The Role of Advanced Networks in the Education of the Future: A Report of Obafemi Awolowo University, Nigeria i-Lab Initiatives

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Abstract

Many have predicted that a global network of affordable multimedia computers, on-line libraries, student-centered "leaning ware," and enhanced human communications in general will improve access to high-quality education on a scale that simply cannot be accomplished today. Although this may be a compelling vision of the future, many details, methods, capabilities, and even principles necessary to achieve it are not yet clear. Recent rapid progress on several fronts, however, suggests that much of this vision can be realized—and sooner rather than later. There is an exciting ferment in the entire field, both within and outside traditional institutions of higher education. This paper looks at how the emergence of an Advanced Internet has specifically broken the access, performance, and cost barriers that in the past have presented an insurmountable obstacle to the new vision of education at Obafemi Awolowo University, Ile-Ife, Nigeria. It then discusses the more fundamental opportunities and challenges concerning missions, goals, roles, methods, organization, and evaluation that will face most institutions of higher education once the technical barriers have been removed.

1. Role of an Advanced Internet in High Quality Education

Most discussions about new models for distributed learning assume that there will be an underlying network which we will call the advanced Internet that can support the rich variety of communications and interaction required at any location, at an affordable cost. Why should we believe this now, when no past efforts have satisfied all of these requirements? And just what are the requirements, anyway? The following discussion explores the underlying technologies required to support distributed learning and looks at basic performance requirements, past and future methods of delivery, and important cost factors especially in Nigeria. It shows how the advanced Internet will be the first affordable system that can meet all of the basic access requirements of the new learning model, both on campus and off-campus, and how some of these developments will be driven and partially funded by a massive convergence of three global communications technologies into one.

2. Network Requirements for Distributed Learning

A glance at the Web today shows that we do not really have to wait for the advanced Internet to begin to participate in networked distance learning. This is because traditional lectures, presentations, demonstrations, and examples, which are mostly one-way communications to the student, represent a large fraction of a typical course. A standard classroom lecture can be delivered effectively as a video clip, in just the way we can watch a news report over the Internet or on television today. (Indeed, one-way television has been the primary mode of distance education in Nigeria.) Simply dividing *a* lecture into small segments that can be repeated, skipped, called up as needed, and used anytime (as on videotape) adds valuable flexibility. Similarly, hyperlinks to high-quality multimedia examples will further improve the presentation, as can the preparation and delivery of really outstanding content. Adekomi A.A., Adeyanju I.J. Kankam G., Ajibade Y., Oyewusi L., and Oyeniran M.(2009) concluded that just like many of today's classroom experience can be replicated using a network that supports sending video segments to any location one way, Television broadcast has been employed by Obafemi Awolowo University in Nigeria to disseminate instruction, Campus wide. Although the Internet will become the most cost-effective way to deliver this type of content for learning, the real power of the new technology lies well beyond mimicking television. What about the human interaction that takes place in courses, when students ask questions, get help, work together, and discuss common problems? All of these activities take place on today's Internet as well, but with a distinct bow to the limitations of the network. All have been implemented successfully using e-mail, with special software called *groupware* that keeps track of who is in what group, organizes their threads of discussion,

and shares relevant information with group members. This type of communication is called *asynchronous communication,* because it does not require that members of a group be on the network at the same time.

Although the idea of saving messages to be read later may at first sounds awkward, it is a real advantage for distributed learning, since learners' schedules often conflict. (Of course, asynchronous access is also one of the main benefits of voice mail and e-mail.) Alternate versions of groupware support *synchronous communication,* which allows the members of a group to "chat" over the network, instantly receiving and responding to messages from one another. Often called *chat rooms,* these arrangements are a low-speed and inexpensive electronic version of a small-group discussion. Both synchronous and asynchronous communications over networks have been used very successfully for instructors' office hours, group projects, study sessions, and other types of interactions essential to many courses. What can the advanced Internet add to this picture? Well, it can add an actual picture, as well as voices. With an advanced network both synchronous and asynchronous communications can include natural voice and video so that all participants can see and hear one another. This format makes for communication that is not only easier than typing and reading but also richer, conveying the subtleties of expression and tone that are lost in textual communication. Two-way video conferencing has proved to be very effective business meetings and remote classrooms, but it has been too exclusive for widespread use. Advanced networks will make this affordable for both classroom and "anytime, anywhere" education. Network-based curricula will support a full range of interaction with students working alone with lectures in study groups.

3. Web and Needed Improvement on Its Structure and Capability

Although successful on-line collections exist today for certain fields, there are substantial barriers: economic, intellectual, poverty, licensing, authority preservation, and management, that must be overcome to achieve this goal in general. Organizations such as the Coalit Networked Information and the Digital Library Federate are working actively on practical solutions to these problems. While, they are rapidly growing in our institutions there are less well organized collection of digital information for education on the Web, CD-ROM and other media, which can often satisfy specific objectives.

Perhaps the most important components of a distributed learning system will be modules of *learning ware* that is, special computer programs designed to help a student access and work on presentations, questions, experiments, and related information and specific topics. Learning-ware might support flexible access to photographs and charts, sound and video clips, and on-line material focused on some particular learning activity. Such digital collection can be organized in many ways. However we need to adapt them to the particular background, learning styles, and scheduling needs of the learner. More important, the content must be interactive, requiring the learner to search, organize, reason, and experiment with the subject matter, perhaps using special tools, much as in a laboratory or seminar. This type of active learning is usually more effective than a passive lecture, whether or not one uses technology.

4. The Future Internet

The commercial promise of the Internet has led to intense pressures to improve performance and reduce costs. Thousands of signals can now be squeezed into the space that used to carry one. New and existing communications companies are crisscrossing the globe with comprehensive networks of fiber-optic cables costing billions of naira. Satellite and radio companies are finding ways to provide Internet access to locations where there are no cables. Engineers are devising ways to send greater amounts of information using fewer bits of data. Electronic and optical devices continue to decrease in cost. The geographical distribution of information around the world is being shifted in response to demand for access. Modems and GSM compatible Network-aware applications, especially tailored for educational requirements are now part of the developments in projects such as Internet. All of these developments point to vast improvements in capacity and performance.

5. What about Cost?

The cost to the consumer translates to price, which is as much a factor of supply, demand, and competition as of technology. It is most important to note that much of this new capacity introduces new competition between new providers who control and provide alternate routes to the consumers. In Nigeria, prices for connections are beginning to drop in the markets now because real competition. And the cost of network components will plummet at the same time that newer technologies come into mass production. For instance, all GSM providers in Nigeria are now providing data packages at highly reduced price. Nigeria Government now has a better support policy for the use of internet for

instruction.

6. Why all this Intense Investment in the Internet?

Because the basic communications requirements for distributed learning overlap those for collaborative research, electronic commerce, access to government, personal and business communications, and even entertainment, each of these activities could be serviced by an advanced Internet. This means that a solution to the high-quality, low-cost, "anytime, anyplace" Internet worth billions of naira is cost-effective. Such technology is now the subject of intense research and development in Nigerian Universities, government, and the private sector. It is widely agreed that the resulting systems will support a convergence of separate voice, video, and data communications technologies into a single advanced Internet that can replace much of the redundant investment we presently make in all of these three areas.

Future homes, offices, and classrooms equipped with telephone or cable television connections will automatically enjoy the advanced network capabilities required for distributed learning. Taken together, these technical and economic developments point to the possibility of a dramatic increase in access to affordable, high-quality education. Can our institutions of higher education, or their emerging competitors, successfully adapt to the new opportunities in time to realize the vision? This is a challenge for all Nigeria institutions of higher learning. The earlier we join initiative the better for Nigeria as a country.

7. New Opportunities and Challenges for Higher Education

Teaching and learning models of the future assume universal access to the network. Advanced networks appear to offer an educationally and economically viable solution to the pressing need for access to higher education for both the traditional eighteen-to-twenty-two-year-old cohort and for the exploding number of "knowledge workers" who will require access to lifelong learning. It is envisioned that improvements in access to instruction, as well as to its quality and affordability, will occur both on traditional residential campuses and in virtual learning settings. What contextual elements will change as advanced networks enable distributed learning expands?

8. Social and Cultural Issues

With the realization that the twenty-first century will bring with it a set of social issues related to education, the mission of higher education in Nigeria is expanding to provide access irrespective of life circumstances—for example, age, employment status, geography, culture, ethnicity, and family responsibilities will no longer be a barrier. Access means a number of things, from physical access to course materials (provided via the Internet or a learning device) to intellectual access to the subject matter (provided by a neutral, nonjudgmental context, enabled by network-based learning ware).

The classroom lecture and its concomitant social relationships have been dominant in our universities for centuries. Advanced networks and information technology will enable the development of a new pedagogy that nurtures learning among those for whom the traditional classroom model is not a viable form of access or road to academic success. Tensions on campus run high as institutions of higher education face social and economic pressures that their cultural and value systems, embedded in traditional modes of instruction, do not accommodate. Hence industrial actions, cultism and a variety of hidden social vices permeate Nigeria Universities. These vices could be reduced through the evolution of advanced internet instructional strategies.

9. Successful Distributed Learning Environments

Moore and Rossi, (1999) reported the success of Math Emporium project, an elegant example of a felicitous match of advanced networking capability with an institutional need (and desire) to provide access to instruction in Virginia Polytechnic and State University. Faced with burgeoning enrollments and inadequate funding to accommodate students in the traditional classroom model, the university's mathematics department embarked on a courageous effort to transform its approach to entry-level mathematics courses. The Math Emporium, a five-hundred-workstation learning center located in a former department store building, provides an active learning environment for more than ten thousand students. The I-Lab Electronic laboratory project started barely three years ago at Obafemi Awolowo University Ile-Ife It has drastically reduce tension in the area of poor funding of our laboratory as vital research and practical projects can

now be carried out on-line. Using network-based learning modules and diagnostic quizzes, students work at their own pace to master the material. Faculties fulfill their class contact obligations by spending time in the O.A.U. I-Lab, mentoring students when they encounter difficulty with the material. Ongoing assessment of the learning is taking place which alerts faculty to subject matter areas where students are experiencing general difficulty. The identified problem areas then prompt them to schedule short tutorial sessions on those topics. Blacksburg in Virginia, is one of a growing number of communities that offer high-end network access to their residents. Consequently, students are also able to access and work with leaning ware from their homes. Emerging capabilities in authentication and streaming video theoretically will prompt the I-Lab to organize quizzes, "mini lectures," and tutorial help to be made available over the network. It is interesting to speculate whether, over the long term, students will continue to visit the I-Lab for social reasons or if they will build their learning communities solely on the network. Anecdotal evidence from other campuses indicates that students are moving toward the formation of electronic communities and have less psychological need for in-person contact. Enterprise-wide transformational change, such as that taking place at Virginia Tech, requires more than advanced networking; this type of re-conceptualization of the learning environment calls for radical changes in institutional policy and funding allocations. The OAU initiative is as much a study of a courageous group of faculty members and administrators motivated to change the culture of student-faculty relationships as it is a study of the enabling power of advanced networks. This is an example of decisive, strategic action by an institution that understands its priorities. Advanced networking also enables true distance learning to occur by making students' geographical location irrelevant to access.

Examples of the effective use of advanced network abounds in developed countries .The Western Governors University (www.wgu.edu) speaks to the economic importance placed on providing lifelong access to education for the citizens of their states by a number of state governors. The University of Arizona's Southwest Project (dizzy.library.arizona.edu/ SWP/welcome.html) is an example of the use of the Internet to make a large depository of information available to the community, including community colleges and K-12 schools. Both of these examples point to the importance and power of collaboration in realizing successful distance learning.

A milestone in the instructional strategic effort of OAU is the distance learning project which has successfully reduced the number of school-drop outs in our communities. It has also provided effective in-service training opportunities through the digitized Execute MBA pilot program (Adekomi, 2004). Similarly, Jones International University, a non-profit distance education venture, was accredited by the North Central Association Commission on Institutions of Higher Education for offering bachelor's and master's degrees in addition to its certificate programs (Mendels, 1999). There are countless other examples of noncredit, credit, vocational, and degree-granting programs that are being offered to students in a distance learning format. Few would dispute that advanced networks can serve as catalysts for distributed learning opportunities. Many would argue, however, that their capability has outpaced the policy, culture, and infrastructure of U.S. higher education, thus creating a new set of tensions and barriers. It is these tensions and barriers that the National Learning Infrastructure Initiative strives to address.

10. National Learning Infrastructure Initiative and Instructional Management System

The National Learning Infrastructure Initiative (NLII), an EDU-CAUSE program (www.educause.edu/nlii), emerged from the conviction that information technology has the power to bring about systemic change in higher education by transforming teaching and learning. It was formed to address lags in policy, culture, support, and infrastructure that create barriers to transformational change through technology. NLII projects focus on enhancing institutional readiness for such change. Similarly OAU I Lab project serves not only Obafemi Awolowo University but all the surrounding institutions of higher learning. It is an experimental base for software development. Table 1.1 below shows typical course management activities, linked here with the specifications that will enable such activities to take place.

One such project, the Instructional Management System (IMS) (www.imsproject.org), was conceived to build a framework of specifications, standards, and definitions around which interoperable products could be developed. IMS-compliant products will soon enable faculty to execute efficient searches on the Internet for relevant courseware and let them quickly and easily create, obtain and tailor course modules to suit their individual curricula, taste' and modes of expression. The IMS holds much promise as the key element of a technical infrastructure required to move gracefully the modalities for teaching and learning that address the issues of quality, access, and affordability.

The roles of faculty members and students will change in this new learning environment, as will relationships between faculty students, administrators, vendors, and publishers. Students will take more responsibility for their own learning programs and outcome. Faculty members "will become teaching and learning process designers and managers

as well as content specialists" (Massy, 1998, p. 15).

Table 1.1. IMS Specifications

Activity	Specification Type
Find it	Metadata
Get it	Packaging
Run it	Runtime services
Track it	Profiles
Discuss it	Collaboration
Integrate it	Enterprise

Source: Developed by the authors in collaboration with Steve Griffin, technical director of the IMS project place in an interoperable, network-based environment.

11. New Roles and Relationships

Advanced networks also hold the power to alter the social and business relationships surrounding the educational enterprise. Student and faculty alike bring past experiences and assumptions about teaching to the virtual classroom. Swept out of their traditions roles, with the dynamic of their relationship changed, both feel insecure. Students wonder if faculty is really teaching them if more of their learning appears to take place independently, from learning ware accessed via the network. Faculty often questions her values and indeed, her role and identity as teachers when they move from the position of control in the classroom to serving as a helper to individuals and small groups of students, especially since their invention in the learning process often comes only at the invitation of the student; but the more fully engaged student become, owing to the active learning facilitated by information technology, the more will a new faculty-student relationship emerge. Faculty development will take on a new priority. Campus support services will consist largely of teams of faculty members, professionals with formal training in curriculum design and development, and information technologists, collaborating in a partnership that respect and values the critical scrutiny, special insights, and expertise that each contributes to the effort. Our familiar business models will no longer apply as the roles of producer and consumer. A shift will evolve which recognizes the cooperative roles to be played by instructional developers and software managers.

12. New Educational Products and Economic Models

Some institutions of higher education are more ready than others to address the implications of advanced networking for their future goals, priorities, and economic viability. The hype associated with distance education has led some higher education institutions to flounder in attempting to enter an ill-defined market without clear institutional goals or a viable business plan. The higher education community is just beginning to grapple with the policy and cultural barriers to successful entry into the distance learning economy. Some suggest that those barriers may not come down quickly enough to forestall massive structural change. Lee Alley, former director of Global Market Development of Peat Marwick, provides convincing data of the impending; explosion of demand for lifelong education. According to Alkit (1999), the market population of demand for lifelong learning is currently over 165 million persons in the eighteen to sixty-four az's group. This demand is coming both from individuals and from those industries that employ them. Alley implies that traditional institutions of higher education will be too slow to overcome the barriers to the type of transformational change required to address this demand. Wall Street cannot afford to ignore this huge market for lifelong education. Consequently, new corporate educational entities will rapidly emerge. E-commerce, in this context becomes both *educational* and *electronic* commerce.

Alley paints a future higher education landscape that looks dramatically different from what we know today. In his scenario, there are some traditional campuses which will change to a focus on providing a venue for campus life and socialization of the traditional eighteen-to-twenty-two-year-old age cohort; others will find themselves among providers of core courses, whether to students on other campuses or in remote home and business locations. For-profit

Vendor-will provide locally unique or specialty courses. Alley predicts that pricing for commodity (core) courses will contract to the lowest level available among a few branded institutions with high volume and low overhead, resulting in the following provider mix:

- 10 medallion brand institutions
- 100 dominant provider institutions
- 1,000 consortia collaborators
- 2,000 consumer institutions
- 10,000 tor-profit vendors

If these projections are borne out, then we will see a rain-unbundling of campus-based student services from per-credit-to pricing, new credit repositories and services, and the emergence or credit brokering and credentialing services. Advanced networks are again the enabling force behind these changes, because they allow students to be enrolled simultaneously with multiple educational providers, irrespective of their location. In addition to its work on an interoperable teaching and learning standards infrastructure, the IMS is geared toward the development of the standards and specifications to record and report the outcomes of the virtual classroom experience.

13. Summary

Advanced networks are on the cusp of new breakthroughs in communication capabilities. However, the tool is not some to be the solution unless we address its social, economic, and policy implications in concert with the expansion of advanced network. Not all such technical capability will have a positive effect in addressing pressing social issues. To some, these emerging capabilities (such as the ability to see and hear others communicating over a network\ appear attractive because they will enable teaching and learning to occur in ways that are analogous to the traditional classroom. Although such capability may enhance some interactions, it may not be the technology of choice to neutralize certain types of biases that surround the traditional classroom setting (such as cultural, ethnic, gender, or age biases).

Moreover, advanced networks will contribute to the advancement of those institutions of higher education that understand that their commitment to transformation must be grounded in realistic self-knowledge. Those who seek to enjoy the benefits of advanced networks need to match the capabilities of the technology to the strategic goals of the institution.

14. Conclusion

Taken together, these developments in the technology and organization of teaching and learning and the emergence of powerful and affordable networks present a unique opportunity to dramatically improve access to affordable, high-quality education. Such improvements will be needed to help meet the greatly increased demand for all types of education, but they are certain to involve widespread, systemic changes in the way we organize these activities today. Since the issues discuss involve and encompass the core mission of our campuses, the University instructional system must rise to the awareness and concern of all the stakeholders in higher education. We are entering an era of fundamental change that will demand leadership as few eras have before and it is presumed that a strong foundation in advanced internet is a plausible approoach.

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