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Information And Communication Technology (Ict): Catalyst For Enhancing The Intellectual Capacities of Educationists And Closing Observed Skill Gaps of Graduates In Higher Education Institutions In Nigeria.

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Abstract: **-** This paper highlights the challenges facing the adoption of e-learning and utilization of ICT infrastructure in Nigerian tertiary education. It also looks at the effect of e-learning in tertiary education and the support offered by other ICT infrastructures to the activities of teaching, learning and research.

I. INTRODUCTION

Information and communication technology is fast expanding the highway of knowledge and applications and also provides new ways of exchanging information and transacting business. The world is rapidly moving towards knowledge based economic structures and information societies, which comprises network of individuals, firms and countries, linked electronically in an interdependent and interactive relationship.

Advances in information and communication technology are changing the global economy. Knowledge is becoming increasingly important for production. It is also changing the nature of markets and competition. With the dawn of an age of networked intelligence, the new information technologies are changing the ways we work, learn and communicate with each other. The radical technological changes in information technology and telecommunications have contributed towards a more information and interaction intensive activities for human-computer interaction. This trend which is expected to continue causes a whole new range of social, economic and technological considerations and challenges, regarding the structure and content of societal activities in this information age.

The promises of e-learning for transforming tertiary education and therebyadvancing the knowledge economy have rested on three arguments. E-learning could expand and widen access to tertiary education and training: improve the quality of education and reduce its cost. The paper evaluates these three promises with the sparse existing data and evidence and concludes that the reality has not been to the promises so far in terms of pedagogic innovations, while it has already probably significantly improved the overall learning (and teaching) experience. Reflecting on the ways that would help develop e-learning further, it then identifies a few challenges and highlights open educational resource initiatives as an example of way forward. The first section of the paper recalls some of the promises of e-learning; the second compares these promises and the real achievements to date and suggests that e-learning could be at an early state of its innovation cycle; the third section highlights the challenges for a further and more radically innovative development of e-learning.

Information and Communication Technology (ICT) has become a key tool in acquiring, processing and disseminating knowledge. It has become an imperative tool for measuring development of a nation in the 21st century. The revolutionary impact of ICT on all sphere of the society has not spared the educational sector. Education is a prerequisite of today's knowledge-based economy. The production and use of new knowledge required a more educated population. ICT is playing a major role in the acquisition and diffusion of knowledge which are fundamental aspects of the education process. It is offering increasing possibilities of codification of knowledge about teaching and for innovation in teaching activities through being able to deliver learning

cognitive activities anywhere at any time (Larsen and Vincent Lancrin, 2005). The availability of the Internet has given rise to an electronic approach to the educational system called e-learning.

Tertiary educational institutions have always being at the forefront of new scientific discoveries and innovations brought about by the activities of teaching, learning and research. E-learning is becoming increasingly prominent in tertiary education. E-learning being delivered on the platform of ICT infrastructure promise to widen access to education and improve quality of education at reduced cost. Apart from electronic learning, ICT infrastructures are being widely use to support teaching, learning and research activities in tertiary education. Such infrastructures include personal computers, specialized software, handheld devices, interactive whiteboard, intranet and visual library.

Information Technology (IT) is radically altering the balance of power between institutions, government, and people by broadly disseminating important information. Power bases dependent on information virtually flows around the globe without restriction. Information technology has altered the way many people do their jobs, and has changed the nature of work in industrialized nations. The practice of management has been greatly affected and aspiring managers must be fluent in new management trends and techniques in order to succeed.

II. CONCEPTUAL FRAMEWORK

Electronic Learning (E-learning) is an electronic delivery and administration of learning opportunities and support via computer network and web-based technology (Akinyemi, et al, 2007). It covers a wide range of systems, from students using e-mail to accessing course work on-line. E-learning can be of different types: Web-supplemented, Web-dependent and mixed mode (OECD, 2005. Application and processes of e-learning include web-bases learning, computer-based learning, virtual classroom, video-conferencing and digital collaboration where contents are delivered via the internet, intranet/extranet, audio/or video tape, satellite TV, CD-Rom. E-learning creates a self-centered approach to learning by relaxing time and space, it enrich learning content and enhance wider access to information resources. When the potential of e-learning is fully harnessed, it could advance knowledge by expanding and widening access, improving the quality of education and reducing cost. When the needs are huge, fully online learning can be crucial and possibly the only realistic means of increase and widen access to tertiary education. Some developing countries like Nigeria have many young people craving for tertiary education and too small an academic workforce to meet the huge demand; training new teachers would take much time and cost, e-learning might be a means for many potential students and learners to study (World Bank, 2003).

Institutions worldwide are adopting Learning Management System (LSM) software developed for administration and teaching in tertiary education. The software enables the treatment of enrolment data electronically, offer electronic access to course materials and carryout assessments as well as offering online interaction between faculty and students (OECD, 2005). Apart from e-learning, other ICT infrastructures are also aiding effective teaching and learning in the traditional classroom setup. Availability of personal computers and its accessories have enhanced the output of teachers and students. Computer Aided Instruction (CAI) software which are tutorial software are widely available to compliment classroom work. These software sometimes have limited capabilities, but very useful in presentation of graphics that aid learning. Handheld devices like mobile not takers are available to aid learning in term of mobility. Interactive White Board is another infrastructure that allows the projection of images generated by computer onto a touch sensitive screen that is of the size of the traditional white board. The Interactive White Board provides instant access to materials form variety of sources and possibility of using pre-prepared lectures that move without apparent from visual to verbal and vise-visa. Intranet is a web-based collaboration among members of the same group. In education system, Intranet aids collaboration among staff and students of the same department, faculty or institution (Obaniyi and Soroyewun, 2007). It serves as a repository of academic materials and knowledge available for use by members of the same academic group. In Intranet, collaboration is faster and cost effective with the removal of cost associated with Internet connectivity. Visual library is another area where ICT is aiding teaching, learning and research. Visual library sites provides access to a large volume of library resources (articles, journals, books, etc) and online reference services via the Internet.

III. LITERATURE REVIEW

Despite the potentials of ICT to enhance the activities of teaching, learning and research, report showed that the application of ICT in Nigerian tertiary institutions is less than five percent (Guardian, 2007). Knowledge, innovation and Information and Communication Technologies (ICT) have had strong repercussions on many economic sectors, e.g the informatics and communication, finance, and transportation sectors (Foray, 2004; Boyer 2002). What about education? The knowledge-based economy sets a new scene for education and new challenges and promises for the education sector. Firstly, education is a prerequisite of the knowledge-based economy: the production and use of new knowledge both require a more (lifelong) educated population and workforce. Secondly, ICTs are a very powerful tool for diffusing knowledge and information, a

fundamental aspect of the education process: in that sense, they can play a pedagogic role that could in principle complement (or even compete with) the traditional practices of the education sector. These are the two challenges for the education sector continue to expand with the help (or under the pressure) of new forms of learning. Thirdly, ICTs sometimes induce innovations in the ways of doing things for example, navigation does not involve the same cognitive processes since the Global Positioning System (GPS) was invented (e.g Hutchins, 1995) scientific research in many fields has also been revolutionized by the new possibilities offered by ICTs, from digitization of information to new recording, simulation and data processing possibilities (Atkins and al. 2003). Could ICTs similarly revolutionize education deals directly with the codification and transmission of knowledge and information-two activities which power has been decupled by the ICT revolution?

The education sector has so far been characterized by rather slow progress in terms of innovation development which impact on teaching activities. Education research and development does not play a strong role as a factor of enabling the direct production of systematic knowledge which translates into ''programmes that works'' in the classroom or lecture hall (OECD 2003). As a matter of fact, education is not a field that lends itself easily to experimentation, partly because experimental approaches in education are often impossible to describe in precisely enough to be sure that they are really being replicated (Nelson, 2000). There is little codified knowledge in the realm of education and only weak developed mechanisms whereby communities of faculty collectively can capture and benefit from the discoveries made by their colleagues. Moreover, learning typically depends on other learning inputs than those received in the class or formal education process the success of learning depends on many social and family aspects that are actually beyond the control of educators.

Information and communication technologies potentially offer increased possibilities for codification of knowledge about teaching and for innovation in teaching activities through being able to deliver learning and cognitive activities anywhere at any time. learning at a distance can furthermore be more learner-centered, self-paced, and problem solving-based than face-to-face teaching. It is also true, however, that many learning activities cannot be coordinated by virtual means only. The emulation and spontaneity generated by physical presence and social groupings often remain crucial. Likewise, face-to-face exchanges are important when they enable other forms of sensory perception to be stimulated apart from these used within the framework of electronic interaction, the influence of distance.

Education is a prerequisite of todays knowledge-based economy. The production and use of new knowledge required a more educated knowledge which are fundamental aspects of the education process. It is offering increasing possibilities of codification of knowledge about teaching and for innovation in teaching activities through being able to deliver learning cognitive activities anywhere at any time (Larsen and Vincent-Lancrin, 2005). The availability of the Internet has given rise to an electronic approach to the educational system called e-learning.

At the heart of this new epoch of economic and technological development is Information Technology (IT). The world as we know it is changing dramatically in terms of the way we see, work, socialize, learn, shop and conduct business due to the widespread and increasing use of IT. The technology will engender what Toffler (1990) refers to as a 'power shift' giving rise to an entirely new 'system for wealth creation' and the distribution of power. It is for this reason that Frenzel (1996) writes that:

Writers like Toffer (1990), Glastonbury and LaMendola (1992), Frenzel (1996), Naisbitt (1994), and Gates (1995), are also of the opinion that, in the next millennium. IT would determine the countries that would be leaders and those that would be laggards, those that would be rich and those that would be poor, and those that would be powerful as against those that would be weak. Countries that cannot trade using IT would be relegated to the periphery of world commerce and international relations. They would thus become the outcasts of the New World System. Equally, companies that do not have an appropriate IT infrastructure and the promotion of IT use in their operations, management and communication processes would also suffer an existential debacle in the business arena of the new era.

Information Technology comprises computing and telecommunications technologies. It is the merging of the two technologies, especially their organizational and management aspects, that help in fashioning IT for organizational use (Woherem, 1991 and 1993; Frenzel, 1996). In the 1970s and 1980s, the focus is shifting quickly to telecommunications. Now, when commentators and the information superhighway, of which telecommunications is a primary enabling technology.In recent times, researchers working with firm-level data have found significant contributions from IT toward productivity (Lichtenberg 1995: Brynjolfson 1993: Bresnahan 1999: Brynjolfson and Hitt 1995; 1996; 1998; Barua et al, 1991 and Harris and Katz, 1991). Baua et al (1991), Steiner and Teixeira (1991) Strassmam (1995), Hitt and Brynjolfson (1996) and Renkema (2000) all argued that although IT investment have increased productivity, it has not resulted in normal business profitability rather there were some evidences of small or negative impact on profitability.

Information Communication and Technology (ICT) is the modern handling of information by electronic means which involves access to, storage of, processing, transportation or transfer and delivery (Bell 2008) it is acquisition, processing, storage and dissemination of vocal, pictorial, textual and numerical information by a micro-electronic based combination of computing and telecommunication (Lucey 2008).

The focus of ICT is on telecommunication and computerization (Lucey 2005) it implies the convergence of computing and communication (Telecommunication) technologies and its uses or application for global internet, Extranet World Wide Web (WWW), Visual reality cyberspace-the New Digital Mentality and culture (Uwaje, 2007). Information Communication and Technology comprises the physical devices and software that link (connect) various computer hardware components and transfer data from one physical location to another (Laudon 2008). Connectivity has facilitated the use of electronic delivery financial transaction.

IV. THE CONCEPT OF UNEMPLOYMENT

Every economy is characterized by both active and inactive populations. The economically active ones arereferred to as the population willing and able to work, andinclude those actively engaged in the production of goodsand services and those who are unemployed. TheInternational Labour Organization (ILO) defines theunemployed as numbers of the economically activepopulation who are without work but available for andseeking work, including people who have lost their jobs and those who have voluntarily left work (World Bank,1998).

According to Fajana (2000), unemployment refersto a situation where people who are willing and capableof working are unable to find suitable paid employment. It is one of the macro-economic problems which everyresponsible government is expected to monitor andregulate. The higher the unemployment rate in aneconomy the higher would be the poverty level andassociated welfare challenges. Fajana (2000), Alao(2005), and Wikipedia (2010) identify the following types

of unemployment.Structural unemployment occurs when there is achange in the structure of an industry or the economicactivities of the country. This may be because people'stastes have changed or it may be because technology has outmoded and the product or service is no longer indemand. It is mostly to be found in the developingcountries of Asia and Africa. This type of unemployment

is due to the deficiency of capital resources in relation totheir demand. In other words, structural unemploymentresults from a mismatch between the demand for labour,and the ability of the workers.

Frictional Unemployment is caused by industrialfriction in which jobs may exist, yet the workers may beunable to fill them either because they do not possess the necessary skill, or because they are not aware of theexistence of such jobs. The employable may remainunemployed on account of shortage of raw materials, or

mechanical defects in the working of plants. Therefore,the better the economy is doing, the lower this type ofunemployment is likely to occur. Seasonal Unemployment is due to seasonalvariations in the activities of particular industries causedby climatic changes, changes in fashions or by the inherent nature of such industries. In the tropical region, pure water companies are less active in rainy season becausedemand for pure water is low. Seasonal oriented industries arebound to give rise to seasonal unemployment

Cyclical Unemployment also known asKeynesian unemployment or the demand deficientunemployment is due to the operation of the businesscycle. This arises at a time when the aggregate effectivecommunity demand becomes deficient in relation to theproductive capacity of the country. In other words, when

the aggregate demand falls below the full employmentlevel, it is not sufficient to purchase the full employmentlevel of output. Cyclical or Keynesian unemployment ischaracterized by an economy wide shortage of jobs and last as long as the cyclical depression lasts. Residual Unemployment is caused by personalfactors such as old age, physical or mental disability,poor work attitudes and inadequate training.

Technological Unemployment is caused bychanges in the techniques of production. Technologicalchanges are taking place constantly, leading to the increased mechanization of the production process. Thisnaturally results in the displacement of labourand finally causing unemployment (Oladele, et al, 2011).

Whatever the type and cause of unemployment,entrepreneurship is its answer.

V. CAUSES OF YOUTH UNEMPLOYMENT IN NIGERIA

In the study of unemployment in Nigeria, Adebayo (1999), Alanana (2003), Echebiri (2005), Ayinde (2008), Morphy (2008 and Awogbenle and Iwuamadi (2010) have identified the main causes of youth unemployment in Nigeria. The first is the rapidly growing urban labour force arising from rural urban migration. Rural-urban migration is usually explained in terms of push-pull factors. The push factors include the pressure resulting from man-land ratio in the rural areas and the existence of serious underemployment arising from the seasonal cycle of climate. The factors are further exacerbated in Nigeria by the lack of infrastructural facilities, which makes the rural life unattractive. Youths move to urban areas with the probability of securing lucrative employment in the industries. In addition to this, there is the concentration of social amenities in the urban centers. This meant that the rural areas are neglected in the allocation of social and economic opportunities. The second is the rapid population growth. Going by the 2006 census in Nigeria, the nation's population was put at 140,431,790 and projections for the future indicate that the population could be over 180 million by the year 2020, given the annual growth rate of 3.2 percent (National Population Commission and ICF Macro, 2009).

With this population, Nigeria is the most populous nation in Africa. It is argued that the high population growth rate has resulted in the rapid growth of the labour force, which is far outstripping the supply of jobs. The accelerated growth of population on Nigeria's unemployment problem is multifaceted. It affects the supply side through a high and rapid increase in the labour force relative to the absorptive capacity of the economy.

The third is the outdated school curricula and lack of employable skills. Some scholars and commentators have argued that as far as the formal sector is concerned, the average Nigeria graduate is not employable and, therefore, does not possess the skills needed by the employers of labor for a formal employment. Afterall employers do not need people to pay or spend their money on but people that will help their organization grow and make more profit as the primary goal of every enterprise is to make profit. Often, this is attributed to the Nigeria's education system, with its liberal bias. The course contents of most tertiary education in Nigeria lack entrepreneurial contents that would have enabled graduates to become job creators rather than job seekers.

The fourth is the rapid expansion of the educational system which directly leads to increase in the supply of educated manpower above the corresponding demand for them. This contributes to the problem of the youth unemployment in Nigeria. For instance, according to Manning and Junankar (1998), the total number of graduates turned out by the higher institutions in Nigeria, which were 73,339 in 1986/1987 which rose to 131,016 in 1996/1997. Presently, with over 97 universities in Nigeria (both federal, state, and private) and the increasing demand for higher education there has been the problem of suitable employment for the varieties of graduates who are turned out by these higher institutions every year. Ordinarily, this should not have been a problem, but the reality is that the Nigerian economy is too weak to absorb this large number of graduates (Utomi, 2011). Further, there is no vibrant manufacturing sector which has the capacity to absorb unemployed youths in Nigeria, as there are over 800 collapsed industries in Nigeria and over 37 factories have closed shops in 2009. About half of the remaining operating firms have been classified as "ailing," a situation that poses a great threat to the survival of manufacturing in the country in the next few years. According to a survey carried out as part of its membership operational audit in January 2010 by the Manufacturers Association of Nigeria (MAN), the 834 figure represents the cumulative aggregate of firms that have shut down their operations in 2009 across the country. The MAN survey usually covers five manufacturing enclaves, into which the country is divided, in terms of manufacturing activities. These include the Lagos, northern, southeast, south-south and southwest mareas. The report of the survey showed that in 2009, a total number of 176 firms became terminally sick and collapsed in the northern area, comprising the Kano and Kaduna states manufacturing axis. In the southeast area, which is comprised of Anambra, Enugu, Imo, and Abia states, a total number of 178 companies closed shop during the period. While in the south-south area, which consisted of Rivers, Cross River, and AkwaIbom states, 46 companies shut down operations before December 2009. According to the survey, the southwest area, which is comprised of Oyo, Ogun, Osun, Ondo, Ekiti, Kogi, and Kwarastates, lost 225 companies during the year. It said that the Lagos area, covering Ikeja, Apapa, Ikorodu, and other industrial divisions in the state, followed closely with 214 manufacturing firms closing shop before the end of 2009 (Okafor, 2008; Oparah, Maiyak, 2010; 2011; Usman, 2011). In a nutshell, Nigeria is a country with numerous business and investment potentials due to the abundant, vibrant and dynamic human and natural resources it possesses. As good as the foregoing sounds, Nigeria continues to experience its share of social, economic and political upheavals which have often stunted its growth and development into the regional economic power that it strives to attain. Nigeria has a relative high rate of violent crimes (Onwubik, 2009). The fact is that the Nigeria is becoming hostile to investment due especially to lack of Nkechi et al. 091 steady and sustainable power supply/ energy crisis in spite of the various attempts are reviving this sector lading to firms depending on generators for their operation whose cost of buying, fueling and maintenance are high, thereby increasing the cost of operation in Nigeria. Besides, high and multiple levies and taxations being paid by these companies, energy crises have combined to make the cost of doing business in Nigeria to be very exorbitant. When the industries and factories closed shops or relocated to a friendlier economic environment, workers were laid off and prospects of recruiting new ones were dashed. All these exacerbated the crisis of youth unemployment in the labor market (Adeloye, 2010; Onifade, 2011). Corruption, which has permeated the entire social structure of Nigeria, has robbed the country of developing a vibrant economic base. Funds meant for development projects have been misappropriated, diverted, or embezzled and stashed away in foreign banks, while some incompetent and corrupt bureaucrats and administrators in the public enterprises and parastatals have liquidated these organizations (Okafor, 2010). The point being made here is that the collaboration of the political elites, local and foreign contractors in the inflation of contract fees have robbed Nigeria of the chances of using more than $500 billion estimated revenue from the oil sale in the last 50 years to develop a vibrant economy that would have created jobs for the youths in various sectors of the economy. The ruling (political) class failed because they replaced the vision, policy, and strategy, which should be the thrust of every leadership with transactions (contract award and other mundane moneyrelated activities), as each successive government took turns to prey on the nation's wealth, by using public power, resources, good will, utilities, instrument of abuse, and personal gains (Okafor, 2005). Thus crippling the economy and engendering and exacerbating unemployment which creates abject poverty, hunger and frustration; killing the zeal and means for entrepreneurship development in the Nigerian

VI.   EDUCATIONAL SUCCESS IMPERATIVES OF E-LEARNING

The emergence of ICTs represents high promises for the tertiary education sector (and, more broadly, the post-secondary education sector if one takes into account their impact on non-formal education). ICTs could indeed play a role on three fundamental aspects of education policy access, quality and cost. ICTs could possibly advance knowledge by expanding and widening access to education, by improving the quality of education and reducing its cost. All this would build more capacity for the advancement of knowledge economies. This section summarises the main arguments backing the promises.

E-learning is a promising tool for *expanding and widening access* to tertiary education. Because they relax space and time constraints, ICTs can allow new people to participate in tertiary education by increasing the flexibility of participation compared to the traditional face-to-face model: working students and adults, people living in remote areas (e.g. rural), non-mobile students and even foreign students could now more easily participate in education. Thanks to ICT, learners can indeed study where and/or when they have time to do so- rather than where and/or when classes are planned. While traditional correspondence-based distance learning has long played this role, ICT have enhanced traditional distance education enabled the rise of a continuum of practices between fully campus-based education and fully distance education.

More specifically, fully online learning can allow large numbers of students to access education. The constraints of the face-to-face learning experience, that is, the size of the rooms and buildings and the students/teacher ratio, represents another form of relaxation of space constraints. ICTs indeed allow a very cheap cost of reproduction and communication of a lesson, via different means like the digital recording and its (ulterior or simultaneous) diffusion on TV, radio or the internet. The learning process or content can also be codified, and at least some parts can be standardized in learning objects, for example a multimedia software, that can in principle be used by millions of learners, either in a synchronous or asynchronous way. Although both forms might induce some loss in terms of teachers-learners interactivity compared to face to face teaching, they can reach a scale of participation that would be unfeasible via face-to-face learning.

When the needs are huge, fully online learning can be crucial and possibly the only realistic means to increase and when rapidly access to tertiary education. Some developing countries have huge cohorts of young people and too small an academic workforce to meet their large unmet demand: given training new teacher would take too much time, notwithstanding resources, e-learning might represent for many potential students and learners the only chance to study (rather than an alternative to full face-to-face learning) (World Bank, 2003).

E-learningcan also be seen as a promising way for improving the *quality* of tertiary education and the *effectiveness* of learning. These promises can be derived from different characteristics of ICTs: the increased flexibility of the learning experience it can give to students the enhanced access to information resources for more students; the potential drives innovative and effective ways of learning and/or teaching, including learning tools, easier use of multimedia or simulation tools: finally, the possibility to diffuse these innovations at very low marginal cost among the teachers and learners.

Distance E-learning has not only the virtue to be inclusive for students that cannot participate in tertiary education because of time, space or capacity constraints, as it was shown above. It can also in principle offer to students more personalized to some extent in higher education through the modularity of paths, ICTs allow institutions to give students to choose a wider variety of learning paths than in non-ICT supplemented institutions-not the least because of the administrative burden this would represent in large institutions. This means that students can experiment learning path that best suit them. Moreover, e-learning can potentially allow students to take courses from several institutions e.g. some campus-based and others fully online. This possibly flexibility of individual curricula can be seen as an improvement of the overall student experience, regardless of pedagogical changes. In one word, e-learning could render education more learner-centred compared to the traditional model.

A prestigious university generally has a sizeable library gathering tons of codified information and knowledge. One of the most visible impact of ICTs is to give easier and almost instant access to data and information in a digital form that allows manipulations that are sometimes not otherwise possible. The digitization of information, from academic journals through to books and class notes, can change (and has changed) the life of students by giving them easy access to educational resources, information and knowledge, as well as new data processing possibilities.

But e-learning could also lead to the enhancement of quality in tertiary education by leading to innovative pedagogic methods, new ways of learning and interacting, by the easy sharing of these new practices among learners and teachers communities, as well as by more transparency and easier comparisons and cross-fertilization of teaching materials and methods.

Finally, e-learning can be seen as a promising way to reduce the cost of tertiary education, which is critical for expanding and widening its access worldwide. It might thus represent new opportunities for students having difficulties with this traditional format. Although ICT investments are expensive, they can then generally

be used at near-zero marginal cost. Where would this cost-efficiency come from: the replacement of expensive brick and mortar campuses by virtual campuses: the digitization of library materials that would save the cost of keeping huge paper collections: the improvement of efficiency of institutional management the automation of some of the traditional on-campus activities, including some teaching.

VII.   SUCCESS IMPERATIVES OF E-LEARNING

The real impact of e-learning on the quality of education is difficult to measure. E-learning largely embodies two promises: improving education thanks to improved learning and teaching facilities; inventing and sharing new ways of learning thanks to ICTs, that is a new specific pedagogic techniques. While the first promise is by and large becoming a reality, at least in OECD countries, the second appears further from reach. Viewed mainly as an enhancement of on-campus education, and thus matching the reality depicted in the previous section, there is some evidence that e-learning has improved that quality of the educational experience on both faculty and students sides (not to mention enhancement of administrative management). All institutions participating in the CERI survey reported a ''positive impact'' of greater use of e-learning in all its forms on teaching and learning. The quality of education (with or without e-learning) is very difficult to measure, not the least because learning depends on student's motivation, abilities and other conditions (e.g. family, social, economic, health backgrounds) as much as on the quality of teaching. However, the reasons explaining this positive impact on quality largely lives up to the promises of e-learning to offer more flexibility of access to learners, better facilities and resources to study, and new opportunities thanks to the relaxation of space and time constraints. Basically, they do not correspond to a significant change in class pedagogy, but to a change in the overall learning experience. According to the institutions, the main drivers or components of this positive impact come from:

a.   *Increased face-to-face sessions,* as the availability of archived lectures online frees up faculty time to focus on difficult points and application and because the introduction of e-learning has sometimes led to a debate on pedagogy
b.   *Enhanced communication*between faculty and students and increase in peer learning
c.   A*ccess to materials and other resources,* allowing students to revise a particular aspect of a class, giving more access flexibility to part-time students, or giving remote and easy access to the library materials
d.   *Access to international faculty/peers,* for example with the possibility of online lectures or joint classes with remote students.

The cost of e-learning

Has e-learning lived up its promises in terms of cost-efficiency? Here again, not if one looks at the most radical promises as noted above, virtual universities have not replaced brick and mortars and saved the cost of expensive building investments and maintenance digital libraries have supplemented rather than replaced physical ones the codification and standardization of teaching in a way that would allow less faculty or less qualified academics has not become the norm, nor have new online learning objects been invented to replace faculty altogether finally, it has become clear that there was no once-for-all ICT investments and that the maintenance and upgrading costs of ICT facilities were actually important, contrary to the marginal cost of then replicating and diffusing information.

Moreover, cost-efficiency has for many universities been a secondary goal compared to the challenge of developing innovative and high quality e-learning courses at many tertiary education institutions. Although the ranking of cost-efficiency has increased between 2002 and 2004 by 16%, 37% of respondents considered ''cutting teaching costs long-term'' as a key rationales in the OBHE survey (OBHE, 2004) a small percentage compared to the two key rationales (over 90% of responses). Again, most universities consider e-learning materials and courses as a supplement to traditional class-room or lecture activities rather than a substitute.

The predominance of web dependent and mixed modes of e-learning makes the assessment of the costs and benefits of e-learning investments more difficult to evaluate as they become part of the on-campus experience. It is striking that the institutions participating in the CERI survey on e-learning has no systematic data on their e-learning costs (OECD, 2005). In this context, and after the burst of the dot.com economy bubble that put out of business many e-learning operations (many never started their operations though), identifying sustainable cost-efficient models for e-learning investments in tertiary education has become critical.

There are examples of cost-efficient models ''outside'' the traditional colleges and universities though. Virtual tertiary education institutions as e.g. the Catalonia Virtual University have a cost advantage as they are developing e-learning materials from scratch and not ''building onto'' a physical camp. The Open University in the UK which is gradually moving from a traditional distance learning courses using books, video cassettes, and CD-ROMs to online courses has reported that their costs per student are one third of the average cost for similar on-campus programmes in UK. Fixed capital costs are lower and it is easier to align.

VIII.   E-LEARNING POTENTIAL OF HIGHER EDUCATION INSTITUTION

In most OECD countries the question is no longer whether or not tertiary education institutions should invest in e-learning. Because of the competition between institutions and student demand for easy access to courseware material and flexible learning environments, most tertiary education institutions willing to deliver quality teaching are bound to invest in e-learning. As we have seen, the large majority of institutions are now embracing e-learning adoption cycles one and two, which are basically about providing the students with better access to learning and course material and facilitating the electronic communication between students and teachers. Again, only very few institutions and faculty are however systematically exploring and producing re-usable learning material and objects (third cycle) or have taken full advantage of new ICTs with focus on active learning that combines fact-to-face, virtual, synchronous, and asynchronous interaction and learning in novel ways (fourth cycle). The latter approach would require faculty and students to adopt new roles-with each other and with the technology and support staff.

While ICTs offer powerful new instruments for innovation, tertiary education institutions are generally decentralized institutions where individual faculty often has the sole responsibility for teaching courses and delivering course material. Adoption of the third and especially the fourth e-learning cycle would imply changing to more collaborative ways of organizing and producing teaching material. Faculty members would in many cases have to collaborate with a whole range of new staff as e.g. course managers, web designers, instructional/pedagogical designers, cognitive scientist etc. to produce course material. This could lead to resistance from ''traditional'' faculty arguing that current teaching practices have proved its value for centuries and there is no need to change them to new pedagogical and teaching methods, which have hardly proven their efficiency yet. Moreover, promotion of faculty and funding allocations in universities are often linked to research activities rather than teaching activities, often seen as less prestigious. Faculty members have therefore often relatively few incentives to invest their time in e-learning activities.

The adoption of new ways of teaching and learning at tertiary education institutions through ICTs can therefore create organizational conflicts and tensions. New organizational innovations, new knowledge management practices, and more team working are therefore necessary conditions for tertiary education institutions to be able to move to e-learning adoption has identified a number of lessons learnt by institutions that are in the forefront of e-learning development (OECD, 2005):

- More strategic e-learning planning at the institutional or faculty level and to tie this to the overall goals of the institution is needed
- A paradigm shift in the way academics thinks of university teaching would be necessary, e.g. a shift away from 'scepticism about the use of technologies in education' and 'teacher-centered culture' towards 'a role as a facilitator of learning processes', 'team worker', and learner-centered culture'
- Targeted e-learning training relevant for the faculty's teaching programme as well as ownership of the development process of new e-learning material by academics is also necessary

There is no one-best way or trajectory for e-learning development at tertiary education institutions. But it might prove more difficult to provide the ''softer'' social, organizational and legal changes in tertiary education than provide the technological infrastructures necessary to full embrace the advantages of e-learning (David, 2004). It will depend on a whole range of factors not necessarily related to the development of e-learning including:

- Changes in the funding of tertiary education and in particular e-learning funding
- Student demography
- Regulatory and legal frameworks
- Competition between traditional tertiary education institution themselves and with new private providers
- Internationalization including the possibility of servicing foreign students living abroad and not the least to the extent to which students will want to use the new opportunities for new and flexible ways of learning.

Many tertiary education students would possibly prefer to have some kind of 'mixed model' learning choice involving a whole range of different learning opportunities and forms combining face-to-face, virtual, synchronous, and asynchronous interaction and learning.

IX.   EDUCATIONAL GAINS OF INFORMATION AND COMMUNICATION TECHNOLOGY

The convergence of telecommunications and computing technologies has profoundly changed the way people acquire and share information. The exponential growth of the Internet and other networks has altered the way we are educated, how we conduct our business, how we enjoy our leisure time, and how we obtain our health care. It is the proliferation of information technology throughout the society that makes the digital information age so significant.

The integration of information technology (IT) into teaching, learning and research is a significant part of both the opportunity and the challenge that higher education faces in the information age. These cultural and technological changes provide us with opportunities to create environments where intellectual capacity, information and knowledge bases, methodologies and other valuables are made available to learners anywhere, anytime. Clearly IT is an important tool in creating access to a learning environment that encourages interaction and collaboration and supports a student's ability to explore individual paths of learning. However, these new opportunities do not come without significant challenges. IT will change teaching and learning profoundly. Information Technology (IT) represents a fundamental change in basic technology of teaching and learning.

X.   ECONOMIC GAINS OF INFORMATION AND COMMUNICATION TECHNOLOGY

It is clear that the primary driver of the information age transformation is the integration of historically disparate concepts and approaches into an interrelated environment that offers more value than the sum of its parts. Traditional distinctions and boundaries in technologies-access to information, demand for services, organizational structures and processes are passed. Everything is becoming structurally integrated into networks that exchange information and services among individuals, groups, or institutions on a real-time basis.

Obviously, these technical and cultural changes are affecting how successful organizations compete in this dynamically changing period. Institution must provide their students, employees and entire organization with the environment, experiences and skills for success in a transformed economy and culture. This presents a major challenge in view of the positive empowerment of youths in our society for progressive transformation. IT training, planning and management have moved from independent tactical activities to essential part of an organization's strategic processes. In fact; in the information age, IT system and services are often seen as the factor that distinguishes success from failure in an intensely competitive market place.

Information Technology will increasingly determine the pace of economic growth and the level of human welfare. The prerequisite for the creation of an information-based economy is the existence of an efficient telecommunication structure and technologies. Hence the need for research and advancement in electronic technologies.

XI.   SCIENTIFIC RESEARCH

Scientific research is a core activity in tertiary institutions. This activity has been revolutionized by the possibilities offered by ICT; from digitization of information to new recording, simulation and data processing possibilities. Advance ICT infrastructure offers the resources, information and collaboration needed to solve fundamental scientific problems. This has resulted in finding solutions to grand challenges, such as accurate weather forecasting, building more energy efficient automobiles, designing life-saving drugs and lots more (Adedoyin and Akinnuwesi, 2006). Some of the ways in which ICT infrastructures are being used by researchers are high performance computer, software and high-speed networks which allows researchers access to more computational resources. This has resulted in the achievement of grand feats such as accurately modeling earth's climate, design and simulates high-speed civic transport, improve detection of cancer and enhance the recovery of oil and gas from reservoirs. #

XII.   CAVEATS OF INFORMATION AND COMMUNICATION TECHNOLOGY

Information system must be protected from attack and therefore new capabilities for effective information operations must be developed. Network centric warfare heavily relies on satellite communication and other forms of space-based technology. With the advent of the digital information age, research and advancements in these areas of supportive electronic technologies are challenges and pertinent for progressive achievement.

Advancement in modern electronic research is vital and fundamental to the changing face of information technology. Advancement in information technology has pushed companies and organization to become computer-based thus becoming vulnerable to external and internal attacks. Coping with the rate at which devices, gadgets, systems and utilities are beamed on the society is itself a positive challenge in view of fear of outdating of previously acquired technology and addiction to the eagerness to stay current in rat race in the digital information age. The key trend in computer hardware is ''smaller, faster and cheaper''. Computers are shrinking in size. Much of this change is being brought about by continuing research into microchip technology that allows more and more electronic elements to be packed into less and less space. Research is currently underway into manipulating molecules to reduce the size of computer elements even further. In addition, recent advances in the field of superconductivity have increased the possibility of using it to dramatically increase the speed of computers. The volume of information is increasing exponentially. Personal computers are making it possible for business to manage that flow effectively. He challenge of the digital

information age is that it is also the age of electronic terrorism. Computer vulnerability has opened the society up to highly motivated and malicious actions by criminals, terrorists and disgruntled employees. Electronic and cyber crimes and terrorism are on the increase. Input crime, process crime, output crime and storage crime are various aspects of computer crimes, which present new dimension of challenges in the information age. In addition to these is the challenge of dealing effectively with computer viruses, Trojan horse, time bomb, logic bomb and worms. A virus is a program attached maliciously to a computer program. When the computer executes the program the virus begin to replicate itself, with potentially harmful result. A Trojan horse program appears on the surface to do one thing but actually does another. A time bomb is a program timed to execute itself on a certain date, while a logic bomb executes whenever a certain command is given. A worm is a program that travels through the computers memory, a wiping out information in the process. Criminals often access a computer through a trapdoor a part of the operating system that will allow access to knowledgeable users.The trend in digital technologies makes it possible for information to be collected, processed, stored and disseminated very efficiently. This trend also makes it more challenging to keep secrets. Secured digital secrecy in the information age is a major challenge because it is desirable, fundamental and pertinent to information and communicating systems, in order to avoid hacking, snooping, sniffing, peeping, tampering and forgoing.

While physical protection of the computer is usually a matter of ensuring that unauthorized person do not gain access to hardware, protecting software and data is an entirely different problem. An organizations data are its most valuable and important assets and maybe irreplaceable. Even if data are not destroyed having them all into competitor's hands can have disastrous implications for private companies, banks and business organizations and even competing political parties.

Most computer based systems are vulnerable to external attacks for malicious and damaging purpose. This presents a major challenge in view of the availability of the new electronic technologies to both positive cyberdevelopers and negative cyber terrorists. It is estimated that more funds have been committed to hacking, cracking and cyber terrorism that cyber development, research and applications.

The dark sides of this information age, which in itself is a challenge, is that information technology like gambling and heroine is addictive. We are driven, forced or conditioned into buying new information and communication gadgets of reasons both real and perceived. The sun never sets in the information age. Subscribers are always plugged into the global matrix of the information domain with incurable addition and constantly awash in a sea of electronic stimuli with resulting attendant challenges. We became further dependent that when something breaks, crashes, or is attacked, our ability to function is reduced or eliminated. Addiction of youth to games and undesirable, destructive, misleading non-educative aspects of the Internet is a major the possibility and consequence of youths graduating into cyber terrorists, cyber fraudsters, hackers, crackers and economic saboteurs, caution is the key theme of information technology.

XIII. INFORMATION SECURITY AND CHALLENGES

Information security is a challenge in technology age. Business espionage is a reality. Business with multiple branches and sensitive information, such as law firms, insurance companies and various industrial establishments are likely to be victims of hacking. To meet the challenges in the digital information age, issues of privacy, secrecy and security are very important and pertinent. All these are very important for an open society in this electronic age. The society establishes a right to privacy. But the information age is challenging society's ability to respect it. The use of information technology poses a major threat to gaining compliance among third parties with respect to privacy rights.

Cryptography is a technology that enables secure communications exchange between systems. Embodied in key industry-standard protocols such as SSL (secure sockets layer). Cryptography plays a key role in providing industry-standard solutions. The leading position of DES (Data encryption standard) and RSA (Rivest, Shamir and Adleman) encryption methods make them very strong encryption processes. The greater the key space, the less susceptible the code to brute force attacks. With RSA's 128 bit key standard, such an attack is nearly impossible hacker or cracker would need over 10 years (several million years) to break the encryption. The digital IDSs, also known as digital certificates or public key certificates are small files carrying information about the subject, the issuer, the validity period and the serial numbers. A certificate along with the corresponding private key serves as the identity of its holder entity. Over network, servers may be configured to grant access only to individuals holding particular certificates. Similarly clients may also be configured to trust servers bearing certain kinds of certificates. Secure socket layer (ssl) is an industry standard protocol that makes use of public key technology. Vast amounts of servers around the public Internet and intranet deploy SSL technology to secure information transmission. SSL delivers three basic levels of security services: message privacy, message integrity, mutual authentication. Message privacy is enabled using a combination of public key and symmetric key encryption. The entire data traffic between the SSL server and SSL client is encrypted using a key and an encryption algorithm negotiated during the SSL handshake. Message integrity ensures that the message content is not tampered by the vandals during tis transmission from clients to server. Using a combination of a shared secret and special mathematical functions called hash functions, the SSL technology provides the essential message integrity services. In the process of mutual authentication the server convince the client of its identity and vice

versa. The relative identities are normally coded in the form of public key certificates, which are exchanged during an SSL handshake.

XIV.   THE CHALLENGES FACING ICT UTILIZATION IN NIGERIAN TERTIARY EDUCATION

The challenges facing the adequate utilization of ICT in Nigerian tertiary education can be broadly grouped into four, these are: Inadequate Infrastructure, Inadequate Skilled Manpower, Resistance to Change and Inadequate Funding.

Inadequate Infrastructure

Tertiary institutions in Nigeria lack adequate ICT infrastructure to effectively tap into the opportunities offered by the cyberspace.

Personal computers (PCs) are available in most Nigerian tertiary institutions, but they are not readily accessible to students because of the low computer (PC): student ratio which is averagely put at about 1 to 40. In most cases, the basic software needed for practical works are not available and where they are available, they are not accessible because of the low ratio. There is also the lack of CAI and other specialized software to support some areas of teaching learning and research. Internet connectivity is available in most tertiary institutions in Nigeria, but in most cases the bandwidth subscribed to (which determine speed of access) is too small to support any meaningful academic activity during peak period. Some institutions have subscribed to Virtual Library sites whereby members can access electronic academic materials such as journals. Also some institutions have CD-Rom collections on specialized fields, but the currency of the information on the CDs cannot be guaranteed as no effort is made to update them whereas ICT infrastructures like multimedia projector are available in Nigerian tertiary institutions to support teaching, learning and research, other infrastructures like Interactive White Boards and mobile devices are lacking.

Inadequate Skilled Manpower

Inadequate ICT technical personnel is a major problem in Nigerian tertiary education. The reason for this can be ascribed to the lucrative job opportunities available to ICT professionals outside the academics. The situation has made institutions rely on commercial private ventures to provide support for the few ICT facilities available. The support offered is in most cases are commercial and lack academic content. As a way out of this challenge, some universities like Bells University of Technology, University of Nigeria and NamdiAzikwe University are in partnership with private organizations like AFRIHUB for ICT technical manpower development.

Resistance to Change

There is the concern of faculty members not willing to take the 'soft' approach to teaching and learning. Rather, they stick to the traditional hard ''approach''. Report from OECD (2005) gave reasons while faculties resist e-learning.

- That e-learning development, with its standardization aspects, might conflict to some extent with the professional culture of academic based on autonomy and reward system often based on research.
- Concern about intellectual property rights and shared rights between faculty, institutions and technologies.

Funding

This is the major challenge confronting the acquisition and utilization of ICT in Nigerian tertiary education. Most institutions solely rely on their proprietor for funding and the bulk of such fund goes to servicing the overhead cost. Since no clear sustainable business model has yet emerged for commercial provision of e-learning, and failures have been more numerous than success, (OECD, 2005), institutions are not willing to invest the little fund available to them on e-learning project.

Recommendations

The target of tertiary education in Nigerian should be e-learning for Nigerian tertiary education to be effective, the following recommendation are made:

a. there is the urgent need for infrastructural upgrade and funding of research work. Institutions should exploit alternative source of funding's for ICT infrastructure development. Some of these sources are:

- Collaboration with private organizations for provision of infrastructure and manpower development
- Collaboration on the use of private organizations ICT infrastructures for training of staff and students and for research purposes
- Harnessing the opportunities offer by ICT for commercial purposes.

b. Tertiary institutions should begin to adopt the use of open sources software, which are available for free

c. Encourage the development of in house software for CAI and LMS
d. There is the need for tertiary institutions in Nigeria to recruit a broader range of staff to complement ICT academic staff, such as technologist, instructional designers and learning scientists.
e. Collaboration among institutions. This will enhance sharing of knowledge, technology and personnel. It will also improve the quality of curricula and promote good practices.

With the present situation of tertiary education in Nigeria, where institutions are yet to fully come to term with the reality of e-learning potentials, and that there is no clearly defined sustainability model to support it, there is a case for continued government and its agencies support for ICT acquisition and utilization in the following areas:

- Encouraging the dissemination of good practices to simulate innovation, avoid wasteful duplication of efforts, and scale up successful experiments.
- Encouraging appropriate staff development, in order to ensure progress at institutional level.
- Supporting research and development on learning objects and other promising innovations such as open educational resources or the use of visual simulation tools, and ensuring their relevance to staff and students.
- Promoting collaboration between ICT providers and institutions, and supporting public-private partnerships, in order to keep costs at reasonable level.

XV.   CONCLUSIVE REMARKS AND RECOMMENDATION

This paper discovered that the encouraging effect of e-learning on the overall learning experience is a quantum leap in the accurate of e-learning, though it has not significantly transformed the learning and the teaching processes.

The quality of fully online learning is a more controversial question, possibly because online learning was once viewed as possibly become of higher quality than on-campus education (possibly including e-learning as already mentioned). Comparing the quality (or the beliefs about the quality) of fully online learning against traditional distance learning, traditional face-to-face learning or other mixed models of e-learning might not yield the same results; fully online learning is indeed more readily comparable to distance learning than to on-campus education. While institutions having adopted e-learning have generally a positive view of tis possible impact on quality, there is little convincing evidence about the superior or inferior quality of fully online learning compared to other modes of tertiary education.

Another question is whether fully online learning has entailed innovation in pedagogy or just replicated with other means the face-to-face experience. As noted above, ICTs could indeed entail pedagogic innovations and help create a community of knowledge among faculty, students and learning object developers that would codify and capitalize over successful innovation in pedagogy. At this stage, there is no evidence that e-learning has yielded any radical pedagogic innovation. The most successful fully online courses generally replicate virtually the classroom experience via a mix of synchronous classes and asynchronous exchanges. Arguably, they have not represented a dramatic pedagogical change. We will see below that in spite of worthwhile experiments, learning objects and open educational resources are still in their infancy. They hold promises for educational innovation though.

Worldwide, the use of Information and Communication Technology is changing the face of teaching, learning and research. Nigerian educational system cannot afford to take the back seat. Nigerian tertiary education need to fully utilize ICT resources to make education widely available and accessible at reduced cost. The information age presents us with profound opportunities, numerous benefits, daunting challenges, but frightening cautions. Current approach to planning, provision and use of information technology must change in order to respond effectively to the changes that are occurring. The strategic integration of information and technology is fundamental and pertinent to meet the challenges of privacy, secrecy, security and cyber terrorism in the digital information age.

There are many critical issues surroundings e-learning in tertiary education that need to be addressed in order to fulfill objectives such as widening access to educational opportunities enhancing the quality of learning and reducing the cost of tertiary education. E-learning is, in all its forms, a relatively recent phenomenon in tertiary education that has largely not radically transformed teaching and learning practices nor significantly changed the access, costs, and quality of tertiary education. As we have shown, e-learning has grown at a rapid pace and has enhanced the overall learning and teaching experience. While it has not lived up to its most ambitious promises to stem radical innovations in the traditional learning processes. Most institutions are thus currently in the early phase of e-learning adoption, characterized by important enhancements of the learning processes. Most institutions are thus currently in the early phase of e-learning adoption, characterized by important enhancements of the learning process but no radical change in learning and teaching. Like other innovations, they might however live up to their more radical promises in the future and really lead to the inventions of new ways of teaching, learning and interacting within a knowledge community constituted on learners and teachers.In order to head towards these advances innovation cycles, a sustainable innovation and investment model will have to be developed. While a first challenge will be technical, this will also require a broad willingness of tertiary education institutions to search for new combinations of input of faculty, facilities and technology and new ways of organizing their teaching activities. Like for ICT investments in other sectors, the cost-effectiveness of e-learning investments will depend on whether new organizational and knowledge

management practices are adopted. Experiments are already underway that make us aware of these challenges, but also of the opportunities and lasting promises of e-learning in tertiary education.

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