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Role of ICT in Managing Higher Education for Sustainable Development

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Abstract. This study assessed the role of ICT in the management of higher education for sustainable education in Nigeria. Data were collected from 800 lecturers selected from 16 higher education institutions in the country. The findings were that accessibility of ICT facilities is still very low and that, although lecturers have a positive disposition towards the use of ICT facilities, they scarcely use them. The study also found that the respondents believe in the potential of ICTs to positively transform higher education. It highlighted the ranking of some factors hindering effective usage of ICT in the management of higher education for sustainable development. In light of these findings, it is recommended that ICT facilities are made available and accessible in higher institutions and that relevant end-user training be provided to enhance usage of the facilities.

Keywords: ICT4D; ESD; Information Technology in Education Management

1 Introduction

Higher education around the world is facing unprecedented changes. As these changes continue to accelerate the various higher institutions are subjected to external and internal pressures from stakeholders and students. Major reforms in higher institutions have recognized the changing nature in higher education and the need for change at both the institutional and individual level to make them more mobile, synergetic, creative, future-oriented and sustainable. Higher education should be anticipatory to social, economic and cultural life as well as form desirable sustainable future. It is the kind of education desirable, not only for promoting sustainable development but for improving the capacity of people to address environment and development issues, hence it is critical for achieving environmental and ethical awareness, values and attitudes, skills and

behaviour consistent with sustainable development and for effective public participation in decision making.

The World Commission on Environment and Development (1987) defines sustainable development as "development which meets the needs of the present without compromising the ability of the future generations to meet their own needs". Cox and Cusick (2006) affirms that behind sustainable development is the idea of economic growth, social development and environmental quality and the ability to sustain a consistent balance of interaction among these three systems for present and future redress of any nation. Therefore current technology development should be re-oriented for future development.

ICT refers to technologies that enable the handling of information and facilitate different forms of communication between human actors and electronic systems. In this paper, it refers to technology facilities such as capturing technologies (keyboards and image scanners); storage technologies (magnetic tapes, floppy disks, hard disks) processing technologies (photocopy and fax machine); communication technologies (internet and cellular phone) and display technologies (computer screens, digital TV sets and printers).

The swiftness of ICT developments, their increasing spread and availability and the nature of their content are having major implications for sustainability. ICT plays a significant role in national development and awareness globally as well as in managing quality education. Udida, Udofia and Ozurumba (2008) affirmed that ICT has far-reaching implications in the realization of the social function of education in terms of culture, skills transmission and academic productivity. Succinctly, they argued that ICT has transformed tertiary institutions in Nigeria has become the major breakthrough and challenges causing positive changes in the educational system. The National Policy on Education (Federal Republic of Nigeria, 2004) recognizing the role ICT in the development of skills, abilities and competences for effective development offer that it should be integrated into education in Nigeria at all levels.

The success of ICT in higher institutions will depend largely, on attitude of lecturers and their willingness to embrace it in discharging their functions appropriately, especially in the age of globalization. Hence it is important that to integrate ICT in the management of higher education to reflect on teaching/learning situation, research and administrative functions.

1.1 Context

In this era of globalization, ICT offers support to social and economic development in the developing countries. Hanna, Guy and Arnold (1995) found out that ICT has been used in both developed and developing countries to provide infrastructure for the whole economy, facilitate market entry, reduce costs, improve customer services and increase productivity. Also Talero and

Gaudette (1996) agreed that ICT is a policy that promotes higher education and national extension programme. Similarly, Mansell and When (1998) note that ICT leads to improvement in the efficiency of enterprises and allocation of resources, thereby leading to national development. Daffe and Dansokho (2002) conclude that ICT has multifarious roles in production of goods and services as well as in the dissemination of new information.

The crucial role of ICT in managing higher education and stimulating sustainable development is twofold. While it allows countries to leapfrog stages of economic growth by being able to modernize their production system and value system, it also bring about retardation to those economies that are unable to adapt to the new technological system. Zwick (2003) examining the role of ICT on productivity in German establishments state that there are high and positive impacts on production, on the other hand, Fernald and Rammath (20040 in their study of the impact of ICT on total factor productivity growth in US, agreed that the impact is relatively broad based occurring in private IT industries, technical higher institutions and government sector. Relating all these reviews to higher education, ICT provides a platform for new initiatives. Bendix (2002) sited the South African case, where their tertiary institutions focused on these new initiatives through transitions and transformation of higher education curricula, structure and management.

The role of ICT in higher education in Nigeria cannot be over emphasized. Apart from its use in the classroom for teaching/learning, it enhances curriculum content and teaching methods of teachers. Research development and other out –of classroom activities are not left out. In recent times, ICT is used in the management of staff from recruitment to retirement and students from screening, registration to graduation.

Okon and Jacob (2002) in their study found that the use of ICT by academics in selected universities is low. This further confirm their assertion that in spite of the tremendous use if ICT facilities in teaching-learning situation, the state of ICT facilities in Nigeria's higher institutions is not too challenging and exploiting ICT potentials for educational use is on the worrying side. Akpan (2008) corroborating this assertion confirm that lecturers recognize the importance of ICT in teaching and learning but their competence and usage of the available ICT facilities is below expectations. Furthermore, Huang and Liam (2005) found among other factors that teacher's attitude towards ICT affect the successful use of ICT in institutions. This attitude could be in different dimensions namely: Affective Domain, Behaviour Intentions, Perceived Usefulness and Perceived Competence level, and Knowledge of ICT.

ICT is widely used in developed countries in the management of education which greatly sustain national development. For instance, United Kingdom has a well planned ICT curriculum for Key stages are clearly stated objectives culminating in four cardinals frame work as follows:

1. Finding things out ,
2. Developing ideas and making things happened ,
3. Exchanging, modifying and evaluating work as it is,
4. Reviewing, modifying and evaluating work as it progresses.

Almost all educational institutions in developed nations are thickly equipped with gadgets and facilities for ICT mediated teaching and learning. It is evident that lecturer attitudes towards ICT usage are predictor for future classroom use and development (Myers and Halpin, 2002). Sequel to this, Regeringen in Olisaemeka and Onwusoanya (2009) noted that there are strong expectations and political pressures on the educational system to increase the use of Information and Communication Technologies (ICTs) to enhance performance and facilities flexibility in education in Sweden. The same Swedish government in 1998 gave a report to the parliament on its plan for use of ICT in schools. The report shows that Sweden is just one of the many nations who have imbibed ICT use in schools.

Around 1995, most universities in the USA begun to connect the program used in education with the internet and high expectations about the benefits of the same integration was applauded (Newberg, Rouse and Kruper, 1994). In a Singapore survey with a sample of 139 teachers, it was found that there exist significant relationships amongst years of computer use, level of confidence and attitude to ICT facilities generally (Teo, 2006).

Consequently, ICTs are used for teaching and integrating learning across the curriculum, meaning that availability of ICT devices and a conducive climate will enable students and their lecturers to access and evolve effective learning and effective administration.

Aniebonam (2007) findings on current ICT status in Nigerian higher institutions revealed that there is a big gap in ICT skills between the average Nigerian students and academic staff compared to other institutions around the globe. According to him, if this gap is not addressed with immediate intervention of ICT adoption processes, will continue to grow far beyond the present situation. Aniebonam further used statistical data to show the current status (Table 1). The implementation of education policy reforms most times is subject to the social and political terrain in the country. There are barriers that have been experienced in integrating ICT initiatives in the management of education for sustainable development. Munyua (2000) highlighted the policy and funding issues as the major factor alerting set back in some developing countries. Johnson (2006) added that high telecommunication costs, infrastructure, inadequate human resources and sustainability of new projects as part of the challenges facing the integration of ICT in higher education in Nigeria.

Table 1: ICT Statistics in Nigerian Higher Institutions

Key Performance Indicators	Current Status	1st Year	2nd Year
Student Computer Literacy	7.5%	500/0	85%
Staff computer Literacy	110/0	750/0	1000/0
Students Computer Ratio	50:1	10:1	3:1
Staff Computer access	20:1	2:1	1:1
Software application to learning	50/0	25%	500/0
Bandwidth size (100 meg in USA)	0.25M:256kbps	2Mbp	15Mbp
Campus LANIWIFI (% of schools)	0%	50%	1000/0
Research using Technology	2%	25%)	50%
Administration using Technology	10% (with bank partners)	100%	100%
Learning with Technology content	1%	50%	75%
Web Presence (Web metric %)	750/0	100%	1000/0
e-Mail, domain ownership	15%	1000/0	100%
Power Supply daily percentage	100% (Poor)	500/0	1000/0
Overall Academic Productivity	5%	500/0	850/0

Source: Aniebonam (2007)

Access to ICT is an essential factor in the development of higher education for sustainable development. Knowledge of ICT will go a long way to enhance both lecturers and students ability in their academic work, improve their acquisition of basic employable skills, solve some basic academic and societal problems through research and contribute positively towards sustainable development in the society.

However, Observation has shown that many lecturers and students in higher institutions in Nigeria do not seem to appreciate the important role of ICT in the management of education for sustainable development. The problem is that some university lecturers are not computer literate and ICT facilities that would aid its knowledge and application are not available or are inadequate (Agabi and Uche, 2006). The resultant effect of the problem of low access to and provision of basic ICT tools in higher institutions is a setback not only in the management of education but also in national development. It therefore becomes imperative for a research to be conducted to navigate the role of ICT in higher education management as perceived by lecturers towards a sustainable country.

1.2 Purpose of the Study

The purpose of this study was to examine the extent to which lecturers have access to ICT facilities, investigate their attitude towards ICT, assess the role of ICT in the management of higher education for sustainable development and examine the factors affecting the use of ICT in managing of higher education.

1.3 Research Questions

1. To what extent do lecturers have access to ICT facilities?
2. What are the perceived attitudes of lecturers towards ICT usage?
3. How do lecturers perceive the role of ICT in the management of higher education for sustainable development?
4. How do lecturers rank the factors hindering effective usage of ICT in the management of Higher education for sustainable development?

2 Methodology

The ex-post facto research design was adopted. The study was conducted in higher institutions in the South-West, South-East and South-South geo-political zones of Nigeria. The institutions included universities, polytechnics and colleges of education. The population of institutions was 54. Using stratified random sampling techniques, 16 institutions were selected, representing 30% of the population. A total of 800 lecturers were drawn from the institutions. The instruments used for data collection was the Lecturers' perception Questionnaire (LPT) adapted from the study conducted by Akpan (2008) and interview sessions. The questionnaire consisted of five sections. Section A sought information on respondents' demographic characteristics. Section B sought information on accessibility of ICT facilities to lecturers. Items in this section were responded to using the options of Highly Accessible (HA), Accessible (A) and Not Accessible (NA). Section C items review lecturers' perceived attitude to ICT usage and it responses were rated on a 4-point Likert type scale as Strongly Agreed (SA), Agreed (A), Strongly Disagree (SD) and Disagree (D). This was further grouped into two as Agreed and Disagree for analysis purposes. Section D sought information on the role of ICT in managing higher education and barriers to effective usage of ICT in managing higher education respectively. The pilot study conducted yielded a split-half reliability co-efficient of 0.78 which was high enough for the instrument to be considered reliable. The administration of instrument was handled by the researchers and research assistants. Data were analyzed using frequency percentages.

3 Findings

3.1 Research Question One

This question delved into the extent to which lecturers have access to ICT facilities. The findings are summarised in Table 2.

Table 2: Accessibility to ICT Facilities.

ICT Location Areas	Highly Accessible	Accessible	Not Accessible
Personal Office	96 (12%)	150 (18.75%)	554 (67.25%)
Departmental Office	116 (14.5%)	205 (25.62%)	479 (59.88%)
Departmental Library	68(8.5%)	52 (6.5%)	680 (85.0%)
Institution Library	631 (78.87%)	101 (12.63%)	68 (8.5%)
Institutions ICT Centres	775 (96.88%)	10 (1.25%)	15 (1.87%)
Cyber Café	788 (98.5%)	8 (1.0%)	4 (0.5%)
Classrooms	4 (0.5%)	5 (0.63%)	791 (98.88%)
Staff Quarters	5 (0.63%)	13 (1.63%)	782 (97.75%)

Table 2 reveals that 98.5% of the respondents indicated that ICT facilities are highly accessible from the cyber café. This is followed by the Institution ICT Centres with 96.88% while the staff quarters and classrooms with 0.63% and 0.5% respectively are areas where ICT facilities are not accessible. Also worth noting are the departmental and personal office with low percentages for accessibility. The result showed that ICT facilities are not accessible in all areas or location within the institutions. The interview sessions revealed that at these locations where ICT facilities are accessible, they are not adequately provided.

3.2 Research Question Two

Research Question Two focused on the respondents attitudes towards utilization of ICTs. The result (Table 3) shows that majority of the respondents (73.38%) from the affective domain disagreed that they feel uncomfortable using ICT facilities. Also 67.87% of the respondents agreed that they feel worried using ICT facilities. From the Behaviour Intention aspects, 73.88% of the respondents agreed that they do not want to do any job that involves ICT usage. On whether they avoid the usage of ICT facilities in their institutions or not, they shared almost the same opinion, 50.25% of the respondent disagrees that they do avoid using ICT facilities while 58.87% agreed that they only use ICT facilities when is unavoidable. The perceived usefulness aspect revealed that majority of the respondents agreed to the usefulness of ICT facilities in their different job roles. However, the perceived confidence aspect shows that a high percentage 73% of the respondents agreed that ICT skills can be learnt through constant practice. Also, 65.12% agreed that they cannot easily manipulate ICT facilities and would always prefer to have standby experience person when using them. Only 37.5% agreed that they are always in total control when using any of the ICT facilities.

Table 3: Lecturers' Attitudes towards usage of ICTs

Items	Agreed	Disagree
Affective Domain		
A1 I am reluctant to use the ICTs in my institution	457 (57.13%)	343 (42.88%)
A2 I feel worried about using ICT facilities	543 (67.87%)	257 (32.12%)
A3 I do not feel comfortable using any ICT facility.	213 (26.62%)	587 (73.38%)
A4 ICT usage scared me	400 (50%)	400 (50%)
Behaviour Intention		
B1 I do avoid using ICT facilities in my institution.	398 (49.75)	402 (50.25%)
B2 I only use any ICT facility when it is unavoidable	471 (58.87%)	329 (41.13%)
B3 I get people to handle work involving use of ICT	591 (73.88)	209 (26.12%)
Perceived Usefulness		
P1 ICT facilities help me to work more productively.	550 (68.75%)	250 (31.25%)
P2 ICTs yield quicker and better results for me	480 (60%)	320 (40%)
P3 Using ICT make work more interesting and creative	511 (63.88%)	289 (36.12%)
P4 ICT usage makes my presentation clear, neat & logical	507 (63.38%)	293 (36.75%)
P5 ICT usage does not reduce my workload	522 (65.25%)	278 (34.75%)
P6 ICT facilities gives me access to current information	513 (64.12%)	287 (35.88%)
Confidence		
C1 I learn to use ICT facilities by constant practice	584 (73%)	216 (27%)
C2 I cannot easily manipulate ICT facilities to do my work	521 (65.12%)	279 (34.88%)
C3 When using ICT, I prefer having an expert on standby	503 (62.88%)	297 (37.13%)
C4 I am capable of solving problems using ICT facilities	257 (32.12%)	543 (67.87%)
C5 I am always in total control when using any ICT facility	300 (37.5%)	500 (62.5%)

3.3 Research Question Three

This research question inquired into the way the respondents perceived the role of ICT in the management of higher education for sustainable development. The findings (Table 4) were that majority of the respondents have high perception on almost all the item score relating to the role of ICT in the management of higher education. The only exceptions revealed in this study as the positive role of ICT is in the area of improving teaching/learning and assessment of students' performance where there is moderate perception. Under research role, the findings show that in almost all the items, respondents were of high perception except in the area of transmitting knowledge through research where they recorded moderate perception. As far as administrative activities are concern, respondents have perception of the role of ICT in this area with 90.8% and 54% respectively.

Table 4: Perception of the role of ICT in the management of Higher Education

Items	High	Moderate	Low
Teaching			
Enriching curriculum contents	650 (76%)	118 (14%)	32 (8%)
Development of course materials	715 (89%)	74 (9%)	11 (1%)
Delivering lectures/other presentations	276 (34%)	192 (24%)	332 (41%)
Improving teaching-learning situation	220 (27%)	460 (57%)	120 (15%)
Assessment of student performance	115 (14%)	484 (60%)	201 (25%)
Research			
Improving quality of research	662 (82%)	77 (9%)	61 (7%)
Transmitting knowledge through research findings	340 (42%)	362 (45%)	98 (12%)
Source of current information/literature studies	592 (74%)	128 (16%)	80 (10%)
Data collection, collation and analysis	490 (61%)	165 (20%)	145 (18%)
Global communication	800 (100%)	0 (0%)	0 (0%)
Administration			
Admissions, screening, registration and payment	727 (90%)	26 (3%)	47 (5%)
Connecting within and to the larger society.	432 (54%)	350 (43%)	18 (2%)

3.4 Research Question Four

This question stated thus; how do lecturers rank the factors hindering effective usage of ICT in the management of higher education for sustainable development? The findings are summarized in Table 5.

Table 5: Ranking of Hindrances to Usage of ICT in Managing Higher Education.

Items	Frequency	Percentage	Rank
Inadequate provision of ICT facilities	784	(98%)	1
Low access to ICT facilities	540	(67.5%)	6
Insufficient time or high work load	660	(82.5%)	3
Inadequate or lack of competence in ICT skills	690	(86.25%)	2
Low motivation	570	(71.25%)	5
ICT complexity	409	(51.12%)	8
Constant power failure	620	(77.5%)	4
Policy consideration	345	(43.13%)	10
Inadequate human resource	390	(48.75%)	9
Inadequate funds	460	(57.5%)	7

The data in Table 5 revealed that lecturers rank inadequate provision of ICT facilities as the most inhibiting factor against ICT usage in the management of higher education with 98%. Inadequate or lack of competence in ICT skills ranked 2nd with 86.25% while insufficient time or high work load ranked 3rd with 82.5%. The least factors are inadequate human resources (48.75%) and

policy consideration (43.13%). Generally, eight factors that ranked 1st to 8th position were considered to be hindering ICT usage in the management of higher education. This is because these eight factors had above 50% score each.

4 Discussion

The findings of this study revealed that accessibility of ICT facilities are high in some areas like the cyber café, institution ICT centres and institution library than in other areas like staff quarter, classrooms, personal offices and departmental offices. This implies that in terms of accessibility to ICT facilities it is still low because they are not easily accessible in areas where lecturers carry out their day-to-day activities which require ICT usage like classrooms and personal offices. Agabi and Uche (2006) affirms that in today's information technology driven society, relevant timely and adequate information can only be achieved using ICT medium and information processes that are available and accessible. In their study, they found that accessibility of ICT medium has been a major problem in most of the higher institutions in Nigeria and it has adversely affected the quality of higher education. Also, this has great implication on ICT adoption in higher institutions because they are not easily accessible to both students and lecturers. Kuzib (2002) carried out a study on ICT and networking options in Sub-Sahara Africa and found that adoption of ICT is a factor of availability and accessibility of ICT facilities. It also has great implication on people's orientation. In Nigeria, the application of ICT to all areas of operations in higher institutions has been inhibited by availability and accessibility.

The sub scale of affective domain, behaviour intentions, perceived usefulness and competence were used to measure lecturer's perceived attitude towards ICT usage. The study revealed that from the affective domain, which reveals more of lecturer's reaction to ICT usage, lecturers do not comfortably make use of ICT facilities. According to Udida et al (2006), this may be attributed to the factors reviewed earlier – availability and accessibility. Also it may be attributed to lack of competence in ICT skills, awareness and poor orientation. Behaviour intention measures show that ICT facilities are used only when it is unavoidable. This implies that given other alternatives, of which there seem t o be none, they will opt out. Despite this attitude, the perceived usefulness measure reveals a positive disposition of lecturers towards the usefulness of ICT in different areas. The perceived competence measures lay credence to the findings of Omofaye (2006) that lack of inadequate competence in ICT skills has been a major factor hindering ICT usage by lecturers. Rosswell (1999) and Ballantyne, Labelle and Rugard (2000) on the other hand, attributed this to

complex nature of change which requires a process of attitude transformation and which is mostly affected by age and experience. In other words, this perceived competence measure is greatly affected by lecturer's age, experience and ability to learn new ways of doing things. In a nutshell, lecturers are of the opinion that ICT facilities are useful to them at work but their behaviour showed they might not use them where possible, or would rather get people to handle their work relating to ICT for them. Generally, they have positive dispositions towards its usage. From this vantage point, the problem deduced is that of skills and competence in ICT usage.

The study also reveals that lecturer's perception of the role of ICT in the management of higher education is high. This finding shows the extent to which lecturers appreciate the role of ICT and how ICT has permeated the teaching/learning process, research and administration in higher institutions. Contrarily, Akpan (2008) found that lecturers' perception of the role of ICT in university education management is significantly low. He attributed this to lecturer's low ICT competence. This study further revealed that low or inability to make use of ICT facilities does not necessarily mean that usefulness of ICT cannot be discern and appreciated. This comes to the fact of lessons learnt and not necessarily experience as a motivating factor towards adoption or application. Critically, evaluating the findings of this study, it revealed a low perception in the area of transmitting knowledge through research findings. This finding can be explained on the ground that most of the research outcomes are not put into practice or use, and contributions to knowledge are merely blueprints that are never implemented. It is worthy to note that this study found that lecturers irrespective of age or experience agreed that ICT facilities are very useful to them in their work life. This also corresponds to the finding of Teo (2006) that ICT have reduced academic staff workload and has made teaching-learning process interesting.

The study further showed that inadequate provision of ICT facilities; inadequate or lack of competence in ICT skills; insufficient time or high workload; power failure; low motivation; low access to ICT facilities; inadequate funds and ICT complexity were amongst the numerous factors inhibiting ICT usage in the management of higher education for sustainable development. This does not mean that other factors ranked low cannot hinder effective usage of ICT in enhancing and promoting higher education. Ajinma (2006) indicated that only 22% of the higher institutions in Nigeria have access to less than 5% access to ICT facilities such as electronic mail facilities, computers for networking, internet services and e-library. This has resulted in low application of these ICT facilities by lecturers and students in higher institutions in Nigeria.

5 Conclusion

From our findings, it can be concluded that there is need to improve on the accessibility and usage of ICT facilities in the management of higher education. This will ensure a wider spectrum of interconnectivity among the institutions for better job enrichment and work processes. ICT as a growth factor has implications in all areas of development and as such should be embraced as a formation platform in the higher institutions and for modernity within the society.

References

Agabi, O. G., Uche, C. M. (2006). ICT adoption and information quality in effective university management. *Nigerian Journal of Educational Administration and Planning* 6(2) 148 – 160.

Ajinma, E. (2006). *Nigerian higher education has less than 5% ICT application.* Retrieved 5 May, 2008 from: http://www.vanguarding.com/Article.Liton/on.

Akpan, C. P. (2008). Lecturers' perception of the role of ICT in the management of University Education for sustainable development in Nigeria. *Nigeria Journal of Education Administration and planning*. 8(1) 113-127.

Aniebonam, C. M. (2007). Using technology to drive education reforms in Nigeria. *E-Journal of Nigerian IT Professionals in the Americas.* Available at: www.nitpa.orh.

Ballantyne, P, Labelle, R., Rugard, S. (2000). *Information and knowledge management: Challenges and capacity builders.* Retrieved 10 June, 2008 from: http://www.chhs.ubc.ca/iprv/PDF/iprv0075.pdf

Bello, S. A. (2007). *Management Information System.* Unpublished Manuscript.

Bendix, W. (2002). *Academics grapple with the role of tertiary institutions in sustainable development.* Retrieved 10 September, 2009 from: www.scienceinafrica.co.za/2002/august/emsu.html.

Cox, J. L., Cusick, J. (2006). *What is Sustainable Development*? Retrieved 10 September, 2009 from: http://www.ctahr.hawaii.edu/acad/researchnews.

Daffe, G., Dansokho, M. (2002). *New information and communication technologies: challenges and opportunities for the Senegalese economy*. Berlin: United Nations Research Institute for Social Development.

Federal Republic of Nigeria (2004). *National Policy on Education*. (4th Ed.) Lagos: NERDC Press.

Hanna, H., Guy, K., Arnold, E. (1995). *The diffusion of Information technology: experience of industrial countries and lessons for developing countries.* Washington DC: World Bank Report.

Huang, H. M., Liam, S. S. (2005). Exploring users' attitudes and intentions toward the web as a survey tool. *Computers in Human Behaviour* 21 (5) 729–743.

Johnson, A. O. (2006). Enhancing quality in higher education through ICT in Nigeria. In: J.B. Babalola, G. O. Akpa, J. O. Ayeni, S. O. Adedeji (Eds.) *Access, equity and quality in higher education,* pp.122-128. Ibadan: Nigeria Association of Educational Administration and Planning.

Kuzib, Y. A. (2002). *ICT and networking options: challenges for rural development.* Retrieved 13 March, 2009 from www.urth/ruraldevelopment/afr_cain.

Mansell, R., When, U. (1998). *Knowledge societies: information technology for sustainable development.* London: Oxford University Press.

Munyua, H. (2000). *The role of ICT in rural development and food security: lessons from field experiences in developing countries*. Washington DC: World Bank.

Myers, J. M., Halpin, R. (2002). Teachers' attitudes and use of multimedia technology in the classroom: constructive-based professional development training for school districts. *Journal of Computing in Teacher Education* 18 (4) 133 – 140.

Newberg, L. A., Rouse, R. O., Kruper, J. A. (1994). *Integrating the world-wide web and multi-user domains to support advanced network based learning environments.* Retrieved 29 January, 2009 from: http://www.edu/newbell/publication/NewbergRouseKruper.pdf.

Okon, A., Jacob, E. (2002). Use of Information Technology by Academics in selected universities in Nigeria. *Global Journal of Mathematics and Science.* 2(1) 57-63.

Olisaemeka, B. U., Onwusoanya, B. U. (2009). *Lecturers' attitude towards the use of computer inventions: a Nigerian case.* Paper presented at the National Conference of the Nigeria Association of Educational Administration and Planning (NAEAP) at the Women Development Centre, Akwa, Anambra State, Nigeria. 21 -25 September.

Omofaye, J. O. (2006). *The ICT development in FUTA*. Paper presented at the first international conference on ICT for Development, Education and Training. Addis Ababa. 24 25 May.

Rosswell, T. (1999). *The role of ICT in higher education at the beginning of this new millennium.* Retrieved 22 November, 2008 from http://onlinekennis.org/eva/cra06/ictlu.htm.

Talero, E., Gaudette, P. (1996). *Harnessing information for development: A proposal for a World Bank Group Strategy.* Washington DC: World Bank.

Teo, T. (2006). Attitude towards computers: a study of post secondary school students in Singapore. *Interactive Learning Environments* 14(1) 17 – 24.

The World Commission on Environment and Development (1987). *The meaning of sustainable development.* Retrieved 20 August, 2009 from: http://www.gdrc.org/sustdev/definitions.html.

Udida, L. A., Udofia, I. U., Ozurumba, C. N. (2008). Using ICT to enhance tertiary institution students' academic productivity for sustainable development in South-South Nigeria. *Nigerian Journal of Education Administration and Planning* 8(3) 236- 244.

Yusuf, M. O. (2005). An investigation into teachers' self efficacy in implementing computer education in Nigerian secondary schools. *Journal of the Middle School Computer Technologies* 8(2) 18-22.

Zwick, T. (2003). *The impact of ICT on establishment productivity*. Berlin: United Nations Research Institute for Social Development.