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Harnessing the Use of ICT in Surveying and Geo-Informatics Training in Tertiary Institutions in South Eastern States of Nigeria

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Abstract:
Information and communications technology (ICT) has become a very important feature in the field of surveying and Geo-informatics. Surveying and geo-informatics have witnessed a gigantic leap especially since the emergence of ICT technologies around the world. This field of study has benefited so much from the steady advancement in computer, satellite, digital technologies and geospatial science innovations. To mention a few, it has helped tremendously in not only its methodology and usage, but also in the aspect of data collection, database management and as well as its end user specifications such as the delivery of high quality map products. The advancement in ICT technology has made the training of both surveying and geo-informatics a lot different from what it used to be in the last decades. The adoption of the latest information and communication technologies (ICTS) in education must be embraced by all governments and stakeholders in education to speed up awareness on climate change and other contemporary global issues that are of spatial significance. Thus information and communication technology tools should be properly harnessed in Geomatics training in order to develop the needed capacity to face the daunting developmental challenges in this Nigerian Sub region. This paper is a review of the role and impact of ICT in the field of Surveying and Geoinformatics training in south eastern Nigeria and the inherent benefits.

Keywords: *Capacity building, education, spatial planning, ICT, Surveying and Geo-informatics, spatial intelligence, Globalization*

1. Introduction

The world is moving at an unimaginable speed in the area of information use and dissemination. The most vibrant sector of the national economy is the information technology industry as well as the educational sector (UNESCO, 2002). Generally, ICT holds out the opportunity to revolutionize teaching methods, expand access to quality education and improve the management of education system (World Bank, 2002). There has been a giant stride in the usage of ICT training not only in the surveying and geo-informatics sector but also in the academia as a whole. Due to the digital age we live in now, the era of analogue mode will soon be totally eliminated. Progressive developments have continued to emerge which has made even more discoveries in more digital infrastructure that helps contribute to the overall development of mankind. Looking back to when wired technologies were the only available form of ICT, now we can boast of the "mobile" era where both information processing and dissemination has been made lot easier than it was in the "analogue" mode of our then ICT. ICT represents an embedded platform which comprises of facilities or technologies aimed at information processing and electronic communication (Ndukwe 2008).

ICT is complex and fast changing, and it is confusing for many people. It is so pervasive in the modern world that everyone has some understanding of it but those understandings are often widely divergent.

1. In real terms, ICT supports any type of training either through the teaching or learning medium due to its ease of use, dynamic, interactive, flexible and engaging model. It sheds more light in terms of real opportunity to and individualized institution. Nowadays, the ease of sharing information and knowledge has been aided by the much reliance on today's ICT potential; this has helped so much in environmental sustainability and also helping to revitalize the quality of life for mankind (Takamara, 2005). The introduction of the computer in the last century has also experienced significant reformations. It has led to the emergence of advanced computers that has aided the work of surveyors. The mode of computational habits, mapping devices and also database management and processing have significantly changed.

Nowadays computers are used only for a very little percentage for computing, they are totally integrated in our workflow, serving us within data acquisition, database developments, data processing, data analysis and visualization. The introduction of Internet and the

rapid changes of Information and Communication Technologies (ICT) caused fundamental transformation of our profession, which is now exploring the best ways to serve the new e-Society.

Past research has highlighted a framework which was propounded by Stig Enemark with respect to "Professional Competence Model". Attending a higher institution is no longer a passport for a lifelong professional carrier. Today one must possess multiple competences to main competitive and relevant. The idea of "learning for life" is replaced by the concept of lifelong learning. E-Learning is essential in this regard (Enemark, 2006).

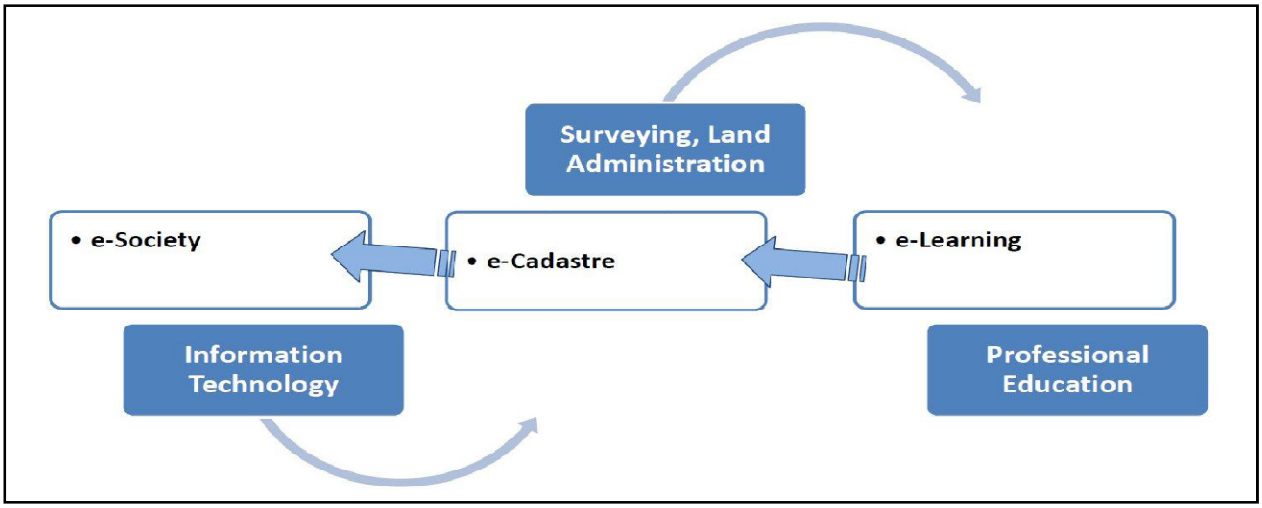


Figure 1: Professional Competence Model (Adapted from: Markus (2011))

Using ICT in the training of surveying and geo-informatics has made the profession more efficient and productive. For instance, e-learning is becoming one of the most common methods of (using ICT to) empower students both on and off campus by means of online tutoring offered via a web based platform (Yusuf, 2005; Murtala, 2003). The acquisition of ICT or IT skills in order to execute a task is as a result of ICT training empowerment. According to Olelewe and Fakorede (2008), there are two categories of ICT training - training for general ICT skills and training for specific ICT skills. Training for general ICT skills involve training in computer appreciation, office application Programmes, sending email, use of internet to mention but a few.

While training for specific ICT skills involves how to use computers in subject based teaching, computer assisted instruction (CAI) packages and so on. In Nigeria today, survey practices are geared towards areas like cadastral surveys essentially for the acquisition of land for the Crown and for developments of estates, mineral resources, road and rail designs, and survey control establishments. All this entails some level of ICT compliance, with respect to the growth and advancement in surveying instrumentation which as far back as 1962 – early 1970s which was the era of measurement with theodolites, levels, tapes and other analogue equipment. We can see a huge difference now in the usage of instruments like the total station, miniaturized GPS, GLONASS, general GNSS technology and also very fast computer specific utilized for surveying purposes.

1.1. ICTs in Development

Enhancing the integration of Information and Communication Technology (ICT) in the implementation of educational policies is a matter of global concern. This is because the introduction of ICT and its integration and diffusion have initiated a new age in educational methodologies and have radical changed traditional methods of teaching and learning. Ololube, Ubogu & Egbezor (2007) described Information and communication Technology (ICT) as advances in technologies that provide a rich global resource and collaborative environment for dissemination of ICT literacy material, interactive discussions, research information, and international exchange of ideas, which are critical for advancing meaningful educational initiatives, training a high skilled labor force, and understanding issues related to economic development. The state of the art of computer networking has totally been revamped as it has become a domineering figure over localized computing around the world which allows for better resources and information dissemination. The bond that exists between computers and the internet has led to better and more efficient information sharing and management platforms. Clearly, ICT is driving the new global economy and has come to stay. Higher Institutions of learning, polytechnics and technical colleges with ready access to information technologies are better equipped in whatsoever training or capacity building program they may be offering.

1.2. ICT Education and Importance

Information and communications Technologies (ICT) education is the society's efforts to teach its current and emerging citizens valuable knowledge and skills around computing and communications devices, software that operates them, applications that run on them and systems that are built with them. Access to information and communication technology (ICT) in education can help individuals compete in a global economy by creating a skilled workforce and facilitating social mobility. Policymakers emphasis that ICT in education has a multiplier effect throughout education system, by:

→ Enhancing learning and providing students with new sets of skills

- → Reaching students with poor or access (in rural areas)
- → Facilitating and improving the training of teachers
- → Minimizing cost associated with delivery of traditional instruction; and
- → Improving the administration of schools in order to enhance the quality and efficiency of service delivery.

ICT revolution is sweeping through the world and the gale has even caught with developing countries like Nigeria and Ghana (Nwezeh, 2014).The impact of ICT revolution in Nigerian education generally can be seen in the introduction of new methods of teaching and conducting researches in education, provision of facilities for on line learning, teaching and research collaboration, if properly harnessed availability of free and inexpensive internet access for students and teachers who are paying so much for this facility unlike their foreign counterparts. Ojedoku and Owolabi (2003) cited in Nwezeh (2014) opined that teachers /lecturers in developing and emerging economies like Nigeria need to change their teaching styles and acquire internet skills and hence ICT skill should transform the class room in the next two decades. Relevance of university education in national development can be seen in the following areas: -

- → Enhancing societal development by training meaningful youths (citadel of learning)
- → Restoration of the dignity of man (UNN motto and mission statement)
- → Enhancing and improving the professional competences of the individual
- → Removal of major sources of poverty and tyranny
- → Development of proper indices for knowledge use and application

There are many important dimensions to ICT education, including:

- → ICT/Digital Literacy: Today, ever one needs a basic understanding of ICT and how to make productive use of it, just to be good students, workers and citizens.
- → ICT infrastructure and support Applied Technologies-Beyond a basic user competency, our society also needs more knowledgeable and capable technical people to deploy, manage and maintain ICT equipment, software and systems, so they work well for users. In all industries, these, these people manage computer and communications hardware, software and systems and applications, networked systems, online information sharing, communication and commerce systems; business processes making use of these systems; and user support.
- → Specialized Business and Industry Uses of ICT-An enabling technology used in almost all businesses and industries. For example:
    - Bioscience industries rely on specialized ICT systems.
    - Financial institutions rely fully on ICT systems to maintain customer records, do business, conduct trades, do financial reporting, secure proprietary information and comply with regulations;
    - Manufacturing industries use specialized computer controlled systems and robotics to design, produce and test products.
    - Property management operations use ICT to network and control heating and cooling, lighting and building access systems.
    - Telecommunications, cable TV and other entertainment industries use ICT to store content, manage customers and deliver their services.
    - Electricity utilities use ICT to monitor and manage electricity distribution, customer billing and smart metering systems.
    - In surveying and Geoinformatics, ICT has found great application in teaching and learning (e-learning), in equipment usage (hardware) and applications (software) engineering generally. Advanced applications are also seen in the usage of satellite imageries in resource inventory and environmental management and also the use of high tech GPS/GNSS systems in fast and efficient geospatial data acquisition, processing, storage and usage (spatial enablement and spatial literacy paradigm).

1.2.1. Aim of the Work and Objectives of This Study

Owing to the importance of ICT in the field of Surveying and Geoinformatics, there is need to develop a competent workforce through adequate education and training that understands not only relevant technologies, but also specialized business and industry environment and operations, to meet these specialized needs. There is also a huge pressure on ICT service providers to improve and remain innovative and competitive. In virtually all modern businesses and industries and in modern society in general, ICT has key strategic roles. It is strategically important to develop citizens and workers who can competently and efficiently operate and add value in these systems and environments.

1.3. Benefits of ICT in Surveying and Geoinformatics Training

The following benefits are derivable from ICT application:

- → can use a handheld GPS to get accurate location information which can be used to show data linked to specific locations within a GIS
- → can collect qualitative data using digital cameras which can be used to help explain findings / anomalies
- → can access data that may not otherwise have been available - e.g. secondary data from internet
- → can ensure greater accuracy in readings and automatic collection to enable studies of change over time (using data loggers)

- → often requires expensive equipment (e.g. data loggers / Global Positioning Systems)
- → May require specific software to actually make use of the data collected using data loggers etc.
- → data from the internet may have some bias (need to consider reliability)
- → can save time - some graphical techniques and statistical tests are time consuming by hand (time saved can be spent on interpreting findings)
- → wide variety of different graphs can be produced quickly
- → base maps can be produced quickly

1.3.1. Modern ICT Application Areas in Surveying and Geoinformatics

Firstly, the use of fast and easy mobile apps has helped so much in the collection of field data and mobile workforce in minutes. It creates an avenue where one can coordinate and collaborate from any location on any device in real time. Digital data of a surveyed area of study can be downloaded easily and be used to produce maps of any kind based on the user specifications. With the introduction of global positioning system, this has helped in the determination of highly accurate data directly on a computer screen either through the hand held or mounted procedure. Some of these GPs equipment are even accompanied with a night vision technology which facilitates surveying during night time which wasn't possible in ancient times when surveying was totally reliant on chains, compass, solar compass, transit, theodolite to mention a few. Many years back as far as 1900s, surveyors used surveying equipment such as Planimeter which is the best known tool for measuring asymmetrical land areas as they eliminate the need for charts or manual calculations; whereas a theodolite allows measuring of horizontal and vertical angles. Most ancient surveying instruments are fixed on a tripod, which acts as a support. As the name suggests, tripods have three legs with length varying capability. Many of this equipment up till this moment are still in use by surveyors around the world. For instance, the GPS surveyor is a free survey app on android mobile phones which uses the GPS on our mobile device to plot and record a series of coordinates on the map. This app allows you to save the survey for future viewing. This app also uses Google map with all its layer options. It comes with features namely (i) display distance between recorded points, option to view measurement in Feet, Meter, Kilometer and Mile (iii) displays detailed information of the survey with coordinates and perimeter measurements (iv)it also creates and share screenshots of the map area in PNG image.

The development of instruments such as the total station which can be functional in almost all locations and which has a high level of precision and accuracy although quite expensive to own one but has made survey work far more flexible and efficient. Laser scanners such as the Topcon have also helped a lot in the surveying profession. Leica high definition 3D Laser scanners have also been used to perform a topographic and location survey times without number. This essence of this technology is such that accurate measurements can be derived in very complicated environments. A number of 3D laser scanners can collect survey data points at a rate of 50,000 points per second.

Talking of the internet, GIS cloud comes into play. This helps to support all popular geospatial vector and raster formats and also gives you the ability to project surveyed field computations "on the fly". Within the land administration context, an agency could place its entire land information infrastructure, including data, on the cloud and directly manage and maintain it over the Internet through web services. Customers would also access it over the Internet and be unaware that it was on the cloud.

The cloud is the next computing paradigm, and many land administration agencies will start to adopt it over the next five years, once confidence in security and portability is built. The main advantages of this approach are that clients can outsource the burden of maintaining servers and applications, scale systems up or down on demand, access their data and services from anywhere with an Internet connection, and substitute regular, predictable operational expenditures for occasional heavy expenditures on ICT (for servers, for example). Cloud computing requires a robust, high-bandwidth broadband connection to the Internet and has real benefits, but there are also reasons for caution. Risks include loss of service and data if the provider has downtime or goes out of business, regulatory problems when personal data are stored internationally, security concerns when users lose control of how their data are protected, one-sided service agreements that give users little redress in the event of a calamity, and lock-in dependency on proprietary cloud applications (Thompson and Waller 2011).

By employing these new technologies, limitations traditionally imposed by spatial differences that could have resulted as a result of this analogue era have all been eliminated.

1.4. ICT Resources for Geoinformatics Training

It is a lot easier to do a good job teaching ICT knowledge and skills with adequate resources and assistance. There is a very great need for contributions to improving ICT education by business and industry. Schools need labs where students can gain real experiences with real ICT equipment doing real things. Programs need money to develop curriculum and improve other facilities. Teachers need teaching aids such as videos, real world scenarios for student exercises, real world site visit opportunities, resource persons who are vast and exposed to cool new technologies.

Leaders of industry like Micro survey, Inc. USA, Trimble Company, Esri and other major players in geospatial business can invest meaningfully in the ICT training by providing necessary assistance in the form of hardware and software usage for schools in Surveying and Geoinformatics and allied fields of learning. This is win-win strategy.

Contributions don't have to be money alone. Participating in business advisory group for an ICT related program makes a big difference and costs only your time and attention. Passing on used ICT equipment for Student labs and workshop makes a big difference at little real cost. Internship, job shadowing, service learning and mentoring opportunities make a great difference in student success.

Some available resource and foreign funding opportunities are:

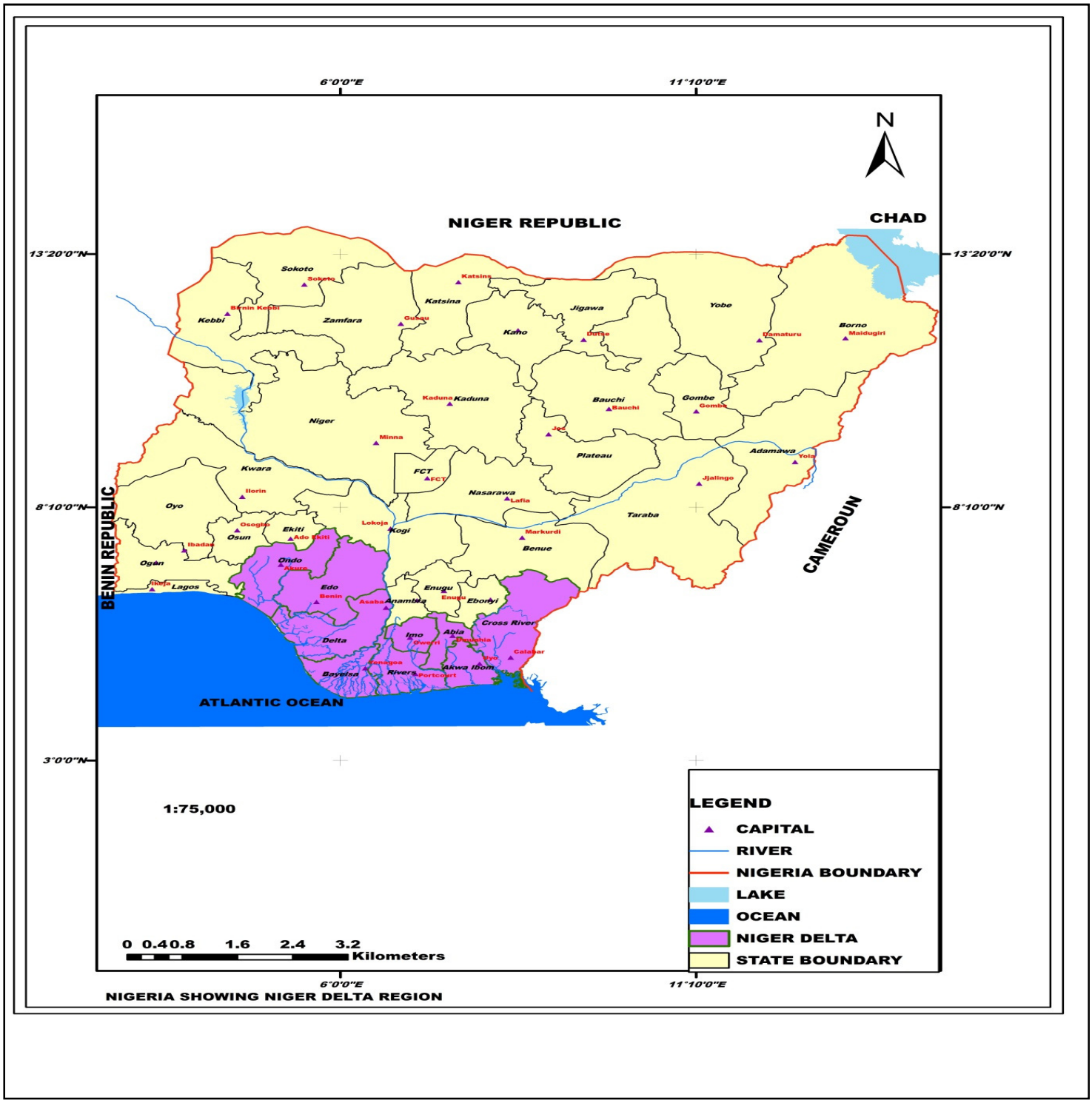
- National Science Foundation Grants and Assistance
- California Specific ICT Education and Resources
- Synchronous online ICT Education
- Improving Diversity in ICT Education and Workforce Development
- Other ICT Educator Resources include:
  - → ACM (ICT standards and Curriculum Recommendations)
  - → ACM Committee for Computing Education in Community College
  - → Applied Math and Science Education Repository-Free Educational Resource and Services)
  - → CNET.com (Tech Gizmos, News and Reviews)
  - → Free Online Dictionary of Computing
  - → O'NET Online (Occupational Information)
  - → World Wide Web Consortium (WWW standards, Community and Course ware)
  - → Webopedia (Online Dictionary)
  - → Whatis? com (Definition of internet and computer related terms)
  - → Wikibooks (Free Textbooks)
  - → Open source consortia for free software (example some GIS and Remote Sensing Image processing software that Multispec, Spring, ILWIS, hosts of some computational software and antivirus)

In Nigeria, the efforts of TET FUND, a federal Government agency for funding of educational development is highly commendable. This agency has been instrumental in the survival of research and ICT development in most tertiary institutions in Nigeria especially the south Eastern States.

Further to the above, the Surveyors' Council of Nigeria (SURCON) has for some time now continued strongly on the advocacy and supervision of ICT development in Surveying and Geoinformatics training and practice in Nigeria by ensuring that Surveying workstations and costly equipment such as GPS Receivers, Total Station equipment, Echo sounders, Digital Levels, Scanners and Photocopiers, etc.; are distributed to schools in Nigeria at zero cost. Scholarships and sponsorships are also made by SURCON to qualified candidates to study abroad at Masters and Doctorial levels.

2. Methodology

2.1. Study Area



NIGERIA SHOWING NIGER DELTA REGION

Figure 2: Map of Nigeria showing the South Eastern States (Source:Chigbu et al; 2014)

The project areas was South Eastern Nigeria(Abia,Anambra Ebony,Enugu and Imo States), that is a consideration of the tertiary Instututions/Universities in the Geo-political zone of Nigeria offering Surveying and Geoinformatics.Relevant data was obtained by oral interview and questionnaires administered on students and lectures in various tertiary institutions in the states.One hundred and ten questionnaires were given out while eighty-two persons responded,which is approximately seventy-five percent.out this number,fifty-two are students,twenty lectures and the rest others with knowlegde and interest in the field of study.The information from respondents were analysed giving rise to the following:

2.2 Tertiary Institutions in the Locality

The following schools were considered in this work:

INST. TYPE	NAME/Year Established	LOCATION	PRGM.S/GI	MODE	ACCRED.	OWNSHP
University	Abia State University (1981)	Uturu	No	NA	NA	State
	Ebony State University (1996)	Abakalika	NO	NA	NA	State
	Federal University Ebony (2011)	Abakalika	None	NA	NA	Federal
	Enugu State University (1996)	Enugu	Yes	BSc,	Yes	State
	Nnamdi Azikiwe University	Awka	Yes	BSc, PGD, MSc, PhD.	YES	Federal
	Anambra State University (2000)	Igbariam	None	NA	NA	State
	Federal University of Tech. Owerri (1980)	Nekede Owerri	Yes	BSc	NO	Federal
	Imo State University (1981)	Owerri	Yes	BSc	Yes	State
	Michael Okpara Fed.Univ. of Agric. (1993)	Umudike	NO	NA	NA	Federal
	University of Nigeria (1960)	Nsukka/ Enugu	Yes	BSc, PGD, MSc, PhD.	Yes	Federal
	Madonna University (1999)	Okija	NA	NA	NA	Private
POLYTECHNICS	Abia State Polytechnic (1992	Aba	Yes	ND, HND.	Yes	State
	Federal Polytechnic Nekede	Nekede Owerri	Yes	ND, HND.	Yes	Federal
	Imo State Polytechnic	Iheagwa	NONE	NA	NA	State
	Institute of Mgt. & Tech	Enugu	NONE	NA	NA	Federal
	Ebony State Polytechnic (1996)	Abakalika	NONE	NA	NA	State
	Federal Dept. Agric and Water Resources	Owerri	Yes	ND HND	Yes	Federal
	Fed.Poly. OKO (1979)	Oko	Yes	ND HND	Yes	Federal

Table 1: Tertiary Institution in South-Eastern Nigeria
Source: (Chigbu et al; 2014)

UNIV/ITEMS	FUTO	NAU	UNN	MAU	FED EBONY
Lecturers	9	11	12	NA	NA
Average student Intake	33	50	40	NA	NA
Graduate intake	NA	40	35	NA	NA
Virtual Library	NA	1	1	NA	NA
Equipment/ Hardware	2Total Stations, DGPS, DLevels, others.>30 computers	>5 Total Stations, Scanners, DGPS, DLevels, others,1 GIS LAB, STUDIOS,1 R/S LAB >40 computers	>25 Total Stations, Scanners, DGPS DLevels, >60 computers.	NA	NA
Software Usage	ArcGIS, Erdas, AutoCad, ILWIS	ArcGIS, Erdas, AutoCad, ILWIS, ANNOVA, QGIS, MATHLAB, etc.	ArcGIS, Erdas, AutoCad, ILWIS, SPRING, QGIS,MATHLAB,Idrisi,Wolfpack etc.	NA	NA
Funding	Federal	Federal	Federal	-	Federal
Affiliation	UNKNOWN	FIG ACADEMIC MEMBER,ISPRS,etc.	FIG	-	-
Source of Power	PHCN Gen. Set	PHCN Gen. Set	PHCN Gen. Set	PHCN Gen. Set	PHCN Gen. Set

Table 2: Level of ICT Compliance in the Tertiary Institutions (Fed. Universities) in S/E Nigeria
Source: (Chigbu et al; 2014)

UNIV/ITEMS	ABSU	ESUTH	EBONY	ANANBRA	IMSU
Lecturers	NA	7	NA	NA	8
Average student Intake	NA	45	NA	NA	28
Graduate intake	NA	NA	NA	NA	NA
Virtual Library	NA	NONE	NONE	NA	NA
Equipment/ Hardware	NA	>2Total Stations, DGPS, DLevels, others,1 GIS LAB, STUDIOS,1 R/S LAB	NA	NA	NA
Software Usage	NA	ArcGIS, Erdas, AutoCad, ILWIS,ANNOVA, QGIS,MATHLAB, etc.	ArcGIS, Erdas, AutoCad, ILWIS,SPRING, QGIS,MATHLAB, etc.	NA	NA
Funding	STATE,TET FUND	STATE	STATE	STATE	STATE
Affiliation	UNKNOWN	UNKNOWN.	UNKNOWN	-	-
Source of Power	PHCN Gen. Set	PHCN Gen. Set	PHCN Gen. Set	PHCN Gen. Set	PHCN Gen. Set

Table 3: Level of ICT Compliance in the Tertiary Institutions (State Unities) in S/E Nigeria
Source: (Chigbu et al; 2014)

UNIV/ITEMS	OKO(ANAMRA)	FED EBONY	IMT(ENUGU)	NEKEDE(IMO)	FED ABIA
Lecturers	10	NA	NA	7	NONE
Average student Intake	30	5NA	NA	27	NA
Graduate intake	NA	NA	NA	NA	NA
Virtual Library	-	-	-	1	NA
Equipment/ Hardware	Total Stations, DGPS, DLevels, others.	NA	NA	Total Stations, DGPS, DLevels, others.	NA
Software Usage	ArcGIS, Erdas, AutoCad, ILWIS	ArcGIS, Erdas, AutoCad, ILWIS, etc.	NA	NA	NA
Funding	Federal	Federal	Federal	Federal	NA
Affiliation	unknown	Unknown.	Unknown.	Unknown.	NA
Source of Power	PHCN Gen. Set	PHCN Gen. Set	PHCN Gen. Set	PHCN Gen. Set	NA

Table 4: Level of ICT Compliance in the Tertiary Institutions (Fed. Polytechnics) in S/E Nigeria
Source: (Chigbu et al; 2014)

UNIV/ITEMS	ABIA POLY	EBONY	ENUGU	ANAMRA	IMO
Lecturers	13	7	NA	NA	NA
Average student Intake	20	50	NA	NA	NA
Studio/Labs	3GIS,1RS	NA	NA	NA	NA
Virtual Library	1	1	NA	NA	NA
Equipment/ Hardware	4Total Stations, 2DGPS, 4DLevels, Ao Plotter &Scanner, >100 Computers.	unknown	NA	NA	NA
Software Usage	ArcGIS, Erdas, AutoCad, ILWIS,QGIS.eCognition,Spring, Wolfpack,etc.	NA	NA	NA	NA
Funding	State,TETFUND	State	State	-	State
Affiliation	FIG ACADEMIC MEMBER,ISPRS,etc.	NA	NA	NA	NA
Source of Power	PHCN Gen. Set	PHCN Gen. Set	PHCN Gen. Set	PHCN Gen. Set	PHCN Gen. Set

Table 5: Level of ICT Compliance in the Tertiary Institutions (State Polytechnics) in S/E Nigeria
Source: (Chigbu et al; 2014)

4. ICT Compliance Appraisal/Analysis Based on Available Data

Based on the above findings and information, it is evident that all is not very well with the compliance level of information and communication technology in the tertiary institutions in the South Eastern States of Nigeria. For instance, the number of Lecturers in most of the schools is not very commendable. It is the human capacity that will be the first driving force in this campaign. Again, the average student intake(less than 40 per session per school) is grossly inadequate, meaning that, the profession is not receiving the required number of students and hence, professional for the future. This is a very bad signal.

The facilities for good research work are also not readily available as funding too is poor.

Tertiary institutions today in Nigeria have been mandated by the National Universities Commission (NUC) to ensure as a precondition for admission, that new students present their Laptops and that PC (Laptop) ownership in tertiary institutions should be at least 1PC to every four students, one PC to every two lecturers below the grade of Lecturer1, one PC for Senior Lecturers, and one notebook a Professor/Reader. Federal universities like Nnamdi Azikiwe University (NAU), University of Nigeria Nsukka (UNN), Federal University of Technology Owerri (FUTO), Federal Polytechnic Nekede Owerri, Institute of Management and Technology (IMT) Enugu, Federal Department of Agricultural Resources, Michael Okpara University of Agriculture (MAU) Umuahia, Federal Polytechnic Oko, Anambra State have achieved a feat in this regard. State owned tertiary Institutions like Abia State University Uturu (ABSU), Ebonyi State University, Abakalika, Enugu State University (ESUTH) and Anambra State University are all struggling to comply with the above Abia State Polytechniccan proudly boast of resource centers fully equipped with ICT devices, work stations, standard GIS centers and laboratories.

The research also went further to reveal that the extent of lecturers' utilization of the ICT facilities is very low. This is sequel to lack of electricity power supply, lack of basic computer operational skills etc.

Also, Yusuf (1997), Okebukola (1990) & Egunjobi (2003) agreed that incessant power failure is a serious impediment to ICT implementation. Another report on the utilization of ICT driven tools in the libraries in south eastern Nigeria showed that there has been no improvement with respect to adopting ICT methods.

Furthermore, lack of infrastructural facilities such as power supply, internet facilities and even adequate numbers of computers to support automation have hindered ICT growth in these institutions.

Most of the libraries agreed to have installed Internet facility in the past but none of them is functional presently. This has been due to lack of finance to sustain and maintain these facilities. Ebiwolate (2010) lamented on lack of ICT as one of the major problems facing Nigerian Institutional libraries in Nigeria. This is primarily due to inadequate funding of these Institutional libraries.

Also inadequate number of professionals and lack of skills and training- These libraries obviously do not have enough professionals to man themiand subsequently, there has been little or no training for the available workers towards acquiring the necessary skills in this areas.

6. Recommendation and Conclusion

6.1. Recommendations

In order to harness the gains of ICT in Surveying and Geoinformatics the following are recommended:

- → There must conscious planning of ICT usage in our schools and tertiary Institutions.
- → Adequate ICT infrastructure must be provided for teaching and learning
- → There must be adequate budgeting for ICT development in our Schools
- → ICT based research projects must be incorporated into the curriculum, hence, a call for careful remodeling of Surveying and Geoinformatics Curriculum to embrace changes and suit challenges in Science and Technology. ICT training is hereby advocated to be introduced at all levels of learning.
- → ICT usage in Surveying and Geoinformatics must be encouraged to develop good professional literate persons. We must careful cultivate positive digital attitude and which also guarantees positive digital citizenship (It is about having the skills and knowledge needed to effectively and positively use digital technologies to participate in society-having the capacity to communicate, create and consume digital content).
- → A strategy for Collaborations amongst tertiary institutions running Surveying and Geoinformatics is also recommended. This can be on national, regional and International basis. FIG, WORLD BANK, INTERNATIONAL SERVICE PROVIDERS need to encourage affiliated institution in the Sub-Saharan especially those that have constantly fulfilled their financial obligations to FIG (ACADEMIC MEMBERS).
- → Such Institutions and Departments can be encouraged through donations such as text books, survey equipment, sponsorships and training to build capacity.
- → As I sum up this piece, let's remember Rosalie O'Neale, who stated that" as technology continues to evolve, and children and young people increasingly weave its use into the fabric of their daily lives, it becomes ever more important that this use of technology is underpinned by positive digital citizenship behaviors and attitudes. This guarantees that children will be able to realize the great potential of the internet and their own potential as well''.

6.2. Conclusion

This paper has attempted to review the ICT application scenario with respect to Surveying and Geo-informatics training in tertiary institutions in South-Eastern Nigeria. It is obvious that contemporary Surveying and Geoinformatics training and practice go on hand -in- hand with ICT compliance.

With the high rate of advancement in the development of sophisticated hardware and software in GIS, Remote Sensing, Satellite and Locational based studies, a lot need to be done to ensure the relevance of this discipline and profession is sustained in the next century. Thus, it has been noted that effectively introducing technology into schools is also highly dependent upon the availability and accessibility of ICT resources (e.g. Hardware, software, and communication infrastructure). If technology cannot be accessed by the teacher, as has been noted in this work, then its utilization and impartation is not possible.

ICT competency standards for teachers must be based on the three identified approaches: technological, knowledge deepening and knowledge creation. These approaches are seen as part of a developmental continuum, and each approach has different implications for education reforms and improvement, different implications for change for components of the education system (UNESCO, 2008).

7. References

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