



Utilization of Information and Communications Technology for Education in Africa

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PREFACE

This monograph was undertaken by Dr. Govinda Shrestha, a research fellow at Harvard University, during a one-month consultancy with the UNESCO International Institute for Capacity Building in Africa (IICBA), Addis Ababa, Ethiopia, in October, 1999. The purpose of the consultancy was to explore ways in which the new information and communication technologies (ICT) can be utilized in Africa, given the situation where the majority of educational institutions at primary and secondary school levels do not have access to electricity, let alone to computers and internet. Even at tertiary level many institutions do not have access to internet, although a considerable number may have access to computers. Internet may be inaccessible either due to low access at country level or high cost.

Despite the serious challenges posed by the lack of electricity, lack of connectivity to the internet, and the present low financial resources available to education in Africa, in particular most of Sub-Saharan Africa, Africa nevertheless has to face up to the essential need to be at the cutting edge of technological innovation. Unless Africa accepts this challenge, its position in world development is likely to deteriorate even further in the next two decades.

Education can play a cardinal role in ensuring that African institutions, teachers and teacher educators have the opportunity to utilize information and communication technologies. A high level of usage of ICT can impact positively on economic and other forms of development.

However at this stage of Africa's development, cost-effective and practical ways have to be devised to enable African universities and schools to access ICT. This monograph is a contribution to the dialogue on how ICT can be used in Africa today to improve both educational access and quality.

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Introduction

The world educational crisis and the world crisis in education scenario painted by Coombs (1968, 1985), still holds substantially valid in Africa. In 1968, Coombs [1] observed:

Since 1945, all countries have undergone fantastically swift environmental changes, brought about by a number of concurrent worldwide revolutions in science and technology, in economic and political affairs, in demographic and social structures. Educational systems have also grown and changed more rapidly than ever before. But they have adapted all too slowly in relation to the faster pace of events on the move all around them. The consequent disparity—taking many forms—between educational systems and their environments is the essence of the worldwide crisis in education.

The growing obsolescence of the old, outmoded curriculum content in relation to the advancing state of knowledge and the realistic learning needs of students, the misfit between education and the development needs of societies, the growing imbalances and maladjustments between education and employment, as well as serious educational inequalities between various social groups, and the gap growing between the rising costs of education and the funds countries would be able and willing to invest in it are some of the glaring disparities, according to Coombs. The causes of disparity are, in his opinion, the sharp increase in popular aspirations for education, the acute scarcity of resources, the inherent inertia of educational systems, “which caused them to respond too sluggishly in adapting their internal affairs to new external necessities, even when resources have not been the main obstacle to adaptation, and the inertia of societies themselves—“the heavy weight of traditional attitude, religious customs, prestige and incentive patterns, and institutional structures—which has blocked them from making the optimum use of education and of educated manpower to foster national development.”

17 years after the publication of Coombe’s first book, things are not much better. In fact, the education situation worsened as the world education crisis turned in 1985 into a world crisis in education. The early warnings of a world educational crisis were no false alarm. Not only had the crisis Coombs [2] noticed in 1985, been intensified by growing maladjustments between education system and the rapidly changing world around them, but it had acquired new dimensions that were even more troubling. The most troubling of all was that there emerged a crisis of confidence in education itself. The explosion of learning needs and the inability of education systems to bring both the quantitative and qualitative changes necessary to balance the evolving learning needs, and the tighter cost squeeze on education were facts of life. And there was a clear-cut maladjustment between education, on the one hand, and the world of work and the economy, on the other. Sadly, Africa faces today all these plus many more problems in education. The crisis impacting African education goes deeper and various drastic measures are required to address it before the situation gets even worse. A number of initiatives were taken in response to the gravity of the complex challenges facing education. The Jomtien Declaration and Framework of Action on “Education for All” in 1990 sought to

re-enforce commitment by Governments, funding agencies and non-governmental organizations on the principles that would bring about basic education for all. The Priority Africa Programme established by UNESCO in 1989 called for vigorous efforts to promote, among others, distance learning, information technology and higher education in Africa. The Assembly of Heads of State and Governments of the Organization of African Unity (OAU), held in Yaounde, Cameroon in June 1996, proclaimed the period 1997-2006 the Decade of Education in Africa. The Education Department of the OAU acts to promote harmonisation of education policies systems and programmes at all levels, as well as the development of networks and the Pan-African cooperation in education area. In 1999, the OAU Ministers of Education and Heads of States approved the Decade of Education Programme of Action in which it clearly noted some of the acute problems [3] faced by the formal education systems in Africa:

- Persistence and maintenance, whether deliberately or otherwise, of the aims, objectives and outcomes of outdated education systems, despite the numerous reforms undertaken from time to time.
- The fall in the general standard of achievement of pupils and students linked to the shortage of infrastructure, equipment and teaching materials, on the one hand, and on the other hand, to the large class sizes as well as poor qualifications and low morale of teachers.
- The lack of relevance of the content of educational programmes, whether in terms of language and culture, or in terms of employability and technology, resulting not only in a significant number of dropouts, but also in a lack of linkage between training and employment, expressed in the persistent unemployment of graduates.
- Inability of formal education systems to satisfy development needs and strategies, and therefore its inability to participate in development

It is increasingly realised among various educational and political circles that present-day educational challenges cannot be met with traditional means alone. The introduction, use/re-use and deployment of new as well as old electronic and communications technology are, therefore, being considered an important contribution to the solution of the problems in education. “Higher education institutions must adopt new approaches for the packaging of information, for course delivery and for thinking traditional approaches to teaching and learning”, says the Consolidated Declarations and Plans of Action of the Regional Conferences on Higher Education held in Tokyo and Dakar (1997-98). The UNESCO Regional Conferences clearly emphasise that teachers, professors and technical and administrative staff must be given training that enables them to integrate new information and communication technologies into their teaching programmes, and to examine the multiplier effect with regard to their use.

Various attempts have recently been made, to increase access to modern technologies and services. However, very few educational institutions have the technical and financial resources needed to use new technologies for educational purposes. In addition, the low level of development of the underlying infrastructure needed to make effective and wide use of technologies is quite discouraging. Africa’s communication and information infrastructure is mostly limited to capital cities and it is out of reach of the great majority of Africans who live in rural areas and dispersed geographical locations. This shows that the current utilization of information and communications technology for education is minimal, limited and constrained in many ways. But since new information and communications technology and education act together as multipliers, the prospect of

educational development working in tandem with the telecommunications development in future looks promising.

This report presents first a general overview of the *present* utilization of electronic and communications technology, particularly new technologies such as computers and the Internet for education in Africa and then recommends specific strategies for the applications of such technologies in education focused particularly on:

- Teacher education
- Curriculum development
- Distance education, and
- Educational policy, planning and management

The report, in describing technology use in African education, will consider application of technology at a broad level, but with some emphasis on the tertiary education. The term ‘technology’ will refer to ‘electronic and communications technology’ and ‘technology use’ will assume both ‘technology as a product’ and ‘technology as a process’ ideas [4]. The terms ‘technology use’ and ‘technology utilization’ are used interchangeably.

Utilization of Electronic and Communications Technology

Several countries in the Africa region are already familiar with different technologies introduced in the educational systems. Various studies have shown that educational radio and educational television have been used in many developing countries primarily as a means of reaching learners in remote locations and making education accessible and affordable to many. Training in-service teachers at a distance has, for example, been a regular practice of teacher education programmes in many African countries.

Although technology use in distance education and learning is, in fact, a long-established practice, there has recently been a remarkable shift in its use in developing countries. Potashnik and Capper [5] observe:

Technology is still a major contributor to the dramatic transformation of distance learning. Although the use of technology for distance learning is not new—radio and television have been used effectively for more than forty years—satellites and the Internet are transforming the world into a borderless educational arena, benefiting both previously underserved citizenries and education entrepreneurs.

New technologies have now greatly expanded, at least in theory, our educational horizons. However, Potashnik and Capper believe that print-based communication will continue at least for some time in future. They note:

Various technologies have been used for distance education, but print-based correspondence courses have been, and will continue to be, the dominant delivery mechanism in both the developed and the developing worlds. Print is still the cheapest technology, and, even if the costs of using high-tech dissemination tolls fall below those of print, it will be some time before many countries have adequate infrastructures.

One good example of the highly successful print- or correspondence-based practice is the Zimbabwe Integrated Teacher Education course (ZINTEC), established after independence in order to train primary teachers in the country. The successful ZINTEC tradition was a precursor to the Zimbabwe Open University (ZOU), established in 1999 to upgrade school administrators and teachers and address the need to provide educational opportunity to a larger clientele [6]. The ZINTEC programme combined distance education through use of print and radio with two extended periods of residential training, weekly seminars held at the schools where trainees were placed in clusters of three, weekend and holiday courses. Residential courses cover twelve months of the four year course.

Africa has a long history of the use of technology of one kind or another for educational purposes. The continent has been a fertile ground for a number of open universities, distance education departments under universities, independent distance education institutions, and various technology-based programmes, projects and initiatives. Many of the institutions and programmes, initiated in the past, are still actively deploying technologies in various forms and combinations as means to enhance existing programmes and fulfil different educational objectives.

Unfortunately, a number of the past technological innovations (based on radio, television, video, film, print technology etc.) have not been sustained. As far as the breakdown of the systems/innovations in education is concerned, it is primarily related to technical know-how in both utilization and maintenance of the systems. External aid played a key role indeed, in the establishment of most of these technologies, but in many cases, the need for the provision/supply of local experts was not given the due consideration it deserved [7]. Consequently, a number of programmes initiated with enthusiasm in the past lost their momentum, and were unable to survive.

Despite some early weaknesses and failures, new technologies, particularly the computers and networking technologies, have, by creating conditions for rapid connections, opened up possibilities for many different educational and learning opportunities. From radio and satellites to computers at the desktop and palmtop, various communications channels have been used to deliver education and training both on-campus and off-campus. Today, Internet connections are, for example, possible over any kind of network: dial up telephone, private digital and analog networks, satellites, radio, cellular, public switched telephone networks, Asynchronous Transfer Mode (ATM), and so on.

Advances in technologies have led to the creation of a great opportunity to what is now called “leap-frog” stages of development. This is an opportunity that is unparalleled in history. In 1995, the World Bank [8] issued a dire warning:

If African countries cannot take advantage of the information revolution and surf this great wave of technological change, they may be crushed by it. In that case they are likely to be even more marginalized and economically stagnant than they are today.

The uses of technology for various educational (and other) activities seem to be growing exponentially in recent years. This is a worldwide phenomenon, and equally true of Africa. In some places, use of various computer-based programs has multiplied. A variety of computer-assisted instruction/programs have

proliferated and the use of computing and information systems in management has increased tremendously. As a result, various initiatives and programmes have been launched to respond to the challenges and crises confronting education and learning and to stimulate change and create new learning environments that address localised and specific needs of learners in different places and settings. Currently, we witness a flurry of activities and projects being run and operated under the cooperation between the public and the private sectors. A few international organizations and institutions have remained increasingly active in transforming the education sector to enable people to acquire new skills and training that are so essential in the Information Age. In some places, such education and training programs form part of formal education, while in others, it is primarily a component of nonformal, even informal education. The following examples were selected, within a limited time frame, out of a large pool of activities and projects throughout Africa. Their presentation does not follow any priority order.

It is clear that despite four decades of development efforts, the nature and quality of education, educational access and opportunity for the majority of people in Sub-Saharan Africa (SSA) have not improved. The education situation at the tertiary level has been deteriorating rapidly. Many tertiary institutions in their present form are overwhelmed with problems related to access, finance, quality, and internal and external efficiency, to mention a few. Two years ago, the African Virtual University (AVU) was launched, keeping in view the monumental problems affecting the higher education sector in Sub-Saharan Africa (SSA). The introduction of AVU is basically geared towards promoting alternative modes for the delivery of tertiary education to complement the efforts of existing institutions of higher learning. As the first interactive instructional telecommunications network, AVU uses the latest telecommunications technology such as satellites, and the computer-based technology (the Internet) to improve the quality and relevance of science, engineering and business instruction for the benefit of students and professionals from 22 countries in Sub-Saharan Africa. One major aim is to expand enrollment levels significantly in these areas. AVU has, by now, provided more than 2,000 hours of broadcast instruction to some 9,000 students and professionals in 14 Anglophone, 8 Francophone and 2 Lusophone countries.

Established only a few years ago, the Confederation of Open Learning Institutions of South Africa (COLISA), serves as the torchbearer of higher education through distance learning in South Africa. COLISA comes as an attempt to address educational needs that cannot be met by individual institutions acting alone. Collaboration and coordination are necessary in various stages of work. COLISA's members include the University of South Africa (UNISA), Vista University and Technikon SA.

UNISA, the oldest and largest distance learning institution in Africa and one of the eleven mega distance education institutions in the world, serves as a prime example of technology-based education and learning. Its three regional centres in the north, south and east, six learning centres throughout Africa plus its library which is one of the largest and best equipped research libraries in the southern hemisphere—all bear testimony to the increased use of technology in South African education.

SchoolNet SA and Cyber School Africa (CSA) are two more examples of the technology-based educational initiative in South Africa. Established in South Africa, SchoolNet SA, a national non-governmental organization (NGO) is actively developing and expanding the use of the Internet in South African schools. This organization is helping educators and learners transform education through the application of

information and communication technologies (ICT). SchoolNet SA works by providing leadership and expertise needed in education, and it helps develop effective partnerships in various areas, including the Internet connectivity and appropriate technology, human resource development and *capacity building* and content and curriculum management and development. The organisation's major activity is to contribute to the realisation of national priorities in the education and training system, working towards a knowledge-based society, expanding access to telecommunications and information, and educating youth for full participation in South African and international life [9].

Cyber School Africa (CSA), an on-going project in South Africa, on the other hand, focuses on the intensive development of web-based revision tutorials in the Physical Sciences (standard and advanced) and Mathematics (standard) related testing for the South African matriculation examinations. The project also includes arrangements for individualized tutoring by e-mail and fax. The provision of supplementary services currently being developed includes free web-based e-mail for all CSA members (including teachers and parents), URL archives (curriculum-based links to other on-line resources), and South Africa's first graphical user interface (GUI) chat facility for educational purposes. CSA also emphasises marketing the site, further enhancing the site, and extending the site to include additional subjects, such as Higher-Grade Mathematics, Biology, or English.

During the last decade, computer networking has spread rapidly in Sub-Saharan Africa. Now, virtually all nations have established some form of connectivity. It is interesting that universities and their supporting governments were not among the network pioneers for obvious monetary and political reasons. Since 1990, however, university participation, to a greater or lesser degree, in computer networking has increased. Establishment of some form of connectivity, however limited, has been a priority for many for quite some time. In Mozambique, for example, there were few human and financial resources to support early uses of the Internet. Consequently, the strategy employed was based not on the imperative of new technologies, but upon providing basic electronic mail connectivity for at least the provinces of the country. The early users of networking on the continent were organizations working in special areas such as health, agriculture, pest control, marine and fisheries and the like with funding from external sources. Online network development has thus been spurred mainly by development agencies and non-governmental organisations and many online connectivity projects have, in fact, used UNIX and FidoNet store-forward technologies.

Aside from the Republic of South Africa, which has an installed base of commercial/university systems facilitating Internet growth, the computer communications in other countries do not have an installed base of commercial/university support systems. So many of them are only small 'bulletin board' systems facilitated particularly by the Association for Progressive Communications (APC). The situation is now changing as a result of the APC's British affiliate GreenNet's help with, particularly the establishment of several dozen small systems aimed at expanding African connectivity.

Other examples of technology utilization and development include RINAF (Regional Information Network for Africa) which has been active in the development and dissemination of information regarding the use of telecommunication technologies in Africa since 1988. PADIS (Pan-African Development Information System), based in Addis Ababa, has served a wide range of development needs that include computer networking throughout a wide region. It is reported that PADIS has been instrumental in the development of low cost

connectivity in numerous university departments in the region. The Regional African Satellite Communications Organisation (RASCOM) was established in order to address the problem of access to telecommunications in rural areas.

Similarly, the American Association for the Advancement of Science (AAAS) has been active since 1987 in a Sub-Saharan Africa Program that focuses upon the problems of dwindling funds for books and periodicals in university research libraries. Side by side with this problem, research capacities of African universities had declined by as much as 50% since 1982, according to a report presented to the Association of African Universities in Accra in 1992. Makerere University reported that its subscriptions to periodicals in all fields had fallen from 800 in 1985 to 200 in 1995. The AAAS project has been working with 8 libraries in an effort to determine the value of CD-ROM uses and other electronic information technologies in research libraries.

The creation of the African Educational Research Network (AERN) in 1992, by a small number of African, American, Canadian and British universities is an example of North/South collaboration in networking activities. The Network coordinates various efforts to support research *capacity building* in African universities. Recently, the AERN is busy implementing “electronic research roundtables” aimed at bringing together professors from African and northern universities as supporting resources for the large number of African students who are working in several northern institutions. The members of the AERN include Kenyatta University, Addis Ababa University, the University of Zimbabwe, Makerere University, the National University of Lesotho, Bayero University in Kano, the University of Ottawa, the University of Manchester, Clark-Atlanta University, Ohio University, North Carolina State University in Raleigh and Oklahoma State University. All AERN members have connectivity with the exception of Bayero University.

The Educational Research Network for Eastern and Southern Africa (ERNESA), currently led by the University of Botswana and the Educational Research Network for Western and Central Africa (ERNWACA) coordinated by the IDRC (International Development and Research Centre), based in Dakar, are examples of two thriving networks that began with conventional modes of exchanges and are now moving toward electronic information exchange.

Technology-based or enhanced educational initiatives focused primarily on African women include proposed activities being planned under the partnership between the Forum for African Women Educationalists (FAWE) and the UNESCO International Institute for Capacity Building in Africa (IICBA). Abantu for Development is a non-governmental organization founded in 1991 by African women for the purpose of harnessing new technology-based information resources to the benefit of African people.

Internet connectivity in African nations is rising, although accessibility remains only in capital cities and/or particular areas of large cities. In the past, the private sector initiatives to bring the continent online were insignificant. But since 1995 there has been a resurgence of efforts to bring "full inter-connectivity" by the year 2010 under the leadership of the United Nations Economic Commission for Africa (ECA). The Regional Symposium on Access to Telematics in Africa, held in Addis Ababa in April 1995, was remarkable in that it gave birth to a new initiative, the “African Networking Initiative”, which comprises the ECA together with a few other international organizations, including UNESCO. The ECA Conference of Ministers held in May 1995, appointed a high-level working group on Information and Communication Technology to draft and design the

Action Framework to help African countries to "leapfrog" stages of development and participate in the Information Age. A year later, the Framework was approved by the meeting of ECA Conference of Ministers. The result is an "African information society initiative" [10]. Africa has lately become the ground for an unprecedented range of development projects aimed at increasing the uses and impacts of information and communications technologies.

The overall position of African inter-connectivity, based on an account presented in 1997 by Jensen [11], is as follows:

- *36 Countries in Africa have full Internet access in the capital cities:* Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi Cameroon, Democratic Republic of Congo, Central African Republic, Cote d'Ivoire, Djibouti, Egypt, Ethiopia, Gabon, Ghana, Kenya, Madagascar, Malawi, Mali, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Reunion, Senegal, Seychelles, Republic of South Africa, Swaziland, Sudan, Tanzania, Tunisia, Uganda, Zambia, Zimbabwe.
- *Countries that will very shortly have capitals with full Internet access:* Gambia, Guinea, Guinea-Bissau, Liberia, Rwanda, Sierra Leone, Chad.
- *Countries with capital cities remaining without full Internet access:* Cap Verde, Chad, Comoros, Congo, Equatorial Guinea, Eritrea, Liberia, Libya, Mauritania, Sao Tome e Principe, Somalia, Western Sahara.
- *Countries with only one full public access ISP:* Algeria, Benin, Burundi, Burkina Faso, Cameroon, Central African Republic, Mauritius, Niger, Malawi, Seychelles, Tunisia, Zaire, Zambia.
- *Countries with access in some secondary towns:* Benin, Botswana, Burkina Faso, Egypt, Kenya, Mauritius, Morocco, Senegal, Republic of South Africa, Zimbabwe.
- *Countries with low-cost dial-up Internet access nationwide:* Burkina Faso, Mauritius, Morocco, Senegal, Republic of South Africa, Zimbabwe.

This shows that African connectivity is rising but it is severely limited to major cities and capitals. Again, there is a great disparity between various sub-regions.

"Creating Learning Network for African Teachers" is a UNESCO project that forms part of the Harnessing Information Technology for Development component of the Special Initiative on Africa. The major aim of the project is to enhance the capacity of teachers and their institutions to become more responsive to new challenges in teaching and learning, by connecting teacher training colleges and Education Ministries, researchers and communities through the existing Internet infrastructures. The project also aims to increase technology applications among teachers and provide them with basic skills to use such new technologies. A regional workshop on Computers in Education, held in Lesotho, in 1996, and a meeting in Harare on Capacity Building for Information Technologies in Education in Developing Countries organized by the International Federation for Information Processing (IFIP) are among the activities linked to this project. Further efforts are being made to develop a project networking four teacher-training colleges in each of the twenty African countries [12].

One remarkable feature of telecommunications development is the increasing number of telecentres, telecottages or community communication centres in various parts of the continent. The establishment and operation of hundreds of telecentres and communication centres indicate a new level and flow of interest in technology use. Some of the common labels used to describe these activities, include telecentres, telecottages, community technology centres (CTC), community communication shops, networked learning centres, multipurpose community telecentres (MCT), digital clubhouses, community communication centres (CCC), technology access centres etc. One common characteristic of these centres is a shared place/facility that provides access to information and communication technologies for various purposes. These centres may differ from one another in the way they are funded, organized, owned and operated/administered. Generally, they are guided by the concept and spirit of universal service in telecommunication. IT is now considered, at least in some policy making circles, an agent of transformation of various dimensions of human life and activities in the knowledge-based society of the new century.

Some of the telecentres are equipped with only a telephone and a fax machine, others with computers, printers and an Internet connection, but they are mushrooming all over Africa. These centres are primarily designed to serve various informational, educational and developmental needs of the community. The ACACIA initiative, launched by the International Development and Research Centre (IDRC) in 1997, serves as an example of telecentres aimed at putting information and communication technologies to work on behalf of social and economic development for local communities in sub-Saharan Africa. It is said that Acacia will initially be focused on four countries: Mozambique, Senegal, South Africa and Uganda and the projects will aim to reform policy, extend infrastructure, address technology and usage issues, and support the creation of relevant applications and content.

Thus, some of the major organizations engaged in telecentre activities are: the International Telecommunications Union (ITU), Canada's International Development Research Centre (IDRC), the U.S. Agency for International Development (USAID), The United Nations Development Programme (UNDP), and the World Bank. Among the major initiatives in Africa include IDRC's Acacia, ITU's Multipurpose Community Telecentres, USAID's Leland and LearnLink, UNDP's Community Communications Centres, and the World Bank's WorLD.

In addition to the International Development Research Centre (IDRC), which supports a range of ICT projects in Africa through the Acacia initiative [13], some of the leading organizations and initiatives related to African inter-connectivity and technology development for various developmental purposes, including educational are:

Bellanet: It aims to serve as a catalyst for the appropriate use of ICTs in development and a 'best practice' model that shares lessons learned from projects and the collaborative initiatives with which it works [14].

International Institute for Sustainable Development (IISD): It provides an Internet site for information on sustainable development, including information and communications technology [15].

World Bank, Knowledge Information and Technology Centre: It provides the Africa Live Database, a system that gives users easy electronic access to the latest economic, social, and sectoral data on sub-Saharan Africa.

<<http://www.worldbank.org/aftdr/connect/connect.htm>>

The Bank also provides the Sector Knowledge Management System, which captures, synthesizes and disseminates knowledge of development practices and lessons learned from experiences on the ground in Africa

<<http://www.worldbank.org/html/extdr/afr.htm>>

Barriers

The development of African connectivity and information and communication technologies (ICTs) also faces a number of problems and barriers. The cost of systems and the need for management (technical and administrative) remain the major challenges facing the development of African connectivity. Technical costs not only reside in hardware. "System running costs can become prohibitive in an African environment when a node must handle the rising tide of "unsolicited" e-mail usually associated with Internet inter-connection", says Karen Banks of GreenNet/APC [18]. She further points out that most local African computer networks are chronically under-financed, under-staffed, and saddled with inappropriate software, and that lack of resources has compelled some to take a stepped "grassroots" approach to the development of connectivity in Africa.

Implications for UNESCO International Institute for Capacity Building in Africa (IICBA)

Internet development is moving fast in northern and southern Africa. The east and west sub-regions are lagging behind, but the central sub-region is the one that is way behind. Internet development is, in fact, very skewed in favour of South Africa. South Africa is relatively quite advanced, with about 225,000 dial-up accounts and hosting between 700,000 to 800,000 of Africa's 1.2 million Internet users. The number of Internet users in Europe and North America is estimated at around one in six, but in Africa the figure is one in a thousand. If South Africa is discounted, the figure is one in five thousand. The Institute (IICBA) should, in partnerships with other institutes and organizations, explore ways to address such an imbalance between regions and among various sub-regions within Africa.

Distance or open learning is expanding worldwide. There is also a new interest in nonformal education. Information and communications technology for development now includes a wide array of nonformal education and training programmes. This is a growing trend that is energized by education's capacity to foster social change and development. Another remarkable development is that telecentre activities and programmes are expanding, gradually in some places, and at a remarkably faster rate, in others. These are valuable resources established, in many cases, under both the public and private, governmental and non-governmental partnerships. Better and innovative ways should be found to utilize them for educational purposes. We need to seize this momentum. At the same time, there are various uncertainties that are overshadowing such efforts and the gap between the rich and poor countries and segments of African societies is widening further. The Institute should make consistent efforts to conduct needed research aimed at opening new avenues of understanding of such problems and challenges. Meanwhile, it would be useful to explore how information and communications activity centres or telecentres can be used to help promote

activities related to curriculum development, teacher education, educational policy, planning and management, and distance education.

Strategies for the Utilization of Electronic and Communications Technology

Strategies for the utilization or application of electronic and communications technology in various dimensions of education form an integral part of the overall educational strategy of IICBA. In this sense, the specific strategies described below are an integral component of the IICBA's overall strategic policy framework. The Institute's overall strategic policy framework focuses on:

- Addressing the educational, technical and professional needs of member states.
- Providing a forum for the sharing of both positive and negative experiences so as to enable institutions and education systems to benefit from work done by sister bodies.
- Bringing the latest research and development in Africa and globally to institutions in Africa.
- Enhancing the capacities of regional, national and local level institutions.
- Providing the opportunity for technological improvements, such as utilization of electronic media for networking and for educational purposes.

One of the biggest problems in the majority of educational institutions in Africa today is the lack of resource materials, in particular the lack of library facilities. Many university libraries are unable to purchase the latest books and journals because of a serious shortage of funds. As a result, students, researchers and lecturers may well be seriously out of touch with the latest developments in their fields. At primary and secondary school level, many classes function with the minimum of resources, often with only one or two textbooks in a class. This serious deficit can today be tackled through the utilization of radio, audio cassettes, television, videos, diskettes and CD roms, which offer a low cost but high impact way of providing educational materials to many learners who are presently deprived of such facilities. IICBA's electronic library programme already seeks to overcome this deficit.

The overall strategic framework of IICBA includes the clause "providing the opportunity for technological improvements" that is directly related to the theme of this report. Intimately linked to this framework are the following strategies focused on the four vital areas of our concern—teacher education, curriculum development, distance education, and educational policy, planning and management.

Strategy for Utilization of Technology in Teacher Education

The Institute has already begun setting up its Teacher Education Network (hereafter called Network), a network of teacher training institutions in Africa utilizing where possible electronic media, including internet. A group of nine countries has already been selected in Phase I of this programme. An inauguration workshop was held in Addis Ababa, Ethiopia, in October, 1999. The Network recognizes the importance of the improvement of teachers' academic and professional skills, their teaching methodologies and their contribution to the improvement of educational systems. It also spells out the need for uniting teacher education institutions Africa wide to each other and to key institutions internationally.

The strategy suggested below takes into account this and other encouraging developments which have taken place in teacher education area recently. Elements of the specific strategy for technology use in teacher education are:

- a) The Institute must have a technology network that is capable of handling high volume work with high levels of efficiency. It must match the nature, extent and networking needs of the Institute's various programmes and activities.
- b) The Institute should make strong efforts to build or develop a comprehensive education sector database, preferably in partnership with groups such as the Africa Live Database at the World Bank and UNESCO Divisions responsible for maintaining education sector database related to Africa. Various international databases contain a large pool of macro-economic and sectoral data. The education sector data cover, in most cases, student enrollment by age, level and gender. Data on other vital educational performance indicators such as teachers (their education level), money allocated to education, library facility and many other education indicators are conspicuously lacking. Organized data and information on nonformal education is hardly available anywhere. Necessary steps must be taken in this direction. The Institute can, in partnership, collaboration or cooperation with other agencies, contribute something of historic significance in both formal and nonformal education areas. And the work that involves updating and maintaining such a database(s) can form an integral part of the Institute's research and development activity.
- c) Proper mechanisms or pilot projects should be initiated or developed to encourage teachers and teacher educators to use or find innovative ways of using, where and when available, telecentres or community communications centres for teaching and learning purposes. For example, one way could involve arrangements of teachers or teacher educators' timely get-together programs to discuss and explore innovative ways of acquiring and using technology for teaching and learning purposes. Such meetings can provide valuable insight into the problem at hand.
- d) Provisions should be established to make distance teacher education or learning courses available in partnership with the African Virtual University, UNISA, the British Open University, the Cambridge Extension College, the Indira Gandhi Open University and reputable institutions from both the North and South.
- e) Also, initiatives should be taken to create an environment, which facilitates innovative ways of using new electronic and communications technologies for expanding teacher education under the Network. For example, where access to electronic network or facility is unavailable, one way would be to facilitate teachers network through the use of facilitators whose job will be to carry messages containing teachers' perspectives, ideas, etc., on a routine basis. The Network can act as a source/provider of information and knowledge that are relevant and which can help fulfil many different needs felt by teachers in educational institutions. Even newsletters and radio programs can be used to reach teachers who are participating in the Network from distant or remote locations.
- f) The "persistent inability of education in general and schools in particular to keep pace with the advances in information technologies" [19] is an important issue. A mixed mode that combines features of both electronic and traditional network can serve the purpose well, enabling classrooms to access resources outside their immediate milieus through electronic means. Moreover the cost of electronic networking is likely to decrease considerably, making the technology cheaper and more easily accessible. We should

plan, prepare and act based on the proven fact that one of the key features of today's electronic and communications technology is the continuing fall in charges.

Strategy for Utilization of Technology in Curriculum Development

IICBA's plan to establish a Curriculum Development Network in Africa aims at serving a number of vital functions in the development of curriculum that is time-sensitive and desperately needed in the new development context. Transforming traditional, outmoded curriculum is not something that can be achieved easily in that such an activity calls for a complex procedure involving the cooperation of many different government agencies, education departments and others. Elements of the specific strategy for technology use in curriculum development are:

- a) IICBA should, through the proposed Curriculum Development Network, conduct a general evaluation of various activities concerning curriculum development in a select group of African countries.
- b) IICBA should plan to hold both face-to-face and electronic discussions, including a list-serve-based discussion periodically to increase interaction and exchange of views focused, particularly on the problems associated with curriculum in science, mathematics, technology and language, with special emphasis on distance learning or other technology-based programmes.
- c) The recently announced WorldSpace broadcast programme has, it is reported, plans to deliver a wide variety of programmes related to, among others, educational, medical and religious information. It is said that international and regional content providers will ensure that listeners have access to news and educational programming content, and that a multimedia service will be offered in the near future which will bring users a variety of content to their desktop computers. IICBA should explore, in addition to the visual data transfer capabilities of such a carrier for use with computers, the possibility of developing curriculum appropriate for our educational purposes via this channel.
- d) Special training programmes should be devised and implemented for teacher educators and facilitators (who assist distance teachers at places such as satellite downlink sites) as well as learners who will have to operate at the interface between curriculum and new technology. Such training will be necessary because, as new technologies such as computers and communications satellites open up new vistas for transmitting educational and learning programmes, curriculum and methods of teaching and learning will have to adapt to these new innovations and programming in order to be effective. New developments are already taking place in content and curriculum development and more will follow in future.
- e) Attention should, at least, be focused on encouraging the use of computer-aided instruction (CAI), where the computer becomes an auxiliary to the teacher or the printed teaching materials. Most African settings are, as can be imagined, still far from the stage of computer-based instruction (CBI), where the computer is used to deliver instruction, or the stage of training in skills such as word-processing, spread-sheeting and database management, where the computer turns into a productive tool.
- f) Proper mechanisms or pilot projects should be initiated or developed to encourage teachers or teacher educators to use or find innovative ways of using, where and when available, telecentres or community communications centres for accessing information and knowledge about curriculum development in African and other developing country settings.

Strategy for the Utilization of Technology in Distance Education

IICBA's plan to establish a Distance Education Network (hereafter called Network) in Africa aims at serving, like the Curriculum Development Network, a number of important functions in the development of distance and open learning in Africa. Elements of the specific strategy for technology use in distance education are:

- a) IICBA should plan to hold both face-to-face and electronic discussions, including a list-serve-based discussion periodically, to increase interaction and exchange of views focused, particularly on the potentials as well as serious problems and challenges associated with distance education and other technology-based programmes.
- b) Special training programmes should be devised and implemented for teacher educators and facilitators as well as learners who will have to operate at the interface between new communications media-based instruction, the body of latest thoughts and developments in a specific discipline or subject and technology. New technologies such as computers and communications satellites require that methods of teaching and learning adapt to these new innovations in educational programming in order to be effective. Additionally, low-cost technologies such as the audiocassette and printed materials should continue, where and when appropriate, to be part of the distance learning process.
- c) Efforts must be made to explore the educational potential using WorldSpace and other new broadcast system. IICBA can benefit from WorldSpace's visual data transfer and tele-educational capabilities
- d) IICBA should, through the Distance Education Network, conduct a general evaluation of various activities concerning the new technology use and distance education in a select group of African countries.
- e) Proper mechanisms or pilot projects should be developed to encourage teachers or teacher educators to use or find innovative ways of using, where and when available, telecentres or community communications centres or any other electronic and communications facility for taking courses at a distance and for accessing needed information and knowledge.
- f) Specific modalities or mechanisms for partnerships with the African Virtual University and other institutions from the North and South should be designed and developed to provide African students with the opportunity to learn what they want and what is needed most for African development.

Strategy for Utilization of Technology in Educational Policy, Planning and Management

The Institute's plan to establish an Educational Policy, Planning and Management Network (hereafter called Network) in Africa next year aims at serving, like the other Networks related to Teacher Education, Curriculum Development, and Distance Education, a number of key functions in the building of African capacity. Elements of the specific strategy for technology use in educational policy, planning and management are:

- a) Matters concerned with educational policy, planning and management require reliable and well-organized data and information. IICBA should make strong efforts to build or develop a comprehensive education sector database, preferably in partnership with groups such as the Africa Live Database at the World Bank and UNESCO Divisions responsible for Africa. Various international databases contain a large pool of macro-economic and sectoral data. The education sector data cover, in most cases, student enrollment by age, level and gender. Data on other vital educational performance indicators such as teachers (their

- education level), money allocated to education, library facilities and many other indicators are seriously lacking. IICBA can, in partnership, collaboration or cooperation with other agencies, contribute significantly by providing data useful for educational policy making, planning and management.
- b) Education, training and learning is a life-long process. This is an important consideration from the point of view of policy strategy. Proper mechanisms or pilot projects should be initiated or developed to encourage policy makers, planners and managers who belong to various levels of administrative and functional chains to use or find innovative ways of using technology training centres or laboratories for learning purposes. Mechanisms must be in place to help policy makers and planners learn about the benefits, costs and challenges of technology-based education and training.
 - c) Such projects or mechanisms can provide planners and policy makers with valuable insight into problems associated with technology use and development.
 - d) IICBA should, through the proposed Educational Policy, Planning and Management Network, make available information on the latest research and development in this area.
 - e) IICBA should, in collaboration with other institutions, devise courses in educational planning linked to economic and other forms of development.
 - f) IICBA should plan to hold both face-to-face and electronic discussions, including a list-serve-based discussion periodically to increase interaction and exchange of views. This should focus particularly on the problems influencing various dimensions of educational policy, planning and management in the Information Age.
 - g) The Network must encourage policy and measures towards improved education at all ages and especially expansion of secondary and higher education, and vocational training via distance learning.
 - h) The Network should devise ways to encourage the participation of education institutions in developing proper policy and regulatory environment that facilitates greater use of telecommunications for educational development.

Conclusion

Today's technology world is increasingly dominated by the Internet. Educational and learning programs, like many other activities, can benefit tremendously from Internet's open architecture and its unique multimedia and other capabilities. These and new technical advances are destined to play a key role in transforming education, commerce and the broad range of other human activities in both industrialized and developing countries. Ironically, if the current crisis in education continues without strong capacity building measures, the impact in poor and low-income countries in particular, can be devastating. New technologies, which can be used to reverse the traditional trend, can also be used to perpetuate the current disparity. Issues related to technology utilization strategy should receive highest consideration. Careful analysis of various technology choices and options are necessary to create maximum impact and benefit for many. In conclusion, despite some problems confronting the continent, great possibilities still lie ahead.

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