

IMPACT OF INFORMATION AND COMMUNICATION TECHNOLOGY ON NIGERIAN TERTIARY EDUCATION: PROCEEDS AND PROMISES

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ABSTRACT

The promises of e-learning for transforming tertiary education and thereby advancing 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 study evaluated these three promises with the sparse existing data and evidence and concluded that the reality has not been up to the promises so far in terms of pedagogic innovation, while it has already significantly improved the overall learning (and teaching) experience. Reflecting on the ways that would help develop e-learning further, the study identified the development and investment model as the way forward.

INTRODUCTION

Knowledge, innovation and Information and Communication Technologies (ICTs) have had strong repercussions on many sectors of human endeavour, for example, economy, information 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 (Hutchins, 1995), scientific research in many fields has also been revolutionised by the new possibilities offered

by ICTs, from digitisation of information to new recording, simulation and data processing possibilities (Atkins et al., 2003). Could ICTs similarly revolutionise education, especially as education deals directly with the codification and transmission of knowledge and information - two activities which power has been decoupled by the ICT revolution? The education sector has so far been characterised by rather slow progress in terms of innovation development which impact on teaching activities. 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.

Focusing on tertiary education, this paper examines the promises of ICTs in the education sector, first as a way to better participate in the advancement of the knowledge economy, second as a way to introduce innovations. Leaving aside the impact of ICTs on the research or e-science performed by tertiary education institutions (Atkins et al., 2003; David, 2004). We concentrate on e-learning, broadly understood 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 would encompass activities ranging from the most basic use of ICTs (for instance, the use of PCs for word processing of assignments) through to more advanced adoption (such as specialist disciplinary software, handheld devices, learning management systems etc.). However, we keep a presiding interest in more advanced applications including some use of online facilities.

The Promises 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.

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 (the rural area), non-mobile students and even foreign students could now more easily participate in education. 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, enabled the rise of a continuum of practices between fully campus-based education and fully distance education.

E-learning can 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 to drive 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 personalised ways of learning than collective face-to-face learning, 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 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 paths that best suit them. Moreover, e-learning can potentially allow students to take courses from several institutions, like some campus-based and others fully online. This possible 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 impacts 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 digitisation of information from academic journals 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-fertilisation of teaching materials and methods.

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 digitisation 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.

Living up to the Promises: A quiet rather than radical revolution

Has e-learning (and especially online learning) lived up to the promises outlined in the previous section? It has 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 has ended when new economy bubble burst about 2002. In this respect, e-learning has followed the ups and down of the new economy and given rise to the same caveats as in other sectors: irrational beliefs about its market value, over-investment, over-capacity, and more announcements than services really launched (Boyer, 2002). Like other activities, e-learning has not proven yet its ability to generate high profits or to replace the old economy of learning. However, interpreting this as a failure of e-learning would however over-simplify the reality and could be seen as "throwing the baby with the bath water". While, perhaps unsurprisingly, e-learning has not led to the radical revolution in tertiary education that was sometimes prophesied, some of its forms are already pervasive in tertiary education and have already led to a quiet revolution. Its modesty should not lead to overlook it.

E-learning adoption: The radical innovation view 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 has been a reason for the creation of new ventures and for established institutions to enter this new market: early adopters could indeed possibly gain a brand name and a serious competitive advantage in the new market. The reality is that, while sometimes successfully experimented, fully online learning has remained a marginal form of e-learning and 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. What do we know about the major trends in the adoption of e-learning by institutions and students?

E-learning has grown steadily in the last decade, at a relatively rapid pace, but from a very low starting point-and for some activities: from scratch. The lack of

comprehensive data renders these trends difficult to document, but existing surveys all point to the same direction of an increasing activity/supply. A significant share of tertiary education institutions have developed some e-learning activities and strategies and believe in the critical importance of e-learning for their long term strategy. The 2003 Sloan Survey of Online Learning based on a sample of 1 000 US institutions shows that only 19% of US institutions have no advanced e-learning activities - that is web dependent, mixed mode or fully online courses (Allen and Seman, 2003). The remaining 81% offer at least one course based on those advanced e-learning activities.

Does e-learning improve the quality of tertiary education? 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 technique. While the first promise is by and large becoming a reality, the second appears further from reach. There is some evidence that e-learning has improved the quality of the educational experience on both faculty and students sides (not to mention enhancement of administrative management). 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 (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. The main drivers or components of this positive impact come from:

- i facilitated access to international faculty/peers, example, with the possibility of online lectures or joint classes with remote students;
- ii 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;
- iii enhancement of 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;
- iv improved communication between faculty and students and increase of peer learning;

This "positive impact" on the overall learning experience is, alone, a significant achievement of e-learning, even though it has not radically transformed the learning and 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 modes 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 its 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.

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: 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 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 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.

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 (cost-effectiveness has been demonstrated in some cases in large undergraduate science classes (Harley, 2003), and initial development costs. The calculations also depend on whether student opportunity costs are taken into account. The initial costs for e-learning development are often high (e.g. infrastructure, creating course material from scratch, experimentation, new kind of staff/units, 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 duplication). Educational innovations, like learning objects, could for example allow supporting 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.

Challenges for the further development of e-learning in tertiary education

A 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 but rather invent new, useful and better pedagogic innovations partly substituting traditional face-to-face teaching. This will require 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.

A second 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, which is not straightforward given that there is little systematic knowledge on the real costs and benefits of e-learning investments in tertiary education. However, like for ICT investments in other sectors, the cost-effectiveness of e-learning investments will depend on whether new organisational and knowledge management practices are adopted. It might indeed 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.

Engaging universities and faculty in e-learning

In most developing 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 or have taken full advantage of new ICTs with focus on active learning that combines face-to-face, virtual, synchronous, and asynchronous interaction and learning in novel ways. 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, organisational and legal changes in tertiary education than provide the technological infrastructures necessary to fully 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:

- i Changes in the funding of tertiary education and in particular e-learning funding;
- ii Student demography;
- iii Regulatory and legal frameworks;
- iv Competition between traditional tertiary education institution themselves and with new private providers;
- v Internationalisation 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.

CONCLUSION

There are many critical issues surrounding e-learning in tertiary education that need to be addressed in order to fulfil 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 pedagogic and organisational models of the tertiary education, it has quietly enhanced and improved the traditional learning processes. Most institutions are thus currently in the early phase of e-learning adoption, characterised by important enhancements of the learning process but no radical change in learning and teaching.

In order to head towards these advances, 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 organising their teaching activities. Like for ICT investments in other sectors, the cost-effectiveness of e-learning investments will depend on whether new organisational and knowledge management practices are adopted.

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