

# INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) AS A CATALYST TO THE TEACHING AND LEARNING OF ENVIRONMENTAL EDUCATION/SCIENCES IN NIGERIAN TERTIARY INSTITUTIONS

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## **Abstract**

Information and Communication Technology sometimes called information and Computer Technology (ICT) has become a global necessity miniaturizing the world into a mini/micro village. The entire world is linked and connected together by this means. The global flow of information as it is these days suffers no barrier as it was some years back when ICT was at its lowest ebb. Information of any kind can be within some seconds disseminated to any part of the world. The world has stepped up Information and Communication technology (ICT) industry to run parallel and compete favorably with any of the world's biggest industries. This paper is set to capture the significance and impacts of ICT on the teaching-learning of Environmental Education/Sciences in Nigerian tertiary Institutions. It highlights the problems militating against attainment of full ICT development in Nigeria. Also, it concludes by recommending remedial or corrective measures to normalize and rectify identified bottle-necks, as to reap the fullest potentials of ICT in this millennium.

The invention of computers and Global system of Mobile Communication (GSM) has transformed the whole world to an information-driven society. The two major technologies of Information Communication Age are microcomputer and GSM. The situation now is that there is an integration of Computer Technology and Communication Technology, collectively referred to as Information and Communication Technology (ICT) or Information and Computer Technology (ICT).

These two Technologies married together have reduced the whole world to a Global village or kindred. Messages can be sent and received anywhere in the world just within seconds.

The United States of America (USA) with the other countries of the West and Japan are leading the rest of the world in the two technologies. Nigeria is trying her best to catch up with some of the developed countries of the world in ICT.

The major operators (providers) in telecommunications such as MTN, Airtel, Etisalat and Globacom are trying their best to improve their services in order to stabilize telecommunications in Nigeria. It is therefore expected that sooner or later, Nigeria would get to a near acceptable standard in ICT, more so, now that the country is marching towards attainment of Vision 20:2020. In the same vein, the Commission (Nigerian Telecommunications Commission (NCC) saddled with the responsibility of overseeing the function and operations of all the Telecommunications in Nigeria is seriously working hard to put Nigeria on the right track in the area of Information and Communication Technology (ICT)

## **Denotation of Information and Communications Technology (ICT)**

Information and Communication Technology (ICT) has brought in overwhelming changes in all facets of life in Nigeria. Nigeria has moved from what is described as telecom dark ages to a state of light as far as ICT is concerned. It is a hub of economic growth in Nigeria.

The integrated components that have majorly constituted what is referred to as Information and Communication Technology or Information and Computer Technology (ICT) today came through:

- i. The Global System of Mobile Communications (GSM)
- ii. The Computers and
- iii. The Geographic Information System (GIS) and Satellite Remote Sensing (SRS)

However, the first two outlined above could be called the major facilitators or facilitating media through which ICT is conducted while the latter, GIS and SRS are auxiliary components providing information on environmental related issues.

### **The Global System of Mobile Communications**

GSM is an integral medium through which communication is easily carried out globally. One is simply connected to the world through a line and a hand set. Any form of Information, messages could get to you no matter where you are as long as there is net work service.

The GSM Technology was introduced in Nigeria on August 7, 2001. Since then, life has not remained the same for Nigerians and the nation. An estimated ₦ 1.43 trillion has come into the nation by way of Foreign Direct Investment FDI (Omordia, 2006). Besides, a total 133, 542 new jobs have been created since 2001. Of this number, the various service providers have employed 5,152 direct staff, direct dealers have 687 people on their pay roll, and indirect dealers have offered 7, 703 jobs to Nigerians. While informal dealers, the highest employer of labour so far, now have 120,000 workers. The figures were given by GSM Nigeria consultative forum in 2005. All these are outside taxes, duties, profits, interest

payments and other gains coming out of the Technology.

Even the larger public continues to regard the GSM revolution as an answered prayer of a sort. Social lives of Nigerians have tremendously improved to the extent that interpersonal Communication no longer poses any problem. The opportunities of instantly getting across to relations in distant places are some of the many gains. Businesses have also improved as negotiations could be made easily with the use of mobile phones.

### **The Genesis of Computer**

Computer can be said to be the “Mother” of modern Information and Communication Technology (ICT). It is the hallmark of ICT. Akukwe (2003), defined the computer as “an electronic

device that is capable of accepting, storing and processing data as well as out putting the result by following a set of instructions called program” Ogbonna (2004), also defined computer as an electronic device, operating under the control of instructions stored on its own memory unit, that can accept data (input), process data arithmetically and logically produce output from the processing and store the results for future use.

God is given the credit as the first originator and initiator of computer who gave man the knowledge and ability to invent computer. About 3000 BC the Abacus, a wooden frame that holds wires on which beads were strung was invented. The Abacus helped in counting numbers, concepts, and place value of numbers, addition and subtraction. In 1614 John Napier developed the logarithm. Logarithms helped in Mathematical Calculations involving multiplication, division, power and roots. In 1642, Blaise Pascal invented the pascaline. The pascaline, a mechanical calculator, operated on the principles of automatic carryover of numbers

during addition, and did subtraction as a reverse order process and multiplication as a repeated addition.

Early 19th century saw major advancements in the inventions. Between 1801 and 1804, Joseph M. Jacquard developed a programmable textile Loom that revolutionized the weaving industry. The Jacquard Loom made use of punch cards. Charles Babbage developed a steam powered machine called the difference Engine. Later, he came up with a more ambitious machine called the analytical engine-a general-purpose automatic calculator. Lady Augusta Ada Byron, a close friend of Charles Babbage wrote a demonstration program for the analytical Engine. Hence she took the place of the world's first female computer scientist and the first computer programmer. Herman Hollerith invented the Hollerith's tabulating machine that made it possible for the 1890 census result of the United States of America (USA) to be completed in two and a half years as against the seven years of that of 1880. The Hollerith's Tabulating Machine relied very much on Jacquard's punch card concept. Tabulating Machine Company (TMC) later merged with other companies to form the Computing Tabulating Recording Company in 1911. The name was changed in 1924 as International Business Machine (IBM) Corporation which today is one of the largest Computer manufacturers in the world.

In 1944, Howard Aiken worked with a team of engineers from IBM and built the mark 1 also called the IBM Automatic Sequence Controlled Calculators (ASCC). John Maucualy worked with his graduate student J. Prosper Eeker to build the first electronic computer, the ENIAC (Electronic Numerical Integrator and Calculator) in 1946. The ENIAC performed calculations faster than any known machine at that time. In 1949, M.V Wilker built and ran the ADSAC (Electronic Delay Storage

Automatic Computer) at the Cambridge University. This machine used the stored program concept. John Neumann, a known logician and mathematician worked with the Moore team to build the EDVAC (Electronic Discrete Variable Automatic Computer) machine, which was completed in 1950 and equally operated on the stored program concept. Scientists and manufacturers kept on improving upon the first generation of electronic computers and this led to what we have today as computers.

### **Geographic Information System (GIS)**

Geographic Information System (GIS) and Satellite Remote Sensing (SRS) are being increasingly used in resource analysis to help improve land use and resource management decisions, made at all levels of administration. Spatial and non-spatial data on various aspects of land use, soil, geology, hydrology, topography etc need to be analyzed for management decisions. Satellite Remote Sensing (SRS) provides a convenient means for deriving such data. Multi spectra, repetitive coverage of the earth by satellites give reliable land cover information of various scales and allow land use maps to be up dated very frequently. High resolution spot and IRS satellites give stereo images which allow the photographic mapping integration of GIS and SRS technologies thereby providing an efficient way for resource management (Sharma, 1999). Sharma (1999) itemized the capabilities of GIS for resource management as:

- iv. Over laying-Terrain Analysis
- v. Logical operations- Proximity Analysis
- vi. Classification – Network Analysis Rate Base
- vii. Aggregation Optimization Measurement of Lengths
- viii. Areas – Modeling Statistical Analysis
- ix. Simulation – Sample Application of GIS and SRS

Good Child in Chima and Kalu (2010) also listed further areas of application to include; Resource evaluation, Habitat analysis, land suitability, mineral processing, Environmental Impact Assessment, Visual Impact Assessment, Environmental Modeling, Non-Point Source Pollution Modeling, Stream Network Modeling, Environmental Decision Making and Land Use Planning (God child, 1993). Other areas that require Remote Sensing in resource analysis include Carrying Capacity Analysis. That is the analysis and assessment of Man- Land Ratio, Biophysical and socio-economic as well as soil and landscape mapping. The term mapping means specifically to designate the delineation of landscape units on an aerial photograph or map base (Ampbel, 1996)

#### **The Impacts of ICT in Environmental Education/sciences**

Information and Communication Technology (ICT) is significantly important in the study of Environmental Education/Sciences, as the study involves passing of information, dissemination of information, research works and storage of data for future use.

#### **Computers as a Source of ICT**

Computer to a large extent has made teaching – learning of Environmental Education/Sciences easy through so many ways vis-à-vis internet, electronic mail, World Wide Web (www), search engine, application soft wares etc.

- x. **Internet:** The internet is a collection of computers, all linked together to share information globally. It was first developed in the US by two universities who were both working on the same contract and wanted to share their data.

They were faxing information back and forth and then re-typing it until they came up with a piece of soft ware called Unit to Unit Copy Programme or UUCP. There is no gain saying the fact that any information concerning Environmental Education/Sciences can now be found in the internet.

- xi. **Electronic Mail:** Sending and receiving messages come now on speed basis. In this process any information can within seconds be transmitted to any destination. The study of Environmental Sciences (Education) is simplified by this approach. One can opt for materials or information be sent to him via electronic mail from any part of the world, and such parcel or documents are sent and received in a question of seconds.
- xii. **Computer Assisted Instruction (CAI):** One of the ways in which the study of Environmental Education has received a boost is through a special package called CAI (Computer Assisted Instruction), which serves as an instructional material/aid. The versatility of this package into any area of knowledge has made it extremely important for the study of environmental sciences. Any person old enough to be taught can learn with CAI. CAI programs for the deaf, dumb, deaf and dumb, mentally retarded, slow and fast learners exist. The effectiveness of CAI depends on simple principles derived from psychological learning laboratories and centuries of experiences with teaching (Uzoma, 2004).
- xiii. **Internet- navigation:** World Wide Web (www) is a collection of web pages connected together with hyperlinks. Each document or page has a unique address

that allows you to find it among the millions of other documents on the web. In other words, if any specific information is sought for, by this method of sorting, relevant documents/instruction that are related to Environmental Education is made available to the researcher or recipient. Other internet media that are useful in the teaching – learning of Environmental Education include file transfer protocol (ftp), internet relay chat (irc), Search Engine web site etc. in addition to all these contributions, it is worthy to mention that ICT development has brought into use special packages or application soft wares that are specifically designed in many specific areas. When this soft ware is used, the expected environment is brought under focus. This brings up all that is required or needed on that particular field of study.

#### **Global System of Mobile Communication (GSM)**

GSM is an essential medium of modern Information and Communication System. Suffice to say that the hand set with which all ICT takes place is a hand top computer. Communication messages, can be initiated and received form it. Before the advent of GSM technology in Nigeria, the nation had the third lowest tele-density in the world, coming after Mongolia and Afghanistan (Omordia 2006). Almost every Nigerian has ICT hand set (GSM) and is globally connected. All the connected can be reached globally within the shortest possible time. Education, teaching and learning of Environmental Sciences/Education has been made possible by its simplification. There are some sophisticated handsets that function as Computer- Internet browsing, e-mail attachment of documents etc are carried

out through them. This has significantly simplified the teaching-learning process.

#### **Geographic Information System (GIS) and Satellite Remote Sensing (SRS)**

Another latest aspect of ICT that is gaining importance in Environmental Education/Sciences is (GIS/SRS). This spectrum of ICT is very useful in obtaining Environmental-related information. Today most natural resources mapping is done using remote sensing. Aerial photograph has been used to produce virtually all topographic maps and most forestry, geology, landscape and soil maps. More recently, air-borne radar and scanner data as satellite imagery are being used to prepare detailed city maps. Municipalities have used photos to identify uncovered property improvements (Aronot, 1995).

Ogbonna (2010) defined Geographic Information System (GIS) as a system which deals with information related to the spatial distribution of features on the earth surfaces. The system is designed to effectively capture, store, update, manipulate, retrieve, analyze and display all forms of geographically referenced information. GIS is an essential tool for the study of Environmental Sciences in any academic Institution of higher learning. The possible areas to the land use application of GIS and SRS include: Oceanic application, Environmental hazard, Land suitability and capability mapping, agriculture, water resources, ecosystem, plants etc.

#### **The Problems of ICT Development in Developing Countries**

In various fields of endeavour, Nigeria along with other African countries has Information and Communication Technology (ICT) developmental problems. The following mentioned below are some of the problems militating against smooth development of ICT.

- xiv. **Political Instability:** Truncation of government affects the concerted effort of government to plan meaningfully towards embarking on the establishment of Information and Communication Technological Institutes. In the same vein, foreign investors who under stable governments find it conducive to come in to invest in Nigeria would not come due to instability and insecurity in the country.
- xv. **High Rate of Illiteracy:** Most Nigerians are illiterates and cannot adapt to the techniques required in ICT for maximum utilization. The application of Information and Communication Technology (ICT) is therefore adversely affected and is left, only to those who have the technical know-how.
- xvi. **Shortage of Manpower:** Effective engineering of ICT requires high level man-power technology. Nigeria lacks such man-power.
- xvii. **Lack of Capital:** ICT is capital intensive. A country that is not financially buoyant will not fully enjoy ICT potentials. A huge amount of money is expended to install and maintain ICT equipments. It should be also noted that ICT is dynamic. All about it changes every day and new technology replacing the old ones. Provision is always made to update ICT at any given point in time. All these require money.
- xviii. **Lack of Qualified ICT Instructors:** There are very few ICT Instructors in Nigeria that will transfer ICT

knowledge in people. All institutions of Learning ought to have qualified Instructors who will internalize or impact this knowledge in them. But this is not obtainable now. This affects ICT development in Nigeria. Others include conservative attitude of some Nigerians to imbibe new technology, poverty etc.

### **Conclusion**

We, sincerely believe, that Nigeria is not there yet, but is actively marching towards getting there. There is no doubt in the researchers minds that if the above recommendations are considered, and immediate steps taken to execute them, Nigeria, it is hoped will monumentally reap the fullest potentials of ICT even before the year 2020

### **Remedial Measures and Recommendations**

The awareness of ICT has been created in Nigeria and she has long started reaping the dividends of ICT. However, the following remedial measures are recommended for more optimization and consummation of ICT benefits:

- xix. **Government-Sponsored-Training:** The three arms of government i.e. federal, state and local governments should train and re-train citizens to acquire ICT knowledge overseas. This when done, will minimize shortage of man-power and ICT instructors
- xx. **Establishment of ICT Centres in all Institutions of Higher Learning:** Kudos is given to the Federal and State Governments for efforts made to establish ICT centres in some of the Nigerian tertiary institutions. But more needs to be done in the areas of equipping them and letting it go round all higher institutions.

- xxi. **Maintenance of Democracy in Nigeria:** We need not underscore the importance of maintenance of internal democracy in Nigeria. Government has the time to plan and execute plans-where democracy exists. There will be peace, security, harmony etc and foreign investors who are experts in ICT will come to invest in Nigeria, thereby making our economy boom. Transfer of ICT knowledge will be benefited from interacting with these foreign experts.
- xxii. Creating specifically the ministry of Information and Communications Technology to adequately oversee the workability of ICT in Nigeria is now imperative. This ministry should also monitor the dynamism of the ICT and update any changes immediately.
- xxiii. Promulgation of policies that will sustain our Information and Communication Technology.
- xxiv. Subscribing to ICT membership on the global level.

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