Information and communication technologies to raise quality of teaching and learning in higher education institutions

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ABSTRACT

This paper aims to help higher education teachers know, and be able to deploy, certain information and communication technologies (ICTs) towards shifting from teacher-centred pedagogy to learner-centred instruction for increased quality of teaching and learning. Theories and many practices have emerged that have faulted teacher-centred classrooms common in educational institutions, especially in developing countries. The argument is that teacher-centred approach to delivering subject contents does not produce the calibre of school leavers and graduates the twenty-first century society needs. This argument has necessitated a longstanding call for a shift to student-centred teaching and collaborative learning. Many ICTs play a critical role in this direction, but are either unknown for the role or unutilized. The paper highlights many benefits of integrating these technologies into teaching and learning, as proved by projects in elementary and high schools. It then lists ICTs that can be used successfully in higher education, explains what they are, and shows how and evidence of use. They include Web-blogs, wikis, e-mail, social networking Web sites, social bookmarking Web sites, mobile phones, presentation software and digital cameras. The paper concludes with suggestions of what can be done to implement their use as integral to the entire higher education effort.

Keywords: colleges; education; e-learning; higher education; ICT; information and communication technology; information technology; learning; teaching; universities

INTRODUCTION

Future professionals and the entire workforce in the private and public sectors of any economy deserve the sort of education that equips them and, consequently, their economy to make steady progress. This sort of education ought to be initiated and sustained with a learning model that enables students to develop the required skills for the future. In its white paper, Intel World Ahead Program (2009) mentions some of these skills, as identified by The International Society for Technology in Education (ISTE) that will help students to work and live in the twenty-first century. The skills include conducting independent research, thinking critically, solving problems, using technology to communicate and collaborate, and understanding societal issues related to digital citizenship.

All over the world, teacher-centred pedagogy is prominent. Teachers talk and students are directed to listen, as Cuban (1993) observes. The assumption is that learners are empty or are just passive observers, an observation Wilson & Peterson (2006) made of schooling in the United States of America. Yet, in explaining the way learners get, organise and apply knowledge and skills; behavioural, constructivist, developmental and social learning theories and practices reveal that teacher-centred approach to delivering subject contents as impotent for producing the calibre of graduates the twenty-first century society and beyond need. Constructivist, developmental; and social learning theories—collectively called cognitive learning theories—have been discussed by numerous authors including Kruse & Wilcox (2013), Kruse (2013), Kruse (2009), Bransford et al. (2005), National Research Council (2000), Anderson & Pearson (1984), LaBerge & Samuels

(1974), Judd (1908), and Bryan & Harter (1897). In summary, these theories point to the following: (1) Learners should be active participants in planning and evaluating what they learn; (2) Learners are most interested in subjects that are immediately relevant to personal life and employment; (3) Learners learn better when they are exposed to solving real life problems than when they are exposed only to theoretical course contents; (4) Knowledge is constructed from experiences; (5) Learners prefer learning new contents based on their existing knowledge and experiences to learning completely strange contents. All these statements place the learner at the centre of the instructional method that must enable twenty-first century students to acquire needed skills, including two advanced skills stipulated by United Nations Educational, Scientific and Cultural Organisation (UNESCO, 2007).

According to UNESCO (2007) two advanced skills required of graduates in this century were the skill of expert thinking and the skill of complex communication. Expert thinking is the ability to solve problems that lack explicit rules-based solutions, unlike algebra. The skill of complex communication is the ability to make effective oral and written arguments, eliciting information from others. These two skills are embedded in information, visual, and technological literacy which are rarely acquired through teacher-centred pedagogy. Higher education institutions (HEIs) have always strived to justify their existence as centres of excellence. To earn this justification, HEIs have a duty to guide students to adequately acquire information, visual, and technological literacy. This requires a shift to student-centred, project-based teaching and collaborative learning in all programmes. ICTs' role in this direction is critical. Before looking at particular ICTs that teachers and students in HEIs can deploy to raise the quality of teaching and learning, it will be helpful to know what are considered as ICTs generally, the scope covered by this paper, and the benefits highlighted by use of ICTs in elementary and high schools where much attention had been given.

What are ICTs?

There are numerous definitions of ICT, but the definition by UNESCO is accepted by this author as adequate. Most definitions fail to capture many ICTs. They create the impression that ICTs are only computers and computer systems, but UNESCO (2002, p. 10) defines ICT as "forms of technology that are used to transmit, process, store, create, display, share or exchange information by electronic means." This definition covers such technologies as radio, television, videotape, audiotape, tape recorder, compact disc (CD), digital versatile disc (DVD), flash drive, telephone (both fixed line and mobile), satellite systems and computer hardware, software and networks. It covers also services associated with these devices, such as video-conferencing, e-mail and blog.

Scope of and rationale for the topic of this paper

As ICTs, radio, television and tapes (audio and video, and their players and recorders) have played and are still playing visible roles in teaching and learning. This paper is, however, dedicated to computer and its associated networks (for example, the Internet), digital hardware and software that can be used in teaching and learning to achieve optimum value. Even then, space restriction has resulted in limiting discussion to only some, among many, appropriate computer-based technologies.

Indeed, much has been written about the role of ICTs in education. Cairncross & Pöysti (2014), Fisseha (2011), Kaffash *et al* (2010) and Oliver (2002) are among the many who contributed on the topic, with emphasis on computer-based technologies. Much has also been written about the use and impact of computer hardware, software and associated services in teaching and learning, but the focus is on elementary and high schools. Such works, which identified many benefits of integrating ICTs into teaching and learning, include those of UNESCO (2011); Intel World Ahead

Program (2009); Texas Center for Educational Research (2009); Aydin & Unal (2008); Escorza & Balanskat (2008); Malaysia Ministry of Education & Intel Malaysia (2008); Rodriguez (2008) and Joyce (2007). Some others are Blamire & Kefala (2006); Trucano (2005); Mitchell Institute (2004); Silvernail & Lane (2004); Ross, et al (2003); Waxman & Michko (2003); UNESCO (2002) and Mann, et al (1999). Not much has been done regarding ICTs use in HEIs that require more advanced application of ICTs. This may be because HEIs are not currently perceived to be leading the way in developing new ways people can learn. Despite that the paper is centred on computer, which is at the centre of today's ICTs, the author chose not to restrict its title to computers in order to introduce to readers other ICTs (not usually known as ICTs) that contribute tremendously to effective education. Radio, television and tapes, for example, have often not been seen as ICTs, but they can be the focus of further research and writing with regard to the use of ICTs in teaching and learning, particularly in communities that have limited access to computers and their derivatives.

Benefits of using ICTs in teaching and learning

Students' enrolment into HEIs in countries of the world is on steady increase. It is common to see an academic lecturing 500 or more students in a class. This eats into the quality of teaching and learning, if tools are not employed to aid the delivery as well as understanding and assimilation of subject contents. ICTs support project-based learning, which removes the difficulties associated with managing a large class. Learning outcomes are improved as learning becomes more interactive. In project-based learning, students try to answer—in groups— questions that have relevance for them. For example, in the social science, the question could be "What can a graduate do to beat unemployment after graduation, apart from applying for white-collar job?" and in the natural science, it could be "What are the causes of poor sanitation on our campus, and how do we tackle them?" Students can search the Internet at their own times for relevant ideas, share and discuss findings through e-mail lists or online forum or Facebook, prepare Microsoft PowerPoint presentations, and come to class to deliver their presentations for general discussion. Using ICTs in teaching and learning have many other benefits for students, teachers and society, respectively.

As revealed by UNESCO (2011), Intel World Ahead Program (2009) and others cited in penultimate paragraph, teaching and learning supported by ICTs empower pupils to, among others,

- become more motivated to learn and so be more involved in the subjects they are studying;

- develop technology-skills, team skills and other twenty-first century skills and produce higher quality work (More than 80 percent of teachers surveyed by US State of Maine discovered this gain, as reported by Sivernail & Lane, 2004);

- improve their research and problem-solving skills;

- acquire deep knowledge about a subject;

- develop creativity and higher-order thinking;

- test how what they are learning can be used in real life.

Economically disadvantaged students and children with disabilities benefit as much as others. In Bolivia, a project that equipped 235 schools with computer laboratories, and trained teachers to develop interactive educational materials, including videos and CD-ROMs—for math and languages—brought about students achieving 10% improvement in performance at the end of the school year (International Institute for Communication and Development, 2010).

For teachers, some of the benefits of integrating ICTs into education are:

- Quick creation and circulation of locally relevant teaching graphics;

- Increased effectiveness and efficiency of lesson planning and delivery.

- Interaction with students anytime and anywhere they are outside the semester, and consequently they gain more time to execute management tasks;
- Better teaching.

- Attending to all other crucial duties and still not missing any teaching session. It is provable that missing class owing to other inevitable engagements and rescheduling them, or not having time at all again for them, badly affects learning. With certain kinds of ICT, when a HEI teacher is in an administrative meeting or in a conference or workshop or any other academic meeting at the particular time he/she is to be in classroom, he/she can still engage students. With the various features ICTs provide, the teacher will even deliver the teaching more profitably than he/she will when present in an ICT-disabled class.

Most importantly, with ICT, teachers have a more positive attitude toward their work and are able to provide more personalized learning. They are as well more effective in administrative tasks. Also, as elementary school teachers experienced in Asia-Pacific countries, which was reported by UNESCO (2007), collaboration through some forms of ICT can be an effective way in which HEI teachers can communicate with counterparts at the national level and strengthen co-operation.

For the society, integrating ICTs into teaching and learning brings the following benefits:

- Communities benefit from bridging the digital divide;

- Economic progress occurs from the better-educated workforce and from direct job creation in the ICT industry;

- Education is tailored to the needs and abilities of learners, and so drop-out rate reduces;

- Lifelong learning is permitted and promoted, resulting in education being more available to everyone, at all ages;

- "ICT helps provide solutions to many of the numerous barriers to the successful delivery of education in developing countries, including insufficient education budgets, inadequately funded teacher training, and a shortage of qualified teachers and appropriate learning materials" (International Institute for Communication and Development, 2010, p. 2).

ICTs THAT ARE POTENT FOR EFFECTIVE TEACHING AND LEARNING IN HEIs

1. Instant messaging (IM);
2. Presentation software;
3. Online community or Internet forum;
4. Online chat room
5. Learning Management System (LMS);
6. Learning Content Management System (LCMS);
7. Social networking Web site;
8. Social bookmarking Web site;
9. Web-blog, popularly called blog;
10. Twitter;
11. Wiki;

12. Mobile phone;
13. Digital camera;

Instant messaging (IM)

IM (commonly called *chatting*) "is a form of real-time, direct, text-based communication between two or more people using personal computers or other devices, such as mobile phones" (Ipsos MORI, 2008, p. 40). The user's text is conveyed over a network, such as the Internet. Yahoo Messenger® is one of the most used of IM applications. There are also America Online (AOL) and Windows Live™ Messenger. Several other free e-mail providers, like Google®, integrated IM facility into their e-mail services (for example, Google Hangout, formerly called Google Talk, which works with Google Mail—Gmail). One can log into one's e-mail account and chat with contacts right from there. Skype is another IM application. It transmits text, voice and video, making it possible for one to speak to and see others and be heard and seen in real time.

IM is being used increasingly by students of HEIs for casual and love conversations and sharing pictures and videos. It has become such an integral part of students' lives that many universities are working to move it beyond the social sphere into teaching and learning (African Leadership in ICT Program, 2011).

Through IM, teachers can meet with their students for interactive sessions. Teacher-students and students-students seminars and conferences can be held using IM. One outstanding benefit is that students who travel out of campus for reasonable cause and will miss such seminars when held in physical classroom are given opportunity to participate. Again, a student while on holiday or ordinarily away from campus can chat online with a lecturer to gain more insight into a topic or what was not well understood in the classroom lecture. Undergraduate and graduate students of online universities are on-hand witnesses to the use of IM by students in interacting with tutors and academic advisors.

Presentation software

Presentation is a method of using a computer to prepare and deliver information or knowledge in an outline form, on electronic boards or slates called slides, in a fashion intended to attract and sustain the attention of the user or audience and to make for easy comprehension and assimilation. Computer programs used for presentation are called presentation software. The most popular of these, in the commercial or proprietary category, is Microsoft Office PowerPoint. A very good free and open source variety, which is fast winning universal appeal, is OpenOffice.org Impress. They are usually used for creating presentations for meetings, conferences and the Internet. Their use for classroom work is recently becoming an obsession in countries that have discovered their positive impact on learning. For example, Microsoft Office PowerPoint presentation of lectures is seen as a normal methodology in Russell Group universities in the UK (UNESCO, 2007). Figure 1 is the first slide of a sample presentation for teaching a topic in English Grammar. Figure 2 is one of the slides of another teaching presentation.

With well created presentations, teachers in HEIs will draw and sustain the attention of very large classes throughout lecture periods. Basic equipment needed for a presentation are: (1) a desktop or laptop personal computer (PC) for creating and hosting the presentation and (2) a multimedia projector and a projection screen (or a plain white wall) for projecting the presentation. It is also helpful to have compact disks read-only-memory (CD-ROMs), flash disks or memory cards for copying and distributing the presentation (See Figure 2). The presentation can be

created to self-run, partially or completely. With the partial self-running option, the teacher prepares slides as visual aids. When the presentation is ready, it can be copied into CD-ROMs or flash disks or memory cards. It is important to ensure that the PC has at least one CD-rewritable drive or universal serial bus (USB) port or memory card slot to support copying. A PC that has all of these is better. Students can then be organized into groups in the classroom. Each group will sit before a PC with one of the CD-ROMs or flash disks or memory cards to watch the slideshow while the teacher physically narrates from his/her own corner. Microphones and loud speakers will be needed if the class is very large. As reported by International Institute for Communication and Development (2010, p. 3), a Zambian teacher says (of Microsoft PowerPoint): "Using ICT applications such as PowerPoint helps us enhance our visual presentations. With computers and the internet, my students learn more easily about their subjects."

Figure 1: *Topic and Author slide of a presentation for teaching a topic in English Grammar*
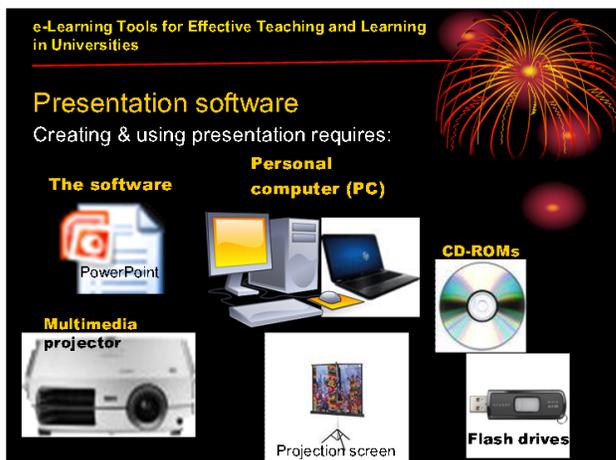
Figure 2: *A slide illustrating the apparatus required for creating, showing and distributing a presentation. It may be one of two or more slides for explaining the sub-topic 'Presentation Software'.*

With completely self-running presentation, the teacher speaks into the computer to record the lecture he/she intends to clarify with the slides. The coming into view—of the slides, when the presentation is being shown (known as *playing slideshow*)—is carefully timed to harmonize with the speaking (called *narration*).   With this option, students can alone engage in fully beneficial work in the classroom in the exact lecture period as if the lecturer is there with them, while the lecturer is in a meeting or in a conference in another country. Students can ask their questions right there (if their PC is online) or later through e-mail or mobile phone call/SMS (Short Message Service, popularly called Text).   Both partial and completely self-running slideshows allow collaboration inside the classroom, and students can copy the presentation for private study and revision.   The presentation can also be uploaded to the institution's Learning Management System (LMS), the class' online community and the teacher's Web site for the students to access. Online community and LMS are discussed below.

More interestingly, Microsoft Corporation has introduced Multiple Mouse Mischief (3Ms). This is auxiliary software (called a *plug-in)* that can be installed into PowerPoint. 3Ms helps teachers to easily make their presentations participatory. Using 3Ms, many mice are connected to a PC. Students individually or in small groups use a mouse to select answers to multiple-choice questions, to draw and paint illustrations, to write and to circle things on the screen.

Online community or Internet forum

Online community or Internet forum services allow people to form online groups and collectively create and maintain their own Web sites, usually hosted free-of-charge on the service providers' Internet domains.   The famous online encyclopaedia, *Wikipedia*, describes it as "a virtual community that exists online and whose members enable its existence through taking part in membership ritual" (http://en.wikipedia.org/wiki/Online_community. Paragraph 1).   Applications that are used to create online communities are legion. They include Google Groups, Google Sites and Yahoo Groups. Many ready-made Web site designs (called *templates*) are provided by these applications to suit various group purposes, including education. Users only need to select the template that relates to their group's nature and replace the contents with theirs, following simple steps provided.

Google Sites (Figure 3) will be of particular interest to HEI teachers and students.   It has a classroom template. People whose institution's e-mail portal is on Google Mail (Gmail) platform, like the University of Nigeria, or whose private e-mail is [at]gmail.com, are already advantaged, because one must create a Gmail account to use Google Sites. Log into Gmail; click on Google Sites tab; click on Create Site; choose the 'Classroom site' template; change the name of the site to that of your class or group. Gradually change all other information on the discussion board, announcements board and other features.

Start uploading, as attachments, your word-processed lecture notes and other relevant articles/books you downloaded from Web sites. Also list Web sites that can be visited. Then invite all the students in the class or group and give them co-owner right, so that they can participate in discussions, take assignment/term paper topics and upload their completed work and other relevant documents. Co-owner right also enables students to ask questions, answer questions, read and post announcements and do other tasks. With this, teachers and students can have rich classroom experience online. A classroom extended to Google Sites is just for the class that owns it, since no outsider enters it or even sees what is in it except by invitation.
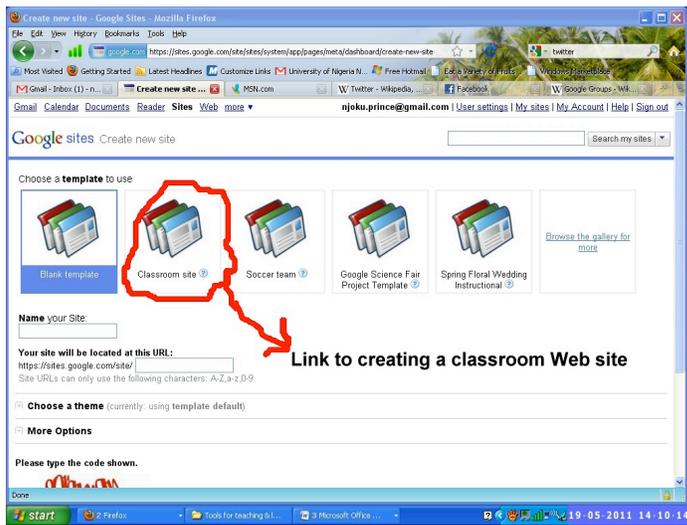
Figure 3: Google Sites home page as seen on Mozilla Firefox browser. Of special interest should be the 'Classroom site" button (circled and labelled by this author).

Internet forum, according to www.unescobkk.org/index.php?id=5323, can be used by educators and students to form networks with other students and teachers in the same university and in others and with subject experts. The tool can also be used for online professional development and to enable students to improve their reading and writing skills.

Online chat room

An online chat room is a type of online or virtual community. It allows people to communicate to one another at the same time. Because the room is on the Internet, the people must connect to the Internet before they can enter it. Questions can be asked and answered immediately, no matter the locations of the questioners and the respondents. Discussants in a chat room must have chosen usernames and passwords with which they logged in. This means that an online chat room can be created and restricted to selected people, and this character makes it a very useful tool with which HEI teachers and students can draw maximum gain. Communication in a chat room is usually by typing and sending text, but—as Phelps (2010) and Roos (2010) also observed—it is as if people are discussing in real life. Figure 4 below illuminates this.

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 [13/10/11 15:02:01] JOHN MATOGO : did you guys get my email.
[13/10/11 15:02:52] JOHN MATOGO : I only have 5 mins so that I do not interfere with
Shirley's session.
[13/10/11 15:03:18] JOHN MATOGO : so what FOSS licensing models are you familiar with?
[13/10/11 15:03:23] Gaius C. Ebere : I got ur mail John
[13/10/11 15:06:29] Omar Cissé : Thank you John
[13/10/11 15:07:30] JOHN MATOGO : I put some links in module 1 so please spend
sometime in checking those out..
[13/10/11 15:08:15] Gaius C. Ebere : @John, Ok, but I think that will be later
[13/10/11 15:09:37] William Shu : Hi everybody
[13/10/11 15:09:40] JOHN MATOGO : ok. guys in respect of Shirley Module 1 session is over.
[13/10/11 15:09:44] Olaniyi Moluga : John are u talking of the link in your mail or the
document folder
[13/10/11 15:10:02] Gaius C. Ebere : Welcome Shu
[13/10/11 15:10:08] JOHN MATOGO : we will continue after the session later.
[13/10/11 15:10:14] William Shu : i had hiccups. hopee I can submit my answer to John's
email
[13/10/11 15:10:29] JOHN MATOGO : Shirley please take over.
[13/10/11 15:10:39] Frederick Yeboah : @John you can continue till we get Shirley back.
Thank you
[13/10/11 15:10:43] CHRIS PRINCE UDOCHUKWU NJOKU : John, Bukola, Gaius, Fred, Ola,
omar, you're here already. I'm sorry I'm late
[13/10/11 15:10:58] CHRIS PRINCE UDOCHUKWU NJOKU : Welcome William
[13/10/11 15:11:02] JOHN MATOGO : @ Njoku welcome
[13/10/11 15:11:14] Frederick Yeboah : no problem Chris
[13/10/11 15:11:17] Gaius C. Ebere : Welcome Chris
[13/10/11 15:12:01] CHRIS PRINCE UDOCHUKWU NJOKU : About FOSS licencing models?
[13/10/11 15:12:46] CHRIS PRINCE UDOCHUKWU NJOKU : I think we talked about GPL
[13/10/11 15:15:37] JOHN MATOGO : what is hindering uptake of FOSS in your opinion?
[13/10/11 15:15:49] William Shu : Since GPL is already discussed, I guess we are looking at
FOSS usage now!?
[13/10/11 15:16:17] JOHN MATOGO : yes..
[13/10/11 15:16:23] CHRIS PRINCE UDOCHUKWU NJOKU : Mentality.
[13/10/11 15:16:37] Gaius C. Ebere : @John, skepticism. the mentality that "if it is free, then
it is not original"
[13/10/11 15:17:10] William Shu : Yeah, I think Chris has hit on the critical point: mentality.
[13/10/11 15:17:24] CHRIS PRINCE UDOCHUKWU NJOKU : Many people think that the free
means no cost. So they seem to take it to be inferior
[13/10/11 15:18:38] Frederick Yeboah : The biggest issues is the provision of technical
support for companies using FOSS.
[13/10/11 15:18:54] Frederick Yeboah : Welcome shirley
[13/10/11 15:19:18] Gaius C. Ebere : Shirley, you can shoot now
[13/10/11 15:19:29] CHRIS PRINCE UDOCHUKWU NJOKU : Absence of tech support, yes.
[13/10/11 15:19:30] Shirley Baffoe : @john kindly notify me when your discussion ends so. I
can take over
[13/10/11 15:20:08] JOHN MATOGO : shirley please take over...thanks for the opportunity
[13/10/11 15:20:22] Shirley Baffoe : Ok
[13/10/11 15:21:17] Shirley Baffoe : I hope you've all been able to download the
assignment
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Figure 4: A section of copy of a class discussion, in an online chat room, on some topics of an advanced course in Free & Open Source Software organized by FOSSFA and GIZ's ict@innovation in 2011 (http://www.ict-innovation.fossfa.net). John Matogo and Shirley Baffoe were moderators or facilitators (teachers). Observe the time in front of a name. That's the time the person's text entered the room's message window; it was automatically attached.

Most chat rooms have three parts (Figure 5):
(1) an input box or field (where a user types in text),
(2) a message window (on which contributions appear when sent),
(3) a participants list (showing names, and sometimes photographs, of persons in the room).

Internet Relay Chat (IRC), MSN, Yahoo, Google Mail, Facebook, and some other Web sites provide chat room. HEI teachers and students can use these universally free chat rooms to give and take quality education.

Figure 5: *A snapshot of Yahoo Chat room (Phelps, 2010, p. 1). Label A is the input box (You can see "Chat" at the beginning of the field); B is the message window; C is the users' list; D is "Send" button.*

Learning Management System (LMS)

LMS (or CMS – Course Management System) is an online education delivery system that improves upon the traditional classroom environment, offering teachers and learners an effective e-learning environment. Most software used in this system has intuitive user interface and robust features that make it easy-to-use and profitable. They can have classrooms, a main office, school announcements board, grade books for recording and computing marks, quizzes and tests facility, whiteboards, a teachers' lounge, messaging systems like chat room and forum, easy-to-use tools for creating lesson plans and courses, and much more. LMS can be hosted on an intranet and used to enhance the physical class experience of students.   On the other hand, it can be hosted on the Internet for 100% distance learning. It can also be used to create a blended environment that combines both distance and physical class learning, or to offer customized courses to either exceptional or below-average students. Moodle® software is an example of LMS. LMS has been recognized by Free Technology Academy (2011, p. 10) as "an essential part of the IT infrastructures for online learning in organizations nowadays."

Moodle® is a LMS an institution or a teacher can use without paying for a licence. It supports learning in a classroom by accepting upload of lecture notes, video files, audio files and other course materials into it. It supports discussion through its facilities for chatting and forums. Students can also ask questions, not only to the lecturer, but also to others, and can take quizzes and examinations online. For each course in Moodle®, students can submit their assignments to their lecturers and share them with others. 'You can view your grades and any feedback from your teacher by clicking on "Grades" from the "Administration" block on your main course page.'(North Carolina State University, 2011, p. 6). Moodle® supports seventy-two languages. Teachers and students can conveniently use Moodle® to add much gain to their teaching and learning. In University of Nigeria (in West Africa), this author's workplace, a Moodle® e-learning platform exists. Ipsos MORI (2008) reported that in many UK universities, some forms of ICT, including LMS, seemed to be a central part of the university experience, impossible to avoid, and on the whole, students welcomed it.

Learning Content Management System (LCMS)

A LCMS is nearly the same as LMS (Table 1). On their difference, McIntosh (2006, p. 4) wrote: "The focus of the LCMS is the management of course content rather than learner activity." LCMS can create, store and deliver personalized content in the form of learning objects (LOs). Free Technology Academy (2011) described a LO as a self-contained unit of instructional material having three components, *viz*: a performance goal, the learning content and evaluation. A LCMS stores LOs in a central learning object repository (LOR).   LOR enables instructional designers to search, to retrieve and to assemble contents into personalized courses. With LCMS, a HEI teacher can:

- gather contents from different sources and easily and quickly create new learning content;
- manage and edit e-Learning content;
- produce dynamic page appearance;
- schedule courses and define learning path;
- administer students effectively;
- make communication possible through e-mail, chatting and forum.

Moodle® is also a good LCMS.

Other LMSs and LCMSs, which can be found on http://www.edutools.com and http://www.trimeritus.com/LMSvendors/CELMS, include the following with free licences:

1. OLAT (developed in University of Zurich, Switzerland) – LCMS

2. LON-CAPA (developed in Michigan State University) – LCMS

3. KEWL (from University of Western Cape) – LCMS

4. COSE (by Cambridge Software Publishing) – LMS

5. Claroline (by Claroline Development Community) – LMS

6. ATutor (developed in University of Toronto, ATRC) – LCMS

7. LRN (called dotLRN, from LRN Consortium;) – LMS

8. Sakai – LMS (a strong player in the industry)

9. Docebo – LCMS

10. Dokeos – LCMS (from Belgium, in 34 languages)

11. Bazaar (incorporates Web Conferencing, Internet Relay Chat, etc.)

12. CourseWork (a LMS first developed and used by Stanford University in 2003 and later made available to others)

13. Pearson OpenClass (a LMS from Pearson Education);

and the following whose licences must be purchased:

14. WebCT (Blackboard Learning System) developed by Murray Goldberg in University of British Columbia, but now owned by Blackboard Incorporated.

15. ANGEL (developed in Indiana University-Purdue University Indianapolis)

16. Global Teach® (developed by ELearning India, Uttar Pradesh)

17. Virtual U (developed in Simon Fraser University)

18. ElearningForce JoomlaLMS (by Elearningforce, Inc.) is a LMS and LCMS adapted from Joomla, an open source Web site content management system.

19. eZ LMS (from University of North Dakota Aerospace Network)

Figure 6, which was made from information in *EduTools* (http://www.edutech.ch/lms/inst-platforms.php), shows the most commonly used LMSs and LCMSs in Switzerland by spring of 2005. WebCT took the first position. OLAT came second, because it was developed in the country and many Swiss universities have adopted it as an indigenous LMS. Moodle® came fourth, and Lotus Learning Space was at the bottom behind Claroline. Some LMSs that had fewer users than Lotus Learning Space had were not shown in the chart.
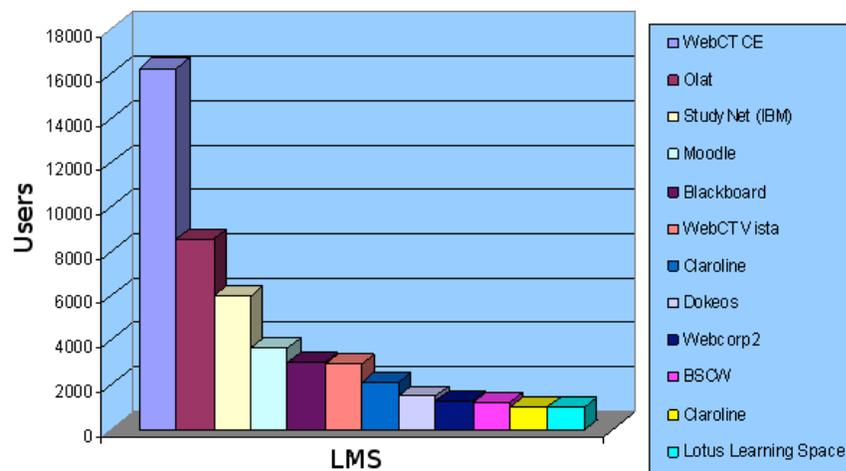
Figure 6: *A bar chart of use of LMSs in higher education institutions in Switzerland*

LMS and LCMS Authoring Tools

LMS and LCMS authoring tools are computer programmes used for creating contents for LMS and LCMS. They are of various types. Some are made specifically for the development of e-learning.   Examples of e-learning-specific authoring tools are:

1. e-Learning XHTML Editor (eXe) which is a Web-based authoring tool formulated to help teachers in any educational institution to design, develop and publish web-based teaching and learning materials.   A teacher does not have to be proficient in HTML (HyperText Markup Language) or XML (eXtensive Markup Language) in order to use eXe. This tool can export content as self-contained Web pages or as content packages that complies with specifications of SCORM (Sharable Content Object Reference Model) 1.2 or IMS (Instructional Management Systems).

2. OpenFuXML developed in the University of Hagen, Germany. It is a highly flexible XML-based tool that produces contents in several formats for various devices and extensively supports creation of mathematical and other scientific contents.

3. CourseLab

4. Hot Potatoes

5. Renpy

6. Wink

There are generic authoring tools. These are also used to build web contents. Generic authoring tools include:

1. HTML editors

2. Dreamweaver (CourseBuilder)

3. Authorware

4. Macromedia Flash.

Some LMSs have an authoring tool inside them, while for others you have to use an external authoring tool. Authoring tools that are designed particularly for e-learning traditionally come with facilities to build course structures, to facilitate questioning and testing and to export courses into LMS or LCMS in formats that conform to Aviation Industry Computer-based-training Committee (AICC) and SCORM standards. Tools to produce audio, video clips, graphics and animations in LMS or LCMS include Dynebolic, Audacity, Songbird, InfraRecorder, Gimp, Inkscape, Blender and Dia. Among browsers for showing content are Mozilla Firefox and Microsoft Internet Explorer.

Comparison of LMS and LCMS

Table 1: What make LMS and LCMS similar and different, as adapted from Greenberg (2010) and http://www.e-learningsite.com/.

Features		LMS	LCMS
1.	Facilities for enrolling in a course and for activity and learners administration online	Present	Present
2.	Online Payment facility	Present	Absent
3.	Imports learners	Yes	Yes
4.	Instructor-led registration of learners	Yes	Yes
5.	Schedules courses	Yes	Yes
6.	Defines curricula	Yes	No
7.	Defines learning path	Yes	Yes
8.	Plans reading materials	Yes	Yes
9.	Supports online courses	Yes	Yes
10.	Supports information on offline events	Yes	Yes
11.	Supports upload of digital resources	Yes	Yes
12.	e-mail facility	Present	Present
13.	Chat room	Present	Present
14.	Discussion Forums	Present	Present
15.	Supports Webinars (i.e. online seminars)	Yes	Yes
16.	Supports learners collaboration	Yes	Yes
17.	Allows assessments	Yes	Yes
18.	Analyzes results	Yes	Yes
19.	Creates and administers tests	Yes	Yes
20.	Tracks results	Yes	Yes
21.	Supports content creation	No	Yes
22.	Develops content navigation controls and user interface	No	Yes
22.	Creates templates	No	Yes
23.	Organizes reusable content	Yes	Yes

Criteria for selecting a LMS/LCMS

It is wise to evaluate several LMSs/LCMSs before deciding which one to deploy. In the evaluation process, it is necessary to have a criteria list that meets the need of the specific e-learning project. Questions that can be asked and honestly answered during evaluation of a LMS/LCMS include the following:

- Which server platforms are supported?

- Which e-learning standards does the LMS support?

- Which collaboration methods are supported?

- Are there functions incorporated for calendar and event notification?

- Does the system have publishing and document sharing functions?

- Can somebody who is not a programmer run the system?

- Does the system allow learner assessments?

- Are the reports meaningful for performance tracking?

- What are the costs of updating and maintaining the system?

- Can the system be scaled up and to what extent?

Social networking Web sites

Social networking Web sites, otherwise known as social media or Web 2.0, have been found to be useful to learning and teaching.   As reported by UNESCO (2008a), Professor Ron Cooke, Chairman of UK Joint Information Systems Committee, said that the use of social networking sites which were driven by students could have real value over study periods when students were away from the campus as well as being able to discuss issues with other students of different universities on similar courses. In UK, Social networking sites are used regularly and, according to a survey (Joint Information Systems Committee 2008) 73%–84% of students informally discuss coursework using these sites. 75% of the students strongly agreed that such sites were useful in enhancing their learning. Minocha (2009) listed several benefits of social networking sites to UK university students and teachers.

A social networking site is a site or platform on the Internet that focuses on the building of social networks among people who share interests and/or activities. In the words of *Wikipedia* (http://en.wikipedia.org), "A social network service essentially consists of a representation of each user (often a profile), his/her social links, and a variety of additional services."   Most social network services are web-based and provide means for users to interact over the Internet, such means as e-mail and IM. Although many social networking sites exist, the most popular of them is Facebook. According to a recent Australian study, Facebook was the fourth most visited Web site (Ng, 2010). On average, users spend 26.5 hours each week online, and a quarter of that time—6.5 hours—is dedicated to Facebook. Another study conducted by Grunwald Associates LLC and the United States (US) National School Boards Association (reported by UNESCO, 2008b) found pupils saying that one of their most common topics of conversation on the social networking scene was education. Almost 60% of the 1,277 primary and secondary school pupils who responded to the survey discussed education topics online, and over 50% of the them talked specifically about schoolwork. Indeed, both US district leaders and parents believed that social networking could play a positive role in students' lives. They recognized opportunities for using it

in education at a time when teachers, as a routine, assigned homework that required use of the Internet to complete.

Facebook can be used to ask questions and receive answers. Hard questions you have not been able to get answers to or topics you want more ideas/information on can be raised. According to http://www.facebook.com, in its note on "How Questions Work", Facebook's "Questions" feature "is designed so that anyone on Facebook can help you find the answer [to a question]." For example, when you ask a question and your friends answer or follow, their friends can see and answer it, too, and so on.

Friends of teachers and students in one HEI include teachers and students in other HEIs. Questioning through Facebook, therefore, results in advanced cross-fertilization and cross-breeding of reliable answers and can create an unfathomable pool of very useful knowledge. You can, however, narrow the respondents to be your class members only, where the question is specifically for them. Entire class or seminar group members can be given assignments in this way, and how far away they are from the giver is not a hindrance. You use "Privacy Settings" on "Account" menu to do this. More conveniently, a teacher or a students' group leader or any student can create a course discussion group within Facebook.

In UK universities, students talk about creating their own group on Facebook and inviting their lecturers to join. A female psychology student remarked thus:

> We have actually done group work through Facebook. We had a presentation to give and we were put in groups of six and we all had Facebook. Most of us lived off campus and it was easy to liaise and share notes through Facebook (Ipsos MORI, 2008, p. 22).

Of course, for any of the above uses of Facebook; teachers, all students and group members in the courses concerned must create accounts on Facebook and invite and accept one another as friends. They also need to have e-mail addresses. Facebook has IM (chatting) facility. The facility here can be used just as explained earlier under instant messaging (IM).

Social bookmarking Web sites

Social bookmarking is a method for Internet users to organize, store, manage and search for bookmarks of resources online. The bookmarks are merely referencing the resources; users do not share the resources themselves. Social bookmarking can be likened to compiling and using bibliographies, which many HEI teachers and students are conversant with. Descriptions may be added to the bookmarks, just like annotations added to a bibliography. These descriptions help users to understand the content of the resource without first needing to download it for themselves. Such descriptions may be free text comments, votes in favor of or against its quality, or tags (keywords) that collectively or collaboratively become *social tagging*, "the process by which many users add related terms (called metadata) in the form of keywords to shared content" (Golder & Huberman, 2006, p. 200).

In a social bookmarking system, users save links to web pages that they want to remember and/or share. These bookmarks are usually public, and can be saved privately or shared only with a group or groups. People allowed to view the bookmarks can usually view them chronologically, by tags, or via a search engine. Rethlefsen (2007) hinted that social bookmarking could be useful as a way to access a consolidated set of bookmarks from various computers, organize large numbers of bookmarks and share bookmarks with contacts. One good and popular social bookmarking site is the one known as "Delicious" (http://www.delicious.com).

Teachers and students can use Delicious to compile, store, share, search for and use lists of books, journals, papers/lectures, videos, speeches, pictures and other media on course-specific topics. HEI teachers can liaise with their institution's libraries so that the libraries can use social bookmarking to provide lists of Web sites relevant to courses. Through these collaborations, the difficulty in a teacher or a student getting sufficient number of materials for writing a lecture or paper will be removed. Also, there will be little difficulty in finding materials to read/use about a topic.

Web-blog

A Web-blog, usually shortened to blog, is "a frequently updated, personal website featuring diary-type commentary and links to articles or other websites" (Kaplan & Haenlein, 2011, p. 1). It is a term used to describe Web sites that maintain an ongoing chronicle of information. Given the personal perspectives presented on blogs, they often generate ongoing discourse and a strong sense of community. Blogs provide diverse, alternative sources of information for HEI subjects. African Leadership in ICT Program (2011, p. 65) observed: "They are a tool that can be used by academics and students for a wide range of educational purposes."

A teacher or a student can create a blog and use it to share and generate immense information and knowledge on various topics. Teachers should try to create blogs and periodically post brief articles on them in a style that motivates students to freely express, in the "Comments" section, their own opinions and findings without fear of being repudiated. Students should be encouraged to search for and read blogs relevant to their courses and comment on them. Comments by other readers, many of whom are experts in the disciplines, will certainly provide more insights and help students to assess their own comments. Creating and using a blog are known as blogging.

Twitter

In *Wikipedia* (http://en.wikipedia.org/), one finds twitter to mean a Web site which offers both social networking and micro-blogging services. A micro-blog is a form of blog that allows typically smaller contents (than a bog) such as short sentences, individual images or video links (Kaplan & Haenlein, 2011). Twitter has been used for a variety of purposes in many different industries and scenarios, with one example reported in the news titled "Could Tunisia Be the Next Twitter Revolution?"   (http://andrewsullivan.theatlantic.com/the_daily_dish/2011/01/could-tunisia-be-the-next-twitter-revolution.html).

Twitter had been used to organize public protests, including the 2011 Egyptian protests, 2010–2011 Tunisian protests, 2009–2010 Iranian election protests, and 2009 Moldova civil unrest. It has also been used in emergencies and political campaigning. It can be successfully used to pressurize governments to take necessary actions towards holistic integration of ICT into higher education for effective teaching and learning. Twitter can be used in higher education, for collaboration and for sending urgent academic messages from teachers to students and from students to students. Below is a testimonial by a teacher who had used twitter.

> In my experience, and in the short time that I have used it, Twitter has grown quickly to play a major part in the way that I interact with fellow colleagues and professionals from around the world. In my classroom and with the children I teach it has been an exciting tool to utilise and support learning…In my opinion there is great potential in the use of Twitter to support teaching and learning. It is

> unique in this role because it is all about conversation on a larger scale (Barrett, 2008, p. 1).

Short text messages displayed on a twitter user's profile page are called tweets. If one uses twitter without changing its settings, tweets will be seen by everybody who visits, but senders of tweets can change settings to keep them visible only to other twitter users that subscribe to their tweets; these subscribers are called followers (Stone, 2009). When a teacher sends tweets and students follow along with other followers, there is a pool of ideas that enhance learning. When a student sends tweets, the impact is similar. Additionally, the use of this technology is a skill in itself, which many students will find very useful after graduation. Twitter is used free-of-charge through the Twitter Web site (http://www.twitter.com/) on online PCs or on mobile phones that connect to the Internet. Using it on mobile phone attracts fee charged by the telecommunication service provider.

Wiki

Wiki is a Web site that allows its users to create and collaboratively edit web pages using a web browser. The major web browsers are Microsoft Internet Explorer®, Mozilla Firefox®, Apple Safari®, Google Chrome® and Opera®. The pages are interlinked; that is, one can move from one page to another and to another. Black *et al* (2007, p. 245) described wiki as "essentially a database for creating, browsing, and searching through information."

A wiki invites all users to edit any page or to create new pages within the wiki Web site. It strongly welcomes scholarly citations, which makes it an authoritative source of knowledge.   A wiki can be said to be a flexible (always updated) online encyclopaedia. They are created using wiki software. "Wikis are already extensively used in many higher education programmes for educational purposes, and are one of the authoring tools being used to generate 'open' content" (Global e-Schools and Communities Initiative, 2011, p. 66). A very popular wiki is *Wikipedia* (http://en.wikipedia.org/).   Academics can collaboratively create wikis around the courses they teach.

Mobile phone

A research conducted in 2010, as reported by UNESCO (2010a) in Bangkok, discovered that 62% of first-year students of Lingnan University in Hong Kong had mobile phones that could access the internet, and about 70% of them took photos with their phones at least once a week. "Students carry mobile phones everywhere they go and use them all the time," observed Kennedy (2010, p.2) who was working with language instructors in the university to develop a blended learning environment that incorporates the use of iPhones and iPad. Njoku (2013) similarly found that 100% of 2,019 undergraduate and postgraduate students surveyed in the University of Nigeria owned mobile phones that could connect to the Internet, and 64% of the phones could download and upload e-mail attachments. These findings in Lingnan University and the University of Nigeria are likely to represent the situation in many HEIs globally.

Prof. Kennedy submitted that mobile phone could make learning more individualized. He added that in their new courses, students would be asked to use the technology in mobile phones as an integral part of their language learning – taking photos, creating voice notes, recording interviews and presentations, and reflecting on the activities and what they have learned. The students would then present what they had done. "Such activities," he said, "will enable each student to contextualise their learning experiences, providing a unique highly personalised experience. Using these strategies, you get much better student engagement compared to what can happen

in a conventional classroom." Also, Tom Joseph, Director of 'Asia Pacific Education Programmes', Autodesk, rightly pointed out that besides enhancing learning, mobile phones had become the best channel to reach students (Ng, 2010). "In parts of Africa where traditional classroom education is inaccessible," wrote UNESCO (2010b, p. 1), "people have taken education into their own hands by utilizing mobile phones and laptops. This innovative way of acquiring information, known as eLearning, provides great potential to expand education."

HEI teachers should agree to Prof. Kennedy's suggestion that they should leverage the technologies and applications in mobile phones and take advantage of the skills students already have by building activities and resources around the phones which the students carry for twenty-four hours of the day and for seven days of the week. A peculiar feature of some HEI programs is that their students are in diverse departments scattered on campus. This demands timely communication towards getting all students to participate in all program activities, even in extreme emergency. Mobile phones meet this demand.

Digital camera

Digital cameras are cameras that shoot, store and export still or motion pictures to PC or the Internet in electronic form. They can be standalone or come as a feature of a mobile device, such as mobile phones and iPads. Many standalone cameras are pocket-sized, which makes them easy to carry and use anytime and anywhere. They can be used to take still photographs and videos that aid understanding and enhance learning. Students can be assigned to take such photographs and videos as relate to their course topics and write notes about them. This places students as collaborators with their teachers and, as Prof. Kennedy said, enables each student to contextualise their learning experiences.

LESSONS AND RECOMMENDATIONS

1. There is a difference between LMS and LCMS, though they appear to be the same. One, therefore, has to give thought to whether it is LMS or LCMS that will actually meet one's needs.

2. The Swiss experience shows that LMS and LCMS are being recognized as needed tools in higher education, and an institution adopted either LMS or LCMS and a particular brand of it according to the institution's peculiar requirements.

3. Students and teachers in many universities in the UK have proved that Facebook, online communities, instant messaging, LMS/LCMS and any other ICTs can be made to be indispensable in academic work at higher education level, going by the report from Joint Information Systems Committee (2008).

4. When students set up their own mechanisms for collaborative learning, they are more engaged than when tutors set up the mechanisms for them.

5. In Australia, a targeted ICT policy is in place to assist teachers to harness the new technology.

6. Stop, look closely and think about LMS/LCMS to choose. Nowadays, a lot of applications are labelled LCMS. It is also necessary not to forget costs for updates, training, support and maintenance when one is calculating the cost of a LMS to adopt.

7. Adopt free and open source software (FOSS). Why? FOSS provides:

(a) <u>Low total cost of ownership (TCO)</u>. You are likely to pay only for training and maintenance by a consultant. The costs of buying a LMS, for example, are generally high. Open source-based LMS offers an interesting alternative to a commercial one.

(b) <u>High flexibility and customizability</u>. You can modify the software to your needs, because you are permitted to change the software by adding or removing features.

(c) <u>Wide user communities</u>. You can participate in the software's user forums, newsgroups, and discussion lists and gain from the experiences of others.

(d) <u>Multi-platform capabilities</u>. Many open source applications run on Windows, Linux and Mac operating systems and works well on older hardware. So you are not tied to using a particular application because you are running an operating system that accepts only that application, or you are not forced to change to another operating system or hardware, as is the case with most commercial software.

8. HEI teachers should hold appropriate belief about teaching and learning and be convinced about ICTs use. They should believe that learning must emphasize collaboration. Only when lecturers themselves are convinced about ICTs use, that they can make sacrifices to get things done in the present phase of institutional infrastructural poverty and personal economic distress. The sacrifices teachers can make include:

(a) personal ownership but professional deployment of the ICT hardware and software they can afford

(b) spending time, and however-small money, to plan, design, use, evaluate, adjust and reuse ICTs and to learn from people who have used or know how to use the tools

9. Like it happened in Latin America and Caribbean schools, as reported by Alvariño & Severín (2009), efforts should be made to train teachers and students of HEIs specifically in making educational use of ICTs, paying more attention to certifying teachers' ICT skills, because, as Sunkel & Trucco (2011) reported, basic ICT training had been found inadequate for effective application of ICT by teachers. Regarding training students, more benefits will come from delivering training which emphasizes attitudes towards information and acquiring information handling and presentation skills, rather than the way technology itself is used.

10. ICTs acquisition projects should be planned and executed. Probable projects include sensitizing teachers and students on education uses of ICTs; setting up e-learning portal; establishing computer laboratories; giving subsidies to lecturers and students for the purchase of personal computers; putting computers, multimedia projectors and interactive whiteboards in classrooms.

11. Some technologies will be easier to introduce into the teaching environment than others. Students ought to be encouraged to use those forms of ICT that they currently use in a social situation—such as social networking sites—for their academic work. It is a good experiment to introduce newer forms—such as wikis, which are perceived to be little used in education (although in reality they tend to be in use to a certain extent). Deploying newer and earlier forms of ICTs will require different approaches from teachers and course designers. HEIs will need to support their staff to deliver this. HEIs need to be aware of the way students already use social networking sites, so as to help students to use the networks they already have in place. They also have to know that some students at present do not use social networking sites at all.

12. ICTs should be integrated into the entire higher education through a tripartite investment strategy. Researches (Light & Martin, 2007; Organization for Economic Co-operation and Development, 2009) indicate that ICT-enabled learning is most effective in a 1:1 e-learning environment where:

a) ICT tools and connectivity are deeply integrated into classrooms and used across the curriculum;

b) Teachers are skilled and comfortable using digital resources to enhance teaching and learning.

The same researches also have evidences that to achieve integration and skill, governments and university authorities must invest in professional development and curriculum resources as well as in PCs and networks. These three investment areas reinforce themselves, according to Intel World Ahead (2009). The author of this paper additionally believes strongly that private-sector companies (including ICTs makers) and international development organizations have a part in this partnership, especially in developing countries. HEIs should reach out to this third party to invest as their corporate responsibility and aid provision, respectively. ICT makers' contribution must move away from giving PCs to university staff and students at prices above market rates for payment in installments, towards offering them at production cost, if donation is not feasible.

13. We may not delay educational use of ICTs until everybody accepts it. When reluctant teachers, students and HEIs, even when they are majority, see others benefiting from the technology, they will want to join. Thus appetite will be raised.

CONCLUSION

Effort has been made here to sensitize readers on the need for HEIs to produce graduates with skills our twenty-first century demands and the role of ICTs in this task. What ICTs actually are, the benefits of integrating ICTs into higher education, what thirteen computer-based ICTs are and how they have been and can be used in higher education, have also been covered. The necessity to deploy new ICTs in HEIs should by now no longer be in doubt, if anybody had doubt earlier. HEIs in developed countries have demonstrated this. In UK, PowerPoint presentations of lectures, WebCT (a LMS) for filing of lecture notes, e-mailing tutors (which is usually available all the time and for some), the submission of coursework and assignments online and discussions of course topics through Facebook are all seen as normal. In Switzerland, the use of LMS/LMCS in higher education institutions is common. Lessons abound for us from these and other spatial experiences and have been outlined alongside valuable recommendations to make things happen in HEIs worldwide. For example, the use of social networking sites, which are driven by students, can have real value over study periods when students are away from the campus as well as being able to discuss issues with other students in different institutions on similar courses.

The next step is to vigorously begin action. Action can, however, not be fruitfully begun if we neglect one assertion UNESCO made:

> The right conditions [both on individual, institutional and government levels] need to be in place…before the educational benefits of ICT can be fully harnessed (Jonassen, 2002, p. 10).

The findings of the research commissioned by Joint Information Systems Committee (JISC) (2008) show that a great opportunity exists for HEIs to enhance their existing ICT provision and for students and lecturers to increase their knowledge and understanding of how these technology channels can help them in their academic work.

The future

Personal computers are, sadly, still out of the reach of many students in most households, especially in developing nations. The ubiquity, acceptability and accessibility of mobile phones today give them the quality to be the central technology for tomorrow's higher education. Software developers and phone makers should partner to ensure that the world has its most affordable phones able to open virtual campuses and upload and download files from them. A time is expected when digital books, hybrid mobile computers and touch-screen writing tablets will be in the hands of every undergraduate and lecturer alongside, if not to replace, the text book, chalk and chalkboard. Since computer applications are increasingly moving away from being those of standalone desktop and laptop computers to those of cloud servers, cloud computing will make information cheaper and more available if the ubiquitous connectivity that many movements are working towards is provided, and this has great positive implications for use of ICTs in HEIs.

This author agrees completely with the science and technology education specialist in the World Bank, Hawkins (2010**),** who observed that the ordered physical classroom of desks might quickly become a relic of the industrial age as schools around the world are re-thinking the most appropriate learning environments to foster collaborative, cross-disciplinary, student-centred learning. Also, we should not be heading into the future with the idea of the traditional one-hour lecture period. Lecturers should begin to think of being virtual teachers or mentors as opportunities for peer-to-peer and self-paced, deeper learning increase. Investigations in order to expatiate on or disprove these future possibilities are needed.

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