

UTILIZING OPEN SOURCE INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) IN TERTIARY INSTITUTIONS IN NIGERIA

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ABSTRACT: *The use of technologies in all spheres of life by an individual irrespective of his/her status and settlement type has now become imperative in our societies; as technologies have become the features that support the teaching and learning as well as wide range of activities. Open Source Information is a multi-channeled learning aspect (involving use of television, radio, cell-phone, internet, white board, computers e.t.c.) which is known to enrich educational experience and effect changes in information and knowledge. As resources for information and communication are lacking in many tertiary institutions especially in Colleges of Education, Polytechnics and alike, providing and utilizing open sources (ICTs) is quite imperative. Training of academics in the use of ICT for teaching and learning is an essential component of successful information technology understanding across education sector which paves a way to the recent development in Education, Science and Technology.*

Keywords: ICT, Teaching and Learning, Open Source, Education, Knowledge.

INTRODUCTION

The global trend is wheeling round, focusing and emphasizing the use of Information Communication Technologies (ICTs) in all works of life.

Based on this fact, this paper addresses:

- ❖ The meaning of open sources as it relate to ICTs
- ❖ Utilizing open source in the context of Education, Teaching and Learning.
- ❖ Barriers to teachers' effective utilization of open source ICT in Tertiary

institutions

- ❖ Enablers that promote teacher utilization of ICTs, skills and techniques in aiding, enhancing and improving teaching and learning.
- ❖ Proposal of improving teacher utilization of Open Source ICTs interactions and above all, the way forward.

In a report on E-Commerce Development from the United Nations Conference on Trade and Development, Geneva, 2002, it is stated that developing countries should seek to leverage emerging opportunities in E-Commerce. This report identified a number of opportunities for developing countries to exploit, one of which was E-Publishing, the electronic publication and delivery of materials for education, pleasure and business.

However, we cannot simply turn a switch and expect local business to adopt open source technologies. Even the provision of training materials and the creation of awareness campaigns will not facilitate an immediate entry into the Open Source arena. This is because the concepts behind Open Source Software are alien to most peoples thinking. The general perception is, if it is free it must be inferior. What is needed is a demonstration to the business community that Open Source Software can be both superior and more cost effective than commercial alternatives.

In the context of this paper Open Source refers to sources that are open to all once one intends to have access to them especially in enhancing ones information or learning base. This source include the Internet, E-Learning, E-Library, handheld devices, like Handset that can be used to access internet, E-Conferencing, E-Registration, Voice Over Telephony etc. Basically ICT is an acronym that stands for Information Communication Technology and in some instance Information and Communications Technologies (Gbenga, 2005)

- Information
- Communication
- Technology

Information: Facts or detail about something (Barrons, 2006)

Communication: The Principles of transmitting or sending information and the method by which it is delivered as print or radio or television etc (Gbenga, 2005)

Technology: Basically, is the practical application of Science/the Art or of Applying Scientific Knowledge to Practical problems. (Barrons 2006, Wikipedia & ITAA, 2005)

Gbenga (2005) reported that “Information and Communications Technologies (ICTs) are the Computing and Communication facilities and features that variously support teaching, learning and a range of activities in education”.

It is pertinent to note that ICT is not limited to computer applications (which is just a component of ICT) it includes computer applications, internet, newsprint, radio, TV etc. (Knowledge Maps, 2005). This brings us to the issue of open source which are not farfetched because they are the sources which are open to all once one decided to have access to them especially in development of teaching and learning. Therefore, this paper focuses on key areas of Open Source ICTs and their effective utilization in Tertiary Institutions in Nigeria.

Utilizing Open Source ICT in the Context of Education, Teaching & Learning

Use of Open Sources in context of Education Teaching and Learning can be seen through the following three (3) perspectives:

- (i) Information Technology uses computers which have become indispensable in modern societies (with particular focus on education) to process data and save time and effort.
- (ii) Telecommunication Technologies, include the phones (with fax) and the broadcasting of radio and television often through satellites
- (iii) Networking technologies, of which the best known is the internet, but which has extended to mobile phone technology, Voice Over Telephony (VOT) satellite communications which is just coming up.

There is a widespread belief that ICTs can and will empower teachers and learners, transforming teaching and learning process that is, from being highly teacher – dominated to student – centered, “This transformation will result in increased learning gains for students, creating and allowing for opportunities for learners to develop their creativity, problem – solving abilities, Informational Reasoning Skills”, Open Source as Appropriate Technology for Global Education. (Carmichael, 2004). However these findings cannot ascertain this belief.

Impact of Student Achievement

Although the impact of ICT use on student achievement remains difficult to measure but some studies have shown that Computer Aided Instructions (CAI) have been seen to slightly improve student performance on some grounds (Knowledge Maps, 2005). CAI which refers generally to students' self-study or tutorials on personal computers (PCs) have been shown to slightly improve students test scores on some reading and Mathematical skills (IDB, 2005). Some issues raised in respect to use of ICT which introduce the bullets are be artificial to Teaching and Learning:

- Need for clear goals – ICTs are seen to be ineffective when goals for their use are not clear. This is so as the specific goals for ICT use in Education are in practice.
- ICTs are used differently in different school subjects – It has been observed that the use of ICTs for simulations and modeling in Science and Math's have been shown to be effective, as word processing and communication software (E-mail) in the development of student language and communication skills.
- Access outside of school affects impacts: although the relationship between in class student computer use and student achievement is unclear. However, studies have shown lower than average achievement was recorded, greatest amount of computer use outside of school is disproportionately devoted to computer gaming (Knowledge maps, 2005)

Impact on Student Motivation

- ICTs motivate teachers and students – There appears to be general consensus that teachers and students feel ICT use greatly contributes to student motivation for learning (IDB, 2005).
- Where to place computer has an impact – placing computers in classrooms enables much greater use of ICTs for higher order skills than placing computers in separate computer centres fewer computers in classrooms may enable more even use than greater numbers of computers located in separate computer centres (Knowledge maps, 2005). Related to this is an increasing attention given to the use of laptops by both students and teachers.
- ICTs can promote learner autonomy – Evidence exists that use of ICTs can increase learner autonomy for certain learners (Knowledge Maps, 2005).

- The “Pilot Effect” can be an important driver for positive impact – Dedicated ICT-related interventions in education that introduce a new tool for teaching and learning may show improvements merely because the efforts surrounding such interventions lead teachers and student to do more” (potentially diverting energies and resources from other activities).
- Gender affects impact – Uses of ICTs in education in many cases to be affected by the gender of learner.
- Another aspect of open source is **multi-channel learning concept** which focuses on enriching the educational experience by engaging all resources that are available to help effect incremental change by coordinating the various ways to connect learners with information, knowledge and simulation, and to mediate those interactions, provides valuable insight into how blended learning approaches can be delivered and tailored in areas of great importance (IDB, 2005). Researcher’s findings established that, resources availability is lacking in most tertiary institutions in some States which is a big blow to the benefits to be derived from utilizing open source ICTs.
- Another aspect of open source ICT which is used in achieving various learning objectives is **where to place computers to make sure they are used efficiently**, going by presented findings on the computers in the tertiary institutions in state like Borno and Yobe, the accessibility to the centre is meant for those only studying computer as a subject or carrier it doesn’t give opportunity to non computer registered students to get the benefits even the computer in the departments are kept in the Head of Department Office which also makes accessibility very difficult.
- The use of **hand held devices** like mobile phones which is another tool for open source ICT researcher’s findings shows that though over 45% of the student using handset or mobile phones can easily be connected or access to internet but most of those holding such devices do not know or are even ignorant of using such phones to improve their learning or knowledge base.

In general we should note that open source ICT have become central to contemporary societies not only in the Tertiary Institutions. Whether you are talking on

the phone, sending an E-mail, listening to sports coverage on the radio, watching the news on TV's working in an office, or in the field you are using open source ICTs.

Gardler et al (2016) reported that modern technology can greatly reduce the cost of education in many ways, these include:

- ❖ Reduce expenditure on course books
- ❖ Reduce printing costs
- ❖ Ensure timely dissemination of incidental or urgent information
- ❖ Communication with parents and students
- ❖ Submission of student assignments (and in some cases automated marking)
- ❖ Recording, achieving and monitoring of student and educator performance
- ❖ Achieving of course materials
- ❖ Delivery of whole courses as part of a distance education program
- ❖ Quality control measures

This list is by no means exhaustive, neither are all points applicable to all forms of education. However, since the Internet can transfer large volumes of information to multiple, distributed recipients at very low cost, it is expected that at least those points focussing on distribution of information will be applicable to all educational models. Even in situations where Internet connections are unavailable, due to geographical and economic barriers, CD and DVD ROM can be used to physically distribute much of this information.

Unfortunately, the cost of adopting technology within an existing educational infrastructure can be prohibitive. There are many costs associated with such a program, some of them obvious, such as the cost of the software to develop course content and the cost of hardware to deliver that content. Some of the costs are less obvious, such as the software for creating CD/DVD versions for students without Internet Access. Furthermore, instructors must be trained to use these new mediums effectively.

Gardler et al (2016) Reiterated that there are two ways that Open Source can assist in the reduction of these costs. The first is in the adoption of Open Source Software (OSS) for course design and delivery. Open Source Software is not free, its cost lies in the implementation and customization of the facilities as opposed to the license fees and support contracts associated with commercial software. However, the

cost of Open Source Software, when managed carefully, can be considerably lower than alternative commercial packages, this is especially true where largely identical packages are used in multiple sites as is the case with educational organizations. In such circumstances the fixed cost of customization of Open Source Software is offset against the variable cost of licenses for each site.

The second way that Open Source can assist in the reduction of costs in education is through the use of Open Courseware. Open Courseware is developed in a similar way to Open Source Software, that is, it is made freely available to all users of the courseware and each user is encouraged to make additions, corrections and improvements to the content.

Barriers to Teachers Effective Utilizing Open Source ICTs in Tertiary Institutions

Actual and perceived barriers to the uptake of open source ICT by Teachers are enormous as listed by Gbenga (2005), some of these are:

- Lack of teacher confidence and teachers' computer anxiety.
- Lack of teacher competence
- Lack of access to resources
- Lack of Time
- Technical Problems
- Conservatism & Negative attitude
- Gender differences

Lack of Teacher Confidence and Teachers' Computer Anxiety

Many teachers who do not consider themselves to be skilled in using ICT feel anxious about using it in front of their students who perhaps know more than they do. Larner and Timberlake (1995) found that teachers were worried about showing their students that they did not know how to use the equipment, and that it was the teachers who experienced this kind of anxiety who were less willing and/or able to make use of computers in their teaching/learning. In addition, student attitudes and expectations of their teachers' competence in ICT are likely to contribute to this teacher anxiety. It should be noted that the problem of lack of confidence as a barrier is closely related to

several other key issues, which themselves alone can be viewed as barriers to teachers' use of ICT. For example teachers' confidence in using ICT is directly affected by the amount of personal access to ICT they have.

Lack of Teacher Competence

A factor which is directly related to teacher confidence levels is that of teacher competence. In order to achieve high levels of teacher competence is ICT, there is a need to provide training, and perhaps unsurprisingly, there is a great deal of literature evidence to suggest that effectively in their teaching (Kirkwood 2000). If training is inadequate or inappropriate, then teachers will not be sufficiently prepared, and perhaps not sufficiently confident, to make full use of technology in and out of the classroom. The lack of teacher competence, then, together with the associated lack of quality training for teachers can be seen as a barrier to teachers' use of ICT, Gbenga (2005) reported that the issue of training is certainly a complex one and many factors are considered to be important in ensuring that the training is effective.

- Lack of time for training
- Lack of skills for training
- Lack of ICT focus in initial teacher training

Those Academic Staff or lecturers in C.O.E Waka & Ramat Polytechnics Maiduguri who responded to oral interview questions which dwelled on computer literacy and also accessing Internet only 57.8% responded they are computer literate. This is indicating lack of time for training or lack of skills for training.

Lack of Access to Resources

Knowledge Maps ICT Tools (2005) in its briefing sheet points out that evidence of very good practice in the use of ICT is invariably found in those schools/colleges that also have high quality ICT resources, and that a lack of computers and software can seriously limit what teachers can do in the classroom with regard to the implementation of ICTs, these include:

Inappropriate software

Lack of personal access for teachers

Lack of Hardware

Poor quality hardware and

Poor organization of resources

Lack of Time

It has been observed that a problem that exists for teachers in many aspects of their work is that of the lack of time available for them to complete given tasks, and teaching ICT is certainly an area that is affected by this. Fabry and Higgs (1977) pointed out that "learning skills in any profession requires time, but teachers have little time left after spending most of their day teaching/facilitation and other commitments like staff/Academic meetings yet they do not have time to experiment with technology, share their experiences with colleagues and attend technology related in-service training programs".

Technical Problems

Gbenga (2005) reported that technical problem can be viewed in two perspectives. The fear of things going wrong is a real concern when considering making use of ICT is the fear of equipment breaking down during a lesson, or that if they use the equipment they will do something wrong and cause damage to it themselves. The second perspective originates from actual breakdown of equipment and the subsequent disruption that these can cause. The presenters observed that if there is lack of technical support available in tertiary institutions, then it is likely that preventive technical maintenance will not be carried out regularly resulting in a higher risk of technical breakdowns.

Conservatism and Negative Attitudes

The presenters discovered that looking at the barriers to ICT use in tertiary institutions suggests that in the teaching profession there is an inherent resistance to change, and this is another barrier to some teachers' use of new technologies in education especially the perception that introduction of new innovation educational change is slow process, with teachers needing time to gain experience with computers and other open source ICTs.

Gender Differences

In the literature review carried out for this document a small abstract of evidence was found that indicates inter-relationship or correlation between teachers' gender and their usage levels of open source in ICT. However, the EC report (European Commission

2003) notes that gender is an issue which determines the use of ICT by teachers stating that 77 percent of male teachers use a computer off-line, compare with 66 percent of female teaches, and points out that the gap is wider when looking at the use of the Internet 56 percent of male teachers compared with 38 percent of females.

Result of interview to respective lectures in Borno and Yobe tertiary institutions showing 64 females responded to interview as against 169 of the male counter part even with the small number of the females interview only 42.7% of them are computer literate while 57.3% are not computer literate. On the part of the male interviewed only 53.5% responded they are computer literate.

Enablers

The enablers are basically the reverse of the barriers. Enablers are stimulants, motivators and energizers to the use of open source ICTs in teaching and learning. Some factors can be identified which are most effective in enabling and encouraging the uptakes of ICT by teachers for better teaching (Gbenga 2005)

- Access
- Availability
- Reliable Technical Support
- Good Training Programmes
- Leadership, Planning and Decision Making.

Access

- Access to our personal desktop/laptop
- Full access to software & hardware at all times
- Provision and access to an interactive whiteboard in the classrooms.

Availability

- Availability of high quality resources
- Effective timetabling, rooms & equipment/access to resources.

Reliable Technical Support

- High level of technical support
- On-site technical support.

In this aspect there are two major aspects i.e. what technical support staff should do

and also who should do the technical support. It is important whoever takes in technical support, it is clear that for teacher and student to get reliable service, co-operation between all parties concerned is required. (Knowledge Maps, 2005).

Leadership, Planning & Decision Making

- In respect of leadership – support/ICT vision from senior management
- While on planning – there is need for the tertiary institutions to adopt policies on utilizing open source ICT across curriculum.
- On decision making: Gbenga (2005) reported that some identified factors that enable teachers to successfully engage in innovative practices include
 - Support of senior management level for implementing new practices and addressing financial implications where needs arise.
 - Involvement of several members of academic and non-academic staff.
 - Willingness to take risks, accepting that some ventures will succeed while others may not.

In the area of computer science education we can learn and achieve much more when using Open Source Software (OSS). Gardler et al (2006) list the many advantages to be gained from using Open Source Software (OSS) in Computer Science education:

- ❖ Often provides free or lower-cost technology in the classroom, permitting the use of technology otherwise too expensive
- ❖ Introduce students to the larger computer science community and to the practice of peer-review
- ❖ Students are given experience in large-scale software collaboration and development
- ❖ The use of internet-driven collaboration tools such as web pages and email lists are proven to be effective in distributed software collaboration, the use of Open Source Software exposes students to this practice
- ❖ By using and developing Open Source Software (OSS), not only is the student participating in a large distributed software community, but is also interacting with large, real, software code-bases.
- ❖ The use of Open Source Software (OSS) is particularly appropriate in a senior

thesis.... Students who are encouraged to build projects on top of Open Source Software (OSS) bases can build more interesting and exciting systems than they might have developed from scratch.... The best of these systems can be contributed back to the open source community.

Proposals for Improving Teachers Utilizing Open Source ICTs.

Training teachers in the use of ICT for teaching in an integrated manner is an essential component of successful use of ICT across the Education sector. This implies that, ICT is a tool to enhance the education and training of teachers and as well as a tool that teachers can use to enhance their teaching. In any aspect training is a key requirement.

Now lets look at **opportunities for training enhance teacher – ICT relationship.**

- Technologies like Radio, Television and Computer enable teacher education to be provided at a distance to the trainee's location, thereby saving travel time and cost, and also avoiding disruption of classroom routines as teachers can learn in their own time.
- Initial and specialized training is never sufficient for the entire professional life of a teacher. Teachers often have to deal with changes in knowledge, methodologies, pedagogical issues, students and school culture. (Gbenga, 2005).
- During the literature review of this presentation it was gathered that ICT provide demonstrations of real teachers in real classroom settings, representing a range of subject approaches and methodologies for example, "MAVIS BEACON Teaches Typing". This demonstration can be dissected, analyzed, watched again and assessed overtime without disruption an actual class.

Challenges

Despites all the laudable benefits and opportunities there exists some issues that have prevented the successful implementation of ICT training for teachers, these include:

- One-off training is never enough. Training in use of ICT for instructional and learning purposes takes time and individual assistance is needed.
- Programmes often cover only computer literacy and do not train teachers in the instructional use of ICT, which is called ICT productivity skills development.

- Most programmes are supply-driven in that it is assumed that, if training is supplied, classroom success is ensured. It should be noted demand side is also very important. The demand of teachers should be taken into consideration, including their interests, needs and attitudes.

Summary

Open source which is regarded as an avenue that are open to all once one intends to have access to them particularly in enhancing ones information or learning base. Most of these source that deals with teaching and learning include internet, e-library, e-conferencing, e-registration, Handset and host of others. Utilizing open source in the Tertiary Institutions in Nigeria is facing a lot of challenges that ranges from lack of functional internet facilities inadequate computers, issue of power and payment of subscription to the service providers. Leadership/management which is supposed to be a driving force in this aspect does not help thing as they lack support/ICT vision, coupled with problem of funding on the part of the Federal and state government plays a negative role in areas of utilizing open source ICT in tertiary institutions in Nigeria.

Conclusion

It is evidently clear that technology changes – rapidly – and newer, more cost effective and more powerful technologies will continue to emerge for potential use in Education. At the same time, evidence shows that, once installed in schools, ICTs continues to be used for the life. The importance of Utilizing Open Source ICTs in Education has a lot of prospect. It is hoped that all hands should be on deck to actualizing the concept.

Recommendations

The following recommendations were made:

- (i) All computer centres should be equipment with functional facilities like internet.
- (ii) With the ongoing problem in the energy sector, all computer centres should have at least two standby generators;
- (iii) Institutions management should ensure prompt payment of necessary subscription fee to the appropriate service providers to avoid disruption of networking.

- (iv) The computer centres should be accessible to those willing to use them irrespective of the Department one come from. The departments should ensure installing reasonable number of computers for use of their students.
- (v) Awareness campaign through lectures, paper presentation on the use of the aspect of open sources, like use of mobile phones with internet and fax facilities and the broadcasting of radio and television often through satellites.
- (vi) The tertiary institutions management should embark on massive training of both academic and non-academic staff on use of ICTs.
- (vii) State and Federal government should place more emphasis on funding the tertiary institutions under their Jurisdiction and emphasis should be on ICT related ventures.

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