AJOTE
African Journal of Teacher Education

THE ROLES OF ICT DEVELOPMENT IN OPEN AND DISTANCE EDUCATION: ACHEIVEMENTS, PROSPECTS AND CHALLENGES

Dickson Ogbonnaya Igwe
National Open University of Nigeria

ABSTRACT
The promises of information and communication technologies (ICT) have driven e-learning in transforming open distance education and thereby advancing the knowledge economy that rested on three arguments: E-learning could expand and widen access to tertiary education and learning; improve the quality of education; and reduce its cost. This article evaluates these three promises based on existing data and evidence. It concludes that the reality has not matched the promises so far in terms of pedagogic innovation. This does not mean that ICT development has not produced any significant positive results in improving the overall learning (and teaching) experience in the institutions and societies where it is implemented. That implies that what will help further to identify the new challenge. ICT development faces will be further research. Obstacles and problems of ICT that could have affected the open educational resource initiatives are yet to be established. The first section of the paper recalls some of the proposed values of e-learning. The second section compares achievements so far and suggests that e-learning could be only at an early stage of realising educational innovation aspirations. The third section highlights the challenges of future developments in e-learning.
Key words: ICT Development; Knowledge Economy; E-Learning; Distance Education; Open Education; Tertiary Education; Innovative Circle.

Introduction

Knowledge, innovation and Information and Communication Technologies (ICTs) have had strong repercussions on many economic sectors, such as informatics and communication, finance, and transportation sectors (Foray, 2004; Boyer, 2002). ICT has also had an influence on education. The knowledge-based economy for example sets a new scene for education and new challenges and prospects for the education sector. In the first place education is a prerequisite of the knowledge-based economy and the production and use of new knowledge both require a more educated population and workforce. Secondly, ICTs are a very powerful tool for diffusing knowledge and information, which is a fundamental aspect of the education process. In this capacity, they play a pedagogic role that could in principle complement (or even compete with) the traditional practices of the education sector. These are therefore two challenges for the education sector if it is to continue to expand with the help (or under the pressure) of new forms of learning. Thirdly, ICTs sometimes induce innovations in the ways business is conducted in the education sector. For example, navigation does not necessarily involve the same cognitive processes since the Global Positioning System (GPS) was invented (e.g. Hutchins, 1995). Also scientific research in many fields is revolutionised by the new possibilities offered by ICTs, from digitisation of information to new recording, simulation and data processing possibilities (Atkins and al., 2003). Another question to ask then is, "Could ICTs similarly revolutionise education, especially as education deals directly with the codification and transmission of knowledge and information?" These two activities (codification and transmission) are effectively decoupled by the ICT revolution.

It is important to discover the characteristics of education before considering whether ICT can revolutionise education. The education sector has so far been characterised by rather slow progress in terms of innovations that impact teaching activities. Educational 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 work" 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 precisely enough to ensure that they are actually 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.

However, information and communication technologies potentially offer increased possibilities for codification of knowledge about teaching and for innovation in teaching activities through the delivery of learning and cognitive activities anywhere at any time. Learning at a distance can be more learner-centred, self-paced, and problem solving-based than face-to-face teaching using traditional media, social media through networking to create open space interact between the lecturer and the students without necessarily face-to-face classroom situations. 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 those used within the framework of

electronic interaction. Still it is important to note that the influence of distance and time is waning now that the technological capacity is available for knowledge-sharing, remote access and teamwork, and organising and coordinating tasks over wide areas (OECD, 2004a).

Focusing on tertiary education, this article examines the promises of ICTs in the education sector, first as a way to better participate in the advancement of the knowledge economy and second as a way to introduce innovations. Leaving aside the impact of ICTs on the research or e-science performed by tertiary education institutions (see Atkins and al., 2003; David, 2004), we concentrate on e-learning, broadly understood or used interchangeably as the use of ICTs to enhance or support learning and teaching in (tertiary) education. E-learning is thus a generic term referring to different uses and intensities of uses of ICTs, from wholly online education to campus-based education through other forms of distance education supplemented with ICTs in some way. The supplementary model, referred to above, would encompass activities ranging from the most basic use of ICTs, i.e. use of PCs for word processing of assignments, through to more advanced adoptions such as, specialist disciplinary software, handheld devices, learning management systems etc. However, in our model we keep a presiding interest in more advanced applications including some use of online facilities.

Secondly, this article draws on existing evidence, including a recent survey on e-learning in post-secondary institutions carried out by the OECD Centre for Educational Research and Innovation (CERI) that shows that e-learning has not yet lived up to its promises. The promises in fact, were overstated in the hype of the new economy. Even so, ICTs have nonetheless had a real impact on the education sector, introducing a quiet rather than radical revolution. Finally, the survey shows some possible directions to further stimulate use of ICT development. The remainder of this article is organized as follows: the first section recalls some of the promises of e-learning. The second section compares these promises and the real achievements to date in developing countries, particularly in Nigeria, and suggests that e-learning could be at an early stage of its adoption cycle in Nigeria. The third section highlights the challenges for further development of e-learning and shows what future directions might be most promising.

Advancing Knowledge and Knowledge Economy: Prospects 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 these possibilities.

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 open distance learning (ODL) by increasing the flexibility of participation compared to the traditional face-to-face model. In this way working students and adults, people living in remote rural areas, non-mobile students, and even students outside the country 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, ICTs have enhanced traditional distance education by

enabling 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 student/teacher ratios, 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 be standardised 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 teacher-learner interactivity compared to face-to-face teaching, they can reach a scale of participation that would be unfeasible via face-to-face learning.

The Promises of ICT in the Education Sector

When the needs are huge, fully online learning can be crucial and possibly the only realistic means to increase and rapidly widen access to tertiary education. Some developing countries have huge cohorts of young people and shortages in their academic workforce that result in unmet demands for education. Given that training new teachers would take too much time, notwithstanding resources, e-learning therefore might represent for many potential students the only chance to study, so it is not merely an alternative to full face-to-face learning (World Bank, 2003).

E-learning may also be viewed as a promising way for improving the quality of tertiary education and the effectiveness of open distance learning. These promises can be derived from different characteristics of ICTs, including: the increased flexibility of the learning experience it can give to students; the enhanced access to information resources for more students; the potential to drive innovative and effective ways of learning and/or teaching, including learning tools; easier use of multimedia or simulation tools; and the possibility to diffuse these innovations at low marginal cost among 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 was shown above. It can also offer to students more personalised ways of learning than collective face-to-face learning. It can be helpful even in small groups. Although learning is often personalised to some extent in higher education through the modularity of paths, ICTs allow institutions to give students a wider variety of learning paths from which to choose. This is not usually the case in non-ICT supplemented institutions because of the administrative burden this represents in large institutions. This means that students can experiment with learning paths that best suit them. Moreover, e-learning can potentially allow students to take courses from several institutions, i.e. some campus-based and others fully online. This potential flexibility of individual curricula may be seen as an improvement of the overall student experience, regardless of pedagogical changes. In brief, e-learning could render education more learner-centred compared to the traditional model.

Finally, as far as prospects and promises are concerned e-learning may 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 traditional education formats. Although initial ICT investments are expensive, they can then generally be used at near-zero marginal cost. Where does this cost-efficiency come from? It comes from the replacement of expensive brick and mortar campuses by smaller virtual campus centres; the digitisation of library materials that save the cost of keeping huge paper collections; the improvement of efficiency of institutional management; and the automation of some of the traditional on-campus activities, including some teaching.

A Quiet Rather than Radical Revolution: ICTs' Achievements

Has e-learning (and especially online learning) lived up to the promises outlined in the previous section? The answer is "yes, to some extent." The reality of e-learning has never matched its most radical promises (Zemsky and Massy, 2004). While experiments are still underway, the initial stage of over-enthusiasm ended with new economy bubble burst about 2002. In this respect, e-learning followed the ups and down of the new economy and gave rise to the same caveats as in other sectors, including: irrational beliefs about its market value, over-investment, over-capacity, and more announced initiatives than services actually launched (Boyer, 2002). Like other activities, e-learning has not yet proven its ability to generate high profits or to replace the old economy of learning. However, interpreting this as a failure of e-learning would over-simplify the reality and could be seen as "throwing the baby out with the bath water." While, perhaps unsurprisingly, e-learning has not led to the radical revolution in open distance education that was sometimes prophesised, some of its forms are already pervasive in tertiary education and have led to a quiet revolution. The modesty of its achievements should not lead one to overlook these achievements. This section gives an overview of the available evidence of achievements that are visible with the adoption of e-learning in tertiary education.

E-learning Adoption Benefits

The radical perception of e-learning was that fully online learning would progressively supersede traditional face-to-face learning and represent a competitive threat for traditional tertiary educational institutions. To some extent, this belief was a reason for the creation of new ventures and for established institutions to enter this new market and early adopters could indeed possibly gain a brand name and a serious competitive advantage in the new market. The reality is that, while sometimes successful in experiments, fully online learning has remained a marginal form of e-learning and is often not even the ultimate goal or rationale for e-learning adoption. However, this does not mean that e-learning in other forms has not gained significant ground over the past decade in tertiary education. There is indeed some evidence of a noticeable growth of e-learning adoption both on demand and supply sides.

One must bear in mind that e-learning encompasses a wide range of activities. Following the terminology used in the CERI survey (OECD, 2005) we distinguish between different levels of online learning adoption as sub-sections of e-learning as follows, from the least to the most intensive form of e-learning:

- *None* or *trivial* online presence;
- *Web supplemented*: the Web is used but not for key "active" elements of the programme, i.e. course outline and lecture notes online, use of email, links to external online resources, without any reduction in classroom time;

- *Web dependent*: Students are required to use the Internet for key "active" elements of the programme, i.e. online discussions, assessments, online projects or collaborative work, but without significant reduction in classroom time.
- *Mixed mode or blended*: Students are required to participate in online activities, i.e. online discussions, assessments, online project or collaborative work, as part of course work, which *replaces* part of face-to-face teaching/learning. Significant campus attendance remains.
- *Fully online*: the vast bulk of the programme is delivered online with typically no (or not significant) campus attendance or through "learning objects".

What about the major trends in the adoption of e-learning by institutions and students in Nigeria? What levels of online learning do they incorporate? The next section addresses these questions.

ODL Education Platform: A Historical Juxtaposition

Open distance learning (ODL) is an acronym associated with National Open University of Nigeria (NOUN). For the present, NOUN cannot compete with many of the open universities, such as: United Kingdom Open University (UKOU), Indira Ghandi National Open University, India (IGNOU), Alberta Open University, India, Open University of South Africa, Open University of Hong Kong in the area of e-learning. NOUN still depends on print materials and face-to-face facilitation which are meant as supplemental materials. NOUN is handicapped by the low level of development in Information and Communication Technology (ICT) facilities and support resources, such as electricity and inadequate infrastructural facilities in throughout the country that NOUN ought to serve.

The course materials printed by NOUN headquarters are not equitably distributed to all the study centers and the study centers are poorly equipped. This makes it difficult to align materials from headquarters to appropriate course scheduling. NOUN, it may be said, is still at the beginning stages of implementation and cannot for now be compared in any open and distance education universities outside Africa or even with open and distance learning universities in the neighboring African countries.

This growth rate for online course enrolments, which was estimated at 25% in 2005, is much higher than the growth rate of total tertiary enrolments in the United States. From a low starting point, fully online learning is growing at a rapid pace, even if it is merely as a complement to face-to-face or mixed mode learning. Moreover, fully online learning is clearly very important for distance institutions. In the CERI survey, the institutions willing to embrace fully online learning to the greatest extent were all virtual/distance learning only institutions (or branches) (OECD, 2005). In conclusion, e-learning seems to live up to its promises in terms of flexibility and access possibilities. It is a growing activity that has significantly increased the participation in tertiary education of foreign students (OECD, 2005).

Does E-Learning Improve the Quality of Open Distance Education?

The real impact of e-learning on the quality of open distance education is difficult to measure. E-learning largely embodies two promises: improving education thanks to improved learning and teaching facilities, and inventing and sharing new pedagogical techniques or ways of learning thanks to ICTs. The quality of education (with or without e-learning) is very difficult to measure,

not the least because learning depends on students' motivation, abilities, and other conditions, i.e. family, social, economic, health backgrounds, etc., as much as on the quality of teaching.

The reasons that explain ICTs' positive impact on quality of e-learning is its ability to offer more flexibility of access to open distance learners, better facilities and resources for studying, and new opportunities for learning thanks to the relaxation of space and time constraints. Its success does not correspond to a significant change in class pedagogy, but to a change in the overall learning experience. According to (OECD, 2005), the main drivers or components of this positive impact come from:

- facilitated access to international faculty/peers, i.e. the possibility of online lectures or joint classes with remote students;
- flexible access 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;
- improved communication between faculty and students and increase of peer learning;

These "positive impacts" on the overall learning experiences of the learners is alone, a significant achievement of e-learning, even though it has not radically transformed the learning and teaching processes.

Cost Efficiency of E-Learning: Looking beyond Nigeria

Has e-learning lived up its promises in terms of cost-efficiency? Here again, it is not the case, if one looks at the most radical promises as noted above. Virtual universities have not replaced brick and mortar classrooms or saved the cost of expensive building investments and maintenance. Digital libraries have supplemented rather than replaced physical ones. The codification and standardisation 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 is clear that there was no one time only ICT investments as the maintenance and upgrading costs of ICT facilities are actually important, so contrary to the idea of marginal costs for 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. The ranking of cost-efficiency has increased between 2002 and 2004 by 16%. Further, only 37% of recent survey respondents considered "cutting teaching costs long-term" as a key rationale in the OBHE survey (OBHE, 2004); this is a small percentage compared to the two key rationales, which were reflected in over 90% of responses. Again, most universities consider e-learning materials and courses as a supplement to traditional classroom 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 per se 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 had 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 many e-learning operations out of business, 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, such as the Catalonia Virtual University have a cost advantage as they are developing e-learning material from scratch and not "building onto" a physical camp. The Open University in the UK which is gradually moving from traditional distance learning courses using books, video cassettes, and CD-ROMs to online courses reported that their costs per student are one third of the average cost for similar on-campus programmes in the UK. Fixed capital costs are lower and it is easier to align staffing structures to e-learning processes than at "traditional" universities. The e-learning activity of the University of Phoenix, which is a private for-profit university mainly for adult students, is also seen as cost-effective. Its business model is based on "standardised teaching," relatively small on-line class size, and use of proven low-tech e-learning technologies (inducing lower costs than more sophisticated technologies). Much of the faculty staff at the University of Phoenix is hired part time with fulltime jobs at other tertiary education institutions. This indicates that staff development costs are lower at University of Phoenix than other tertiary education institutions.

E-learning investments in tertiary education can be cost-effective, but it depends on the business model, the profile and number of students and topics. In fact, its cost-effectiveness has been demonstrated in some cases in large undergraduate science classes (Harley, 2003). The calculations also depend on whether student opportunity costs are taken into account. The initial costs for e-learning development are often high. They include among other items, infrastructure, creating course material from scratch, experimentation, new kinds of staffing, immature technologies, etc. In order to ensure that e-learning investments are cost efficient, e-learning activities may need to substitute parts of the on-campus teaching activities rather than duplicate them. Educational innovations, like learning objects, could for example support the re-use and sharing of e-learning materials.

Although data is lacking on cost-efficiency, at this stage there is little evidence that e-learning has led to more cost efficiency in tertiary education. Failures have been more numerous than success stories, although the latter document the possible sustainability of e-learning. The adoption of ICTs for administrating tertiary education institutions has probably been the main source of cost efficiency in the tertiary sector, like in other economic sectors.

ODL in Nigeria and E-Learning Prospects

So, has e-learning lived up to its promises? This is probably true as far as it holds promises for incremental improvement, including an increased access and quality of the learning experience—a improvement whose importance should not be underestimated. As for radical innovation, the answer is, not yet. So far, e-learning has induced a quiet rather than a radical revolution of open distance education particularly in Nigeria.

As noted earlier NOUN is the first fully fledged university that operates in an exclusively open and distance learning (ODL) mode of education in Nigeria. The university focuses mainly on a distance teaching and learning system, and delivers its course materials via print in conjunction with ICT formats. NOUN currently has thirty study centres, which are stratified into the six geopolitical zones of the nation. Students' enrollment capacity is projected at about 50,000 students. This figure is the reason to conclude that ODL mode of education holds a great prospect as it increases capacity in the educational sector. Its greatest challenge is power generation and high cost of access to ICT facility by both students and staff.

As a force contributing to social and economic development, ODL in Nigeria is fast becoming an accepted and indispensable part of the mainstream of educational systems. This growth is stimulated in part by the interest among educators and trainers in the use of new Internet based and multimedia technologies and also by the recognition that traditional ways of organizing education need reinforcement by innovative methods. In this way the fundamental right of all people to learning may be realized.

Development Challenges of E-Learning in Tertiary Education.

The aim of this final section is to identify and reflect on some of the key issues that need consideration in a systematic way for e-learning to develop further and become a deeper driver of innovation in tertiary education. In general and in particular in ODL, if the vast majority of colleges and universities whether in close or open distance learning platforms are to embrace e-learning, a sustainable innovation and investment model must be developed. The first challenge lies indeed in the development of sustainable e-learning innovation models which go beyond using e-learning as an add-on to traditional forms of teaching and learning in tertiary education. There is a need to invent new, useful and better pedagogic innovations that may partly substitute for traditional face-to-face teaching. This requires a broad willingness of these institutions to search for new combinations of input of faculty, facilities, and technology and new ways of organising their teaching activities.

Secondly, the challenge lies in the development of a realistic model for investment in e-learning that would stimulate the participation of faculty and other stakeholders and be financially sustainable. This requires more straightforward, systematic knowledge on the real costs and benefits of e-learning investments in tertiary education. However, like ICT investments in other sectors, the cost-effectiveness of e-learning investments will depend on whether new organisational and knowledge management practices are adopted. Experience has shown that it might be more difficult to provide the "softer" social, organisational and legal changes in tertiary education than the technological infrastructures necessary to fully embrace the advantages of e-learning.

This article emphasises partnerships and networks as a possible way forward for further investment, product development, and innovation diffusion in e-learning. There are many examples where tertiary education institutions seek to share the costs of e-learning development through partnerships and networking. Partnership and network building are also useful for accessing new knowledge, to learn from others' experiences and exchange information about the latest developments in e-learning. This may involve many different organisations, such as traditional colleges and universities, virtual universities, libraries, for-profit ICTs and training companies from different sectors, etc. These activities can range from sharing material, joint technology and software development, joint research and development, joint marketing, joint training, connectivity and may be regional, national, and/or international (OECD, 2004b; Cunningham et al., 2000). After showing the importance and challenges for universities to engage their faculty in e-learning, this article considers an innovative practice exemplifying the potential power of partnerships and networks, as well as open educational resources (OER). These partnerships will have significant implications for the way e-learning activities will develop over the coming years in tertiary education.

E-learning: A Possible Way Forward through Open Educational Resources

Open Educational Resources appear as an innovative practice that provides a good example of the current opportunities and challenges offered by ICTs in order to trigger radical pedagogic innovations. Digitalisation and the potential for instant, low-cost global communication have opened tremendous new opportunities for the dissemination and use of learning material. This has spurred an increased number of freely accessible OER initiatives on the Internet including: 1) open courseware; 2) open software tools, i.e. learning management system; 3) open material for capacity building of faculty staff; 4) repositories of learning objects; and 5) free educational e-learning courses. At the same time, there are now more realistic expectations of the commercial e-learning opportunities in tertiary education.

The OER initiatives are a relatively new phenomenon in tertiary education made possible by the use of ICTs. The open sharing of one's educational resources implies that knowledge is made freely available on non-commercial terms sometimes in the framework of user and doer communities. In such communities the innovation impact is greater when it is shared, i.e. the users are freely revealing their knowledge and work more collaboratively.

These communities are not always able to extract economic revenues directly from the knowledge and information goods they are producing or from the sharing of these good which are not steered by market mechanisms. Instead they have specific reward systems often designed to give some kind of credit to inventors without exclusivity rights. Others do seek patents for their innovations, but may not charge for use as long as they are credited for the innovation. In the case of open science, the reward system is collegial reputation, where there is a need to be identified and recognised as "the one who discovered" which gives incentives for the faculty to publish new knowledge quickly and completely (Dasgupta and David, 1994). The main motivation or incentive for people to make OER material available freely is that the material might be adopted by others and maybe modified and improved to further its development. Reputation is therefore also a key motivation factor in OER communities. Being part of such a user community gives access to knowledge and information from others, but it also implies that one has a "moral" obligation to share one's own information.

Inventors of OER can benefit from increased "free distribution" or from distribution at very low marginal costs. A direct result of free revealing is to increase the diffusion of that innovation relative to conditions in which it is licensed. If an innovation is widely used it would initiate and develop standards which could be advantageously used even by rivals. The Sakai project, for example, has an interest in making their open software tools available for many colleges and universities. Therefore they have set a relatively low entry fee for colleges and universities who wish to access their software tools.

The financial sustainability of OER initiatives is a key issue. Many initiatives are sponsored by private foundations, public funding or paid by the institutions themselves. In general, the social value of knowledge and information tools increases to the degree that they can be shared with and used by others. The individual faculty member or institution providing social value may not be able to sustain the costs of providing OER material freely on the Internet in the long term. It is therefore important to find revenues to sustain these activities. It might, for instance, be possible to charge and to take copyrights on part of the knowledge and information activities springing out of the OER initiatives. Finding better ways of sharing and re-using e-learning material, like the discussion on learning objects above, might also provide some revenues.

It is also important to find new ways for the users of OER to be "advised" of the quality of the learning material stored in open repositories. The wealth of learning material is enormous on the Internet and if there is little or no guidance of the quality of the learning material, users may be tempted to look for existing brands and known quality. There is no golden standard or method of identifying quality of learning material in tertiary education on the Internet as is the case with quality identification within tertiary education as a whole. The intentions behind the MERLOT learning object repository was to have the user community rate the quality and usability of the learning objects that were made freely available. In reality very few users have taken the time and effort to evaluate other learning objects. There is little doubt that the generic lack of a review process or quality assessment system is a serious issue and is hindering increased uptake and usage of OER. User commentary, branding, peer reviews or user communities evaluating the quality and usefulness of the OER are possible ways forward.

Another important challenge is to adapt "global OER initiatives" to local needs and to provide a dialogue between the doers and users of the OER. Lack of cultural and language sensitivities might be an important barrier to the receptiveness of the users. Training initiatives for users to be able to apply course material and/or software to local meet specific language or cultural needs might be a way to reach potential users. Also important is the choice, maintenance, and user access to the technologies chosen for the OER. This is a huge task in better understanding the users of OER. There are a very few surveys on the users of OER are available and these are hardly conclusive. There is a high need to better understand the demand and the users of OER.

A key issue is who owns the e-learning material developed by faculty. Is it the faculty or the institution? In many countries including the United States, the longstanding practice in tertiary education is to allow faculty the ownership of their lecture notes and classroom presentations. This practice is not automatically applied to e-learning course material. Some universities have adopted policies that share revenues from e-learning material produced by faculty. Other universities have adopted policies that apply institutional ownership only when the use of university resources is substantial (American Council of Education and EDUCAUSE, 2003). In any case, institutions and faculty groups must strive to maintain a policy that provides for the university's use of materials and simultaneously fosters and supports faculty innovation.

It will be interesting to analyse how proprietary versus open e-learning initiatives will develop over the coming years in tertiary education. Their respective development will depend upon several points, including:

- How the copyright practices and rules for e-learning material will develop at tertiary education institutions;
- The extent to which innovative user communities will be built around OER initiatives;
- The extent to which learning objects models will prove to be successful;
- The extent to which new organisational forms in teaching and learning at tertiary education institutions will crystallise;
- The demand for free versus "fee-paid" e-learning material;
- The role of private companies in promoting e-learning investments.

It is likely, however, that those proprietary e-learning initiatives will not dominate or take over open e-learning initiatives or vice versa. The two approaches will more likely develop side by

side sometimes in competition, but also being able to mutually reinforce each other through new innovations and market opportunities.

Conclusion and Recommendations

There are many critical issues surrounding e-learning in tertiary education that need to be addressed in order to fulfil e-learning objectives. These include: 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 neither has not radically transformed teaching and learning practices nor significantly changed the access, costs, and quality of tertiary education. As this article has shown, e-learning has grown at a rapid pace and has enhanced the overall learning and teaching experience in developed countries with less use demonstrated in developing countries, like Nigeria, due to high cost of power generation and access to ICT facilities. While e-learning has not lived up to its most ambitious promises to stem radical innovations in the pedagogic and organisational models of the tertiary education, it has quietly enhanced and improved the traditional learning processes. Most institutions, especially in developing countries like Nigeria, are still in the early phase of e-learning adoption, characterised by important enhancements of the learning process but no radical change in learning and teaching.

NOUN, using ODL platform, was established basically to put an end to the regional tertiary education disparity in Nigeria and to offer quality education to every nook and corner of each state in the country at affordable rates. ICTs can be used through e-education to spread quality education and pedagogy. A balanced blend of technology and content offers a window of opportunity to the learners in the rural schools to bridge the digital divide. The e-learning system is a comprehensive and well thought-out initiative to open new vistas of learning and to provide a level playing field to schools' students in rural areas and isolated towns. This highlights the need to bridge the diverse proliferation of education across different socio-economic and geographic segments of the country.

The ICTs programs developed impact when and where students learn. In the past, educational institutions provided little choice for students in terms of the method and manner in which programs were delivered. Students typically were forced to accept what was delivered and institutions tended to be quite traditional in terms of the delivery of their programs. Learning through e-education is now creating competitive edges through the choices they are offering to the students. These choices extend from when students can choose to learn to how and where they learn.

Like other innovations, the innovations of e-learning, ICTs, and open resources may eventually live up to their more radical promises in the future and really lead to inventions in new ways of teaching, learning, and interacting within a knowledge community constituted of learners and teachers. However, in order to head towards these advanced innovations, a sustainable innovation and investment model needs to be developed. While the first challenge is technical, it 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 organising their teaching activities. Similar to ICT investments in other sectors, the cost-effectiveness of e-learning investments will depend on whether new organisational and knowledge management practices are adopted. Experiments are already underway that make us aware of these challenges,

but also that the opportunities and lasting promises of e-learning in tertiary education are eminent. There is a quite a bit which may be achieved by the successful implementation of e-learning modules via ICTs and e-learning campaigns across Nigeria. The level of literacy of the country itself is also likely to increase because e-learning is possible in all Nigerian languages, i.e. Igbo, Hausa, Yoruba and others, as well as English language components. The migration of students towards towns and cities for studying may be reversed. Availability of quality education at their door steps should result in increased opportunities to learning which should translate to increased earning power. This increased knowledge and awareness also increases overall growth of skilled manpower in the country.

REFERENCES

Allen, I.E. and Seaman, J. (2003), "Sizing the opportunity: The quality and extent of online education in the United States, 2002 and 2003," Newport, MA: The Sloan Consortium.

Baer, M.A., King, J.E., Anderson, E.L., Hawkins, B.L., Barone, C.A., Eds. (2003). *Distributed education: Challenges, choices and a new environment*. Washington DC: American Council on Education.

Atkins, D.E., Droegemeier, K.K., Feldman, S.I., Garcia-Molina, H., Klein, M.L., Messerschmitt, D.G., Messina, P., Ostriker, J.P., Wright, M.H. (2003). *Revolutionizing science and engineering through cyberinfrastructure: Report of the National Science Foundation blue-ribbon advisory panel on cyberinfrastructure*. Arlington, VA : National Science Foundation.

Bates, A. W. (1995). *Technology, e-learning and distance education*. New York: Routledge.

Boyer, R. (2004), *The future of economic growth: As new becomes old*. English translation by Michel Albin. UK: Cheltenham.

Cunningham, S., Ryan, Y., Stedman, L., Tapsall, S., Bagdon, S., Flew, T., Coaldrake, P. (2000). *The business of borderless education*. Canberra, Australia: Australian Department of Education, Training and Youth Affairs.

Dasgupta, P. and David, P.A. (1994), "Towards a new economics of science", *Research Policy*, 23:5, 487-521.

David, P.A. (2004), "Toward a cyber infrastructure from enhanced scientific collaboration: Providing its 'Soft' foundations may be the hardest threat," Paper presented at the International Conference Advancing Knowledge and the Knowledge-Economy, National Academy of Science, Washington D.C., 10-11 January 2005.

Foray, D. (2004). *The economics of knowledge.* Cambridge, MA: MIT Press.

Harley, D., Henke, J., Lawrence, S., McMartin, F., Maher, M., Gawlik, M., and Muller, P., "Costs, culture, and complexity: An analysis of technology enhancements in a large lecture course of UC Berkeley," Center for Studies in Higher Education, 3.03 (March 2003).

Hutchins, E. (1995). *Cognition in the wild.* Cambridge, MA: MIT Press.

Nelson, R. (2000), "Knowledge and innovation systems", Centre for Educational Research and Innovation, Editor, in *Knowledge Management in the Learning Society*, Paris: OECD Publications, 115 - 124.

Garrett, R., (2002), "Online learning in commonwealth universities: Selected data from the 2002 observatory survey, part 1," Observatory for Borderless Higher Education http://www.obhe.ac.uk/documents/view_details?id=577

OECD (2003). *New challenges for educational research*. Paris: OECD.

OECD (2004a). *Innovation in the knowledge economy: Implications for education and learning*. Paris: OECD.

OECD (2004b). *Internationalisation and trade in higher education: Opportunities and challenges*. Paris: OECD.

OECD (2005). *E-learning case studies in post-secondary education*. Paris: OECD.

Smith, J. M. and Thille, C. (2004). *The Open Learning initiative: Cognitively informed e-learning*. London: The Observatory on Borderless Higher Education.

World Bank (2003). *Constructing knowledge societies: New challenges for tertiary education*. Washington, D.C.: The World Bank.

Zemsky, R. and Massy, W.F. (2004). *Thwarted innovation: What happened to e-learning and why.* Philadelphia, PA: The Learning Alliance.