenstream digital lease lines.

In Senegal, the University Cheikh Anta DIOP De Dakur: Campus Network in 2000 established a campus information technology network with the support of French cooperation.

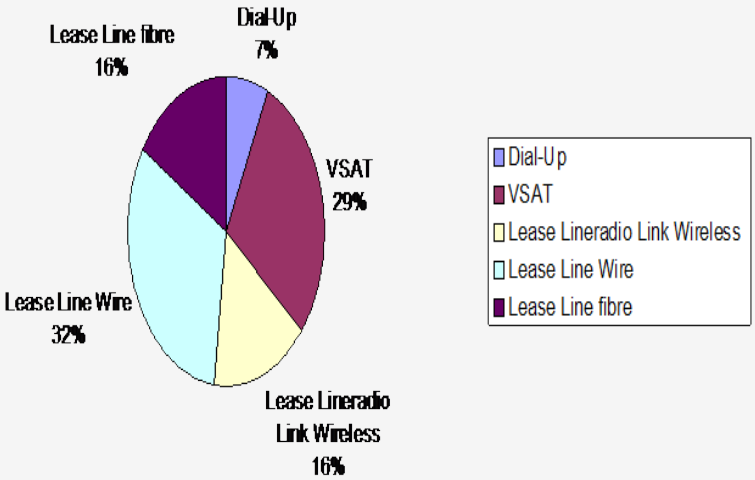
Internet Connectivity in African Universities

According to Aluoch (2006), connectivity in Africa is poor, unreliable, scarce and very expensive, where available, it is almost never dedicated and users have to contend with frequent service outages at very slow speed. She also revealed the result of the 2006 African Tertiary institutions connectivity survey (ATICS) which indicates that Universities in Africa, on an average pay about US $40.50 per kilobits per second (kbps) per month while some institutions pay as much as US $36 kbps for bandwidth. These figures are very high compared to users in North America who are on megabit and Gigabit speeds and

pay much less, that is $10 per month for a 3 mbps Digital subscribers line(DSL) link.. She also attributed the high cost of Internet connectivity in Africa to limited availability and capacity of national fiber backbones. National fibre backbone is the main cable connecting other cables and linking them to the international traffic in a country. Oghenevogaga and Oghenevogaga(2006) in their study on the impact of the Internet on research: the experience of Delta State University, Nigeria, found out that many staff have no access to the Internet either at home or in their offices. This depicts the state of Internet connectivity in Africa as at 2006. However, there has been a remarkable change to this situation.

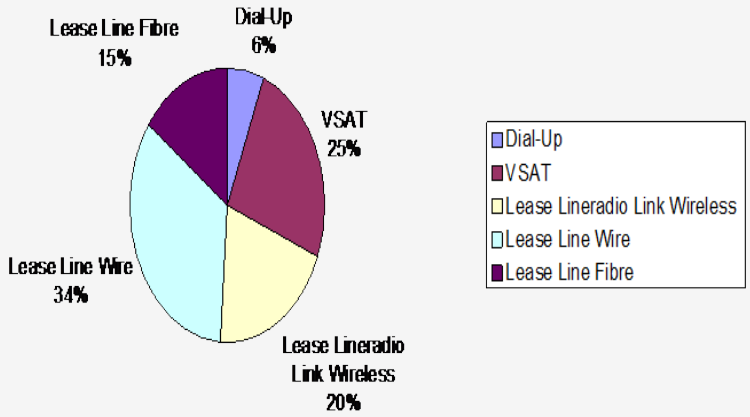
The Internet bandwidth connection of most higher education institutions (HEIs) is very low for these institutions to enjoy most of the multi-media services and on-line academic facilities available on the Internet. Many of the HEIs still use Store and Forward Connection and others are connected with dial-up facilities with the bandwidth limitation due to the poor telephone facilities. Some of the Universities have dedicated line access, even though the VSAT satellite facilities offer tremendous opportunities and can eliminate in many cases the problem of poor telephone lines (Ajayi, 2001). He goes further to say that "digital libraries offer a lot of facilities for on-line access to an ocean of academic information, by HEIs in Africa". A large number of libraries in HEIs in the developed countries are now digital with availability of electronic books, journals and other periodicals. One of the main reasons for a library organization to become so deeply involved in what is a technological project was the urgency of the desire to provide access to content that would really impact the academic community.

African universities use various types of connectivity to link to the Internet service providers. These connections include Dial up, leased line fiber, leased line radio link fiber, leased line wire and VSAT. The pie chart below illustrates the connectivity to ISPs and the state in 2006 as compared to 2004 according to African Tertiary institution survey (ATICS) 2006 report.

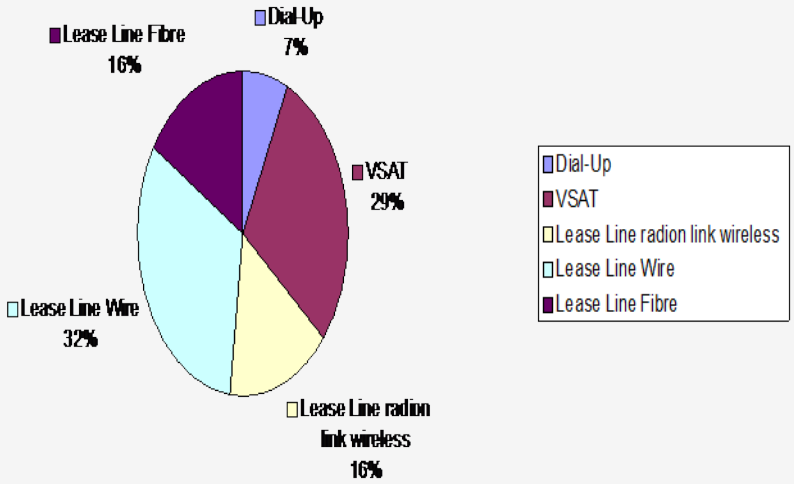


TYPES OF CONNECTIVITY USED BY INSTITUTION TO LINK TO ISPS

African Tertiary Institution Survey (ATICS) 2004 report.



African Tertiary Institution Survey (ATICS) 2006 Report.



From the above chart, majority of the tertiary institutions use terrestrial based leased lines (wire, radio link wireless fibre) for connectivity purposes. This has total of 69% (64% in 2004) while 25% (29% in 2004) use VSAT and very few of the institution still rely on dial-up connection 6% (7% in 2004). The implication is that more institution is migrating from VSAT to terrestrial connectivity. Rosenberg (2005) recognized that libraries in institution with older established connectivity tend to use leased lines. This implies that there is great improvement in the Internet connectivity in Africa tertiary institutions. As a result, many of the university and research initiations in sub-Saharan African in or near to major cities are and will be able to enjoy broadband, terrestrial connectivity to each other, Research and Education Networks (RENs) in other parts of the world, and to the Internet generally. Ubuntunet Alliance (2008) envisioned that from 2010, any of the region's major universities and research institutions may well be finished with VSAT connectivity. This can be facilitated by donor agencies such as UNDP. It is worthy to note that the university libraries of the African universities as pivot of research and learning, share the same connectivity with their parent institution.

Nature of Connectivity

As has already been stated, the Internet connectivity is very poor and costly. The poor nature leads to slow speeds which infringe on the usefulness of the connections and a real barrier to using e-resources. Bandwidth capacity determines the speed of Internet connectivity. The following table shows the ranking of the institutions with highest and lowest bandwidth capacity

Table 1: Ranking Bandwidth capacity per institution

Institutions with highest bandwidth capacity	Top ten	Total kbps uplink + downlink
Akhawayn University	Morocco	16,000
Makerere University	Uganda	15,000
Eduardo Mundane University	Mozambique	8,500
University of Botswana	Botswana	7,000
University of Jos	Nigeria	6,000
National University of Science and Technology	Zimbabwe	5,512
Bayero University	Nigeria	4,5000
Botswana Institute of Administration and Commerce	Botswana	4,000
University of Djibouti	Djibouti	4,000
Chinhoyi University of Technology	Zimbabwe	4,000
Institutions with lowest Bandwidth capacity	Bottom ten	Total kbps uplink + downlink
Copper Belt University	Zambia	192
Malawi	Malawi	192
Cast African University	Somalia	192
Somalia Institute of Management and Administration Development	Somalia	192
Université du Burundi	Burundi	160
Kanwzu School of Nursing	Malawi	128
Université du Yaounde	Cameroon	96
Ecole Africane des Métiers de l'Architecture et de l'Urbanisme (EAMAU)	Togo	64
Njala University	Sierra Leone	50
Mount Meru University	Tanzania	27

Courtesy of ATIC 2006 report

The table revealed a wide gap between the lowest bandwidth capacity of 27 kbps and the highest capacity of 1600kbps. Al Akhawayn University, Morocco has the highest total kbps while Mount Meru University; Tanzania has the lowest total kbps. According to ATICS 2006 report, Morocco and most of the North African institution have higher capacity of connection because of the presence of national backbones and utilization of undersea cable connecting the National Research and Education Networks to the Internet. The report also indicated that universities in Africa, on average pay about US$4.50 per kilobits per second(Kbps) per month while some institutions pay as much asUS$36 per Kbps for bandwidth. While the African countries operates in kilobits per second, the North African countries are on

megabits and gigabits speeds and pay less, for example, some pay ten dollar per month for a 3mbps DSL link while some universities pay $2million annually for gigabits speeds.

Rosenberg (2005) in her findings on an investigation to establish the current status of digital library of university libraries in Africa, noted that VSATs are currently the most popular method of connectivity perhaps because it is the cheapest and is often the only available one .She cited OSIWA project in Nigeria which is connecting libraries by VSATs .However, the present use of fibre optics brings down Internet bandwidth costs by at least 80% compared to terrestrial infrastructure services. For example, the Eastern Africa Submarine Cable System(EASSY)is an initiative to connect countries of Eastern and Southern Africa via a high bandwidth optic cable system thereby enhancing the speed and lowering cost.

Status of Internet Connectivity in Africa

Table 2: Status of Internet Connectivity in Africa

World regions	Population (2007)	Internet usage	Usage %	Population (2008)	Internet usage	Usage %
Africa	933448292	33334800	3.0	955206348	51022400	3.6
Asia	3712527624	398709065	35.8	3776181949	529701704	37.6
Europe	809624686	314792225	28.3	800401065	382005271	27.1
Middle East	193452727	19424700	1.7	197090443	41939200	3.0
North America	334538018	233188086	20.9	337167248	246402574	17.5
Latin America/Caribbean	556606627	96386009	8.7	576091673	137300309	9.8
Oceania/Australia	34468443	18439541	1.7	33981562	19353462	1.4
World total	657466417	114274426	100	6676120288	1407724920	100

Source: http://www.Internetworldstats.com/stats.htm

Africa is second to Asia in world population with a population of 955,206,348 and Internet users of 51,022,400, representing 3.6% of the world users' (Internet World Statistic 2007). Though there is an increase in Internet usage in Africa, the percentage usage is still very low as compared to other regions of the world.

Table 2 shows the comparison between the world 2007 usage and 2008 usage.

Globally, there is an increase in the Internet usage percentage in the developing region (southern pole) the highest Internet user percentage growth is Asia with 1.8% followed by Middle East with 1.3% Latin America 1.1% and Africa 0.6.In Europe, there is decrease in the percentage of Internet user of 1.2% and Oceania/Australia 0.3%

Table 3: Internet connectivity in Africa for countries with one percent and above users.

Africa	Population (2008 est.)	Internet users	% Users in Africa
Algeria	33769669	3500000	6.9
Egypt	81731517	8620000	16.9
Ghana	23382848	650000	1.3
Kenya	37953838	3000000	5.9
Morocco	34343219	7300000	14.3
Nigeria	138283240	10000000	19.6
Senegal	12853259	820000	1.6
South Africa	43786115	5100000	10.0
Sudan	1500000	40218455	2.9
Tunisia	1722200	10383577	3.4
Uganda	31367972	2000000	3.9
Zambia	11669534	500000	1.0
Zimbabwe	123828200	1351000	2.6

Source: http://www.Internetworldstats.com/stats.htm

Aqili and Moghaddam (2008) citing WSIS (2005) state that there are some commonly used phrases to indicate the Internet status of Africa such as "there are more than eight times as many Internet users in the USA than on the entire African continent," "there are more than three times as many Internet in Japan as on the entire African continent", "there are more than twice as many Internet users in Germany than on the entire African continent – home to over 50 countries has fewer intent user than France alone." They indicate that this situation encourages digital divide. Mutula (2002) was of the opinion that lack of basic infrastructure such as PCs, inadequate Internet access, and inadequate telephone lines contributes to the African deficiency in web content. The use of the Internet depends to a great extent on the state of the telecommunication environment.

Presently, there has been a remarkable improvement on the condition as noted by Eyitayo (2008) that despite these low Internet usage rates in Africa, the Internet can now be accessed virtually anywhere by numerous means within Africa. He also indicates that libraries and Internet cafés, where computers with Internet connections are available and are the major places where the Internet is used. Stressing the remarkable improvement in Internet connectivity in Africa these days, he points out that hotels now have fee-based public terminals. To add to this, churches now have terminals for their e-church services. Sophisticated handsets or mobile phones which come with Internet access now abound in African markets. Mobile phone users can connect to the Internet from anywhere there is a cellular network supporting the technology.

In ATICS 2006 report, North Africa and Southern Africa with Eastern Africa have the highest average computer density. On the other hand, they have the lowest average number of users per networked computers in their campuses in sub-Saharan Africa. The situation is now improving as the numbers of computer are increasing with fewer and fewer people per computer.

Findings and Discussion

The challenges and prospect of Internet connectivity among African universities and their university libraries emerging from the study are discussed as follows:

ICT Infrastructure

- African universities have low speed Internet infrastructures such as VSAT and Lease line wire connection
- Power supply in Africa is very poor, endangering Internet connectivity.
- The introduction of new optic fiber technology is a great improvement in the speed of the Internet.
- Current development in digital technology has made mobile telephone and more PCs available to higher education in Africa
- Government policy encourages monopoly. This indicates that African government contribute to the poor Internet connectivity and high of cost bandwidth.
- No government is on a national fibre backbone; rather, they create satellite connectivity which promotes and protects monopolistic markets and impose high cost of telecommunication license, bringing prices up.

Digital Divide

- South African submarine fiber connection to Europe offered opportunity to other African countries to be connected to the international digital traffic.
- There is marginalization of the developing world digitally.

Bandwidth Management

- Bandwidth is a scarce resource in developing world and requires strategic decision for its allocation.
- Consortium formation is necessary as it encourages economics of scale and purchasing of bandwidth in bulk through VSAT. It will equally facilitate migration from VSAT to terrestrial connectivity or the optic fibre connection.
- African universities operate at bandwidth capacity in kilobits while the developed world is in megabits and gigabits.
- Bandwidth management should be incorporated into the institutional objectives of African universities
- Foreign project aids and partnership that will target African universities should be sought

Discussion

There is poor Internet infrastructure in African universities. The mostly used is the VSAT which has low speed connectivity as a result of narrow bandwidth. This is creating a digital divide between the North Pole (developed world) and terrestrial and optic fibre connectivity. This is in line with Greaves (2008) Opinion that there is a disparity in the bandwidth provision between the developed and developing world due to the regulatory and competitive environment, the availability of terrestrial infrastructure, the distance from the global network cores and the cost and quality of bandwidth. In the developed world, the institutional bandwidth is 50kbps per client while in the south or developing world it is 0.5kbps.

Government polices which encourage monopoly and non-effective telecommunication policy indicate that the state contributes to poor connectivity and high cost of bandwidth in Africa. African telecommunication policy border on VSAT provisioning and connectivity rather than establishment of national backbones. This national backbone enhances terrestrial and fibre optic connectivity. Satellite connectivity encourages monopolistic markets by few government licensed agencies. However, many countries are now making progress by setting out ICT policies that will encourage globalization. Womboh and Abba (2008) advocated that governments should exempt ICT equipment from customs and exercise tax so that the prices of such equipment will be drastically reduced and become affordable.

There is a wide digital gap between the developed and the developing worlds. This is characterized by the prevailing connectivity in the areas. While the development world uses high speed, cost –effective fibre optic technology for connectivity, most Africans are still on satellite connectivity which is very costly and narrow bandwidth. Omekwu and Echezona (2008) also identified this divide when they noted that the North-South digital divide is proportionately skewed against Africa there by making information global access faster, broader and diverse in the Europe and America than in Africa and Nigeria. However, it is the poor ICT infrastructure and lack of adequate manpower and economic condition that creates this digital divide.

Implication for LIS

Information access

Internet connectivity among African Universities initiates them into the information super highways for international academic and research information delivery and utilization. However, the poor state of Internet connectivity in African University libraries affects the information needs of the clientele as it hinder access to information globally).

High cost of Internet connectivity and bandwidth and low speed Internet connectivity pose a treat to African Universities joining the digital information world where knowledge and research findings are accessed digitally. Currently the Library and information science profession in Africa is yet to be fully globalize considering the stage of their Internet connectivity. This is appalling as globalization is the order of the day in various walks of life.

ICT literacy

The frantic effort made by Organizations and African government to abridge the digital gap between African and the developed world is an indication of future Internet worked Africa. As a result librarian are compelled to acquire the necessary skills to operate in the new information digital environment. ICT literacy then becomes mandatory for every librarian to function effectively and render same service to their patron. This is consistent with Olalude (2007) who stated that for African information professional to remain relevant and meet the needs of their patrons . they must posses adequate knowledge and mastery of Internet facilities as tools for accessing current information. Therefore, librarian need re tooling to acquire necessary ICT skills. For Africa to harvest the goodies of Internet connectivity, there should be a focus on the manpower development on how to use the Internet to access the online resources for learning and research purposes .Mahajan,R (2006) recommended that the academic staff should be sensitized on the use of electronics information sources for study and research and that librarians should also provide proper training in the use of online information resources.

Economy of scale

Internet connectivity is very expensive in Africa considering their economic condition. This necessitated the formation of bandwidth consortium to reduce unit cost per megabyte, increase Internet speed and encourage ICT infrastructural development. The consortia can serve as a platform for the formation of library collaboration for resource sharing and effective library service to the clientele

Recommendations

- Liberalization of telecommunication market will reduce high cost of Internet connectivity bandwidth.
- Government should pay attention to ICT infrastructure facilities provision in their policy and budget to bridge the digital divide and encourage globalization.

- Bandwidth management should be incorporated into the institutional objectives of African Universities
- Foreign project aids and partnership that will target African Universities should be sought for

Conclusion

The resultant effect of inadequate or lack of affordable connectivity is that universities in Africa are unable to satisfy the information needs of students, researchers, professors, scientists and libraries with tools needed to be involved in building a knowledge economy. This hinders access to information and further impeding socio-economic development. It may be worthy to note that Internet is an indispensable tool for teaching, learning and research in the present .globalize world.(Oghenevwogaga and Oghenevwogaga,2006)

Universities are the centre of developments in Africa and the university libraries remain the pivot of academic and research activities in their parent institutions. Internet connectivity among African universities initiates them into the information superhighways for international academic and research information delivery and utilization. High cost of connectivity and bandwidth and low speed Internet connectivity, poses a treat to African universities joining the information world.

There have been efforts to interconnect Africa by Internet initiatives in many African countries. Countries such as Kenya, Cameroon, Nigeria, Senegal, South Africa and Tunisia have made some significant moves in Internet connectivity, nationally, regionally and internationally. Though these efforts are still very little, they are in no doubt steps in the right direction. In the same vein,, bandwidth consortia are springing up in order to resolve the issue of high cost bandwidth access by saving cost through economies of scale across Africa

In spite of the constraints highlighted above, the continent of Africa cannot afford to do without access to Internet facilities, if she hopes to close the gap between the developed world and her in the area of science and technology. Universities, research bodies, libraries and other information documentation centers over the world paste current research findings and information on the web. Olalude,(2007)stated that for African information professionals to remain relevant and meet the needs of their patrons, they must possess adequate knowledge and mastery of Internet facilities as tools for accessing current information. Therefore, University libraries should be recognized as information centre and be accorded full support by proper funding and interconnectivity

There is an identified digital gap between the developed and the developing world. All African universities libraries are implored to think towards the direction of abridging this gap in order to ensure information and research exchange (Adelanle, Omaba and Tella, 2007). The South African submarine fibre connection to Europe offered opportunity to other African countries to join the international digital traffic.

African universities should recognize the issue of bandwidth problem in Internet speed reception. This will help in making strategic decisions in Internet connectivity in Africa. Coupled with this, the African government should try to implement their ICT policies in order to enhance Internet connectivity. (Womboh and Abba(2008) emphasized that Nigeria with an information technology mission statement as to make Nigeria an IT capable country in Africa and a key player in the information society by the year 2005, has not achieved this as at 2008. Government should have focused attention to ICT development and Internet connectivity in particular. They note further that the number and quality of computer literate librarians and library staff are not adequate; however, ICT requires money for acquisition, installation, maintenance, training, and sustainability. Many Nigerians university libraries do not have funds to venture and sustain ICT.

References

AAU (2002). African universities and the challenge of knowledge creation and application in the new century: Proceedings of 10th General Conference of Association of African Universities held in Kenya, Nairobi February 5-9, 2002.

AAU (2005). IDRC: A decade of ICT for development investment in Africa. *AAU Newsletter 11*, (3): 13-14.

AAU (2006). Editorial. AAU *Newsletter 12*: 2.

AAU (2005). The story of the MALICO VSATS: The Logic of library-driven NRENS. *AAU Newsletter 11*, (3): 7-8.

Adekunle, P.A., Omoba, R.O., & Tella, A. (2007). Attitudes of librarians in selected Nigerian universities towards the use of ICT. Library *Philosophy and Practice*. Available: http://unllib.unl.edu/LPP/tella3.htm

African Tertiary institution connectivity survey (2006). ATICS 2006 Report. Available: http://biotrade.aauorg/renul/docs/ATICS2006.pdf

Ajayi, G.O. (2002). Information and Communications Technologies: Building capacity in African universities. Being a paper presented at the 10th General Conference of Association of African Universities held in Kenya, Nairobi, February 5-9, 2001

Alhassan, J.K., & Adepoju, S.A (2007). An evaluation of Internet connectivity of information technology firms in Minna Metropolis. *Information Technologist 4*(1): 96-103.

Aluoch, A.A. (2006). The search for affordable quality Internet connectivity for African universities. *AAU Newsletter 12* (3):8.

Agili,V. S., & Moghaddam, I.A. (2008). Bridging the digital divide: The role of librarians and information professionals in the third millennium. *The Electronic Library 26*(2)

Collaboration on international ICT policy for East and South Africa (CIPESA) (2006). The Eastern African submarine cable system (EASSY): The open access challenges and debate. Available: www.cipesa.org/files/EASSYdoc.pdf

Eyitayo, O. T. (2008). Internet facilities and the status of Africa's connectivity. In Aina, L.O., Mutuala, S.M., & Tiamiyu, M.A. Information and knowledge management in the digital age: Concept, technologies and African perspectives. Ibadan: Third World Information Services.

Gakio, K. (2006). Africa tertiary institutions connectivity survey (ATICS) 2006 Report. Botswana: Cyberplex Africa. Available: http://www.aau.org/renu/docs/ATICS 2006.pdf

Greaves, D. (2008). Making strategic decisions about bandwidth. *INASP Newsletter 1* (35): 3-5. Available: http://www.inasp.info/uploadeddocuments

Ibrahim, A. (2005). Networking steps in Nigeria. *AAU Newsletter 11*(3): 11-13.

Ibrahim, M. (2005). Universities Cheikh Anta Diop de Dakar: Campus Network. *AAU Newsletter 11*(3): 10-11.

International Association of Universities (2008). Horizon news. *IAU Horizons*

Jain, P. (2008). Bibliographic and library networks in Africa. In Aina, L.O., Mutula, S.M., & Tiamiyu, M. *Information and knowledge management in the digital age; Concepts, technologies and African perspectives*. Ibadan. Third World Information Services: 229-250

Kayla, V. (2005). Kenya education network. *AAU Newsletter 11*(3): 6-7.

Mahajan, P. (2006). Internet use by researchers: A study of Panjab University, Chandigarh. *Library Philosophy and Practice 8* (2). Available: http://unllib.unl.edu/LPP/mahajan2.htm

Ngwira, M. (2005). The Ubuntu Net Alliance for Research and Education Networking. *AAU Newsletter 11*(3): 9.

Oghenevwogaga, B.A., & Oghenevwogaga, D.T. (2006). The impact of the Internet on research: The experience of Delta State University Nigeria. *Library Philosophy and Practice 8* (2). Available: http://unllib.unl.edu/LPP/adogbeji.htm

O'Leary, et al. (2005) in Alhassan, J.K. and Achepoju, S.A (2007) An evaluation of Internet connectivity in information technology firms in Minna Metropolis. Information Technologist vol. 4, (1) p. 96-103.

Olalude, F.O. (2007). Utilization of Internet sources for research by information professionals in sub-Saharan Africa. *African Journal of Library, Archive, and Information Science 17* (1): 53-58.

Omekwu, C.O., & Echezona, R.I. (2008). Emerging challenges and opportunities for Nigerian libraries in global information environment: A paper presented at the 46th annual NLA conference in Kaduna.

Rosenberg, D. (2005). *Towards the digital library: Findings of an investigation to establish the current status of university libraries in Africa*. Oxford: INASP.

September, R (2004). For Africans: The SAT3/WASC/SAFE submarine cable project. Available: www.cto.ICT.Org/ \

Tonye, E. (2005). ICT networks in Africa: Cameroon Inter-University Networks. *AAU Newsletter 11* (3): 4-5.

Ubuntunet Alliance (2008). What is Ubuntu? Availavle: http://www.ubuntunet.net.document/whatisubuntunet -v7.2.pdf

Unesco/RINAF (2004). Distance education in Africa. Available: http://portal.unesco.org/c/en/eo.php

Womboh, B.S.H., & Abba, T. (2008) The state of Information and Communication Technology (ICT) in Nigerian university libraries: The experience of Ibrahim Babangida Library, Federal University of Technology, Yola. *Library Philosophy and Practice*. Available: http://unllib.unl.edu/LPP/womboh.htm