DISTANCE LEARNING
for
TECHNICAL and VOCATIONAL EDUCATION
in
SUB-SAHARA AFRICA:
CHALLENGES and OPPORTUNITIES

August 2001

Geoff Stevens, Consultant

AFTH4
The World Bank
CONTENTS

Summary .................................................................................................................. 3

1. Background and Purpose ................................................................................. 11

2. Definitions and Terminology ........................................................................... 14

3. Learning Technologies and Distance Learning Models .................................... 16

4. Technology and Media Selection .................................................................... 39

5. Distance Learning Trends ................................................................................ 43

6. Challenges and Issues .................................................................................... 52

7. Conclusions ...................................................................................................... 63

Appendix 1 - Cases Studies ................................................................................. 70

Appendix 2 - Technikon SA ................................................................................ 91

Appendix 3 – Glossary of Distance Learning Terminology ................................... 93

Appendix 4 – Internet Resources On Distance Learning ...................................... 105

References - ........................................................................................................ 106
CONTENTS

Tables

Table 1. Learning Technologies Summary
Table 2. Distance learning institutions and programs summary
Table 3. Cost Comparison of ICBC Training Options
Table 4. Comparison of delivery costs via GDLN vs. traditional seminar
Table 5. Cost per Student Study Hour for CBT
Table 6. Cost Analysis of Internet-Based University Course
Table 7. Summary of Costs Per Student Study Hour
Table 8. Distance Education Delivery Models
Table 9. General Learning Technology Assessment For TVET in the SSA Region
Table 10. Instructional methods & media (U.S.)

Boxes

Box 1. Technical College of South Africa
Box 2. New Zealand Open Polytechnic
Box 3. Print Summary
Box 4. Bolivia’s Radio San Gabriel
Box 5. Interactive Instructional Radio Summary
Box 6. Audio Teleconferencing Summary
Box 7. Audiographics Summary
Box 8. Interactive television training at Unisys
Box 9. Interactive Television Summary
Box 10. Video Teleconferencing Summary
Box 11. Distance learning at Carrefour (Brazil)
Box 12. Computer-Based Training Summary
Box 13. Technikon SA Integrated Learner-Centered Distance Education Model
Box 14. Internet/Web-based Training Summary
Box 15. Distance Learning at Australia’s Technical and Further Education Institutes
Box 16. The virtual campus of Peru’s Higher Technological Institute
Box 17. What is driving e-learning?
Box 18. Corporate e-learning in the U.S.
Box 19. Motorola’s Learning Objects Initiative
Box 20. Chile’s Instituto Nacional de Capacitacion Profesional
Box 21. Educational Media Agency (Ethiopia) and digital radio
Box 22. Botswana College of Technical and Vocational Education
Box 23. China Central Radio and Television University
SUMMARY

Background and Purpose\(^1\)

After a decade in which lending in support of technical / vocational education and training (TVET) has declined, the World Bank has received requests from some countries in the Sub Sahara region for assistance to reform their technical / vocational training systems. The Bank has initiated studies in order to establish a base of knowledge that can be used to provide advice to client countries in the region and guide potential lending. Distance education is believed by many to hold promise in addressing critical problems facing skills development at present, namely: a lack of qualified instructors, the need to greatly increase the delivery of skills training on a wide scale, and the need to deliver training at much lower unit costs owing to constraints on financing.

The objectives of this study are to review the current literature on the application of distance education in reforming TVET, describe and assess the various technology assisted models of distance education, describe any technological, pedagogical and policy issues associated with the application of distance education to TVET, and derive conclusions.

Definitions and Terminology

A relatively broad definition of TVET has been used. It includes skill levels ranging from functional / workplace literacy programs to advanced technical skills, delivery within institutional and workplace contexts, and training for both unemployed and employed participants.

Learning Technologies & Distance Learning Models (Paras. 11-41)

The primary technologies used in support of distance learning are described in the following table along with their advantages and disadvantages:

<table>
<thead>
<tr>
<th>Medium</th>
<th>Description</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Print</td>
<td>Pre-produced instructional materials normally distributed via postal systems</td>
<td>Familiarity, portability and flexibility; widespread availability of required development and reproduction technology, low set up and operating costs; availability of existing content</td>
<td>Little or no interactivity, associated problems with learner motivation and retention, requirements for the pre-distribution of materials, need for tutorial support, requires basic to intermediate student literacy</td>
</tr>
</tbody>
</table>

\(^1\) This report is one in a series of nine specific studies contributing to an overall review by the World Bank of Technical / Vocational Education and Training in Sub-Sahara Africa. The studies are financed through a Trust Fund grant provided by the Norwegian Government. An earlier version of this report was reviewed by John Middleton (World Bank), Paud Murphy (World Bank), Vis Naidoo (Commonwealth of Learning), Peter Materu (Africa Virtual University), and Richard Johanson, coordinator of the overall review. The views are those of the author and not necessarily those of the World Bank.
<table>
<thead>
<tr>
<th>Interactive Instructional Radio</th>
<th>One-way audio broadcast combined with traditional instruction in the classroom.</th>
<th>Low set up and operating costs; widespread availability of radio receivers; ease of operation; and potential to use existing infrastructure</th>
<th>Lack of direct interaction with the remote instructor; the requirement for pre-distribution of support materials; and the requirement for integration with other traditional delivery models.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio tele-conferencing</td>
<td>Two-way technology allowing instructor and learners to interact via audio in real time</td>
<td>Low set-up and operating costs; ease of operation; and the use of existing telephone infrastructure.</td>
<td>Lack of visual contact with the remote instructor; the requirement for pre-distribution of support materials.</td>
</tr>
<tr>
<td>Audiographics</td>
<td>Two-way technology using computers to add a visual component to audio teleconferencing</td>
<td>Low set up and operating costs; ease of operation; the use of standard telephone lines; and the ability to share and annotate slides, graphics and pictures</td>
<td>Lack of visual contact; the requirement for the pre-distribution of computer files; and the requirement for moderate levels of computer literacy.</td>
</tr>
<tr>
<td>Interactive Television</td>
<td>Broadcast television and two-way telecommunications tools link multiple, distributed, remote sites.</td>
<td>Ability to transmit live video and audio to multiple, widely dispersed sites; cost effectiveness for large audiences; the availability of required infrastructure; and moderate levels of interactivity</td>
<td>High head-end equipment costs; moderate to high equipment costs at receive sites; high telecommunications costs; and the requirement for advanced levels of training to support the delivery infrastructure.</td>
</tr>
<tr>
<td>Video tele-conferencing</td>
<td>Two-way compressed video, audio, and other tools link limited number of distributed, remote sites</td>
<td>Capability to transmit and receive live video and audio among multiple sites; high interactivity; the capability for all sites to originate instruction/content; and moderate levels of training</td>
<td>High equipment costs; high transmission costs; and limitations in the numbers of sites that can be simultaneously connected.</td>
</tr>
<tr>
<td>Computer-based training</td>
<td>Independent learning using pre-produced courseware running on a standalone and / or networked computer</td>
<td>Capability to individualize and customize training; low replication / duplication costs for content; and integrated evaluation</td>
<td>High costs and long timelines for content development and revision and the requirement for moderate levels of student computer literacy.</td>
</tr>
<tr>
<td>Internet / web-based training</td>
<td>Pre-produced learning materials distributed by the Internet / web combined with on-line collaboration / interaction.</td>
<td>Ease of content updating and distribution; low equipment costs; and open standards</td>
<td>Requirement for moderate to high levels of computer and instructional design skills to create content; limited audio and video capabilities at low bandwidth; problems with learner motivation; and a current shortage of well-designed content.</td>
</tr>
</tbody>
</table>
Most distance learning programs do not rely on a single technology but rather integrate several technologies and methods to create more comprehensive and flexible delivery systems. Distance learning models can be broadly separated into three categories: distributed classroom, independent study and blended delivery.

**Technology and Media Selection**

Decision-making frameworks for selecting the most appropriate learning technologies are presented. These include the ACTIONS framework which poses a set of key questions within each of seven dimensions: access, costs, teaching and learning, interactivity, organizational issues, novelty and speed. A number of criteria that are more specific to technology selection in the developing world are also described along with some of the problems associated with technology-driven selection processes. (Paras. 42-48)

**Distance Learning Trends**

Distance learning is rapidly transforming the delivery of education at all levels within developed and developing countries. Key trends associated with its application in the more advanced economies are described including its rapid rates of growth and adoption, the trend towards technology convergence on the Internet, innovations in content creation, and the move towards horizontal integration as a necessary organizational strategy to sustain distance learning systems.

More developed countries are in the process of using distance learning as a primary strategy in TVET reform. These initiatives are being driven by a recognized need for more efficient and effective human resource development strategies in response to the forces of international competition and globalization:

- **Australia** is aggressively implementing a national strategy for the application of distance and flexible learning to reform its vocational education and training system. Key components of the strategy include training VET staff to exploit new information technologies, expanding access to information and telecommunications technologies, investment in instructional content and the development of enabling policy frameworks. (Para. 60)
- **Canada** has established the Office of Learning Technologies to work with private and public sector partners to expand the application of learning technologies to workforce development. (Para. 61)
- **The European Community** has established a number of complementary programs to expand the use of distance education. The most recent is the $13.3 billion eLearning Action Plan that aims to broaden digital literacy in Europe and address the continent’s current shortage of IT workers. The plan will target all levels of education and comprises specific strategies for teacher training, the development of online learning platforms, the development of instructional content, and the networking of education and training institutions. (Para. 62)
- **Great Britain** has launched The University for Industry to expand access to skills training tied to the requirements of the labor market and economy. A key focus of UFI will be the use of information and telecommunications technologies to provide access for adult learners to a broad range of highly flexible training opportunities including those in the trades and technical areas. In addition to commissioning the development of media based learning materials, UFI aims to establish a network of over 1000 learning centers throughout Great Britain where learners can access the required technology and support services to participate in the UFI e-learning model. (Para. 63)
- **The United States** has emerged as the leader in the application of learning technologies in support of technical and workplace education. The heaviest concentration is in I.T.-related training and currently approximately 25% is delivered using distance learning methods. There are a number of
state and national initiatives underway to accelerate the development of technology-based learning at all levels of the education and training system including *The Commission on Technology & Adult Learning* and *The National Web-Based Education Commission.* (Paras. 64-67)

**Challenges and Issues**

The rapid growth of distance learning has resulted in the emergence of challenges and issues that can, if not well managed, impede implementation efforts and sustainability. (Paras. 68-86) These include:

- **Content and Curriculum** – There is a global shortage of well-designed instructional content that is formatted for more advanced delivery systems such as the Internet. This is mostly due to the high costs for converting traditional content into a distance learning format.

- ** Appropriateness and Efficacy** – Distance educators still must confront a traditional misconception that distance learning is an inappropriate methodology for imparting vocational and technical skills. Still, distance education is generally regarded as most appropriate for post-secondary technical level studies rather than manual skills at the vocational level. Technical-level studies often comprise much greater cognitive and theoretical components that better lend themselves to distance learning methodology. Also, students at the technical level tend to have higher levels educational attainment and are better prepared to undertake self-study. The challenge of providing manual / psychomotor skills can be overcome through blended program models that incorporate practical workshop-based components.

- **Quality and Branding** – There are concerns among many potential participants that distance learning is a “second best” option. There are also concerns relating to the quality of offerings provided by the proliferation of private sector, on-line education organizations. Branding by well established, accredited institutions, along with recognized qualifications, are important for winning learner confidence.

- **Stakeholder Resistance** – Distance learning is often seen as a threat to many instructors and faculty involved in more traditional education. Fear of technological change and job loss can present significant barriers to implementation. Distance learning can often entail a shift in job function and professional development of faculty, instructors, and support staff to enable them to support new models of delivery is critical.

- **Digital Divide** – There is, at present, highly inequitable access to information and telecommunications technologies between the developed and developing worlds and even within the more advanced economies. The potential of distance education to expand access to training will be increasingly predicated upon finding ways to democratize access to technology.

Countries of the Sub Sahara will need also to address challenges that are more specific to the region in their efforts to expand distance learning-based TVET (Paras. 76-86). These include:

- **Technology and Telecommunications Infrastructure** – The current levels of infrastructure and access in most countries of the region are poor relative to nearly all other regions of the world. This lack of basic infrastructure limits, at least for the present, the options for distance delivery models.
• **Instructional Content** – There will likely be a need to acquire instructional content at first from other jurisdictions during the initial stages of implementation. Developing capabilities and capacity in the region to originate distance learning content can, eventually, resolve issues of affordability, longer-term dependency, and cultural incongruence.

• **Skill and Knowledge Requirements** – Developing and sustaining distance learning systems will require investment in new skills and knowledge for learners, technical support staff, teachers and instructors, administrators, and policy and decision makers.

**Conclusions**

• Upgrading the skills of Sub Sahara Africa’s largely unskilled workforce is essential if the region is to advance. The expansion of traditional models of skills delivery is unlikely to be able to meet present and future demand. Consequently, the use of distance learning compatible with the region’s existing technical capabilities and infrastructure should be considered as an important stratagem. (Para. 87)

• There are a number of exciting, large-scale technical innovations that hold great promise for providing future access to information and telecommunications technologies in Sub-Sahara Africa, and, in turn, advanced distance learning delivery systems. Among the most notable of these are the RASCOM and WorldSpace satellite networks. (Para. 79)

• It is, however, unlikely that most countries in the region will be able to “leap-frog” through the accelerated application of advanced information and telecommunications technologies. Distance learning strategies need to take into account the region’s poorly developed telecommunications and technology infrastructure. This precludes the use of many models of distance learning, in evidence in the more advanced economies, predicated upon widespread access to digital technologies such as the Internet. More importantly, technologies and delivery models that cannot achieve significant economies of scale are not generally suitable for a region that needs to provide flexible and cost-effective training for hundreds of thousands of students and workers. An evolutionary distance learning strategy that integrates successively advanced technologies incrementally, as they become available, is most appropriate for the region. The Technology Enhanced Learning Initiative (TELISA) of Technikon SA in South Africa is a good institutional illustration of this approach within the region. Similarly, China’s systematic utilization of a range of successive technologies over the past several decades to dramatically expand access to tertiary education and training provides as an excellent larger-scale implementation model. (Paras. 88-89)

• Still, the lack of infrastructure in Sub Sahara Africa does not preclude the region from moving forward on the application of distance learning for technical / vocational training. The most viable option for the region, under the prevailing conditions, is the implementation of a relatively basic model of distance education delivery that integrates print-based materials, remote study / access centers, and the incorporation of face-to-face components for imparting manual / psycho-motor skills. (Para. 90)

• Print, as the basic medium of instruction, has the capability to provide access to training for large numbers of participants at relatively low unit costs. Other advantages include reliability, ease of access, relatively low development costs, capability to integrate well with other media, and its proven effectiveness for technical / vocational training in developed countries and the region. (e.g. Technikon SA). When developing specific institutional and/or program strategies it will be
important to explore how print might be integrated with broadcast / instructional radio and other mass media. Additionally, the acquisition of print-based learning materials from other jurisdictions is a cost-effective strategy for expediting implementation in the region. Although acquired materials will likely need to be adapted to the requirements of the region, local adaptation costs are a fraction of original development. Potential sources of well-designed materials in technical and vocational subjects include Australia, Canada, New Zealand, South Africa, the United Kingdom, and the United States. (Paras. 91-92)

- Comprehensive student support systems are critical for learner success and will need to be an essential component of distance learning delivery models implemented in the region. The study / access center model can be used to provide a range of learner support services in countries where a reliable postal system and basic telecommunications infrastructure are lacking. Services provided through these centers can include registration, assignment handling, materials distribution, access to tutors, and, in some cases, face-to-face instructional components. With relatively small levels of additional investment in technology, a basic study center can be transformed into a cost-effective mechanism for providing student and public access to information and telecommunication technologies. As such, the tele-center can serve as a cornerstone for the gradual development of more technically advanced delivery systems and provide a way to narrow the digital divide. (Paras. 93-95)

- Blended delivery strategies that combine distance learning with practical hands-on components can overcome the considerable challenge of providing manual or psychomotor skills within distance learning models. Manual skills components can be provided within traditional institutional settings or, as in the case of models established in New Zealand, the U.K., Canada and Australia, within the workplace in partnership with employers and industry bodies. The primary benefits are increased flexibility and reduced opportunity costs for the trainees and employers and efficiency gains for technical / vocational training systems resulting from decreased institutional training time. (Paras. 96-97)

- Finally, the development of specific and detailed strategies for the implementation of distance learning in the Sub Sahara region need to occur on a country by country basis, and, in some cases, at the institutional level. The judicious use of external technical assistance for the transfer of required distance learning expertise, the establishment of partnerships with established distance learning organizations, and the creation of distance learning consortia among institutions within the region are a number of measures that can potentially mitigate risk, reduce costs and expedite the implementation of distance learning strategies. Most importantly, a systematic and comprehensive planning process for distance learning implementation, driven primarily by needs rather than technology, can greatly assist in designing pedagogically sound and sustainable policies and programs. The Technology Enhanced Learning Investigation (TELI) process, developed in South Africa with World Bank and UNESCO support, provides an excellent decision making framework for use in the region. (para. 98)

Examples of distance education institutions and programs in both developed and developing countries that are either wholly or partially focused in the technical / vocational area are referenced throughout the paper. These are summarized and cross referenced in Table 2. Five, more comprehensive case studies from developing countries are contained in Appendix 1. They are:
• Africa Virtual University
• Zambia Technology-Based Community Literacy Centers
• Community Learning Centers for IT Training (Benin & Ghana)
• Agricultural Officer Extension Training (Jamaica & Ghana)
• Management Training For SMEs (Vietnam)

Table 2. Distance learning institutions and programs Summary.

<table>
<thead>
<tr>
<th>Institution / Program</th>
<th>Content</th>
<th>Target Audience</th>
<th>Delivery Model</th>
<th>Technologies</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>TECHNISIA (South Africa)</td>
<td>Technical / Vocational</td>
<td>Entry Level</td>
<td>Independent Study</td>
<td>Print</td>
<td>Page 16</td>
</tr>
<tr>
<td>New Zealand Open Polytechnic</td>
<td>Technical / Vocational</td>
<td>Entry Level &amp; In Service</td>
<td>Independent Study</td>
<td>Print, Audio / Video Teleconferencing, Internet</td>
<td>Page 17</td>
</tr>
<tr>
<td>Radio San Gabriel (Bolivia)</td>
<td>Technical / Vocational</td>
<td>Entry Level &amp; In Service</td>
<td>Distributed Classroom, Blended Study</td>
<td>Radio, Print</td>
<td>Page 19</td>
</tr>
<tr>
<td>OLA Dental Assisting (Canada)</td>
<td>Technical / Vocational</td>
<td>Entry Level</td>
<td>Blended Study</td>
<td>Print, Audio, Internet</td>
<td>Page 21</td>
</tr>
<tr>
<td>University of Wisconsin</td>
<td>Language</td>
<td>In Service</td>
<td>Distributed Classroom</td>
<td>Audiographics</td>
<td>Page 22</td>
</tr>
<tr>
<td>Okanagan University College</td>
<td>Technical / Vocational</td>
<td>Entry Level</td>
<td>Blended Study</td>
<td>Audiographics</td>
<td>Page 22</td>
</tr>
<tr>
<td>Unisys Corp. (USA)</td>
<td>Technical / Vocational</td>
<td>In Service</td>
<td>Distributed Classroom</td>
<td>Interactive Television</td>
<td>Page 24</td>
</tr>
<tr>
<td>ICBC (Canada)</td>
<td>Technical / management</td>
<td>In Service</td>
<td>Distributed Classroom</td>
<td>Interactive Television</td>
<td>Page 24</td>
</tr>
<tr>
<td>Global Development Learning Network</td>
<td>Management</td>
<td>In Service</td>
<td>Distributed Classroom</td>
<td>Video Teleconferencing</td>
<td>Page 26</td>
</tr>
<tr>
<td>Carrefour Corp. (Brazil)</td>
<td>Technical / management</td>
<td>In Service</td>
<td>Distributed Classroom, Blended Study</td>
<td>Video Teleconferencing, CBT/Multimedia, Internet</td>
<td>Page 28</td>
</tr>
<tr>
<td>University of B.C. (Canada)</td>
<td>Higher Education</td>
<td>In Service</td>
<td>Independent Study</td>
<td>Internet</td>
<td>Page 31</td>
</tr>
<tr>
<td>Nova Scotia Community College (Canada)</td>
<td>Technical / Vocational</td>
<td>Entry Level</td>
<td>Blended Study</td>
<td>Internet</td>
<td>Page 32</td>
</tr>
<tr>
<td>Technikon SA (South Africa)</td>
<td>Technical / Vocational</td>
<td>Entry Level</td>
<td>Independent Study</td>
<td>Print, Internet</td>
<td>Page 32</td>
</tr>
<tr>
<td>Technical and Further Education Institutes (Australia)</td>
<td>Technical / Vocational</td>
<td>In Service</td>
<td>Blended Study</td>
<td>Print, Video Teleconferencing, CBT/Multimedia, Internet</td>
<td>Page 35</td>
</tr>
<tr>
<td>Higher Technological Institute (Peru)</td>
<td>Technical / Vocational Management</td>
<td>Entry Level</td>
<td>Independent Study</td>
<td>Internet</td>
<td>Page 38</td>
</tr>
<tr>
<td>Motorola Corp.</td>
<td>Technical / Management</td>
<td>In Service</td>
<td>Independent Study</td>
<td>Internet</td>
<td>Page 47</td>
</tr>
</tbody>
</table>

2 Africa Virtual University is primarily focused on the delivery of higher education programs, although it does have a component that focuses on continuing professional education. It has been included as a case study since it represents what is perhaps the most ambitious effort to date to use a technologically advanced distance education model to expand access to education within the Sub-Saharan region.

3 *Entry Level* refers to programs which are designed primarily for persons seeking initial qualifications in order to enter the labor market. Programs are typically taken on a part or full-time basis within formal institutional contexts. *In Service* refers to programs which are primarily designed for employed individuals who require upgrading of skills and knowledge related to their current employment. Programs are typically taken on a part-time basis within a workplace context.

4 Descriptions of *Distributed Classroom, Independent and Blended* models of distance delivery are described on pp. 35-36.
<table>
<thead>
<tr>
<th>Institution / Program</th>
<th>Content</th>
<th>Target Audience</th>
<th>Delivery Model</th>
<th>Technologies</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instituto Nacional de Capacitacion Profesional (Chile)</td>
<td>Technical / Vocational</td>
<td>Entry Level</td>
<td>Blended Study</td>
<td>Print, Audio and Video Tapes</td>
<td>Page 51</td>
</tr>
<tr>
<td>Educational Media Agency (Ethiopia)</td>
<td>Teacher Training</td>
<td>In Service</td>
<td>Blended</td>
<td>Instructional Radio</td>
<td>Page 58</td>
</tr>
<tr>
<td>Botswana College of Technical and Vocational Education</td>
<td>Technical / Vocational</td>
<td>Entry Level</td>
<td>Blended</td>
<td>Multimedia, Video Conferencing, Internet</td>
<td>Page 59</td>
</tr>
<tr>
<td>Central Radio and Television University (China)</td>
<td>Higher Education / Technical / Vocational</td>
<td>Entry Level</td>
<td>Distributed Classroom</td>
<td>Print, Television, Radio</td>
<td>Page 62</td>
</tr>
<tr>
<td>Africa Virtual University</td>
<td>Higher Education / Management</td>
<td>Entry Level</td>
<td>Distributed Classroom</td>
<td>Interactive Television</td>
<td>Page 70</td>
</tr>
<tr>
<td>Technology-based Learning Centers (Zambia)</td>
<td>Open University, International Center For Distance Learning</td>
<td>Entry Level</td>
<td>Blended Study</td>
<td>CBT / Multimedia</td>
<td>Page 75</td>
</tr>
<tr>
<td>Community Learning Centers (Benin &amp; Ghana)</td>
<td>Technical / Vocational</td>
<td>In Service</td>
<td>Blended Study</td>
<td>CBT / Multimedia</td>
<td>Page 79</td>
</tr>
<tr>
<td>COL Agriculture Extension Training (Ghana &amp; Jamaica)</td>
<td>Technical / Vocational</td>
<td>In Service</td>
<td>Blended Study</td>
<td>Linear Video</td>
<td>Page 83</td>
</tr>
<tr>
<td>IFC SME Training (Vietnam)</td>
<td>Technical / Vocational</td>
<td>In Service</td>
<td>Independent Study Blended</td>
<td>Print</td>
<td>Page 87</td>
</tr>
</tbody>
</table>
SECTION 1 – BACKGROUND AND PURPOSE

1. There is a growing recognition that the skills and knowledge of the workforce are important determinants of economic and social progress within an emerging global economy. Due to the high costs and inefficiencies associated with traditional forms of classroom-based training many national governments and international agencies are actively seeking new ways to improve the productivity of education and training systems through distance learning. There is also evidence that some policy makers and practitioners now regard distance learning as a mechanism to “leap frog” incremental improvements in “bricks and mortar” educational systems and introduce transformational learning strategies predicated upon investments in telecommunications and information technology infrastructure. For many regions, including Sub Sahara Africa, it is far from apparent that such strategies are feasible. Some newer forms of distance learning, particularly in the developed economies, are intensively technology-based, requiring advanced telecommunications networks and hardware platforms. Other very effective models have been implemented using relatively low levels of technology. While distance education models have been most evident in the higher education and corporate training arenas, their use in vocational education and training, in both developed and developing economies, is expanding.

2. The increased importance of information and telecommunications technology (ICT) for the delivery of vocational training was underscored at the Second International Congress on Technical and Vocational Education convened by UNESCO in Seoul in April 1999. The central theme of the Congress was the strategic role that TVET must play in enabling individuals and societies, particularly in the developing world, to adapt to and manage the accelerating effects of globalization, technological and social change. There was also broad recognition of the urgent need for reform of TVET systems to ensure expanded access, flexibility, relevance, and efficiency. The relatively high costs of traditional TVET systems combined with extremely constrained financial resources within most developing countries led conference participants to conclude that the informed use of learning technologies is essential:

There is a need to find alternative methods of delivery of instruction for TVET. Teaching institutions and teachers should be reoriented to use flexible teaching and learning materials. Some of these should include the development of modularized curricula and assessment methods; the development and use of appropriate technologies for instruction – online services and training materials, computerized learning packages, use of CD-ROMS, intranet and internet, etc.

The Deputy Director-General for Education identified the following aims and objectives in a Congress address outlining UNESCO’s planned TVET program for the new millennium:

- Introducing and applying the new information and telecommunications technologies in the TVET teaching and learning process without losing valuable aspects of traditional teaching methods;

---

• Assisting member states in using information/communications technologies as a tool for teaching and learning both in direct contact and in distance learning mode; and

• Implementing projects for developing sample modular materials and interactive learning packages for Internet & Intranet use.\(^6\)

3. World Bank lending as a share of total assistance in technical and vocational education, while still averaging approximately $300 million per year, has generally fallen over the past decade. This is partially due to significant increases in lending to expand the participation of children in basic education under the ‘Education For All’ programs of the 1990’s. Another significant factor was the conclusion of the Bank, based on a number of comprehensive policy studies, that much of publicly funded TVET is inefficient and fails to address the overriding goal of poverty reduction in client countries. The World Bank has identified two strategic objectives for the TVET sub-sector: (1) to provide knowledge support to governments on TVET policies and practices, and (2) to provide lending support for the reform of TVET systems. Future Bank lending practices for reforms will:

• take full account of and encourage TVET provided by employers and private providers;
• establish an appropriate and evolving role for governments in public/private partnerships with public provision being well linked to employers and flexible in design and management;
• provide equitable access for all, based on choice by students;
• avoid early and narrow occupational specialization; and
• involve stakeholders in policy, planning and implementation.\(^7\)

4. World Bank lending for technical-vocational education and training (TVET) within Sub-Sahara Africa was only about 6\% of the total for the sector in the 1990s – a relatively small share. The demand, however, is growing from government clients for assistance for TVET programs. IDA is being asked to finance TVET in a number of countries, including Zambia, Gambia, Lesotho, Mozambique, Comoros and Ethiopia. There has been little updating of knowledge about recent experiences with TVET in Africa, or experiences from other parts of the world that might have a bearing on Africa. Little evidence has been gathered to assess systematically the effectiveness of innovations in the 1990s. One exception is analytical work done on TVET, including case studies on reforms, by the Bank and ILO in the second half of the 1990s.\(^8\) These included several studies from SSA (South Africa, Tanzania, Zambia). This study was highly useful, but it has been determined that work needs to be done to determine how TVET can best contribute to economic growth and poverty reduction in the African context.

5. The Bank has consequently initiated a comprehensive analysis of TVET in Sub-Sahara Africa that will generally review performance of the portfolio, explore individual country cases, highlight and assess sector issues, and draw together international and regional experience that will form a knowledge base for dialogue with its client countries in the region. This knowledge, in turn, will be used to provide advice to countries in the region in the area of TVET. Distance learning in support of TVET in the Sub-Sahara region has been included as an integral part of this overall review

---

\(^6\) Ibid.
Scope and Objectives

6. The overall purpose of this study is to ensure sound policy advice and investments by the Bank, other donors and countries on the subject of distance education-based TVET in Sub-Saharan Africa. This is to be achieved through the synthesis and documentation of key trends and issues and the provision of pragmatic advice for best approaches under the prevailing conditions in the region. The general scope of this study includes both synchronous and asynchronous models of distance learning with a primary emphasis on the use of information and telecommunications technologies (ICTs). Distance education-based reform efforts in other developing countries / regions that have the potential to inform policy development for Sub Sahara Africa are also included. Similarly, trends and examples in the application of distance education models for technical and vocational education in the more advanced countries are also considered to the extent that they may assist policy and program efforts in Africa. The specific Terms of Reference for this study include the following:

- Review the available literature on the application of distance education for TVET throughout the world, including Africa;
- Provide documentation of current activities and develop a series of case studies that illustrate the range of models that have been implemented, particularly in developing economies;
- Provide specific documentation and case studies of distance education TVET in Sub Sahara Africa;
- Describe the various technology-assisted models of distance education that are available and evaluate their efficacy, costs and limitations for TVET in the Sub Sahara context;
- Identify any technological, pedagogical and policy issues that have emerged or may emerge as a result of the use of distance education-based TVET approaches; and
- Based on the foregoing, make general recommendations for the development and implementation of distance education-based approaches for TVET in Sub Sahara Africa, including the best practices to follow.
SECTION 2 – DEFINITIONS AND TERMINOLOGY

Technical / Vocational Education and Training (TVET)

7. Terminology and definitions within all education sub sectors, including TVET, are evolving to reflect fundamental changes in the organization of education systems. There has been a gradual blurring of many of the traditional boundaries between the tertiary level sub-sectors reflecting broader changes in societies, economies, and labor markets in response to globalization and technological change. At the UNESCO Second International Conference On Technical and Vocational Education there were clear and consistent calls for a broadening of technical and vocational education provision beyond the more traditional focus on skills training for the labor market (UNESCO, 1999):

TVET of the future must not only prepare individuals for employment in the information society, but also make them responsible citizens who give due consideration to preserving the integrity of the environment and the welfare of others...TVET programs [need] to be not only “demand driven”, but also “development need driven”. Here development includes all social, economic, personal and environmental aspects.

A relatively broad definitional framework is used for TVET within this report. It encompasses programs that provide participants with skills, knowledge, and aptitudes that enable them to engage in productive work, adapt to rapidly changing labor markets and economies, and participate as responsible citizens in their societies. TVET includes:

- skill levels ranging from functional / workplace literacy programs to more advanced technical/vocational skills;
- delivery within formal institutional and workplace contexts; and
- unemployed and employed participants.

Distance Learning

8. As distance education has grown and diversified within the last twenty years so to have the terminology and attendant definitions within the field. The more traditional term, correspondence education, gradually gave way in the 1970’s to the term distance education or distance learning. This was partly due to a re-branding effort on the part of its proponents and partly as a result of the increased use of more interactive delivery strategies and a greater emphasis upon learner support. Other terms that have emerged during the interim to describe variations on distance learning include flexible learning, open learning, distributed learning and, more recently, virtual learning. A broadly accepted definition for distance learning has been articulated by the American Council on Education (Mantyla and Gividen, 1997):

Distance learning is a system and a process that connects learners with distributed learning resources. While distance learning takes a wide variety of forms, all distance learning is characterized by:

- Separation of place and/or time between instructor and learner, among learners, and/or between learners and learning resources; and
• Interaction between the learner and the instructor, among learners and/or between learner and learning resources conducted through one or more media; use of electronic media is not necessarily required; and

• The learner is an individual or group that seeks a learning experience offered by a provider. The provider is an organization that creates the learning opportunity. The provider approves and monitors the quality of the learning experience. Providers include schools, colleges and universities, business and industry, professional associations, labor unions, government agencies, the military and other public and private organizations.

9. Among the important elements within the foregoing definition is the recognition that distance learning is not necessarily predicated upon the presence or participation of an instructor who imparts the content at a distance. The definition also reflects the inherent structure and organization of the learning activity by defining it as both a “system” and a “process” organized by a provider who is involved in the assessment and monitoring of the learning activity. It is distinguished, in this respect, from non-formal and/or experiential learning that can occur through an individual simply accessing information or interacting with media.

10. One limitation of the ACE definition, published in 1996, is that it fails to sufficiently reflect the major impact that information and telecommunications technologies are having on the field. The term e-learning has begun to move into common use among policy makers, practitioners, and academics over the past several years. It has paralleled the evolution of terms such as e-commerce, e-business and e-government, and is broadly defined as the delivery of instructional content via all electronic media, including the Internet, Intranets, extranets, satellite broadcasts, audio/videotape, interactive TV, and CD-ROM (W R Hambrecht + Co., 2000). The rapid adoption of information and telecommunications technologies within all training and education sub sectors suggest that the term e-learning may soon become most prevalent. Growth in the use of information and telecommunications technologies has also resulted in a new vocabulary that often creates confusion among the most experienced educational practitioners and observers. A glossary of current distance learning terminology is contained in Appendix 2.

9 There is an emerging school of thought among some practitioners that the rapid utilization of information and telecommunications technologies, and the trend towards models that blend traditional forms of education with technology-enhanced models will obviate the need to use or create hyphenated terminology (i.e., distance-education, e-learning etc.). Rather, we will simply be able to revert to the basic terms of learning, education and training since it will be assumed that all learning and education will, in some form, be enhanced through the use of technology.
SECTION 3 – LEARNING TECHNOLOGIES & DISTANCE LEARNING MODELS

Learning Technology Descriptions

11. This section provides a general overview of the learning technologies and models that are most commonly used in both advanced and developing countries. The relative advantages and disadvantages of each are also described. The section concludes with a discussion of some of the most common criteria and considerations that are used by policy makers and practitioners in selecting technologies for distance learning.

12. Print – Print is the oldest and still remains the mostly widely used of all of the technologies used in distance learning in developed and developing countries. Print-based correspondence models of distance education, for example, emerged as early as the late 19th century in North America. These were enabled by the development of reliable and affordable postal systems that provided the required mechanism for the physical distribution of learning materials to the student (Farrell, 1999). The attributes of print as a medium of instruction for traditional and distance learning models are widely acknowledged (Bates 1995):

> From a teaching point of view, print is by tradition a powerful medium...[it has] major advantages for dealing with logical and rational thinking, which requires precision, factual accuracy, and clarity of thought. Print leads itself both to consciously critical analysis and to intellectual – as well as emotional - persuasion, by those who have learned the rules of communicating through print.... Print can represent words, numbers, musical notation, two-dimensional pictures and diagrams.... Print allow[s] students to develop higher levels of interpretation, synthesis and evaluation, as well as comprehension. It is not surprising then that print is still the dominant medium in education.

Box 1 Technical College of South Africa

TECHNISA was established in 1984 as an autonomous state-funded Technical College. It is the only Technical College in South Africa offering ‘N’ Level courses by distance education. The main aim of the College is to offer career-directed education in various fields of study to persons in the country who requires specific qualifications offered by the College. The College offers full programs in engineering, business and general studies, as well as general vocational courses in areas such as hair care, care of children, water and waste water treatment, pest control, power station operation, and surface mining. TECHNISA uses a basic print-based correspondence model that relies on the postal system to provide materials and student support. Most courses are available in both English and Afrikaans. All examinations are written at the student's nearest technical college. TECHNISA has approximately 9,000 students, 90 full-time and 60 part-time staff members.

Source: International Center For Distance Learning (www.icdl.open.ac.uk)

13. Most distance learning models based on print media involve the pre-development of instructional materials using a team-based model. Typically a subject matter expert develops the initial content which is, in turn, translated into a more user friendly and pedagogically effective format through the efforts of an instructional designer, and in some cases, graphics specialists. Distance

---

10 The descriptions are derived from the work of the American Society of Training Development (1997) and Tony Bates (1995)
learning text can be differentiated from other kinds of printed material by the deliberate attempt to explicitly structure a student’s response to the material through:

- detailed objectives expressed in measurable outcomes;
- a system of headings and sub-headings that make explicit the structure of the text;
- self-assessment questions within the text;
- activities and model responses;
- frequent summaries; and
- examination or assessment questions (Bates 1995).

The most frequently cited weakness of print-based distance learning models is the limited interactivity if print is used as the sole instructional medium. This can often create problems with student motivation which, in turn, can result in high attrition rates. Most institutions have improved the effectiveness of print through the provision of comprehensive tutorial systems. In developed countries tutor support and feedback are typically provided asynchronously via marked assignments and comments returned to the student via the postal system and/or synchronously via e-mail and audio conferencing.

---

**Box 2. New Zealand Open Polytechnic**

The Open Polytechnic is New Zealand's leading provider of open and distance learning at tertiary level. It is also the country's largest tertiary institution in terms of student numbers, with over 30,000 enrolments annually, representing one fifth of all polytechnic students in the country. The Polytechnic operates from a central base in Waikato in Lower Hutt, with business centers in Wellington, Auckland, and Christchurch. The Open Polytechnic celebrated its 50th Anniversary in 1996 and during its first half century has served over 750,000 students. Over three-quarters of current students are already in paid employment, and are studying part-time to enhance their career opportunities. Seventy-three per cent are over the age of 25. The institution offers over 130 programs and 1300 courses and grants formal qualifications at the certificate, diploma, and degree levels. Most of our courses are approved by the New Zealand Qualifications Authority and registered on the National Qualifications Framework. The major program areas include:

- business and management,
- computing, information systems and technology,
- education and community services,
- engineering and technology,
- financial services,
- health,
- horticulture, agriculture and natural resources, and
- planning and construction

The Open Polytechnic consults with industry and employers in developing courses and works closely with the Industry Training Organizations. It also delivers customized distance education programming in specific industry sectors.

The Open Polytechnic uses an independent study model in which print-based learning materials are the primary learning resource. These can be supplemented with audio and/or video tapes, audiographics and teleconferencing. Students also have toll free access to a course tutor who provides instructional support. Like many distance learning institutions, the Open Polytechnic has begun to migrate some of its programs to on-line learning. It has recently established an internet delivery arm, Open Mind Online, and is now offering business programs and qualifications through this medium.

Source: New Zealand Open Polytechnic website (www.topnz.ac.nz)
14. Print-based distance learning models are generally considered the most cost-effective means to provide access to large numbers of learners. The cost components of a typical instructional model based on print include:

- instructional materials development
- materials reproduction / printing
- materials warehousing and distribution
- instructional / tutor support

Bates (1995) analyzed costs for both the British Open University and Open Learning Agency both of which, in that year, still primarily used print-based delivery models. His analysis indicates that Open Learning Agency was able to develop a 13-week print-based course for approximately $90,000. This represents about one-tenth of the costs for development at BOU. He attributes the substantial cost difference to the practice at OLA of using contractors as subject matter experts rather than a full-time faculty. Many institutions, including OLA, have also been able to achieve considerable cost efficiencies through a practice of acquiring and adapting instructional materials rather than engaging in original development. As with most one-way instructional media the efficiency of print-based distance delivery models depends on the achievement of economies of scale, normally in excess of 250 students per course per year in developed countries. At this volume Bates estimates a typical cost per student study hour of US $1.50.

Print is widely used as the foundation distance learning technology for many institutions that deliver technical / vocational training. Examples include National Extension College (U.K.), New Zealand Open Polytechnic, Open Learning Agency (Canada), and Technikon SA (South Africa).

### Box 3. Print Summary

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highly flexible and portable medium</td>
<td>No interactivity if used as a stand alone</td>
</tr>
<tr>
<td>Familiar medium for most learners</td>
<td>Problems with learner retention</td>
</tr>
<tr>
<td>Low set-up and operating costs</td>
<td>Requires basic-intermediary literacy</td>
</tr>
<tr>
<td>Widespread availability of technology required for materials development and printing</td>
<td>Pre-distribution of materials required</td>
</tr>
<tr>
<td>Learners require no specialized technology or skills for interaction</td>
<td>Requires tutor support to be effective</td>
</tr>
<tr>
<td>Availability of existing materials</td>
<td></td>
</tr>
<tr>
<td>Integrates well with other media</td>
<td></td>
</tr>
</tbody>
</table>

15. Interactive Instructional Radio - Broadcast radio, after print, is perhaps one of the oldest of the technologies used to support distance learning. Radio has, for example, been widely used by universities and government agencies in agricultural extension work to improve practices in rural
areas. As reflected in the following excerpt from a World Bank / USAID report (1999), in order
to achieve interactivity the radio delivery component is most often integrated with a more
traditional classroom-based model:

…the distant teacher carries the main weight of the teaching, and directs learning
activities (such as exercises, answers to questions, songs and practical tasks) that take
place during carefully timed pauses in the audio script. The classroom teacher’s role is
to facilitate the lesson, give individual assistance to learners and provide follow-up
support after the audio component is finished. In some programs, such as those for
language instruction, the classroom teacher’s role is expanded to include periods of
teaching.

16. Interactive instructional radio can be transmitted via a number of means including the use of
traditional commercial and public broadcasting infrastructure, low cost, portable FM transmitting
stations and, most recently, specialized digital satellite radio networks. A clear advantage of IRI
as an educational medium for developing countries is its potential to reach very large numbers of
participants due to the widespread availability of inexpensive, radio receivers. The cost
components of a typical instructional model based on IRI include:
• instructional materials preparation and distribution
• rental / use of radio broadcast / production facilities
• transmission (purchase of broadcast time)
• instructor / moderator costs (head end)
• local instructor / facilitator costs
• radio receiver costs

Bates (1995) cost analysis of the British Open University’s use of instructional radio during the
early part of the 1980’s demonstrates the economies of scale that can be achieved through a
mass medium:

Radio costs per student for courses with just over 100 students a year are ten times
higher than courses with 1,250 students or so per year…Courses needed to have
over 1,250 students a year before unit costs dropped below $1.50 per student study
hour; on the foundation courses, though, each with more than 6000 students a year,
radio costs came down to 30 cents per hour.

Box 4 Bolivia’s Radio San Gabriel

Radio San Gabriel was established in 1955. Radio San Gabriel: La Voz del Pueblo Aymara, Sistema de
Autoeducacion a Distancia (SAAD) was initiated in 1986. The main aims of SAAD is to help reduce
the 65% illiteracy rate among adult Aymarans and provide general education to the rural population.
SAAD offers programs in basic and intermediate literacy and community education. Subjects taught
include health and hygiene; traditional Aymara medicine; handicrafts; farming; Aymara language and
culture; religion; and community cooperation. It is hoped to be able to translate the thematic units into
the Quechua language, so that those people may be served in the same way as the Aymara people are at
present. Courses are delivered using broadcast radio, printed correspondence texts, study centers
and facilitated discussion groups. When people in a community wish to study, they form study centers or
discussion groups. They elect a leader/facilitator from amongst their number, who must hold the
Radio's Leader's Certificate. Participants study at home, and meet once or twice per week. When they
are ready to be evaluated, the leader arranges for a team of teachers to come to carry out the evaluation
and certification

Source: Open University, International Center For Distance Learning

World Bank (Africa)
17. The IRI World Bank and USAID report also reveals that the primary applications for instructional radio in developing counties over the past 25 years have been for academic, K-12 level education, teacher education, and adult non-formal education. The University of South Africa has used community radio as one component of its model for delivering higher education to its students throughout the region (Darkwa and Mazibuko, 2000). A very recent application of IRI in support of general education in Sub-Sahara Africa involves two pilot projects initiated by the Commonwealth of Learning in Zambia and South Africa. A key innovation has been the design of a portable, community FM broadcasting system that effectively fits into a briefcase and costs approximately $5000 per unit. The systems are configured to transmit over a 30-40 kilometer area. A major component of the COL projects has been to train local personnel in technical support and basic production techniques. Initial programming includes community discussions relating to health care and education.\(^{11}\) There is little evidence that IRI has yet to be widely used as a primary medium for the delivery of TVET in either the developed or the developing world. The potential for its expanded use in TVET in Sub-Sahara Africa is significant particularly if used in conjunction with other media such as print. Additionally, the advent of satellite-based, digital broadcast systems, such as WorldSpace, with a capability to transmit both audio and data over large geographic distances to specialized hand-held receivers may hold great potential for future TVET programming in the region.\(^{12}\)

### Box 5. Interactive Instructional Radio Summary

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low set-up and operating costs</td>
<td>No direct interaction between learners and remote instructor</td>
</tr>
<tr>
<td>Widespread availability of radios</td>
<td>Pre-distribution of support materials required</td>
</tr>
<tr>
<td>Easy to operate / minimal training</td>
<td>Requires integration with traditional delivery models to be effective</td>
</tr>
<tr>
<td>Uses existing radio broadcasting infrastructure</td>
<td></td>
</tr>
</tbody>
</table>

18. **Audio Teleconferencing** - Audio teleconferencing or tele-training is one of the simplest and most inexpensive of the available interactive learning technologies. It uses relatively common “twisted pair” telecommunication infrastructure (i.e. the telephone system) to enable multiple learners to communicate with each other and an instructor in real time. This is accomplished through the use audioconferencing bridge that effectively creates a conference call between an instructor / moderator and a group of learners. Audio bridges can be purchased by delivery organizations or, more typically, bridging services are purchased commercially from telecommunications suppliers at an hourly rate. If there are a number of learners at one site an audio convenor, similar to a speakerphone, can be used. Audio tele-training is normally accompanied by print materials and other visual aids distributed to the participants in advance.

\(^{11}\) Additional information on COL’s portable community broadcasting system can be found at: http://www.col.org/models/nonform.htm
\(^{12}\) A description of the Worldspace radio network is provided in Section 6.
19. The cost components within an instructional systems based upon audio conferencing typically include:

- instructional materials preparation & distribution
- local & long distance telephone charges (as per local country tariffs)
- hourly audio teleconference bridging services (as per local commercial rates)
- audio convenors
- instructor / moderator costs

Bates (1995) provides a cost analysis of Open Learning Agency’s use of teleconferencing in support of a primary print-based distance education model during the early 1990’s. Using an example of a one-hour course tutorial involving an instructor and 12 students, a $19.41 cost per student hour is calculated. Bates also makes a critical distinction between the cost structures of programs incorporating this technology as contrasted to those using mass media:

*However, irrespective of the mode of telephone teaching, both production and delivery costs are directly related to the numbers of students on a course, unlike one-way media. Thus the structure of telephone teaching costs is similar to that of the costs of classroom teaching...The important point is that telephone costs are variable, i.e. they rise roughly proportionate to the numbers of students using the service, unlike the one-way technologies of print and broadcasting. Audio conferencing becomes increasingly expensive per study hour than print, radio or audiotapes as course numbers exceed 150 students a year.*

20. Audio teleconferencing is most widely used as one component of a more comprehensive instructional model to provide enhanced real-time interaction between student(s) and instructor. One example is the Open Learning Agency’s Dental Assisting Program that integrates on-the-job training, independent study (via print), clinical training, and interactive components. While Internet is the primary mechanism for asynchronous communication between the tutor and student, structured, bi-weekly audio conferences between groups of students and the tutor provide a critical means of interaction and group collaboration. Due to its ease of use, widespread availability, and relatively low cost audio teleconferencing has been used by numerous educational organizations that deliver TVET via distance learning including Open Learning Agency (Canada), Open Polytechnic (New Zealand), Open College (U.K.), and the TAFE system in Australia. The students participate in the audio teleconferencing component of the program using a home or workplace telephone in almost all models. The relatively low tele-density in Sub Sahara Africa and high line charges greatly limit its application for home-based delivery models at this time.

<table>
<thead>
<tr>
<th><strong>Box 6. Audio Teleconferencing Summary</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Conference-call interaction allows learners to interact with an instructor and with each other in real time. Usually accompanied by pre-prepared learner materials distributed in advance.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Advantages</strong></th>
<th><strong>Disadvantages</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Low set-up and operating costs</td>
<td>No visual contact between learners</td>
</tr>
<tr>
<td>Easy to operate / minimal training</td>
<td>Pre-distribution of support materials required</td>
</tr>
<tr>
<td>Uses existing phone lines / telecommunications infrastructure</td>
<td></td>
</tr>
</tbody>
</table>

World Bank (Africa)
21. **Audiographics** - Training using audiographic technologies takes the tele-training model one step further through the addition of a visual component comprising graphics and slides. System components include those required for audio teleconferencing plus a personal computer, specialized audiographics software, and an interactive white board at each site. Additional components allow the learners and instructor to create graphics and share them with other sites. The interactive white board performs in a very similar fashion to a computer mouse, allowing the user to select menu items and annotate either pre-prepared slides or graphics that are generated during the session. A specialized modem allows graphics and audio to be transmitted simultaneously from the PC over regular phone lines to an audio bridge and, in turn, to other personal computers. Normally two telephone lines are used at each site. The cost components within an instructional systems, based upon audiographics, include:

- instructional materials preparation
- local & long distance telephone charges (as per local country tariffs)
- hourly audio teleconference bridging services (as per local commercial rates)
- audiographic systems (U.S. $5,000 - $10,000)
- instructor / moderator costs

The cost structures of audiographic-based training delivery models are very similar to those of audioteleconferencing. Additional costs are imposed by the specialized equipment required at both the originating and receive sites and the requirement for an additional telephone line needed to support the transmission of graphics and slides.

22. The College of Engineering, University of Wisconsin is one example of an organization using audiographic technology (Mantayla and Gividen, 1997). The College uses the technology to deliver a continuing professional education course in reading and understanding technical Japanese at the work site to scientists and engineers from local companies including IBM, GE and General Motors. The technology was selected by the College since it met their following requirements:

- ability to view what learners were writing
- ease of inputting materials through use of a scanner
- ease of material presentation
- ease of equipment use
- low capital costs per site

Evaluations of the program comparing campus-based participants with those studying via distance / e-learning have shown no statistical difference in performance between the two groups.

23. The Center for Computer-Based trades and Technology at Okanagan University College in Canada has adapted two traditional trades qualification and journeyman upgrading courses for delivery via audiographic technology (Office of Learning Technologies, 2000). The two courses, automotive technician and recreational vehicle technician, are designed for delivery into a variety of settings including homes, the workplace, and college sites. The technologies enable the instructors to create a “live interactive learning environment” in which small groups of students at a variety of sites are connected to one another and an instructor via a basic telecommunications link in real time. Groups of students share one specialized computer and a speakerphone. The instructor typically prepares course materials in advance on a computer and students view the material simultaneously on their screens. The instructor and students can also edit and annotate the graphics and images in real time. The project’s manager indicates that the
opportunities provided real-time interaction was the primary reason for using audiographics technology rather than an asynchronous web-based design. It is important to note, however, that this program has been designed for participants who have already developed the manual skills required for the trades through either formal apprenticeship or informal on-the-job training.

<table>
<thead>
<tr>
<th>Box 7. Audiographics Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conference-call interaction wherein learners are able to interact with an instructor and with each other in real time and share computer-generated graphics and slides in a live interactive mode.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low set-up and operating costs</td>
<td>No visual contact between learners</td>
</tr>
<tr>
<td>Easy to operate / minimal training</td>
<td>Requires pre-distribution of computer image files</td>
</tr>
<tr>
<td>Uses existing phone lines</td>
<td>Requires moderate computer literacy</td>
</tr>
<tr>
<td>Ability to share slides, graphics, digital</td>
<td></td>
</tr>
</tbody>
</table>

24. Interactive Television - Interactive television (a.k.a. business television, video teletraining and narrowcasting) exploits the distributive capabilities of full motion, broadcast television and adds one or more additional components to achieve interaction between the origination and the participating sites. Participants can see, on a normal television monitor, an instructor who is located at a broadcast studio. They can ask questions and/or provide feedback to the instructor through a number of mechanisms that can be used either independently or in combination. The most common is the addition of a live audio link that uses the same basic technology as the audio tele-training model described earlier. These can also be supplemented with asynchronous tools such as fax machines and, more recently, e-mail. Learners are usually assembled at specialized sites or classrooms that incorporate satellite receivers, teleconferencing tools, and large monitors or projection systems for easy viewing. The more sophisticated systems also include a viewer response pad for each learner to provide increased interactivity. Response pads are linked to a computerized instructor console in the broadcast studio and allow learners to interrupt for questions and allow the instructor to include polling elements such as multiple choice assessments to assess learner comprehension. The broadcast component of an interactive television program is normally uplinked to a commercial, geo-stationary satellite and, in turn, downlinked to multiple receive sites within the satellite’s footprint. Other telecommunications options can entail the distribution of the television signal via terrestrial systems such as microwave, cable or fiber optics. The other interactive components including audio, fax, e-mail and student response systems are most frequently transmitted via standard, terrestrial telecommunications infrastructure.

25. There are a fairly wide range of options and levels of sophistication associated with the educational use of interactive television. Current trends are toward reducing the relatively high,

---

13 Educational broadcasting is another application of television technology in which pre-recorded educational programs with generally high production values are broadcast to large general audiences through public television networks. This one-way medium is similar to instructional radio since it does not provide opportunities for direct interaction between instructor and participants and is usually used in conjunction with other media such as print.
head-end production / operational costs through the utilization of simplified robotic studios that enable the instructor and/or a skeleton crew to manage the technical elements such as cameras. More recently, cost reductions for spectrum or satellite time are being achieved through the transition to digital broadcast and receive systems that require much less bandwidth than older analog systems. The cost components within an instructional systems based upon interactive television include:

- instructional materials preparation
- rental of production / broadcast facilities (including technical staff)
- transmission / satellite time (as per local commercial rates)
- terrestrial telecommunications costs (phone, fax, e-mail)
- remote site costs (including local facilitators)
- instructor / moderator costs

26. Interactive television can be a very powerful and cost-effective method of distance learning delivery in those circumstance where training is required for very large numbers of learners spread over large geographic distances and where existing broadcast infrastructure can be accessed. It is widely used within North America for corporate training by larger companies with nationally and globally distributed workforces. Companies such as Ford, IBM, and Hewlett-Packard have established in-house interactive television infrastructure dedicated to training and corporate communications. Additionally, there are numerous commercial suppliers that provide both infrastructure and program development services. Among the benefits that are often cited for this instructional technology are reduction in travel and accommodation costs associated with traditional training and the capability to quickly deliver consistent training to large numbers.

**Box 8. Interactive television training at Unisys**

Unisys is a global technology company with operations in over 100 countries. In 1996 the company was confronted with the challenge of providing training in a newly introduced suite of Microsoft Office software to over 7,500 employees in multiple locations. The key requirements to be met by the program were cost-effectiveness, compressed training timelines, and high levels of interaction. A decision was made to use the company’s business television network that could broadcast to 95 U.S. and 43 European Unisys facilities. The network to that point had not been used for training but rather to meet the ongoing corporate communications needs of the internal workforce and the more than 50,000 clients in over 100 countries. The network uses broadcast television as the primary technology and enables interactivity between the remote and the originating site(s) through student response pads, telephone, fax and e-mail.

The program comprised six one-hour interactive training sessions that were delivered over six weeks. The sessions were converted for distance education delivery from traditional classroom instruction. Since there were no computers at the remote sites, participants were assigned practice exercises to be completed between each broadcast segment. Approximately 1200 employees participated at the same time in each broadcast segment. The cost per learner for the training was $41 and the company estimates that the program increased the productivity of the participants on the desktop applications by 20 percent. The director of the Unisys Business Television Network comments, “It isn’t enough for trainers to limit their delivery methods to classroom or computer-based training /self-study. Satellite delivered training works easily into employees schedules, provides live instruction and offers high levels of live interactivity between instructor and learner.”

Source: Mantyla and Gividen (1997)

27. The Insurance Corporation of British Columbia successfully used interactive television to train 1200 adjusters in 50 sites throughout the province in a newly introduced policy for dealing with...
soft tissue injury claims. As the implementation of the training using interactive television was accomplished within two days, ICBC concluded that it saved several million dollars in soft tissue claims costs by being able to activate its new policy on a rapid and highly consistent basis. Table 3 details an analysis prepared by ICBC comparing the costs of three options that were initially considered: traditional head office training, sending training teams to the field, and using interactive television.

**Table 3. Cost Comparison of ICBC Training Options**

<table>
<thead>
<tr>
<th>Item</th>
<th>Head Office</th>
<th>Field Teams</th>
<th>Interactive Television</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inst. Design</td>
<td>5,000.00</td>
<td>5,000.00</td>
<td>19,000.00</td>
</tr>
<tr>
<td>Delivery Teams</td>
<td>79,925.00</td>
<td>102,630.00</td>
<td>6,950.00</td>
</tr>
<tr>
<td>Staff Per Diems</td>
<td>14,725.00</td>
<td>8,965.00</td>
<td>n/a</td>
</tr>
<tr>
<td>Remote Site Costs</td>
<td>n/a</td>
<td>14,000</td>
<td>34,000</td>
</tr>
<tr>
<td>Technology (Facilities)</td>
<td>n/a</td>
<td>n/a</td>
<td>34,000</td>
</tr>
<tr>
<td>Travel / Accomm.</td>
<td>93,822.00</td>
<td>21,844.00</td>
<td>21,844.00</td>
</tr>
<tr>
<td>Overtime</td>
<td>46,025.00</td>
<td>5,416.00</td>
<td>5,416.00</td>
</tr>
<tr>
<td>Rollout Time</td>
<td>23 events</td>
<td>29 events</td>
<td>2 events</td>
</tr>
<tr>
<td></td>
<td>23 weeks</td>
<td>38 weeks</td>
<td>2 days</td>
</tr>
<tr>
<td><strong>Total Costs</strong></td>
<td><strong>239,497.00</strong></td>
<td><strong>157,855.00</strong></td>
<td><strong>121,210.00</strong></td>
</tr>
<tr>
<td><strong>Cost per Participant</strong></td>
<td><strong>199.00</strong></td>
<td><strong>132.00</strong></td>
<td><strong>101.00</strong></td>
</tr>
<tr>
<td><strong>Cost per Part. Hour</strong></td>
<td><strong>24.87</strong></td>
<td><strong>16.50</strong></td>
<td><strong>12.62</strong></td>
</tr>
</tbody>
</table>


Examples of the application of this interactive television in the Sub-Sahara region include Telekom Skytrain, the distributed employee training system of South Africa’s telecommunications supplier, and the African Virtual University.  

**Box 9. Interactive Television Summary**

Mass media, broadcast technology wherein learners are able to see and hear an instructor using live television. The instructor receives feedback and interacts with learners through an audio connection, asynchronous tools, and, in some cases, a viewer response pad.

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ability to transmit live video and audio to multiple sites an widely dispersed locations</td>
<td>Very high equipment costs at head end / originating site</td>
</tr>
<tr>
<td>Significant cost effectiveness for large audiences</td>
<td>Moderate to high equipment costs at receive sites</td>
</tr>
<tr>
<td>Existing infrastructure available in countries</td>
<td>High telecommunications costs</td>
</tr>
<tr>
<td>Moderately interactive model</td>
<td>High levels of training required countries</td>
</tr>
</tbody>
</table>

28. Video Teleconferencing - This relatively recent technology (a.k.a. compressed video conferencing and two-way video conferencing) initially emerged within corporate environments

14 A case study on the African Virtual University is contained in Appendix 1
as a means to facilitate meetings between participants at relatively small numbers of remote sites. Video teleconferencing, unlike interactive television, enables all participants to both hear and see one another in real time since all sites have full originating and receive capabilities. The heart of a conferencing system is the CODEC (Coder / Decoder) that digitizes and compresses analog audio and video signals for transmission through commercial, broadband telecommunications services. These are normally tariffed on an hourly basis. Connections are scalable, with greater bandwidth (and higher costs) providing for less audio delay and a more fluid visual image. Low transmission rates between sites (i.e. less than 256 kbps) result in a distracting, slow motion effect. It is possible to link together a number of sites simultaneously through the use of a video conferencing bridge.

29. A number of additional components or peripherals are typically added at each site when this technology is used for instructional use. These can include computers for graphic presentations or document sharing, a document camera and white board, additional cameras for participant capture, a VCR for playing linear video, additional large screen monitors allowing the presentation of graphics while maintaining the video connection, and a viewer response pad. The cost elements within an instructional systems based upon video teleconferencing include:
   - instructional materials preparation
   - room-based video conferencing system (US $25,000 - $75,000 per site)
   - telecommunications costs (as per local tariffs)
   - conferencing bridge costs (as per local commercial rates)
   - remote site costs (including local facilitators)
   - instructor costs

   Bates (1995) estimated a range of between US $9 per hour to $18 per hour for serving 125 students per year using this technology. These costs will have declined over the past several years in some regions due to price reductions for equipment and bandwidth.

30. An example of the application of this technology in Sub-Saharan Africa is the World Bank Global Development Learning Network which has incorporated room-based video conferencing as a primary technology. GDLN Distance Learning Centers that have been established in Côte d’Ivoire, Benin, Ethiopia, Ghana, Senegal, Tanzania and Uganda. Table 4, prepared by the World Bank Institute (2000), illustrates the anticipated savings for a 5-day video conference-based training session for senior policy makers as contrasted to a more traditional Washington-based seminar.

   **Table 4. Comparison of delivery costs via GDLN vs. traditional seminar**

<table>
<thead>
<tr>
<th></th>
<th>Face-to-face</th>
<th>GDLN (5 sites)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numbers of Participants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Trainers (30) salary &amp; travel</td>
<td>$21,000</td>
<td>$15,000</td>
</tr>
<tr>
<td>Participant travel</td>
<td>$60,000</td>
<td>0</td>
</tr>
<tr>
<td>Per Diem</td>
<td>$33,000</td>
<td>0</td>
</tr>
<tr>
<td>Materials Shipment</td>
<td>$5,000</td>
<td>0</td>
</tr>
<tr>
<td>Facilities &amp; Maintenance</td>
<td>$1,000</td>
<td>$16,000</td>
</tr>
<tr>
<td>Network Access</td>
<td>0</td>
<td>$10,500</td>
</tr>
<tr>
<td>Local Staff</td>
<td>0</td>
<td>$9,000</td>
</tr>
<tr>
<td>DLC Operations</td>
<td>0</td>
<td>$20,000</td>
</tr>
<tr>
<td>GDLN Central Costs</td>
<td>0</td>
<td>$12,500</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>$120,000</strong></td>
<td><strong>$82,500</strong></td>
</tr>
<tr>
<td><strong>Per Person Costs</strong></td>
<td><strong>$4,000</strong></td>
<td><strong>$550</strong></td>
</tr>
</tbody>
</table>

31. The above table reflects that a video teleconferencing model can be very cost effective for the training of senior level personnel who travel internationally to participate in professional development. It is, however, prohibitively expensive for TVET in Sub Sahara Africa due to high infrastructure and operating costs, and the need to reach much greater numbers of participants than the technology allows. The estimated set-up costs per Center are approximately U.S. $600,000 with annual operating costs for core personnel, facilities, and telecommunications of approximately $450,000. It seems unlikely that sustainable models of technical / vocational training in the region would be feasible if these fixed costs were fully factored into the calculations for the variable/delivery costs.

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ability to transmit and receive live video and audio among multiple sites in widely dispersed locations.</td>
<td>Very high equipment costs</td>
</tr>
<tr>
<td>Highly interactive model</td>
<td>High transmission costs requiring specialized telecommunications infrastructure</td>
</tr>
<tr>
<td>All sites can be originating and/or receiving sites for instruction</td>
<td>Limitations on the number of sites (6-8) that can be connected</td>
</tr>
<tr>
<td>Moderate levels of training required</td>
<td></td>
</tr>
</tbody>
</table>

32. Computer-Based Training / Multi-media - Improvements in the price / performance ratio of personal computers resulted in computer-based training becoming the most prevalent distance learning model for TVET in the more developed economies during the early years of the 1990’s. The growing multimedia capabilities of computers have enabled the most common PC to play full motion video, stereo audio, and access large amounts of information from CD-ROMs. Additionally, the front-end costs for the development of multimedia CBT have declined, to some degree, through simplified authoring systems. The majority of CBT is designed as a fully independent learning tool wherein the learner, using the computer’s standard interfaces (keyboard, mouse, and touch screen), interacts with software or courseware installed either on the computer’s hard drive, a CD-ROM or a Local Area Network. Well-designed CBT programs will guide the learner through a variety of activities to facilitate the attainment of prescribed learning objectives. Assessment features and branching allow self-pacing and a high degree of learner control over the learning process. Most systems also incorporate learning management capabilities that track and record learner progress. A large, commercial CBT training industry has emerged and there are numerous off-the-shelf courses available in a wide range of skill and subject areas. Training related to information technology is perhaps the most widely available area of content. Additionally, many larger organizations have developed customized programs that are specific to their own requirements.
33. The cost elements within an instructional systems based upon CBT/ multimedia technologies include:

- courseware development / licensing
- courseware duplication and distribution
- multi media computer
- instructional support

By far the largest cost element is for courseware development which, depending on the topic and production levels, can be substantial. The advantage of CBT is that, once developed, the variable or delivery costs per student drop dramatically. Bates (1995) indicates that it is extremely difficult to generalize about costs relating to CBT since there are such a broad range of possible applications:

A second difficulty in costing is that, as the technology improves, so do the range of applications. The earlier model of pre-programmed computer-based learning, based primarily on textual communications, multiple choice questions, and limited student interaction is quite different from a model based on the learner remotely accessing a wide range of multimedia resources, under the guidance of a ‘real’ but remote mentor, possibly working collaboratively with other students, and constructing and re-constructing multimedia projects and assignments. Not surprisingly, the cost implications are very different for these two models.

Stahmer and Green (1993) developed general guidelines for estimating both CBT front-end development and costs per student study hour. They defined three levels of development (low, medium, high) and estimated costs per instructional hour ranging from a low of US$1,852 to a

---

Box 11: Distance learning at Carrefour (Brazil)

Carrefour is the largest wholesale chain in Brazil, with almost 50,000 employees. The chain, founded in 1963 in France, has a long tradition of employee training. In the late 1980s, Carrefour had founded one of the first “corporate universities” in the world, the Institute Marcel Fournier, and was using video-conferencing for employee training. Currently, the chain has three “corporate universities,” one of them in São Paulo, Brazil – the Instituto de Formação Carrefour (Carrefour Training Institute). The universities offer a variety of training not only to employees, but also to clients and vendors. The Brazilian Institute provides 114 courses in different areas that include informatics, marketing, management, etc. The programs have different platforms, including multimedia, video, DVD, television broadcast via satellite, and Intranet. The training programs vary from four hours to 15 days. Some courses are mandatory while others are elective and participation depends on the interests of the employee and his or her supervisor. Courses can also be provided on site, and the Institute has many training rooms in addition to a large auditorium with simultaneous translation capabilities. At this time, the Institute is serving only employees, but training programs for clients and vendors are programmed to open late this year. Plans for expansion also include courses on the Internet and a mix of online and face-to-face strategies. In less than one year of functioning, the Institute has trained about 3,000 employees.

Source: TechKnowLogia, May/June, 2001
high of US$15,121. Total course costs ranged from $50,000 to $407,000. The costs per student hour were then calculated and are reflected in Table 5.

**Table 5. Cost per Student Study Hour for CBT**

<table>
<thead>
<tr>
<th>No. of Students</th>
<th>High Level Development</th>
<th>Medium Level Development</th>
<th>Low Level Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>150</td>
<td>$109</td>
<td>$34</td>
<td>$16</td>
</tr>
<tr>
<td>250</td>
<td>$67</td>
<td>$22</td>
<td>$11</td>
</tr>
<tr>
<td>500</td>
<td>$35</td>
<td>$14</td>
<td>$7</td>
</tr>
<tr>
<td>625</td>
<td>$28</td>
<td>$11</td>
<td>$7</td>
</tr>
<tr>
<td>1,000</td>
<td>$19</td>
<td>$8</td>
<td>$5</td>
</tr>
</tbody>
</table>


**Box 12. Computer-Based Training Summary**

An independent learning technology where learners use standalone or locally networked personal computers to access pre-designed courseware. Training can range from simple text-based screens through to complex simulations using video, animation and sound.

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allows individualization of training</td>
<td>High costs for development</td>
</tr>
<tr>
<td>Allows some customization</td>
<td>Long development timelines</td>
</tr>
<tr>
<td>Low replication / distribution costs</td>
<td>Requires physical distribution (i.e. CD-ROMs) of content to learners</td>
</tr>
<tr>
<td>Evaluation integrated into instruction</td>
<td>Moderate computer literacy required by learners</td>
</tr>
</tbody>
</table>

34. **Internet/Web-Based Training** - Previously mentioned advancements in computer hardware have combined with the emergence of the Internet / Web and improvements in telecommunications infrastructure to create a revolution in distance learning in many countries of the developed world. These development have enabled the creation of very powerful virtual learning environments in which the main learner requirements are access to a personal computer, a modem, and a standard telephone or broadband telecommunications connection. Learners are able to register on line and access web-based training from multiple suppliers by simply accessing the providers web page from an Internet connection anywhere in the world. As with traditional CBT, the types of learning interactions can vary widely. These can include on-line interaction with pre-designed CBT courseware, bulletin board discussions, e-mail communications with instructors and other learners, downloading content and course materials, audio and video play back, and on-line testing and assessment.

35. The majority of online learning interactions still occur asynchronously although more recent developments point to the emergence of more synchronous models of Internet-based training. These enable learners to interact in real time using chat functions, white boards, audio conferencing, and low-speed video conferencing. Many organizations are achieving the same advantages and functionality of Internet-based training through the use of corporate Intranets.

---

15 Cost estimations assume a CBT course of 27 hours instructional / interaction time.
that are only accessible to their employees and, in some cases, customers. The most commonly cited advantages of Internet / Web-based training for corporate training include:

- lower unit costs for training (where large numbers of distributed employees are involved);
- reduced travel and accommodation costs;
- the ability to integrate training into the job site / work processes and thereby minimize disruption and lost productivity;
- opportunities for more immediate application of skills and knowledge;
- relatively low costs for instructional content distribution and updating;
- simplified, universal access to instructional content for learners;

As in the case of CBT, a large new industry dominated largely by the private sector is aggressively exploiting the instructional capabilities of the Internet to serve an emerging global market for distance learning.

36. The primary cost elements within an instructional systems based on the Internet include:

- courseware development
- instructional content hosting and technical infrastructure / support
- telecommunications (for participants and host site)
- computer / PC access for participants
- tutor instructor support
- administration / registration support

Online learning, particularly in the higher education sector, has seen a dramatic growth over the past several years. This has been stimulated by an increasingly competitive environment and the initial promise that online learning could dramatically reduce delivery costs and, in fact, constitute a highly profitable business activity. These optimistic assumptions have proven to be entirely unrealistic for many institutions as a result of much higher than anticipated costs and revenue projections that have never materialized. There are now greatly increased efforts to develop improved cost-benefit analysis models. One example is an activity-based model developed by the Teaching, Learning and Technology affiliate of the American Association for Higher Education that attempts to more accurately capture many of the previously overlooked hidden costs that can accrue across an entire delivery organization. A recent article in The Chronicle of Higher Education (February, 2001) focused on the difficulty in assessing accurate costs for online learning and reflects an emerging, much more conservative perspective:

> From the very beginning we had to combat the myth that online learning is cheaper to produce and cheaper to deliver than face-to-face curricula”, says Robert E. Meyers, the executive vice president of the University of Maryland’s University College. “But I think we are finding that as people become more sophisticated and knowledgeable about the online education space, there are fewer and fewer people out there that you have to disabuse of the myth that online is cheaper”…Most of the reports – based on studies conducted at the Rochester Institute of Technology, the University of Illinois, the University of Maryland’s University College, and Drexel, Pace and Pennsylvania State Universities – reveal that the universities are hovering close to the break-even point with their distance learning programs…In most cases, the studies relied on estimated cost projections because the university accounting procedures were not always well suited to a case-study approach… “Some people have this idea that you can save or make a lot of money in doing online learning, but I don’t really believe that,” says Tim

---

L. Wentling, a professor of education at Urbana-Champaign and a leader of the study conducted there. "I just think it is another way to deliver quality instruction and reach people who otherwise would not be reached."… “Many commercial companies spend even more on developing courses -- some have put millions of dollars into a single course, Mr. Mayadas [Sloan Foundation's Asynchronous Learning Network] says -- making it impossible to compare their costs with those of nonprofit universities. "In our model, the cost of creating the course is not too high, but the cost of delivery is roughly the same as if it is delivered on campus," he says. Mr. Mayadas says he expects that eventually the cost of creating and teaching an online course will end up being 20 percent cheaper than the cost of developing and teaching a traditional course.17

37. Bates (1999) has developed a concrete example of costing for online learning development and delivery for a specific university-level course at the University of British Columbia. The course comprises one component of a post-graduate certificate program in educational technology which UBC delivers both to domestic and international students. Specific costs for both development and delivery of online instruction will vary according to the level of sophistication, the nature of the content to be developed, and labor costs. Table 6 provides some insight into the anticipated and the actual cost structures for one online course:

Table 6. Cost Analysis of Internet-Based University Course

<table>
<thead>
<tr>
<th>Source of Cost</th>
<th>Actual</th>
<th>Budgeted</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fixed Cost</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Planning (staff time = 33.2 hours)</td>
<td>$1,641.68</td>
<td>0</td>
</tr>
<tr>
<td>Development (337 hours)</td>
<td>15,993.37</td>
<td>15,300</td>
</tr>
<tr>
<td>Marketing (122.5 hours)</td>
<td>3,70.80</td>
<td>0</td>
</tr>
<tr>
<td>Copyright</td>
<td>700.00</td>
<td>700.00</td>
</tr>
<tr>
<td>Admin Overhead</td>
<td>12,295.32</td>
<td>4,000</td>
</tr>
<tr>
<td>Library</td>
<td>1,000</td>
<td>1,000</td>
</tr>
<tr>
<td>Server Costs</td>
<td>300.00</td>
<td>300.00</td>
</tr>
<tr>
<td>International Tutors</td>
<td>3,000</td>
<td>3,000</td>
</tr>
<tr>
<td><strong>Total Fixed Costs</strong></td>
<td>$40,716.51</td>
<td>$28,300</td>
</tr>
<tr>
<td><strong>Variable Costs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instructional Support (382 hours)</td>
<td>$16,344.28</td>
<td>8,800</td>
</tr>
<tr>
<td>Administration / Registration (400 hours)</td>
<td>12,265.08</td>
<td>1,521</td>
</tr>
<tr>
<td>Printed Materials</td>
<td>1,500.00</td>
<td>1,500</td>
</tr>
<tr>
<td><strong>Total Variable Costs</strong></td>
<td>$30,209.36</td>
<td>$11,821</td>
</tr>
<tr>
<td><strong>Total Costs</strong></td>
<td>$70,925.87(^{18})</td>
<td>$40,121.00</td>
</tr>
<tr>
<td><strong>Cost Per Student (1999)</strong></td>
<td>$1182.08</td>
<td>$668.68</td>
</tr>
</tbody>
</table>

Source: Bates (1999)

The author makes the following conclusions and recommendations with respect to the economics and potential benefits of online learning:

The economics of online courses are complex, fascinating and not transparent. Under the right conditions, online learning can not only be cost-effective, but can actually

---

17 Chronicle of Higher Learning. *Is anyone Making Money on Distance Education?* February 16, 2001
18 The authors attribute the 75% budget overrun to much higher than anticipated instructional and administrative costs.
bring in net profits for an educational institution...Whether or not online learning can be considered successful and worth the investment will largely depend on the values and goals of the organization. For example, if the organization’s focus is on revenue generation or saving money, online learning may not be a good choice...If the organization values collaborative learning, increased access for lifelong learners, and the internationalization of curriculum, then an online program may be of value, even if the costs are the same or slightly more than for a conventional course...It is important not only to focus on the costs of developing and delivering an online course or program, but also to focus on potential performance and added value benefits to both the institution and more importantly the student.

<table>
<thead>
<tr>
<th>Box 13. Technikon SA Integrated Learner-Centered Distance Education Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technikon SA is an example of an institution that has begun to use the Internet for vocational and career oriented distance delivery in the Sub Sahara region. A restructured institution was launched in 1993 along with a shift from traditional correspondence-based delivery to what the institution now terms its Integrated Learner-Centered Distance Education Model, providing much higher levels of learner support. Whereas the model is still primarily print based, the Internet is being used increasingly for administrative and student support functions and, in some cases, as an alternative strategy for the distribution of instructional materials. The strategy of the publicly funded institution is to gradually introduce more Internet capabilities into the instructional model as the penetration and availability of the technology improves within South Africa. The development of tele-centers, through which learners can access required digital technologies, is one strategy the institution has recently initiated in order to accelerate the application of information and telecommunications technologies to its delivery model. The institution is presently undertaking the conversion of many of its courses into pdf. format that will enable it to electronically distribute content to regional tele-centers for local printing. It is felt that this will facilitate eventual conversion to internet-based delivery and, in the short term, improve the efficiency of its existing centralized materials distribution model. In 2000 Technikon SA served 70,000 registered learners, including some from neighboring countries, in over 70 programs including accounting, applied communications, business management, correctional services management, engineering, information technology, marketing, tourism, policing, real estate, and security management.</td>
</tr>
</tbody>
</table>

Source: (www.trsa.ac.za/)

38. Internet / web–based delivery is being used extensively in North American higher education, and in the corporate training market for a wide range of knowledge and skill areas. IT skills training across all sectors is by far the largest area of application for Internet-based technical training in the in the workplace in North America (ASTD, 1999). Nova Scotia Community College has recently introduced an Internet-based model for the delivery of the technical training component of its trades / apprenticeship training programs. The new Virtual Campus uses both synchronous and asynchronous Internet technology to deliver the technical training component of the formal apprenticeship program in 13 traditional trades to participants in the home, the workplace, and college campuses. The courses are organized into 30-hour equivalent blocks and participants have the option of a traditional instructor led or technology-assisted format. Both formats include manual skills training components delivered in a face-to-face setting by an instructor. The college has also recently introduced a new program for the training of Licensed Practical Nurses that integrates online instruction with practical skills training in community learning centers and the work site.

19 Additional information on Technikon SA is contained in Appendix 2 and the NSCC Virtual Campus can be found at (www.access.nscc.ns.ca)
Box 14. Internet/Web-based Training Summary

A highly interactive model of training that uses the Internet and Intranets to synchronously and asynchronously connect learners using a wide range of on-line tools and capabilities

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructional materials easily updated</td>
<td>Moderate to high levels of computer and instructional design</td>
</tr>
<tr>
<td>Increasing volumes of instructional content becoming available</td>
<td>Skills needs to create content</td>
</tr>
<tr>
<td>Low distribution costs</td>
<td>Limited audio and video capabilities with low bandwidth connections</td>
</tr>
<tr>
<td>Low equipment costs for learners</td>
<td>Problems with learner retention</td>
</tr>
<tr>
<td>Open technology standards</td>
<td></td>
</tr>
<tr>
<td>High level of learner control</td>
<td></td>
</tr>
</tbody>
</table>

Technology Costs Summary

39. The most comprehensive attempt to provide a comparative cost analysis for various learning technologies was undertaken by Bates (1995). Due to the widespread use of Internet / online delivery and a corresponding decline in the use of many of the other technologies described in this section, there has been little or no recent updating of comparative data. It can be reasonably assumed that in the intervening years since Bates’ analysis was published the costs of hardware and telecommunications costs for many of the technologies have declined. It can also be assumed that labor costs for content development and instructional support costs have increased. Bates’ data must consequently be interpreted with some degree of caution and is most useful for illustrating the nature of cost structures for each technology and the relative differences in cost structures between technologies. A comparative summary, based on Bates 1995 cost data, is contained in Table 7.

Table 7. Summary of Costs Per Student Study Hour

<table>
<thead>
<tr>
<th>Technology</th>
<th>50</th>
<th>125</th>
<th>250</th>
<th>625</th>
<th>1,250</th>
</tr>
</thead>
<tbody>
<tr>
<td>Print</td>
<td>2.61</td>
<td>.63</td>
<td>.37</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radio</td>
<td>14.88</td>
<td>2.97</td>
<td>1.48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Audio Conferencing</td>
<td>7.12</td>
<td>4.11</td>
<td>3.67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interactive Television</td>
<td>67.24</td>
<td>34.36</td>
<td>29.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Video Teleconferencing @ 384 kbps</td>
<td>56.74</td>
<td>34.36</td>
<td>29.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer-based Training</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium level</td>
<td>99.75</td>
<td>41.25</td>
<td>22.50</td>
<td>11.25</td>
<td>6.75</td>
</tr>
<tr>
<td>High-end</td>
<td>322.50</td>
<td>130.50</td>
<td>66.75</td>
<td>28.50</td>
<td>15.75</td>
</tr>
<tr>
<td>Computer Conferencing / Internet</td>
<td>2.25</td>
<td>1.81</td>
<td>1.80</td>
<td>1.69</td>
<td>1.68</td>
</tr>
</tbody>
</table>

Bates draws the following general conclusions with respect to costs associated with the application of the various learning technologies:

- the major cost of using technologies for distance teaching is in production and hence recurrent, rather than capital; for instance, the yearly recurrent cost often exceeds the total start-up capital cost. In general, the recurrent costs of producing good quality technology-based materials tend to be underestimated;

- audio cassettes and radio have low fixed and low variable costs;

- face-to-face teaching, computer-mediated communication and tutor-mediated telecourses have low fixed costs but high variable costs, i.e. costs increase with student numbers;

- pre-programmed computer-based learning and multimedia have high fixed costs and high variable costs, if work-stations [for students] are to be provided;

- since production [i.e. development] is the main cost, and hence fixed for any course, for most one-way technologies [i.e. print, radio, broadcast television] currently used in autonomous distance teaching institutions, fixed costs far exceed variable costs. This means that economies of scale apply to one-way technologies: the more students, the more cost-effective these technologies become;

- two-way technologies such as audio, video and computer conferencing, reduce fixed costs, but have high variable costs. Thus while suitable for courses with relatively low student numbers they will be increasingly expensive for courses with high student numbers. Even these technologies, though, need more than 100 students per course per annum to offset the fixed costs; and

- transmission costs are insignificant compared with production costs for most technologies. It is important then to consider all costs when deciding on technologies.

Distance Learning Models

As reflected in the preceding section, there are various learning technology options that are available to distance educators. In almost all cases these technologies are not used in isolation but are rather combined with other technologies and methods to create more comprehensive models of delivery. Many of the models developed by specific institutions are often quite unique and are influenced by such factors as the target group requirements, available technology infrastructure, financial resources, institutional capacity and capabilities, and educational philosophy. The Institute For Distance Education at the University of Maryland College has developed a useful framework that broadly categorizes the various delivery models into three general groupings: distributed classroom, independent learning and blended model. A description of each of the models is contained in Table 8.
Box 15. Distance Learning at Australia’s Technical and Further Education Institutes

Open Learning Institute of TAFE

The Open Learning Institute of TAFE was established in November 1993 in recognition of the growing demand from government, industry and the community for flexible new approaches to the delivery of vocational education. The Institute incorporates four independent units: Vocational Education and Training, Center for Strategic Leaders, Vocational Education and Training Technologies Center, and Library and Information Management Services. Course programs include: accounting, automotive studies, business, building, child care, civil construction, communications, drafting, electronics, justice administration, literacy, management, real estate management, rural technology, small business and water treatment.

A range of services are made available to students in the form of counseling, free postal library, and advisory services at centers in Queensland. This is in addition to the normal provision for students who study at a distance, namely, printed course materials, audio and video tapes, computer software, tele- and videoconferencing, residential / special classes and loan of equipment.

Adelaide Institute of TAFE

The Institute has a broad role providing education and training in distance and traditional formats that reflects the demands of industry. It offers a variety of awards at Certificate, Advanced Certificate, Associate Diploma and Diploma levels by attendance and external study. Subjects include: accounting, banking and finance, marketing, justice awards, professional writing, performing arts, music, english language and literacy, office administration, visual arts, hair and beauty, library studies, tourism, management, hospitality, small business training and vocational preparation. It also offers a range of short courses which are designed to assist individual organizations and industry groups to cater for their specific needs in upgrading the skills of their personnel.

Students make use of the network of learning centers which have been set up throughout South Australia. Each of these centers is equipped with a range of facilities, such as a teleconferencing terminal, a fax machine, a video recorder and monitor, a computer and a range of printed learning materials and information from Adelaide Institute. In addition to the range of external studies courses, the Institute also offers a small number of courses which use a mix of study modes, including written materials, telephone tutorials and seminars. These courses may require students to use a learning center.

The Open Training and Education Network – Distance Education (OTEN-DE)

(OTEN-DE) is one of the largest providers of distance and flexibly delivered education and training programs in Australia. OTEN-DE offers over 200 courses via distance education. In addition, OTEN-DE delivers courses to school-age students who also study by distance education and are supported by Distance Education Centers (DECs) located throughout the state of NSW. More than 31,000 TAFE NSW students are enrolled in courses that range from Statement of Attainment through to Advanced Diploma level. These students receive educational support and advice from OTEN-DE teaching staff and a large number of qualified industry contract teachers. All OTEN-DE courses are available to international students except courses that have tutorials or workshops that require attendance on campus. Foreign nationals resident outside Australia are required to pay fees in order to undertake an external course with the Open Training and Education Network - Distance Education.

The course materials consist of print-based learning materials with some courses incorporating audiotapes, slides, videotapes and computer materials. A number of courses are Internet supported (e.g. Fire Technology and Information Technology). OTEN-DE's facilities include two television broadcast studies, CD-ROM and Website production facilities, video conferencing studio and audio conferencing equipment.

Source: Open University, International Center For Distance Learning
<table>
<thead>
<tr>
<th>Table 8. Distance Education Delivery Models</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>Distributed Classroom Model</td>
</tr>
<tr>
<td>Independent Learning Model</td>
</tr>
<tr>
<td>Blended Model</td>
</tr>
<tr>
<td><strong>Characteristics</strong></td>
</tr>
<tr>
<td>Interactive telecommunications technologies extend a classroom-based course from one location to a group of students at one or more other locations. The typical result is an extended “section” that mixes on-site and distant students. The faculty and institution control the pace and place of instruction.</td>
</tr>
<tr>
<td>This model frees students from having to be in a particular place at a particular time. Students are provided a variety of materials including a course guide and detailed syllabus. Students have access to a faculty member who provides guidance, answers questions, and evaluates their work. Contact between the individual student and the instructor is achieved by one or a combination of the following technologies: telephone, voice-mail, computer conferencing, electronic mail, and regular mail.</td>
</tr>
<tr>
<td>This model involves the use of a printed course materials and other media (such as videotape, Internet or computer disk) to allow the individual student to study at his or her own pace. Independent study is combined with occasional use of interactive telecommunications technologies and/or face-to-face instruction. The learning or tele-center through which students can access required interactive technologies and participate in face-to-face training is becoming a primary mechanism for the delivery of blended models of instruction.</td>
</tr>
<tr>
<td><strong>Faculty Role</strong></td>
</tr>
<tr>
<td>Faculty typically do not change their role significantly from the one they assume in the traditional classroom. However, the use of technology does require adaptability in the manner of presentation.</td>
</tr>
<tr>
<td>The faculty structure and facilitate the learning experience, but shares control of the process with the student. They must become familiar with the content prior to the beginning of the course to develop the detailed syllabus and, if appropriate, plan for effective use of the interactive technologies such as computer conferencing and voice-mail.</td>
</tr>
<tr>
<td>Faculty structure and facilitate the learning experience, but share control of the process with the student to some extent. Role change encourages faculty to focus on the instructional process and to take advantage of the available media. They must become familiar with the content and other materials and plan for effective use of the interactive and/or face-to-face sessions.</td>
</tr>
<tr>
<td><strong>Student Experience</strong></td>
</tr>
<tr>
<td>Because the faculty member is physically present in the space, on-site students generally have an experience similar to that of the traditional classroom. They may be less tolerant of technological problems and challenges than distant students because they are unlikely to perceive a personal benefit resulting from the use of technology. Remote students can often feel isolated.</td>
</tr>
<tr>
<td>Students to not attend class which gives them ultimate flexibility in structuring their time. They are responsible for organizing their work and time to meet course requirements and deadlines. Students must be highly motivated and require good organizational and time management skills, the ability to communicate in writing, initiative, and a commitment to high standards of achievement.</td>
</tr>
<tr>
<td>With fewer class sessions, gain flexibility. Periodic classes help students to structure their work and assists in motivation. The blended format still requires greater discipline and maturity on the part of students than traditional models. Group sessions can serve to diminish perceived disadvantages of students who do the majority of their studies independently.</td>
</tr>
<tr>
<td>Technologies</td>
</tr>
<tr>
<td>--------------</td>
</tr>
<tr>
<td>Supporting Class Sessions</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Technologies</th>
<th>Distributed Classroom Model</th>
<th>Independent Learning Model</th>
<th>Blended Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supporting Out-of-Class Communication</td>
<td>-telephone</td>
<td>-telephone</td>
<td>-telephone</td>
</tr>
<tr>
<td></td>
<td>-mail</td>
<td>-mail</td>
<td>-mail</td>
</tr>
<tr>
<td></td>
<td>-fax</td>
<td>-fax</td>
<td>-fax</td>
</tr>
<tr>
<td></td>
<td>-computer (for e-mail and conferencing; access to library and other on-line resources; submission of assignments)</td>
<td>-Internet / computer (for e-mail and conferencing; access to library and other on-line resources; submission of assignments)</td>
<td>-computer (for e-mail and conferencing; access to library and other on-line resources; submission of assignments)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Opportunities For Interaction</th>
<th>Distributed Classroom Model</th>
<th>Independent Learning Model</th>
<th>Blended Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>All students have opportunity for verbal interaction during class with instructor and each other. On-site students have visual interaction with instructor and other students in class; off-site students may have opportunity for visual interaction with instructor and other students depending upon the technology used. On-site students can interact with instructor before and after class; Out-of-class interaction for all students can be facilitated by telephone; by computer conferencing, voice-mail, or other means if available.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Support Services Needed</th>
<th>Distributed Classroom Model</th>
<th>Independent Learning Model</th>
<th>Blended Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access to technical support is required at each location, with a fully trained technician/troubleshooter at origination site. Each remote site requires a site assistant to handle logistics and materials distribution /collection. Access to fax machine, telephone, and photocopier is also usually provided.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: University of Maryland College (www.umuc.edu/ide)
Box 16. The virtual campus of Peru's Higher Technological Institute

Peru is a country of approximately 26 million people, has a per capita income of $2400 and wide disparities in income. A shortage of skilled technical workers, especially in the country’s core production industries that include mining, energy, oil and communications industries, continues to be a major constraint. In response to the shortage of skilled workers, the past 20 years have seen an explosion of Higher Technology Institutes (Institutos Superiores Tecnologicos, or ISTs) throughout the country. These institutes offer short-term (up to three years) post secondary training programs focusing on practical, not theoretical, learning. Many, but not all, of these institutions suffer from ill-equipped facilities, outdated teaching techniques and weak links with the industrial sector.

Among the group of technical institutes TECSUP is widely known for delivering high quality training and development courses for technical personnel as well as for using innovative teaching tools and methods. TECSUP has two campuses, one in Lima and the other in Arequipa. TECSUP currently offers three-year technical programs that confer a technical degree, as well as individual courses in areas ranging from leadership and discipline, to top computer and management skills, and maintenance, installation and operation of modern equipment. TECSUP also offers short-term technical development courses for those who are already part of the work force and need to sharpen their skills, in the areas of heavy equipment maintenance, plant maintenance, industrial electronic engineering, electronics and industrial automation, chemical and metallurgical processes, data networks and communications. TECSUP also delivers "closed" courses that are specifically tailored to meet the needs of the particular enterprises, delivered either at the TECSUP or at the enterprises’ facilities. So far, over 1,136 short-term training courses have been delivered to more 18,700 students.

Aware of the potential for virtual training, TECSUP, in 1999, became the first IST in the country to set up a virtual campus, TECSUP Virtu@l. TECSUP received assistance from the Monterrey Institute of Technology (ITESM), as well as the Open University in Cataluña (Spain) in course design. It has signed a cooperation agreement with the Madrid Polytechnic University to accredit its distance education courses. Currently over 1600 technical workers are enrolled in workforce Internet training. The Inter-American Development Bank is supporting expansion of the virtual campus. It is expected that within the next three years, 7900 technical workers and 840 students pursuing technical degrees will participate in virtual courses in areas such as informatics, business applications, and engineering.

The virtual campus enables students to take courses at their convenience from TECSUP facilities, their workplace, their homes or public Internet kiosks that are rapidly becoming available throughout the country. Approximately 40% of TECSUP’s distance continuing education students log into the campus from their workplace, 30% from public booths and 20% from home. TECSUP’s Internet courses generally have a fixed seven-week duration. Once enrolled in a course, the student is able to study the course content, perform self-evaluations to monitor his or her performance, participate in debates with other students, and interact with the teacher through the Internet. Students are required to present themselves to take a final examination at a specified TECSUP testing center at the end of each course, but may log in and study at any given time. The virtual courses are designed, monitored and evaluated by a team of experts, hardware and software are updated on a regular basis, and teachers constantly receive training on virtual campus teaching methodologies in order to better serve the needs of the students online or through e-mail. TECSUP Virtu@l has been able to take advantage of the development of communication systems and the increased access by the Peruvian population to the Internet to expand its course availability throughout the country.

Source: Wolf and Garcia (2001)
SECTION 4 – TECHNOLOGY AND MEDIA SELECTION

General Selection Framework

42. One of the greatest challenges that practitioners and policy makers have traditionally faced in developing distance learning systems is selecting the most appropriate technologies or combinations of technologies from an ever-expanding range of options. In far too many cases misinformed decisions have led to very expensive mistakes with long-term consequences (Bates 1995):

Because of a lack of generally agreed criteria for media and technology selection in education and training, crucial technology decisions have tended to be made primarily for commercial, administrative or political reasons: the availability of spare broadcasting capacity; an offer from supplier of free or cheap equipment or services; the comfort level of academics with technologies that replicate the lecture format; or the enthusiasm of a key decision makers for a particular technology.

43. Much of the past and, regrettably, some of the current decision making is still framed within a supply-side paradigm. The problem with such an approach is that technology often drives the learning process as opposed to learning requirements driving the selection of technology. Some of the challenges associated with technology selection are being mitigated due to the phenomenon of technology convergence that has enabled the integration of multiple media on a single platform (e.g. Internet). Equally as important has been the development of enabling, decision-making frameworks. One of the most pragmatic is the ACTIONS framework that poses a set of key questions to enable appropriate decisions to be made regarding the choice and application of the various technologies20. It can be summarized as follows:

Access
Who are the primary target groups to be served? (e.g.: Unemployed persons, employees, students)
What is the most appropriate location in which to provide services? (e.g. home, traditional institution, workplace, community center)

Costs21
What will be the medium cost per student study hour for a particular technology for a given number of students over the expected life of the courses to be delivered / supported by that technology?
What will the costs be for necessary additional services or technologies?

Teaching and Learning
What kinds of learning outcomes need to be achieved? (e.g. manual skills, cognitive strategies, attitude change)
What instructional strategies will be employed to enable the required learning?

---

20 The reader is encouraged to refer to Bates (1995 for a detailed discussion and guidance in the application of the ACTIONS framework. An alternate, more theoretical, systems-based approach is provided in Romiszowski (1988).
21 Bates emphasizes the importance of understanding the cost structures associated with the various technologies and in particular the distinctions between capital and operating costs, fixed and variable costs and production and delivery costs.
What are the unique characteristics of each available technology and how well do they match the learning requirements?

**Interactivity and User-Friendliness**
- What kind(s) of interaction does the technology enable? (e.g. learner to instructional materials; learner to instructor; learner to learner)
- How easy is the technology to use?
- How reliable / stable is the technology?

**Organizational Issues**
- What opportunities or threats exist in the external environment that may influence the choice of a particular technology? (e.g. national technology infrastructure, regulations)
- What are the internal organizational requirements and barriers? (faculty resistance, management support, financial resources)

**Novelty**
- What is the currency of the technology? Is it soon to become redundant?

**Speed**
- How quickly can the technology be installed?
- How quickly can content be created and/or updated?

*Learning Technology Selection in Developing Countries*

44. There are a number of special considerations in developing countries that need to be taken into account selecting learning technologies (Puryear 1999):

**Costs**
- A distinction needs to be made between fixed and variable costs and both need to be fully factored into decisions. Puryear, like Bates, points out that fixed costs in distance learning have a unique characteristic since they are distributed over all of the learners served:

> We need to remember that the fixed costs per student for some educational technologies such as radio and television drops rapidly as more students are served, because of economies of scale. The fixed costs of an educational program that serves just 1000 students would be the same as the fixed costs of a program that serves 100,000 or 1,000,000. You need the same upfront investment in producing programs. By contrast, approaches that have low fixed costs, such as conventional teaching – which relies heavily on the time of the teachers – offer no significant economies of scale.

Variable costs also differ greatly for different technologies and Puryear warns against a frequent failure to anticipate some of the very high and often hidden costs (e.g. computer maintenance and support, staff training, telecommunications) associated with various technologies. These can seriously undermine longer-term sustainability of distance learning programs and institutions.

**Effectiveness**
- Puryear stresses that all technologies, if used well, can prove effective and challenges the notion that the more expensive, complex technologies are more effective than the simple and inexpensive. He indicates that the critical task in determining cost effectiveness is determining what it takes to make a technology effective and how much it costs. He suggests that a review of the research reveals that, generally, learning technologies have better potential for improving effectiveness and / or expanding access than reducing unit costs.

---

22 Bates argues that, while novelty should be the least important criterion, we should not discount its impact on securing funding or its impact in creating much needed change momentum in many traditional settings.
Surrounding Conditions – Finally, of particular relevance to developing countries is the requirement to determine, in advance, what combination of factors or conditions in the surrounding environment are necessary to make a selected technology work and whether it is possible to bring that combination together. Some technologies, for example, may require highly skilled technical support staff, stable power supplies, broadband connectivity, sophisticated management and training systems, or a fundamental redefinition of instructor/faculty roles. Some or all of these simply may not be available or feasible in a given region or country. He indicates that the most frequent obstacle to the sustainability of technology-based delivery models is the lack of supporting political and institutional frameworks. Puryear concludes with the assertion that the only logical point of departure for any systematic assessment of technology is the definition of clear educational goals and enabling policy frameworks by governments and policy makers.

45. Claudio de Moura Castro (1999) cautions against inappropriate learning technology decisions in developing countries. He is critical of what he sees is an emerging tendency on the part of many developing countries to “mimic” trends and developments in the more developed countries:

….copying these styles of utilization constitutes a capital sin in less affluent countries. These styles require exactly the factors [i.e. surrounding conditions] that are particularly scarce in poor countries – namely resources and well-trained teachers. If poor countries had a vast supply of the teachers needed….they would not have the miserable education they do. By the same token, where telephone lines are expensive and rare, the Internet is doomed to remain an elitist resource, available only to a small number of students. No less important, these remain expensive technologies for developing countries, even with falling costs over the last several decades.

Castro also maintains that it is important for all developing countries to keep abreast of developments in the newer, leading-edge technologies and even engage in small-scale innovation and experimentation. He stresses, however, that the primary goal must be on exploiting the power of more sustainable, broadcast technologies such as television and radio to serve very large numbers of learners.

46. A comprehensive decision making tool that builds on the ACTIONS framework has been developed in South Africa as part of a broader strategic plan for the expansion of technology-enabled distance education in the country. The Technology-Enhanced Learning Investigation (TELI) was undertaken for the Minister of Education with support from UNESCO and the World Bank. The management tool comprises a series of modules which the user is guided through to make appropriate technology choices. These include:

- Teaching and Learning Module – to enable decision makers to develop a clear picture of the teaching and learning environment for their existing or planned educational program
- Technologies Module – to provide decision makers with information about the range of available technologies that can enhance education and training
- Module on Integrating Technologies into the Teaching and Learning Environment – to guide decision makers through a set of questions to help them understand the implications of introducing technologies into the teaching and learning environment; and

Additional information on the TELI policy framework and the decision making tool, developed as part of the strategy, can be found at the South Africa Department of Education’s Center for Educational Technology and Distance Education web site (www.education.pwv.gov.za/teli2/).
• Costing Module – to assist decision makers to understand the financial implications of introducing the various technologies.

47. In summary, the preceding frameworks for the selection of learning technologies would seem to require little more than the systematic application of common sense. The phenomenon of the inappropriate application of learning technologies is, however, still evidenced at all levels of education, within private and public sector organizations and within developing and more fully developed countries. The consequences of misinformed policy decisions for learners, teachers and national treasuries can be very negative, particularly in environments characterized by extreme scarcity of financial resources. The complexity of the technologies may be increasing but the fundamental principles associated with their application remain simple; develop, through analysis, a comprehensive understanding of the learners’ needs and the context in which the learning will need to occur and let these, rather than technology, drive decision making.

48. Table 9 illustrates a general application of the ACTIONS framework for technical / vocational training within Sub Sahara Africa. The good, average and poor ratings along the seven dimensions within the framework, while highly generalized, are intended to reflect their potential degree of appropriateness for each of the technologies relative to prevailing conditions within the region.

Table 8. General Learning Technology Assessment For TVET in the Sub Sahara Africa Region

<table>
<thead>
<tr>
<th></th>
<th>Access</th>
<th>Costs</th>
<th>Teaching</th>
<th>Interactivity</th>
<th>Organization</th>
<th>Novelty</th>
<th>Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Print</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Print</td>
<td>Good</td>
<td>Good</td>
<td>Average</td>
<td>Av./ Poor</td>
<td>Average</td>
<td>Poor</td>
<td>Average</td>
</tr>
<tr>
<td>Instructional Radio</td>
<td>Good</td>
<td>Good</td>
<td>Average</td>
<td>Poor</td>
<td>Poor</td>
<td>Average</td>
<td>Poor</td>
</tr>
<tr>
<td>Audio Teleconferencing</td>
<td>Poor</td>
<td>Average</td>
<td>Poor</td>
<td>Poor</td>
<td>Good</td>
<td>Average</td>
<td>Good</td>
</tr>
<tr>
<td>Audio Graphics</td>
<td>Poor</td>
<td>Poor</td>
<td>Poor</td>
<td>Good</td>
<td>Poor</td>
<td>Good</td>
<td>Av/Poor</td>
</tr>
<tr>
<td>Interactive Television</td>
<td>Poor</td>
<td>Poor</td>
<td>Poor</td>
<td>Good / Av.</td>
<td>Good</td>
<td>Poor</td>
<td>Good</td>
</tr>
<tr>
<td>Video Teleconferencing</td>
<td>Poor</td>
<td>Poor</td>
<td>Poor</td>
<td>Good / Av.</td>
<td>Good</td>
<td>Poor</td>
<td>Good</td>
</tr>
<tr>
<td>Computer-based Training</td>
<td>Poor</td>
<td>Av./ Poor</td>
<td>Poor</td>
<td>Average</td>
<td>Average</td>
<td>Average</td>
<td>Good</td>
</tr>
<tr>
<td>Interactive Television</td>
<td>Poor</td>
<td>Poor</td>
<td>Poor</td>
<td>Good / Av.</td>
<td>Good</td>
<td>Poor</td>
<td>Good</td>
</tr>
<tr>
<td>Video Teleconferencing</td>
<td>Poor</td>
<td>Poor</td>
<td>Poor</td>
<td>Good / Av.</td>
<td>Good</td>
<td>Poor</td>
<td>Good</td>
</tr>
<tr>
<td>Computer-based Training</td>
<td>Poor</td>
<td>Av./ Poor</td>
<td>Poor</td>
<td>Average</td>
<td>Average</td>
<td>Average</td>
<td>Good</td>
</tr>
<tr>
<td>Internet / Web-based Training</td>
<td>Poor</td>
<td>Poor</td>
<td>Poor</td>
<td>Average</td>
<td>Average</td>
<td>Average</td>
<td>Good</td>
</tr>
</tbody>
</table>
SECTION 5 - DISTANCE LEARNING TRENDS

The impact of the Internet on education is almost certain to be very much greater than on any business. The average knowledge worker will outlive the average employing organization. This is the first time in history that this has happened.... So the center of gravity of education is already shifting from the education of the young to the continuing education of adults.... The continuing professional education of adults will be the No. 1 gross industry in the next 30 years, but not in the traditional form... The Internet combines the advantages of both class and book.24

49. The above quote from Peter Drucker, who first coined the term knowledge economy, reflects a growing recognition that education and training systems throughout the world are in the midst of transformational change. Virtually all of the key innovations in the general application of information technologies are originating within the highly industrialized countries, with the U.S. clearly at the forefront. Major advances in the use of ICTs to support distance learning are, correspondingly, most prevalent in the advanced economies. Given this fact, it is worthwhile considering some of the key distance learning trends particularly in the vocational, technical, corporate training sub-sectors. The following section describes general trends at both the program implementation and policy levels.

50. Box 17 reflects that much of the change dynamic in the more advanced economies is based on an increase in demand for more responsive and cost-effective models of skills development that are compatible with new, technology-enabled business processes.

Box 17. What is driving e-learning?

![Diagram of e-learning factors]

DEMAND
- Rapid obsolescence of knowledge & training
- Need for just-in-time training delivery
- Need to increasingly integrate learning and work
- Need to train a larger portion of the workforce to higher standards
- Search for cost effective ways to meet the needs of increasingly distributed workforces
- Skills gap and demographic changes drive need for new learning models
- Demand for flexible access to lifelong learning

SUPPLY
- Access to information and telecommunications technologies at home and the workplace is rapidly expanding
- Advances in digital technologies enable the creation of interactive, media rich content
- Increasing bandwidth and better delivery platforms makes e-learning more feasible
- Growing selection of high quality e-learning products and services at lower prices
- Emerging technology and content standards facilitate compatibility and useability of e-learning systems


24 Peter Drucker, Sage Advice, August 2000

World Bank (Africa)
Industry Trends

51. The graphic also reflects that, in addition to market demand, a range of general supply factors are driving the expansion of distance learning. The pace of change within the field, as with all technology-enabled processes, is extremely rapid. The primary drivers are technical developments in hardware and software and major improvements in the price / performance ratio of information and telecommunications technologies. These developments along with the proliferation of new vendors and products often create confusion within organizations that are planning for new technology-assisted training models. Despite the high levels of “churn” in the e-learning market, it is possible to identify a limited number of emerging trends, within the supply side, that can inform policy and program development.

52. Growth - The most obvious trend in e-learning has been the extremely rapid growth in acceptance and utilization within both the formal education system and the corporate training market. For many years the actual use of training technologies fell far short of their promise. It has only been within the last three to five years that growth patterns have truly accelerated. Unfortunately, trend data available for many parts of the world are either non-existent or poor. A recent snapshot of the U.S. workplace training market, which is experiencing the most rapid rates of growth and innovation, reveals a clear shift to technology-enabled models of delivery (ASTD, 1999):

Table 10. Instructional methods & media (U.S.)

<table>
<thead>
<tr>
<th>Method</th>
<th>% Using</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom</td>
<td>90</td>
</tr>
<tr>
<td>Workbooks / Manuals</td>
<td>74</td>
</tr>
<tr>
<td>Videotapes</td>
<td>69</td>
</tr>
<tr>
<td>Public Seminars</td>
<td>56</td>
</tr>
<tr>
<td>CD-ROM</td>
<td>54</td>
</tr>
<tr>
<td>Self Study</td>
<td>39</td>
</tr>
<tr>
<td>Role Plays</td>
<td>37</td>
</tr>
<tr>
<td>Audio Cassettes</td>
<td>36</td>
</tr>
<tr>
<td>Internet / WWW</td>
<td>36</td>
</tr>
<tr>
<td>Case Studies</td>
<td>33</td>
</tr>
<tr>
<td>Intranet / Internal</td>
<td>24</td>
</tr>
<tr>
<td>Games / Simulation</td>
<td>23</td>
</tr>
<tr>
<td>Video Conferencing</td>
<td>23</td>
</tr>
<tr>
<td>Satellite / Business</td>
<td>19</td>
</tr>
<tr>
<td>Teleconferencing</td>
<td>14</td>
</tr>
</tbody>
</table>

Source: 1999 Industry Report: An Overview Employer Sponsored Training In the U.S.

- In 1997, only 15% of the U.S. population used the Internet – then mostly the domain of educational institutions and business. By 2003 it is estimated that 63% of Americans will be using the Internet and the web. By 2003, it is estimated that one quarter of all business-to-business purchases will be done on-line.
• Fourteen percent of employer sponsored training in the U.S. is now delivered via computer

• Twenty-five percent of all IT training, representing one-third of total employer-based training expenditures, is provided by computer. Online IT training, a $87 billion dollar industry, has outsized the market for soft skills training since its emergence. However, at a 123 percent annual growth rate, soft skills training online is growing twice as fast as IT and should surpass it by 2003.

• The fastest growing portion of the market, for the foreseeable future, will be web-based training products and services in the corporate, professional and consumer market segments. International Data Corporation estimates that corporate spending on online training will exceed $11 billion by 2003; a more than 900 percent increase from the $1.1 billion companies spent in 1999.

• The number of e-learning pilots conducted in the corporate world has increased dramatically over the last two years. In 1999 approximately 92% of large corporations implemented web-based learning pilots. The majority of Fortune 500 companies today already use some form of e-learning to deliver professional development and training to their employees.

• A recent survey by the U.S. Department of Education found that, from 1995 to 1998, the number of distance education programs increased 72%. Moreover, an additional 20 percent of the institutions surveyed plan to establish distance education programs within the next three years.

53. The Internet & Technology Convergence- The ability to converge a wide range of media including text, sound, images, animation, and video on the Internet has been perhaps the single most important factor underlying the expansion of technology-based learning. One of the greatest challenges and barriers to the implementation of technology-based learning models in the past has been related to the selection of technology. Over the past twenty to thirty years there have been a succession of expensive and often under-performing learning technologies. Many of these, implemented at great expense, are now largely redundant. Simple text-based CBT running on standalone PC’s has given way to interactive videodisc, audio-graphic systems, business television, compressed two-way video conferencing, and CD-ROM. The capability to provide richer, interactive learning environments has steadily improved with these successive technologies. A number of significant obstacles, however, have remained including rapid obsolescence, prohibitively high content development costs, high equipment purchase costs, lack of learner access, platform instability, a lack of common standards, and an inability to effectively integrate media. The Internet and the Web have literally “changed everything” by providing a powerful, relatively ubiquitous vehicle for the creation and distribution of learning materials in multiple formats and media. Rather than facing often-difficult technology selection choices, training organizations in the developed world can now cost-effectively access all of the capabilities required for the development and dissemination of pedagogically sound instruction via a single technology platform. The Internet not only integrates all predecessor technologies but also adds additional capabilities and reach that were once unimaginable. The often-stated ideal of “just-in-time” training that can provide on-demand learning anywhere, anytime, and anyplace is now a reality.
Advances in on-line learning tools and methodologies have coincided with advances in the technical capabilities of the Internet. Whereas the initial focus of much e-learning has been on asynchronous course delivery, many analysts are now predicting a rapid expansion of new synchronous models that enable the delivery of instruction to a group of distributed learners in real time, using a variety of interactive media; in effect a “virtual classroom”. Most Internet delivery systems, unlike earlier generations of expensive and often unstable learning technologies, now simply require a basic computer and a standard web browser. New standards-based, synchronous learning systems generally utilize four key tools: voice-over-IP, streaming video, document sharing and text-based chat.

**Box 18. Corporate e-learning in the U.S.**

E-learning will never totally replace other methods of training, including traditional classroom instruction. Rather, it will exist alongside these other methods, including CD-ROM’s, audio, video-conferencing, and computer-based training. A popular technique is the “blended” approach, which weaves together the best practices of all the different training techniques. Analysts predict that e-learning will become a larger and larger percentage of the corporate training “pie”.

Trace Urdan, senior research analyst at WR Hambrecht & Co. notes that in 1999, corporate America spent $63 billion on educating and training its workforce. “At $3 billion, e-learning occupied the fastest growing fraction of the market,” he says…. The Internet is poised to become the medium of choice for delivering education and training. In the next few years, classroom use in corporate training will drop dramatically from its current 78 percent share of the training market top 64 percent by 2001, according to the American Society for Training and Development, the leading professional organization in the training field….Merrill Lynch forecasts that expenditures for corporate e-learning in the U.S. will soar from $1.1 billion in 1999 to $11.4 billion in 2003.

Source: Fortune Magazine, November 2000

Another key requirement for e-learning models predicated upon the Internet is adequate telecommunications bandwidth. Most asynchronous learning systems are designed to work very effectively with standard “twisted pair” telephone connections providing access speeds of between 28.8 kbps and 56 kbps. The use of the more highly interactive, synchronous systems has been limited by the requirement for broadband connections (i.e. greater than 64 kbps). Rapid technical developments in digital compression for video and audio, combined with advances in streaming technology, are providing the capability to allow synchronous learning applications over standard dial-up connections. Additionally, the availability of more affordable broadband services, including digital subscriber lines, cable modem services, and home satellite connections are providing high-speed Internet access within the reach of home-based learners and the small-medium business sector. Whether asynchronous, synchronous, or mixed models of delivery the advantages of e-learning systems based on Internet technology include:

- reliable, standards-based technology platform;
- broad reach and portability;
- relatively low technology costs for the learner / participant;
- capability to update training content / curriculum quickly and cost-effectively at source; and
- capability to create rich, highly interactive learning environments through integration of multiple media.
56. **Structured Content** - Another major trend is the emergence of new capabilities to implement highly flexible instructional design strategies based upon the concept of object-based learning content. The core concept is to decompose instructional content beyond the traditional course and module level to a more finite unit termed *learning objects* or *granules*. These reusable learning objects, once developed in any number of media, can then be *meta-tagged* (i.e. labeled) and stored in a relational data base for retrieval and assembly to create training programs that can be delivered via distance /e-learning or even more traditional methodologies. The evolution of structured content strategies has been predicated upon developments in software (e.g. Extensible Mark Up Language or XML) hardware, and, equally as important, major initiatives to establish global standards for defining and labeling learning objects. While developments in this field are relatively new, the potential benefits are seen as potentially far-reaching and include:

- cost efficiencies gained through the capability to re-purpose and re-use instructional content for multiple training applications;
- the opportunity to customize training to the specific requirements of the individual, when combined with intelligent tutoring systems; and
- commercial opportunities to package, market and globally distribute instructional content resulting from a standards-based approach.

Box 19 describes Motorola’s application of Internet-based training and learning objects in order to meet the needs of its global workforce.

**Box 19. Motorola’s Learning Objects Initiative**

Motorola University, Motorola’s training arm, has embarked upon an ambitious development effort to create an object-based learning library for its worldwide training programs. The program is among the first to put object-based learning into practice on a global scale.

“It’s a four-tiered approach” says Christine Good, Director of Learning Technologies for the Schaumburg, Illinois – headquartered Motorola U. “First comes the network infrastructure on which to build the system, and we now have 20 servers worldwide through which to distribute training”

The next two components -- an object oriented database that will store a library of learning objects for everything from technical training courses to management education and a design template to create online learning from objects stored in the database. The final tier is an end-user interface and a user profile that will aid in matching content with a learner’s needs.

Why wade into an emerging technology that, like any system in today’s fast-changing digital realm, entails risk of obsolescence and no guarantee of success? “We’re a global organization and we need to distribute training far and wide” explains Good. “Instead of having every facility create its own CBT, we need to reduce, reuse and standardize what we already have and be able to provide quality and consistency. We believe this approach will allow us to do that”.

Source: American Society For Training & Development, 1998

57. **Horizontal Integration** - A final trend is the requirement for strategic partnerships in order to implement and sustain new models of development and delivery. Many organizations that both develop and utilize e-learning systems have concluded that it is generally not feasible to “do it all” – develop curriculum and content, create and sustain technology infrastructure, provide learner support, provide administrative support and tracking, test for outcomes, and provide certification. The trend toward specialization and partnerships is most pronounced in the private sector e-learning supplier market that has literally seen the entry of thousands of new companies attempting to capture market share. Industry analysts have identified more than 50 distinct market segments that can be aggregated into three more general supplier categories:
• content providers - author and publish intellectual in a variety of media;
• technology vendors - provide creation and capture tools, enterprise systems and learning specific hardware enabling the creation, deployment, delivery and management of technology-based training; and
• service providers - offer a variety of learning related services such as, content hosting, portals, and on-line testing

58. Horizontal integration within the training and education sector is most frequently manifested in new forms of organizational structures designed to overcome the high costs for entry and other implementation challenges. These often take the form of private / public sector partnerships or the establishment of distance learning consortia through which members share the costs of development, infrastructure, marketing, and administration.\(^{25}\) Organizations that are having the most difficult time in developing and / or sustaining technology-based distance learning models are those that are either unwilling to move toward horizontal integration strategies or those that are unable to due to internal rigidities and barriers (e.g. collective agreements).

**Policy Trends**

59. The concept of human capital investment has become more pronounced as countries in the developed and developing world struggle to find comparative and competitive advantage within a highly interdependent, global economy. There is growing realization within some countries that they must effectively “re-engineer” their education and training in order to provide continuous skills and knowledge upgrading to their workforces. We are beginning to see in a number of jurisdictions the development of national training policies and specific strategies in which distance learning plays a central role.

60. **Australia** - Australia has been aggressively implementing a systematic national strategy for the application of flexible learning to reform its vocational education and training system since 1995. This process has recently culminated with the approval by the Australian National Training Authority of a new national strategy. It has been designed to support both the accelerated take-up of flexible learning approaches and to position the Australian VET system as a world leader in applying new technologies to vocational education products and services. The framework incorporates four key goals:

- **Creative, capable people** - To build a critical mass of VET staff who are able to use flexible learning approaches to accelerate Australia’s transition to the information economy;
- **Supportive technological infrastructure** - To achieve a national VET system which facilitates affordable access by all communities, learners and employers to online services; is underpinned by advanced information and communications technologies, and achieves connectivity and interoperability in the application of technology for the delivery of training services;
- **World-class online content development, applications and services** - To assist the Australia VET system to maintain and expand its share of the training market within Australia and internationally; and
- **Enabling policies** - To ensure that all nationally agreed policies and protocols for VET are designed to facilitate the uptake and usage of flexible learning.

\(^{25}\) The African Virtual University is one example of a distance learning consortium.
The Australian National Training Authority has initiated numerous specific strategies and projects throughout the training system, and has allocated a budget of over $20 million in the current fiscal year to support framework implementation.

61. **Canada** - The Office of Learning Technologies has been established by the Government of Canada to work with private and public sector partners to expand learning opportunities through technology that, in turn, contribute to the development of a knowledge-based economy and a learning society. Its primary activities include:

- promoting the effective use of learning technologies;
- participating in the development of policies and strategies that guide the evolution and application of learning technologies;
- supporting research, testing and assessment related to the use of learning technologies;
- facilitating the sharing of information on national and international developments in learning technologies; and
- showcasing effective Canadian learning technologies products and services

The Office of Learning Technologies has just launched its *Learning Technologies in the Workplace* program that provides funds on a cost-share basis for projects that expand opportunities for skills development in the workplace and through the practical implementation of technology-enabled training models. This is in addition to some more general financial support programs that have provided funding for more than 220 learning technology projects across Canada.

62. **European Community** - The E.U. has established a number of complementary programs to support the adoption of distance learning under the general framework of *The Fifth Framework Programme* covering the period 2000 – 2006.

- **CORDIS** (*Community Research and Development Information Service*) is the E.U.’s largest R&D effort to advance learning technologies, finances applied research and demonstration projects in a wide range of areas including TVET and worker training. For example, the Adapt-IT project aims to use ICTs to assist workers, especially those whose jobs may become obsolete; to help enterprises increase their competitiveness; to prevent unemployment by improving the qualifications of the workforce; and to facilitate the development of new jobs.

- **Socrates II** is a broad-based program to facilitate the creation of a lifelong learning culture within member states through eight separate initiatives. *Minerva*, for open and distance learning, aims to promote understanding among teachers, learners, decision-makers and the public at large of the implications of distance learning for education; to ensure pedagogical considerations are given proper weight in the development of ICT and multimedia based educational services and products; and to promote access to improved methods and educational resources and best practices.

- **The Leonardo Da Vinci Programme** is focused exclusively on vocational training and has general objectives to support lifelong learning and the development of knowledge, aptitudes and skills necessary for the individual’s integration into working life and society.

- **The eLearning Action Plan** is the most recent development in the EU. The three-year, $13.3 billion plan aims at broadening digital literacy in Europe, reducing the continent’s shortage of IT workers, and challenging the U.S. for dominance in the information technology sector. The plan will target all levels of education and comprises specific strategies for teacher training, the development of online learning platforms, the development of instructional content, and the networking of education and training institutions. In addition, the European Commission is investigating the concept of standard
I.T. diplomas to be issued to persons who successfully complete foundation courses in computer and Internet competency. It is anticipated that the European Investment Bank and other agencies will play a role in financing the plan’s implementation.

63. Great Britain - The University for Industry (UFI) is a recent national initiative of the British Government that became fully operational in September 2000. The broad goals of UFI are to stimulate demand for lifelong learning among business and individuals and to promote the availability and access to relevant, high-quality learning opportunities. A key objective of UFI is to stimulate demand for and supply of lifelong learning tied to the requirements of the economy and labor market. UFI has been established as a non-profit corporation with funding support from the British government. A key focus of UFI will be the use of information and telecommunications technologies to provide access for adult learners to a broad range of highly flexible training opportunities including those in the trades and technical areas. In addition to commissioning the development of media based learning materials, UFI aims to establish a network of over 1000 learning centers throughout Great Britain where learners can access the required technology and support services to participate in the UFI e-learning model. The centers are established on a franchise basis and will be located in communities, institutions, and workplaces.

64. United States - The U.S. has perhaps emerged as the undisputed leader in the application of learning technologies, particularly in support of technical and workplace training. Although distance and e-learning are presently being used for everything from basic skills/literacy development to leadership skills, the heaviest concentration is within the technical skills area. Information technology training now accounts for more than 35 percent of all corporate training expenditures in the U.S. The volume of I.T.-related training delivered via distance/e-learning now accounts for more than 25 percent of the total. Additionally, the U.S. military, which has over the past 30 years pioneered most of the advances in learning technology, now delivers a very significant portion of its technical and trades training using technology-assisted models.

65. There are numerous state and national initiatives underway to accelerate the development and adoption of technology-based learning at all levels of the U.S. education system. One of the most notable is the recently announced Commission on Technology & Adult Learning, a joint initiative of the National Governors’ Association and the American Society for Training and Development. The Commission is bringing together State Governors and CEO’s from business and post-secondary education to examine the most critical issues for public policy and practice raised by changes in the economy and the increasing use of information technology for adult learning. The expected outcomes of the Commission over the next 18 months are to:

- frame the questions and implications for the public and private sectors as adult learning develops through information technology;
- identify best practices in the public and private sectors for promoting access to and the effective use of information technology for adult learning;
- describe the appropriate public and private sector roles that will facilitate the use of information technology for lifelong learning; and
- make recommendations for state and national public policy to facilitate the transition to an information economy.
66. The National Web-Based Education Commission, in a similar thrust, recently submitted its report to Congress.\(^{26}\) The Commission, recognizing the “extraordinary promise” for web-based learning, called for its aggressive application in support of lifelong learning. Specific recommendations include:

- the widespread availability of broadband connectivity;
- professional development for educators in learning technologies;
- applied research into the application of learning technologies;
- the development of high quality content;
- the revision and/or removal of impeding policies and regulations;
- protection of learner’s privacy; and
- adequate funding to support e-learning at all levels.

67. Finally, there are a number of specific federal programs that have been established within the U.S. to promote innovation and expand the use of distance learning in workforce training. The $10 million per year Learning Anytime, Anywhere Partnerships Program (LAAP) of the U.S. Department of Education is a cost-share program that funds innovative, scaleable, and nationally significant projects that broaden student access. Funded projects include those that use distance learning for the training of production workers in the petrochemical industry and para-professionals in the health care industry. Literacylink is a $15 million program of the U.S. Department of Education and the Public Broadcasting Service whose aim is to create an integrated instructional design system of video and on-line computer technology that will help adult learners improve their literacy and workplace skills. Product development is to be completed by 2001.

---


Open University, International Center For Distance Learning
SECTION 6 - CHALLENGES & ISSUES IN DISTANCE LEARNING

68. General developments within the e-learning field are attracting the attention of educators, unions, governments, business, investors, and international development agencies. The field is not, however, without issues and challenges which if not managed well can present significant barriers to implementation and sustainability. The first section below describes some of the more general issues that are emerging in contexts where distance learning models are being implemented. The following section examines the more significant challenges that exist within Sub-Saharan Africa.

General Challenges & Issues

69. Content and Curriculum - Much of the focus within the distance /e-learning arena tends to fall on the more captivating developments in learning technology. The absolute cornerstone of any distance /e-learning model is, however, content or curriculum. A current impediment to the further growth and diffusion of more advanced systems in all parts of the world is the unavailability of relevant, well-designed instructional content. This is particularly true in the technical/vocational training area. The primary reason is the considerable front-end investment required to re-purposed traditional curriculum, including print-based distance learning materials, for electronic delivery. An expanding market has led to the emergence of new private sector firms that assemble, package, and market distance learning content globally. The current scarcity of content raises fundamental issues for developing countries that need to acquire instructional content within commercial markets. It also can force difficult “buy or build” decisions for almost all organizations that seek to move into distance learning.

70. Appropriateness and Efficacy – There has been a traditional perception among many educators and policy makers that distance education is an inappropriate methodology for imparting vocational and technical skills. This perception stems largely from the stigma associated with older forms of correspondence education and the notion that vocational skills can only be acquired in traditional training centers or the workplace. This viewpoint has some validity. Many distance education organizations involved in vocational programs fully acknowledge the difficulty in teaching many manual / psychomotor skills at a distance. To overcome this challenge they now often incorporate traditional components delivered in training centers and/or the workplace. This trend towards blended program models is likely to become even more pronounced with the increased integration of learning and work. Two other points are also important in this regard. First, it is apparent that, for many occupations within the emerging ‘knowledge economies’ the cognitive and affective learning domains are becoming more substantial relative to psychomotor skills. Using distance education to provide training and education targeted at these two domains is a much less challenging task than imparting manual skills. Secondly, multimedia and Internet technologies now enable the creation of modeling and simulations that can closely approximate many processes, activities and scenarios encountered in the workplace. Flight simulators used by major airlines to train pilots are perhaps the most

---

27 A major exception is the IT technical training market that has seen significant content investment by the private sector in response to demand for skills training and upgrading by employers.

28 Bloom’s taxonomy of the cognitive objectives of education is still widely used as means to classify learning and as the basis in many curriculum and instructional design processes. (Romiszowski, 1988) The three primary domains are the cognitive domain (knowledge and its application), the affective domain (feelings, preferences, value systems) and the psychomotor domain (physical skills).
advanced example of these capabilities. As the technology further advances it will be increasingly feasible to use technology to simulate and, even replicate, many workplace environments.

71. This notion that distance education is not an effective method for vocational / technical training is strongly refuted by Greville Rumble and Joao Oliveira (1992):

> Over the years it has become clear that students can learn almost anything at a distance. In the process of discovering this truth, an important psychological barrier which limited the growth of distance education was breached...This coincided with an increasing recognition among those concerned with vocational, professional and technical education that traditional methods of training are often too inflexible, too time- and place-constrained and too expensive...It is clear that distance education offers a means of delivering vocational, job-related training to employees within a single enterprise or sector, or more generally in industry, business, commerce and the public services in general...It is clear that distance education systems can satisfy such needs effectively and economically, through current and developing technologies.

The authors support their position through the presentation of a series of international case studies profiling a number of organizations that provide training in a range of vocational / technical skill and subject areas. These include a workplace re-orientation program for unemployed (Radiovolksuniversiteit, Netherlands), banking training (SENA/ Banco Popular, Colombo; Sanpaolo Banking Group, France), general public vocational training (U.K Open College; New Zealand Open Polytechnic), computer technology training (University of Victoria, Canada), telecommunications technician training (National Extension College, U.K.), agricultural development (Wye College, U.K.), and engineering professional development (National Technological University, U.S.)

72. Concerns often expressed within the traditional education sector over poor educational outcomes for distance learning relative to classroom-based models are not supported by the evaluation literature. Concerns, however, regarding relatively high attrition rates for some programs, particularly older correspondence–based models, have some validity. As evidenced by the program examples cited by Rumble and Oliveira, institutional models referenced in the body of this paper (e.g. Africa Virtual University, New Zealand Open Polytechnic, Open Learning Agency, University of Wisconsin, Technikon SA, TECSUP Higher Technological Institute), and the case studies detailed in Appendix 1 effective distance learning models have emerged that both retain learners and meet educational needs. It is reasonably safe to predict that, based on current trends, the efficacy of distance learning for technical / vocational training will continue to improve as a result of:

- much improved instructional design that will optimally blends synchronous, asynchronous and traditional classroom components;
- the provision of strong learner support systems and access to distance / e-learning within more highly structured learning environments, such as community or workplace-based learning centers;

29 A summary of the evaluation literature on the effectiveness of distance education relative to traditional models has been assembled by Thomas L. Russell at North Carolina State University. Russell has reviewed more than 400 distance education evaluation studies and has concluded that the clear majority of studies show “no significant difference” in learning outcomes between distance and traditional classroom-based models. Details on the individual studies can be found at (http://teleeducation.nb.ca/nosignificantdifference/index.).
• the development of intelligent tutoring and adaptive learning models that continuously adjust the presentation of content in accordance with the learner’s style, preference and progress; and
• the emergence of a new generation of learners who are more open to computer technology and are much more inclined toward a self-directed style of learning.

73. **Quality & Branding** - A third barrier to the expansion of distance learning is that many prospective participants are often suspicious of both the quality of the offerings and of the organizations that are providing them. Distance educators have had to overcome a persistent perception that distance learning is “second best” to more traditional forms. Consumer and learner surveys have also revealed that distance learners are more attracted to sponsoring organizations that have an established track record in the traditional training and education sector and have some form of public accreditation or mandate (W R Hambrecht + Co., 2000). The proliferation of online learning organizations, particularly among North American private sector suppliers, has made many learners wary of the quality of the content and the legitimacy of the entire methodology. Most analysts now conclude that branding of distance and e-learning offerings by recognized institutions and agencies will, along with the provision of recognized public credentials, be critical in winning learner confidence and expanding participation.

74. **Stakeholder Resistance** - The introduction of distance learning models can represent a significant threat to some stakeholders within education and training systems. Many instructors and faculty express concerns regarding technological change and potential job loss should distance learning models become more pervasive. These concerns, if not addressed, can present significant and even insurmountable barriers to broad-based implementation efforts. While the resolution of this issue will certainly never be easy, it is becoming more evident that the consequences of distance learning on traditional instructors will not be job loss but rather job redefinition. Many instructors and faculty will need to acquire new skills and knowledge and will see their roles gradually shift from teaching to facilitation within technology-assisted, interactive learning environments. This will require both ongoing professional and the incorporation of new curricula within existing teacher training programs.

75. **Digital Divide** - A final and, perhaps, most critical issue has been termed the “digital divide” and refers to the growing separation between those that have access to and mastery of information and telecommunications technologies and those that do not. The digital divide is most pronounced between the developing and the more developed countries but also manifests itself within more advanced economies along income lines, levels of educational attainment, between small and mid-large sized firms, and between rural and urban areas. Providing equitable access to technology will be essential if one accepts the propositions that increasing access to computers and high speed networks will be a fundamental prerequisite for participation in the new technology-based learning models, and that training and education are the cornerstones for economic and social development. There are widely expressed fears that, if this issue is not addressed, the promise of distance learning for democratizing access to training opportunities will have the opposite effect of fostering elitism and restricted access. In the next section the reality of the digital divide and other issues associated with the development of distance learning systems in Sub-Sahara Africa are more fully explored.
Challenges & Issues for Sub-Sahara Africa

76. Technology and Telecommunications Infrastructure – Current trends, primarily in the more developed economies, clearly suggest that information and telecommunications technologies will likely be the bedrock upon which future distance learning systems are built. The inadequacy and, in some cases, the entire absence of technologies which can enable the development of interactive distance learning systems is perhaps the most central and serious issue facing the Sub-Sahara region. Access to the Internet is now often used as a global benchmark by which to measure the penetration of information and telecommunications technologies – a phenomenon described as tele-density. A recent analysis indicates that, globally, regular Internet users have grown from fewer than 90,000 in 1993 to more than 304 million in 2000 (U.S. Internet Council, 2000). The report predicts that if current trends prevail, global penetration will reach more than 1 billion users by 2005, with the numbers of users in Asia surpassing those in North America and Europe by 2003. It is not surprising that, at present, the wealthier regions of the world tend to dominate. North America comprises 45% of the total, Europe 27%, and Asia Pacific 23%. In stark contrast, the total numbers of users in the entire continent of Africa is estimated to be between 800,000 and 1 million, of which approximately 700,000 are located in South Africa. At more basic levels of technology, access to the telephone, which most of the developed world now takes for granted, remains an enormous challenge for much of the region:

Infrastructure is critical since connectivity is essential. Data on telephone access are illuminating. East Asian tiger economies provide telephone access of 50 lines per 100 population or better. In much of Africa line access is below 1 per 100. Moreover, quality in telephone systems, which use landlines, and exchanges that have not been upgraded is often inadequate for data transmission. Estimates of the number of graduates in science and engineering give some indication of the availability of those who can technically manage and develop ICT systems. This varies from less than 2 per 10,000 inhabitants in some countries in Sub-Sahara Africa to over 100 in some European countries. It is evident that, for the poorest countries, convergence towards levels of connectivity necessary for widespread access to ITC’s is a distant prospect.

It is clear that bringing developing countries into the information highway constitutes a colossal challenge if we are to promote economic growth…the reality is that there are more telephone lines in Manhattan, New York, than in Sub-Sahara Africa.

77. A recent Commonwealth of Learning report (1999) provides a good summary of ICT developments in Africa. It draws on data available from the World Bank and Mike Jensen, an expert on ICTs in Africa:

- Radio is the most widespread communications medium on the continent.

---

30 An overview of general distance learning trends and issues in SSA, particularly those pertaining to ICT, can be found in Chapter 7 – “Virtual Institutions on the African Continent” authored by Mr. Vis Naidoo and Prof. Casper Schutte in The Development Virtual Institutions: A global perspective, Farrell, Glen, 1999
31 Keith M. Lewin, New Technologies and Knowledge Acquisition and Use in Developing Countries, Compare, Vol 30, No. 3, 2000
32 Thabo Mbeki, South Africa Deputy President as quoted in Commonwealth of Learning (1999).
33 http://www3.sn.apc.org

World Bank (Africa)
49 of 54 countries and territories in Africa have Internet access in their capital cities; three years ago only 12 countries had full access.

Only 17 countries have Internet servers in their secondary towns, imposing the requirement for long distance calling in order to access the service.

At an average of US $ 50/month, ISP subscription fees are much more than an average monthly salary.

Each computer in Africa with an Internet connection has an average of three users.

Internet access levels in Africa are one user for every 1400 people compared to a world average of one user for every 35 people and a North American average of one user for every 3-4 people.

78. The profound poverty of the Sub Sahara Africa region combined with the required capital investments are the primary reasons for extremely poor levels of ICT infrastructure. Jensen estimates, for example, that just doubling the numbers of phone lines in Africa would cost approximately $20 billion. It is also apparent that a portion of the problem can be attributed to the telecommunications policies in the region. In many countries this sector is still operated as a state-owned monopoly, effectively preventing the entrance of new suppliers and much needed capital investment needed to expand and upgrade infrastructure. The Commonwealth of Learning (1999) also attributes the problem to “…a lack of vision, knowledge and appreciation of ICT in top governmental structures.” The imperative of expanding access to information and telecommunications technologies in Africa and the likely consequences of failure were identified by the World Bank in 1995:

In an increasingly knowledge-based economy, information is becoming at least as important as land and physical capital. In the future, the distinction between developed and non-developed countries will be joined by the distinction between fast countries and slow countries, networked nations and isolates ones. The Information revolution offers Africa a dramatic opportunity to leapfrog into the future, breaking out of decades of struggle and decline. Africa needs to seize this opportunity quickly. 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 marginalised and economically stagnant in the future than they are today.

79. There has unfortunately not been a great deal of evidence over the past six years that Africa has been able to achieve the kinds of developmental gains that are envisioned in the World Bank report. To the contrary, it is apparent that Africa’s economic, social, and political situation has grown more perilous, with the breadth of the digital divide more pronounced. There are still, however, a number of recent developments that may have potential to expand ICT access within the region:

- The issue of connectivity between Africa and the rest of the world has now been largely resolved through the installation of the SAFE and SAT/3WASC submarine cable system by an international telecommunications consortium. The fiber optic cable will enable high speed, digital telecommunications access to the rest of the world from the African West Coast, with a likely future expansion to nations in east Africa.

---

The challenge of expanding telecommunications access across Africa’s enormous geographic distances and difficult terrain may soon be partially addressed through satellite technology. The Regional African Satellite Communications Organization (RASCOM) is a treaty-based organization comprising 44 African nations that was established in 1995. RASCOM’s plans call for the connection of all major African cities using a small, $450 million satellite network. The plan is to launch the first of three satellites, RASCOM-1, in 2003. Once established, it is envisioned that the network will be able to handle a wide range of applications: Internet, long-distance telephone, videoconferencing, television, and radio broadcasts. Progress in realizing the project’s goals continues to be impeded by financing issues, regulatory barriers, regional instability, and political discord among the member states. RASCOM holds the promise of enabling African educational institutions to enter the global information age if these substantial barriers can be overcome.

U.S.-based WorldSpace Corporation, founded in 1990, is establishing a specialized satellite digital communications network to serve a potential audience of 5 billion people in the developing countries of the Southern Hemisphere. The $800 million system was originally conceived as an affordable mechanism to provide public health information, via digital radio, to mass audiences in order to combat the spread of the HIV/AIDS epidemic in Africa, and it has now expanded to include many other commercial and non-commercial programs. The system, which operates on a commercial basis, incorporates three satellites (AsiaStar, AfriStar, AmeriStar) and delivers digital audio and multi-media programming directly to listeners through 50 audio channels. AfriStar and AsiaStar were launched in October 1998 and March 2000, respectively. AmeriStar is scheduled for launch in 2001. WorldSpace satellites are geostationary, orbiting in fixed positions more than 35,000 kilometers above the equator. Using powerful spot beams, each of which can support more than 50 services per beam, the satellites transmit to three overlapping coverage areas of approximately 14 million square kilometers each.

WorldSpace satellites use on-board processing to enable program reception from many stations. Content providers on the system can uplink their programs via the traditional hub method, sending broadcast signals to a central location for transmission to the satellite. A second mode enables use of smaller, more mobile Feeder Link Stations (FLS). Onboard processing technology converts these multiple signals at the satellite combining them into a single downlink signal before transmitting them back to earth. In addition to audio, the system can support the broadcast of data, text, and images. A key component of the system is a specialized digital, portable radio receiver costing from $250 - $400 that can receive audio signals and display data and text. In 2000, WorldSpace launched Direct Media Service (DMS) in Kenya. DMS is delivered to a user’s PC through the WorldSpace digital receiver coupled with a PC Adapter or through a specialized PC receiver card.

WorldSpace satellites, based on digital technologies, hold considerable promise in providing broadband telecommunications access to rural areas in Sub-Sahara Africa. The first are powerful geo-stationary systems that orbit 36,000 kilometers above the equator at the same speed of the earth’s rotation. The RASCOM system falls into this category. A second, more recent system, is based upon multiple, low orbit satellites that circle the earth every two hours at altitudes of 1,500 kilometers. Receive stations or antenna will cost approximately $500 - $1000 per installation and bandwidth capabilities will be in the range of 18 MBPS. The advantage of either system for Sub-Sahara Africa is that they eliminate the need for the establishment of expensive terrestrial infrastructure such as fiber-optic networks and can provide telecommunications access to any site on the earth that has access to a reliable electrical power supply.

Additional information on Worldspace Corporation can be found at (www.worldspace.com) and on the Worldspace Foundation at (www.worldspace.org).
Large amounts of web content, selected by the subscriber, can be loaded directly to the hard drive of a user's Pentium-class PC, without the need for a telephone line, at speeds of up to 128 kbps. It is important to note that DMS is a one-way broadcast system and is not an interactive Internet system. DMS supplements traditional Internet services by offering access to web content without per-minute telephone line charges.

- WorldSpace Foundation is a U.S. based non-profit organization that was created in 1997 to provide educational and informational programming to people in developing regions of the world who are disadvantaged by illiteracy, poverty or geographic isolation. The foundation partners with a wide array of organizations to produce its educational programs for broadcast on WorldSpace satellites. (The corporation allocates 5% of its total channel capacity to the foundation for social development and educational programming.) These organizations include non-governmental organizations, UN agencies, government ministries, international development groups, universities, and community radio stations. Content on WorldSpace Foundation channels may include basic education and information on a variety of development-related topics, such as health, agriculture, environment, women’s issues, and civic education. The Africa Learning Channel (ALC) broadcasts materials collected from African productions and co-productions and focuses on social development issues such as micro-enterprise development, health, HIV/AIDS, history, English as a second language, conflict resolution, economic development, women’s issues, and human rights. The service is intended to benefit African NGO’s, universities, community radio stations, and community centers.

**Box 21. Educational Media Agency (Ethiopia) and digital radio.**

EMA has partnered with WorldSpace which has recently launched the AfriSat satellite that broadcasts digital programs from space. AfriSat covers the African continent using three transmitting beams, each of which has the capability of carrying 60 audio channels simultaneously. Although principally a commercial venture, WorldSpace Corporation through its Foundation has dedicated part of its broadcasting capacity for the nonprofit sector in areas such as education, health, the environment, and women’s issues. As one initiative to help test the capacity of this technology to support education, WorldSpace is providing one broadcasting channel exclusively for use in Ethiopia. In addition, it has donated 50 digital receivers for a pilot program. EMA has already identified approximately 400 programs to be broadcast from AfriSat. These programs include harmful traditional practices, folk media, science subjects, gender issues, primary school teacher training programs, and English.

There are several advantages to this new technology:
- The programs can reach the most remote areas. The transmission signal is not bothered by mountains or other terrain as experienced with conventional radio.
- It provides a crystal clear audio signal, which is particularly important in instructional programs, especially for languages.
- The satellite not only has the capacity to broadcast audio programs, but since it uses digital technology, it can also transmit multimedia information as well. Thus, the satellite can download text, video, audio, and graphics to a radio, which in turn, can pass the file to an attached computer.

EMA will distribute the 50 digital receivers to schools for the pilot activity to begin next October. In addition, EMA has initiated discussions with WorldSpace to utilize the capacity for downloading multimedia information to support the new distance education program for primary school teachers. EMA is particularly interested in the capabilities of transmitting data directly to resource centers throughout the country via the satellite. This would provide an exceptional opportunity to send extensive multimedia information, even including copies of multiple Web sites and links, to resource centers where teachers will meet periodically as part of their upgrading program.
USAID’s Leland Initiative is a five-year, $15 million effort to extend full Internet connectivity to twenty or more African countries in order to promote sustainable development. The project seeks to bring the benefits of the global information revolution to the people of Africa through connection to the Internet and other ICTs. A key objective of the program is to assist in the establishment of private sector Internet Services Providers (ISPs) through the provision of financial and technical assistance. The three primary objectives on the project are to create an enabling policy environment for Internet growth, create a sustainable supply of Internet providers, and to enhance Internet use for sustainable development. Training individuals in the use of the Internet has been a major focus of the program.

Box 22. Botswana College of Technical and Vocational Education

Planning is underway to combine modular education and training with the use of information and communications technology (ICT), i.e. distance education delivered through interactive electronic means, using multimedia and videoconferencing as well as CD-ROMs, through Internet and Intranet direct access or download. A joint Government of Botswana/European Union project is in place to pilot this approach at the College of Technical and Vocational Education, a technical teacher training college, to be located in Francistown, designed with electronically linked remote learning centres in four other locations across the country. The work on this project started in 2000 with implementation to be completed in January 2004.

Source: Atchoarena and Delluc, 2000

80. Instructional Content - The availability of well-designed, relevant, instructional is as important to the development and sustainability of a distance learning system as the media through which it is disseminated to the learner. Bates (1995) indicates that, whereas relevant, well-designed content can overcome the challenge of inadequate technical infrastructure, the most sophisticated technologies are not able to overcome or compensate for poor content. Instructional content in vocational / technical subjects that is designed for more advanced technology-based delivery is both expensive and, at present, relatively scarce due to the high costs of development. Domestic or locally produced content for developing regions like Sub-Sahara Africa is generally not widely available, often leaving the importation of content from the more developed countries the only viable option in the short term. Notable exceptions are Technikon SA and the Technical College of South Africa (TECHNISA). Both institutions have developed a substantial volume of print-based instructional materials in the career, technical, and vocational areas that have the potential to be adapted for broader use in the region and eventually reformatted for electronic delivery.

81. The importation of instructional content, particularly from the more advanced economies, can pose a number of problems for the region, including affordability. There is much evidence to suggest that ICT-based education and training is emerging as a major global industry in its own right characterized by high levels of corporate concentration, with content and pricing strategies designed almost exclusively for the advanced economies. Varoglu and Wachholz (2001) caution against the negative implications for developing countries of the rapidly growing private sector

Note: The Leland Initiative (www.usaid.gov/regions/afr/leland/) currently has projects in Benin, Botswana, Cote d'Ivoire, Eritrea, Ethiopia, Ghana, Guinea, Guinea Bissau, Kenya, Madagascar, Malawi, Mali, Mozambique, Namibia, Rwanda, Senegal, South Africa, Tanzania, Uganda, Uganda and Zimbabwe.
involvement in global education. They also express concerns with the efforts by more advanced countries to “commoditize” knowledge and rigidly enforce international copyright and intellectual property rights:

The fundamental premise of private property rights in industrialized countries – that knowledge is a private capital – is challenged by a number of developing countries. It was argued that in some countries certain forms of intellectual property are viewed as a public good and that some cultures are hostile to any notion that knowledge is a private capital… Limited resources and lack of competition between suppliers may adversely affect quality, access and price of educational services as marginalized groups do not constitute a significant ‘target’ market….The ICT development agenda, directed by powerful pressure groups, is driven by supply rather than by demand, and is currently dominated by western education models and market leaders. Inherent risks in this context include the creation of monopolies and brand-name universities and celebrity professors, concentration of the ownership of content and communications systems, as well as a shortage of affordable, high quality, relevant software in critical sections of the education market.

82. While acknowledging the potential benefits, in his keynote presentation to the 1999 Pan Commonwealth Forum on Distance and Open Learning in Brunei Maurice Strong also cautioned against the potential risks for developing countries inherent in the globalization of education and training through technology:

But despite this impressive potential, however, it has now become apparent that the globalisation of information presents both risks and opportunities for developing countries. There are many economic, technical and political constraints that prevent the knowledge revolution from realizing its full potential….Another more insidious risk from globalisation of ICTs stems from the issue of language and culture. Global communications systems spread mass popular culture in ways that can dominate cultures, languages and values. English has evolved into a kind of digital “lingua franca” for the Internet and Web communications …. that doesn’t help the millions of people and local authorities throughout the world who communicate in thousands of languages other than English….But the problem is not only one of dissemination. It is also one of appropriation. To assume that developing countries are only passive recipients of information for development is a paternalistic and even crude attitude…Developing countries must be proactive participants in the global information exchange. They must not remain passive consumers of imported information and Web content; instead becoming active contributors to the global resources and thus strive to garner a larger share in content production and creation39.

83. One promising development in the content arena is a recent announcement by the Massachusetts Institute of Technology that it intends to provide free access to all of its online course material (Daniel, 2001). Daniel interprets the move as one indication of an emerging open-source courseware movement and an affirmation that, in addition to quality materials, good distance learning is dependent on the other values that institutions add to the education process. These include learner support, assessments and evaluations, and

39 Honourable Maurice Strong, The Knowledge Revolution: Opportunities and Risks for Developing Countries, Commonwealth of Learning, 1999 (www.col.org/forum/strong.htm)
certification of learning outcomes. Daniel also regards the fledgling open-source movement as critically important for developing nations:

*I see the trend towards open-source courseware as extremely helpful to institutions in the developing world. Good distance learning materials, whether delivered on the Web or through other media, are expensive to develop. It would be tragic if, through excessive royalties for its use, courseware becomes another area where there is a net flow of wealth from the poor world to the rich world. Open-source courseware will help to bridge the digital divide....*

84. There is, unfortunately, not yet any evidence that other public institutions and for profit developers are following the lead of MIT. The current reality is that almost all public and private sector organizations engaged in the development of distance / e-learning content still seek to recover their costs and, in most cases, generate a return on investment. Given the high cost-structures implicit in developing instructional content in the high-wage economies of the developed world, the resulting purchase and/or licensing fees can be prohibitive for many developing countries and institutions to either finance themselves or pass on in the form of fees to the learner. 40 This suggests that building capacity within the region to initially adapt and then, eventually, to originate content for distance delivery must become a primary component of any sustainable strategy. The acquisition and local adaptation of existing technical / vocational training instructional materials, given the technical nature of the content, are not as likely to raise issues of cultural mismatch. More importantly, the benefits of such a strategy, including substantially reduced implementation costs and compressed implementation timelines, must be considered to far outweigh any potential risks.

85. **Skill and Knowledge Requirements** – Finally, it is apparent that the development, implementation and administration of technology-intensive distance learning systems require new skills and knowledge. 41 These are often substantially different from those required for more traditional delivery systems:

- learners, depending on the technologies used, participation often require a basic level of traditional literacy in the language of instruction and a basic technical literacy in the technology being used;

- technical support staff require advanced technical skills relating to the technology being used with specialized competencies in troubleshooting often complex systems;

- teachers and instructors generally require moderate levels of technical literacy in the equipment being used and specialized training in its pedagogical application. This often

40 For example, the courseware licensing fees from SmartForce Corporation for the Microsoft Certified Systems Engineer Program for a maximum of 100 learners is approximately US $35,000 per year. SmartForce is the largest commercial supplier of high quality e-learning content for the IT sector. The 6-8 month MCSE program has become a global, industry standard qualification for network /LAN administrators is currently offered by public and private training suppliers in North America for between US $7,500 and $11,000 per student.

41 A comprehensive description of the roles and competencies required to develop, implement and sustain distance learning systems can be found in, George M. Piskurich and Ethan S. Sanders, *ASTD Models For Learning Technologies: Roles, Competencies and Outputs*, American Society For Training and Development, 1998
implies a functional shift from teaching to facilitating and, in some cases, basic competence in the design of technology-enabled instruction

- administrators need to develop knowledge of administrative, financial, technical and human resource support systems required to implement and sustain new models of education and training, as well as keeping fully abreast of developments in the expanding distance learning and ICT field; and

- policy and decision-makers need to become sufficiently informed of all issues and opportunities associated with the utilization of technology and distance learning to reform education and training systems. An understanding of the critical nature of developments in global, regional and national telecommunications infrastructure, and the role of public policy is essential.

86. In summary, the challenges of underdeveloped technical infrastructure, a lack of instructional content, and the critical need for supporting skills and knowledge are substantial, but not insurmountable, obstacles to the development of distance learning systems for the delivery of technical/vocational training in the countries of Sub Sahara Africa. The existence of successful distance-education institutions in more developed countries and within developing countries, including those in the Sub Sahara region (pp.8-9), confirms both a basic market demand and the feasibility of using non-traditional methodologies and a relatively wide variety of technologies for meeting technical and vocational training needs. The overriding challenge for a region, so lacking in basic infrastructure and financial resources, is to develop pragmatic programs, institutions, and enabling policy frameworks. These will need to be compatible with the surrounding conditions in the region at present, but also capable of evolving to exploit eventual improvements in human and technical capabilities.

Box 23. China Central Radio and Television University

China Central Radio and TV University (CCRTVU) is a dedicated distance education institution, which offers multi-media university courses through radio, TV, print, audio-visual materials and computer software. It is located in Beijing under the direct supervision of the State Education Commission. At present this distance education system is made up of the CCRTVU, 44 affiliate TV universities, more than 690 branch schools at prefecture and city level, 1,600 study centers at the county level and 13,000 teaching classes. PTVUs mainly offer two or three year specialized college degree courses, aiming at training applied professional personnel at grass-roots level, in 529 specialties covering 55 disciplines in natural science, engineering, humanities, economics and management, agriculture and medical science.

CCRTVU offers courses in those subjects which are recognized as being of national interest. It is responsible for the production of the printed course material, associated radio and television broadcasts, developing and scheduling national examinations and setting the marking standards. It also trains teachers, technicians, and administrative staff and conducts research in higher education through distance learning. PTVUs are responsible for the production of course materials including radio and television programs for those courses that are of interest locally or regionally. They also develop, schedule and supervise examinations and marking procedures for these courses. In addition, they enroll students, keep students records, issue degrees, diplomas and certificates and provide student counseling services. Branch schools oversee and administer all aspects of teaching/learning activities such as scheduling of TV programs, tutorials, laboratory work, tests and examinations, and field studies as stipulated by CCRTVU and PTVUs. They also provide a counselling service to students and issue course certificates for secondary, technical and vocational courses. By 1996, 2.953 million students had been enrolled on degree courses with the TVU system, from which 2.127 million have graduated.
SECTION 7 – CONCLUSIONS

A priority task is to examine not only the potential for technologies in education but also the need for technologies in specific educational settings, the added-value in terms of quality, additional opportunity or cost-benefit, and the obstacles to overcome. International organizations have the moral obligation to simultaneously help make modern means of communication a part of all societies; they must also try to protect poor countries and communities from making expensive mistakes.42

87. Economic and social development in the countries of Sub-Sahara will require major, locally initiated reforms of nearly all political, social, and economic institutions and targeted investment. Investment in human capital through the training of the largely unskilled workforce is essential if the region is to advance. It is unlikely that expanding traditional models of TVET will be able to provide the skills required in the labor market. Consequently, the introduction of distance-learning models that are appropriate to the resources of the region must be considered as a stratagem. The fundamental challenge confronting policy makers and educators is determining how to use distance learning in the region in a manner that is effective, efficient and sustainable. Distance learning has the potential to play an important role, but is not, in and of itself, a solution to the many problems in Sub Sahara Africa’s current technical / vocational training systems. It has the capability, however, to increase flexibility, responsiveness and access for learners if it is planned and implemented as one component of a broader reform agenda. TVET reforms by countries in the region and possible increases in donor support for this purpose can provide an opportunity to use distance learning as a tool to provide more cost-effective and flexible models of training delivery in institutions, the workplace, and the community.

88. The notion that the Sub Sahara Africa region has the potential to pursue a “leap-frog” reform strategy through the accelerated application of advanced information and telecommunications technologies is an intellectually appealing but unrealistic option for the foreseeable future. Staggering levels of capital investment are required in the region to provide even minimal access to the most basic levels of technology infrastructure (e.g. reliable electricity supply, stand-alone computers, basic telephone access). It seems highly unlikely that such investments will quickly materialize against the present backdrop of political and social instability, rising debt loads, falling productivity, and the HIV/AIDS epidemic. Even if the required infrastructure were in place, many of the more advanced, interactive technologies that impose both high fixed and variable costs are extremely difficult to justify. Distance learning models and technologies that cannot achieve significant economies of scale are not presently viable or appropriate options in an impoverished region that urgently needs to find practical ways to provide highly cost-effective technical /vocational training for hundreds of thousands of students and workers.

89. There are examples throughout the developed and the developing world of training institutions and countries that have substantially expanded learner access through the initial introduction of distance learning models based on relatively simple, low-cost technologies. These basic models have been systematically expanded and improved through the gradual introduction of more advanced technologies. Technikon SA, through its Integrated Learner-Centered Distance Education Model (page 31), is one institution that has been effectively applying this approach in the region over the past decade. On a much larger scale, China is perhaps the best example of a developing nation that has used such an evolutionary strategy on a national basis. The country has made effective,

sequential use of a range of distance learning technologies over the past three decades including print, radio, television, and, most recently, the Internet (Ruth and Min Shi, 2001). The experience in using more basic mass-media technologies has provided Chinese educators with the essential knowledge and experience to leverage more advanced technologies as they have become available. At present, over 200 million Chinese are taking training and further education through a television-based delivery system that was initiated in the 1980’s to succeed an earlier print-based model. The next generation of technology-based delivery, based on the Internet, is now rapidly being established. A consortium of over 30 universities and colleges is now enrolling nearly 200,000 per year in online offerings.\textsuperscript{43} It is these forms of pragmatic, graduated models and strategies that countries in the Sub Sahara region need to pursue at this stage in their development in order to reform their educational systems, including TVET. As in the cases of both China and South Africa, improvements in information and telecommunications infrastructure in the Sub Sahara Africa region will, over time, allow training providers to incorporate incrementally more sophisticated technologies into basic distance models to further expand access, improve pedagogy and streamline administration.

90. The present lack of an adequate and affordable information and telecommunication infrastructure is a significant barrier to more technology intensive delivery models, but it does not preclude the region from moving forward on distance learning for technical / vocational education at this time. Given the prevailing conditions in the SSA region, an initial distance learning model that can serve as a strong foundation will need to meet a number of basic requirements. It must be:

- financially sustainable, entailing relatively low fixed and variable costs\textsuperscript{44};
- capable of achieving economies of scale in terms of student numbers;
- supportable within an environment characterized by extremely low levels of technical infrastructure and literacy;
- broadly accessible to students and learners, particularly those who have been unable to access more traditional institutional delivery models (e.g., women, full-time workers, non-urban population)
- pedagogically sound, providing strong student support and capable of imparting both cognitive and manual / psychomotor skills sets;
- sufficiently adaptable to allow for variations on its application within countries and institutions in the region;
- technologically scalable and allow for the gradual integration of more advanced technologies; and
- capable of reasonably quick implementation.

Based on the foregoing requirements, a core distance learning model for the region will likely need to integrate three key elements: the use print-based materials as the primary instructional medium; the development of study / access centers for the provision of student support services; and the use of a blended delivery model that enables the incorporation of face-to-face instructional components within institutional or workplace settings.

91. **Print-Based Instructional Materials** - Distance learning models based on well-designed print materials can provide access to large numbers at relatively low unit costs and have the greatest

\textsuperscript{43} A recent report on Internet use in China found that there are approximately 22.5 million people online in the country. Almost 30 percent are in the major cities of Beijing, Shanghai and Guangzhou (Ruth and Min Shi, 2001)

\textsuperscript{44} Experience in the Sub Sahara and other regions has demonstrated that all media, if used well, can be effective in facilitating the attainment of learning outcomes. Consequently cost, rather than pedagogical issues, must become the determining considerations for the region at this time (Saint 1999).
The provision of any form of instructional content for distance learning, including print, poses substantial challenges within the Sub Sahara region. Most significant are the high front-end costs and long timelines for development and the requirement for specialized instructional design skills and knowledge among instructors and staff. The most practical and cost-effective approach to initiate new programs in the region quickly will be to identify and acquire instructional materials that have been developed in other places. There are, at present, a significant volume and variety of print-based materials in vocational and technical subjects that have been developed for programs in both developing and developed countries. These will need to be carefully assessed for relevance to the Sub Sahara labor markets and then adapted for local use. The costs of this approach, at least for early stages of implementation, are a fraction of original development. Suppliers of technical/vocational content include both commercial organizations and public institutions that are attempting to recoup their own development costs through the sale of curriculum. Australia, Canada, New Zealand, South Africa, the United Kingdom and the United States are counties that potentially can serve as sources of relevant, high quality instructional content. A mid to longer-term strategy for countries and institutions in the region must be to develop their own internal capabilities and capacity to originate instructional content in a variety of media. This will require the establishment of new internal structures and processes within traditional technical/vocational institutions, possible collaborative relationships with other institutions, and targeted investment in the professional development of instructors and staff.

Study / Access Centers - Comprehensive student support systems for distance learning are universally recognized as the most critical factor in retention and student success (Saint 1999). In addition to basic logistical requirements for the distribution of learning materials to the student, other required support systems include registration, assignment processing, examinations, practical assessments and, most critically, mechanisms for facilitating regular student—instructor/tutor interaction. Print-based distance education systems in the more developed countries have traditionally relied on efficient postal systems and basic telecommunications services including telephone, fax, and e-mail to provide both instructional and administrative support to the distance learning student in the home and, in some cases, the workplace. In the absence of such basic
infrastructure in many countries of the region, an alternative mechanism is the regional study / access center. These community-based centers typically comprise a small core support staff, basic telecommunications infrastructure, and administrative computers. Their services can include registration assistance, fee payment, materials distribution, assignment processing, student access to instructors / tutors, access to library resources, and, in some instances, opportunities for the integration of face-to-face instructional components.

94. The incorporation of study / access centers as a key component of an overall distance learning strategy for the region presents a modest but concrete opportunity to address the enormous challenge of the digital divide. With relatively low levels of additional investment in technical infrastructure, the basic study/access center can be transformed to a more comprehensive tele-center model that can provide a scaleable and relatively cost-effective mechanism for facilitating student and public access to information and telecommunications technologies. The technology-based literacy center in Zambia and the community-based learning centers in Benin and Ghana, described in detail in Appendix 1, are all variations of this basic concept. Emerging non-terrestrial telecommunications services, such as WorldSpace, can now facilitate the one-way transmission of data to multiple remote sites in the region at very low costs. At its simplest level, the WorldSpace service can provide distance education providers with the opportunity to integrate pre-scheduled instructional radio components, downlinked into study centers, to complement print resources. A further possible application would be to use the capabilities of Worldspace’s newly introduced Digital Media Service as the basis for a decentralized materials distribution system, thereby overcoming the current logistical problems stemming from unreliable postal systems. Under this model it may be feasible to download student materials in digital format from a central campus / repository to remote centers where they can then be printed. This would obviate the need for expensive central warehousing operations and expedite the delivery of instructional materials to students. More advanced innovations enabling full, high speed Internet access via non-terrestrial satellite communications are literally just over the horizon. Although its prohibitive costs now limit its broad-based and immediate application for the region, The Global Development Learning Network has already demonstrated the technical feasibility of using commercial VSAT-based telecommunications systems to provide global, broadband data connections for learning centers in the region. New regional initiatives such as RASCOM and an emerging generation of lower cost asymmetrical VSAT systems may soon provide the critically needed capabilities to electronically link central campuses and multiple remote centers with one another and, very importantly, provide access to global educational resources. The inclusion of study / access centers in an initial and relatively basic distance education delivery system can, in this respect, serve as the cornerstone for the eventual development of more technically advanced delivery systems.

95. The Technology Enhanced Learning Initiative (TELISA) of Technikon SA in South Africa is a strong, regional example of the integration of a more traditional print-based distance learning model with the study center and the tele-center concepts. The institution has now established 21 regional centers throughout the country to provide a range of student support services. Most recently it has pioneered, with World Bank and corporate support, cost–recovery ICT Centers that cater to both registered students and local businesses. It is intended that these centers will eventually serve as the vehicle for the delivery of online and multimedia courses delivered through the TSA Virtual Campus. The longer-term vision, comprehensiveness, and proven track record of the Technikon SA TELISA model warrants its further assessment for replication in other countries of the region.

96. Blended Delivery Model- Of the three basic distance education models described earlier in this paper, a strategy that blends distance learning with more traditional delivery is the most appropriate for the Sub Sahara region for the delivery of technical and vocational training. Distance education
methods are generally most effective in delivering the cognitive skill components of jobs or occupations. A frequent challenge in delivering technical/vocational training via distance education is the design of strategies to impart the manual or psychomotor skills components. The acquisition of these skills and competencies often requires opportunities for direct observation, demonstration, and practice on equipment and tools under the guidance of an instructor in a training center or a mentor in the workplace. Simple visual media such as liner video, pictures, and diagrams incorporated into distance learning packages can play an important supplemental role but can rarely replace practical instruction. Current trends are now toward hybrid instructional models that combine manual skill development in institutional and/or workplace settings with distance learning components for the knowledge-based (i.e. cognitive) components. The ratios of the distance delivery component relative to the practical face-to-face instructional components can vary widely by occupation and are typically determined through a systematic instructional analysis and design process. The previously referenced Nova Scotia online apprenticeship for trades training (p.31) and the Open Learning Agency dental assistant training program (p. 20) are examples of a blended approach within formal institutional contexts. Similarly, the Zambia, Benin, and Gambia learning centers (pp. 74-77; 78-81) are, to a lesser extent, illustrations of the application of this approach on a community basis within the SSA region.

97. The trend toward hybrid delivery models reflects an emerging consensus that the primary challenge is not to simply choose between distance and traditional models of delivery but rather to find creative ways to integrate the two. The main advantages are increased flexibility and reduced opportunity costs for learners and employers, and efficiency gains for vocational training systems through a partial reduction in costly, institution-based training. For entry-level training leading to initial qualifications, the implementation of blended delivery models in the Sub Sahara Africa region will require the development of distance learning capabilities in traditional technical/vocational training institutions that have the necessary physical plant to support practical components. This is likely to take time and front-end investment but needs to be pursued. An alternative arrangement, that may warrant consideration, has been used by a number of distance education institutions including National Extension College in the U.K., Open Learning Agency in Canada, New Zealand Open Polytechnic, and the TAFE system in Australia. This involves the establishment of delivery partnerships with employer and industry organizations that have the capability and need to provide manual skills training in workplace. In all instances, the institutions under contractual arrangements with their industrial clients, have developed the instructional resources, managed the distance learning implementation, and certified the outcomes. This approach can be highly effective for the in-service training of the employed workforce, but may have limited application for entry-level training unless apprenticeship and/or cooperative education models of training are incorporated into overall TVET reforms.

98. Implementing substantial reform to TVET systems, including the introduction of distance learning strategies, will not be an easy undertaking given the extreme lack of financial resources and the poor state of most technical/vocational training systems and institutions in the Sub Sahara region. This paper has been developed to provide an overview of challenges and the opportunities presented by the rapidly evolving field of distance learning and to provide broad conclusions regarding implementation strategies. Specific and detailed policies and strategies for the application of distance learning to TVET systems will, however, ultimately need to be developed on a country by country basis, and, as referenced earlier, as one component of a larger reform agenda. Within a general planning and implementation framework, there are a number of additional measures that can assist countries in mitigating risk, accelerating implementation and producing positive and sustainable results:
• **Technical Assistance** – The judicious use of technical experts to assist local policy makers and educators in the planning and implementation phases can greatly assist in transferring essential knowledge relating to distance learning into the region. It is essential that those technical experts that are used have practical experience in developing and administering a range of distance delivery models, including those that are predicated upon more basic technologies. Additionally, familiarity and direct experience in providing assistance in developing countries and, in particular, those in the Sub Sahara region are essential. South Africa can serve as an excellent source of required technical expertise, given the strength of its institutions and the considerable policy development that has been undertaken in distance education in recent years by government agencies. Other potential sources include Commonwealth of Learning, International Extension College, University of Maryland College and New Zealand Open Polytechnic.

• **Institutional Partnerships** – The establishment of formal linkages between existing distance education providers in other regions and institutions in the Sub Sahara region can provide a cost-effective, intermediary step for introducing distance learning. Similar arrangements have been used in other jurisdictions and typically involve the establishment of a brokering arrangement wherein an established distance learning institution provides content, technical expertise and, in some cases, external accreditation, while the local institution provides marketing and a range of student support services. Ideally, institutional partnerships should be negotiated as a transitional, capacity-building stage with an emphasis upon knowledge transfer, in order to avoid the creation of longer-term dependencies. The partnership established between Monterrey Institute of Technology, the Open University in Cataluna, the Madrid Polytechnic University and the Peru Institute of Technology enabling the rapid implementation of the [TECSUP Virtu@l](#) initiative is one example of such an approach. (p.37) Technikon SA can potentially serve an extremely useful role as an institutional model and partner for other institutions due to its current work within the region, its technical training focus, and its successful and evolving distance education model. (p.31)

• **Distance Learning Consortia** – The establishment of distance learning consortia comprising multiple institutions within a given country or possibly within the Sub Sahara region may be an effective strategy for minimizing front-end costs, timelines and risks. Providing that the often difficult issues associated with multi-institutional collaboration can be overcome, consortia can be very effective mechanisms for sharing the costs of planning, content development/licensing, materials reproduction, technical expertise, and physical facilities such as study centers. Distance learning consortia can also be particularly effective during initial stages of implementation when inadequate student numbers in any given program or institution prevent the attainment of sufficient economies of scale. The African Virtual University, although primarily focused on the higher education sector, may provide both a regional precedent and a model for multi country and multi institutional collaboration that can be adapted and applied within the technical/vocational training sector in Sub Sahara Africa.

• **Systematic Planning** – Finally, a systematic planning process at the country and/or institutional level is an essential step in a rational decision making and implementation processes relating to the use of distance learning for TVET reform. While a number of distance learning planning models are available, most are more appropriate for guiding planning within more developed regions that have widespread access to advanced technology infrastructure. The Technology Enhanced Learning Investigation (TELI), developed in South Africa with World Bank and UNESCO support, provides a comprehensive, regionally developed decision making framework
for aid organizations, governments and training institutions. The TELI framework focuses on developing a clear understanding of the teaching and learning environments and the capabilities of the various technologies before examining the likely impact and cost of integrating them into the educational environment. The intent of this approach is to guard against technology-driven models and programs which invariably fail to provide effective or sustainable educational solutions (Butcher, 1998). An inclusive and demand driven planning process can prevent very costly and largely avoidable mistakes in policy development, program design and technology selection. It is the logical and very necessary next step in moving forward to incorporate distance learning within the TVET reform agenda in countries in the Sub Sahara Africa region.

\[45\] Information on the TELI framework can be found at the South Africa Department of Education’s Center for Educational Technology and Distance Education web site (www.education.pwv.gov.za/teili2/)
Appendix 1

Case Study 1

Program/ Project Name: Africa Virtual University (AVU)

Sponsoring / Implementing Organizations: 25 African Universities / The World Bank/ Bilateral Donor Organizations

Content Focus: Higher education (Science & Technology), Continuing Professional Education

Situational Analysis:
The African Virtual University has been developed as one response to the crisis that continues to plague African higher education. The symptoms of the crisis include a lack of adequate teaching and research, a “brain drain” to the developed world, tight budgets, obsolete libraries and equipment, deteriorating physical plant, little or no student access to information and telecommunications technologies, and an overall inability to expand access to ever increasing numbers of students seeking advanced educational opportunities. Only 25 percent of Africans eligible for college and higher education attend – the lowest rate in the world. The causes for the rapid deterioration of African higher education are rooted in the financial crisis that gripped the region following the economic restructuring of the last two decades and also, in part, to the greater priority that was placed by the international aid community on the provision of basic education. For these reasons, universities and countries in the Africa region need to find affordable alternatives to simple “bricks and mortar” expansion of existing systems.

Project Description:
The World Bank and a number of African Universities initiated the AVU project as a pilot project in 1997. It has been developed to assess the various components of a scaleable, ICT-based higher education system including implementation methodology, curriculum development, technology performance and costing of service delivery. The AVU uses satellite and Internet technology to link 24 African universities in 15 countries with over 30 content providers from across the globe. Courses in sciences, technology, and continuing studies are originated from universities in North America and Europe and transmitted via AVU’s uplink facility located at Clarksburg, Maryland. The content is then downlinked to relatively inexpensive satellite receive stations at AVU’s African sites where 25-30 students watch the lectures on large screen projectors or television monitors. During classes students are able to interact with the instructor in real time using audio connections and email. Course materials are distributed electronically in advance and students are supported at the local sites by trained faculty/facilitators. In some cases lectures are taped for later viewing and, in others, are transmitted to broader audiences via broadcast television. Student assessments and examinations are set and conducted locally, and credit and credentials are awarded by the local, participating

46 Participating organizations include Addis Ababa University (Ethiopia), University of Accra, University of Cape Coast, University of Science and Technology (Ghana), Egerton University, Kenyatta University (Kenya), University of Namibia (Namibia), Technikon S.A., University of Pretoria (South Africa), The Open University of Tanzania, The University of Dar Es Salaam (Tanzania), Makerere University, Uganda Martyrs University, Uganda Polytechnic (Uganda), National University of Zimbabwe, University of Zimbabwe (Zimbabwe)
university. Since the launch of the service over 2,500 hours of interactive programming have been
delivered in the English and French languages, 12,500 students participated in full semester courses,
and an additional 2,500 professionals participated in continuing education seminars and workshops.
In addition to courses and seminars, the AVU has established a digital library that is accessible
through the Internet.

The project has recently progressed to a limited implementation phase involving its expansion to
additional sites, some upgrading of technology, the establishment of a Business Channel carrying
technical and managerial training content, and efforts to originate more instructional content from
Africa. Assuming financing can be secured, the final phase of the project will entail substantial
upgrades to the technical infrastructure to enable multiple African uplinks, two-way video, expanded
high-speed Internet, degree granting status, and full financial self-sustainability.
The AVU was spun off as an independent, non-profit organization in February 2000.

Learning Technology Description

The AVU is a good illustration of the interactive television model of distance learning. It utilizes a
relatively advanced ICT infrastructure comprising the following components:

• production / studio facilities at the North American and European originating sites;
• telecommunications transmission links between originating sites and U.S. uplink site;
• uplink located at COMSAT Tele-port, Clarksburg, Maryland;
• C-Band signal transmission/relay via New Skies Satellite (NSS) geo-stationary
telecommunications satellite;
• 25 receive / downlink sites throughout Africa equipped with TVRO satellite dishes /
receivers, computers, television monitors / projectors, laser printers, terrestrial audio links and
Internet access; and
• television broadcast facilities, in some countries, to re-distribute AVU programming via
national television networks

AVU expanded its capabilities in January 2001 through the addition of a second channel enabling the
simultaneous broadcast of programming in French and English.

The pilot phase of the AVU project demonstrated that the ICT infrastructure upon which the model is
based is reliable and facilitates the attainment of the educational objectives set out for the project. The
same basic design has been implemented in numerous other jurisdictions and can effectively be
considered a proven model for expanding access to widely dispersed learners. Some of the technical
issues that have been identified during the pilot phase include:47

• the unreliability of local power supplies that can cause blackouts and potentially damage the
equipment;
• the lack of required skills and knowledge needed to maintain and service installed equipment
among technicians at receive sites; and
• poor picture quality in some locations due, in part, to the use of 25” monitors.

The AVU leadership has identified the need to substantially upgrade the system’s ICT infrastructure
in order to improve the quality and breadth of programming and achieve longer-term financial
objectives. Planned enhancements include:

• the eventual establishment of 2-way video capabilities at all sites through conversion to a
VSAT network;

47 Jessica N. Aguti, One Year of Virtual University Experience at Makerere University in Uganda, paper presented
at the Pan Commonwealth Forum, 1999
• the installation of high-speed, asymmetric Internet connectivity at all sites that will enable Internet-based course delivery;
• the establishment of dedicated uplink / production sites in Africa that will enable the origination of content from African universities; and
• the development of a Web-based student management system.

**Project Costs / Financing**

The original set up and operating costs for AVU for its initial phases were approximately $13 million, with the Bank contributing $6 million and European, Canadian, American and other bilateral organizations contributing the balance. Under the financing model, the World Bank and a number of bilateral agencies funded the set up and core operating costs while local operating costs are covered by the participating universities through student fees. The financial model calls for the AVU to become entirely self-sufficient during its final phase and efforts are presently underway to identify and secure sources of private capital and financing. Self funding will come from fees from a much expanded traditional student base, expanded academic programming originating from global and African sites, the aggressive expansion of a Business Channel providing practical training for mid career professionals and the private sector, and the establishment of franchised learning centers in corporations and NGO’s. Additionally, plans are presently being developed to link AVU with the World Bank’s Global Development Learning Network initiative that has been developed to provide education and knowledge transfer to senior level representatives of the public, NGO, and private sectors. AVU representatives acknowledge that securing the necessary capital for expansion and achieving self-sufficiency are the greatest challenges that AVU will face.

**Evaluation Outcomes**

To date, there has been no formal evaluation conducted by the World Bank, the bilateral donor organizations or AVU on the project. The reactions of the learners to the AVU model are generally positive. Aguti (1999) indicates that, whereas the initial student reaction at Makerere University to the model was cautious, acceptance eventually grew. Features identified by the students included the novelty of using what most considered an entertainment medium for education, access to computers and on-line library resources, and the relevance and currency of the curriculum. Less positive aspects included discomfort at having to view television monitors for long periods and the desire for more live, interactive sessions (versus taped sessions).

Data collected to date indicate that learners in the AVU delivered programs do at least as well, if not better, than students enrolled in the same courses delivered via traditional classroom methods. A Harvard Business Review article (Light, 1999) reports that the percentage of students earning passing grades is higher than average through AVU delivery. It cites the example of a third-year calculus course where 70% of the students passed, compared to a normal pass rate of between 25 and 40%. Similarly, after analyzing student outcome data, Aguti (1999) concludes:

*The general observation was that students of AVU performed very well...in all subjects there was no significant difference in performance between students of the AVU and students who had done the same courses in the previous year... [and for an electronics circuit course]...the overall performance of the students following the AVU programme was better than those who in the previous year had followed the traditional mode.*
There have been some concerns expressed with the fact that all content to date has originated from the more developed regions of the world. Senior AVU representatives react to such criticism by emphasizing that the course delivery model always integrally involves faculty from the participating African universities who approve the content in advance, provide on-going instructional support to the students, and are ultimately responsible for student evaluation. Additionally, the mid to long-term objective of AVU is to originate an ever increasing proportion of instructional content from participating African institutions. This will, however, require technical upgrades to the network.

**Summary and Implications**

The AVU is an ambitious, pan African distance learning model that has been designed to overcome significant problems with access and quality in the region’s higher education systems.

**Features**

- The model has a demonstrated capability to facilitate learning outcomes.
- The satellite-based telecommunications model is a mature technology, and the only viable option for achieving broad-based connectivity in Sub-Sahara Africa at this time.
- The model is easily scaleable, with decreasing incremental costs to add sites and learners.
- The pan-African scope of AVU provides required economies of scale for the selected ICT model.
- The learning center-based model provides a viable option to make learning technologies available to students who cannot access them at home, workplace or in the community.
- The model provides high levels of instructional support to learners through integration with more traditional methods.
- Participation and hosting within universities confers legitimacy.
- The planned technical upgrades will greatly increase interactivity and opportunities for the origination of African content.
- The diversification of programming and the proposed expansion to additional sites in the workplace and community have the potential to improve financial sustainability.

**Challenges**

- The financial sustainability of the model will be a challenge in an impoverished region.
- Securing financing for planned network upgrades and equipment replacement may prove to be very difficult.
- Video-conferencing and interactive television are likely to be declining technologies for distance learning as a result of technology convergence (via Internet).\(^58\)
- Administrative models based on consortia, particularly multi-national consortia, are difficult to sustain over the longer term.
- The development of revenue streams from private sector / corporate clients will be difficult in an increasingly competitive supplier market.

**Potential Opportunities**

- The existing ICT and administrative infrastructure of AVU can potentially serve as a vehicle for the delivery of TVET in the region;
- The incremental costs of adding additional delivery nodes, capable of supporting TVET programming, are relatively small;

---

\(^{58}\) As bandwidth and compression technologies improve it will become increasingly feasible to cost-effectively integrate a variety of instructional media via the Internet, including video and audio conferencing.
• The AVU Business Channel could potentially serve as a programming vehicle for some TVET content in the region.
Appendix 1

Case Study 2

Program/Project Name: Zambia Technology-Based Community Learning Centers

Sponsoring/Implementing Organizations: University of Zambia / Commonwealth of Learning / British Department For International Development

Content Focus: Functional Literacy Training

Situational Analysis

In 1995 over 800 million adults in developing countries (one in four) were illiterate. Of these, two-thirds were women. In South Asia only one third of women are literate compared to two thirds of men. In Nepal and Afghanistan fewer than 15 percent of women are literate; in Pakistan 25 percent. The incidence of adult illiteracy in developing countries has fallen from around 45 percent in 1980 to 30 percent in 1995; however today there are 24 million more illiterate adults than in 1980. Almost the entire decrease in illiteracy since 1990 has been achieved in East Asia, while the number of illiterate people increased by 17 million in South Asia and 3 million in Sub-Saharan Africa.

Zambia is typical of many countries in the Sub-Sahara region in its struggle to finance and provide access to basic education for its 10 million citizens, 70 percent of whom live in absolute poverty. Significant progress was made in improving literacy rates among the general population during the decades of the 60’s and 70’s through a range of national initiatives, beginning with the Basic Literacy Program. The Functional Literacy Program which was more closely tied to the requirements of the labor market and workforce replaced this project. Instructional methods combined traditional face-to-face teaching, radio broadcasts, rural libraries, and local newspapers. Its sustainability was constrained by its limited focus, the lack of linkages to other education and training programs, and inadequate funding levels. A major national, grass roots literacy program was initiated by the government in 1990 that reached in excess of 98,000 people, most of who were women. Again, the focus of the program was on improving literacy among the working adult population, and improving productivity within the dominant agricultural sector. Financial constraints ended the program.

Government financial support for literacy has plummeted dramatically during the decade of the 1990’s. The result has been the virtual cessation of the impressive progress that Zambia had been making in reducing the 70 percent illiteracy rate that existed in the country at independence in 1964. There are, at present, signs that illiteracy rates are again on the rise, especially in rural areas. For example, it is estimated that approximately 33 percent of the population over the age of 15 are

---

49 Most of the background information for this case study is based upon the unpublished November 2000 project report, COL Literacy Project: A Progress Report To the Board of Governors, and from interviews with Dr. Glen Farrell who is the COL Project Manager and author of the report and members of the project team.

illiterate. The critical lack of financial resources due to serious economic decline has now also been compounded by critical shortages of required human resources to support literacy programming efforts. A BBC news report indicated, for example, that in 1999 more teachers died from the HIV/AIDS epidemic in Zambia than graduated from teacher training programs.

The situation in Zambia with respect the ICT infrastructure that might be used to develop new models of educational delivery shows considerable promise. The existing telecommunications system is considered among the best in Sub-Sahara Africa. High capacity microwave relay connects most larger towns and cities, there are several cellular services, Internet service is widely available, there are a number of private sector VSAT networks, and two Intelsat satellite earth stations provide global connectivity.

The Commonwealth of Learning (COL) was founded in 1987 with a global mandate to encourage the development and sharing of distance learning knowledge, resources and technologies for learners throughout the developing world. A key focus is to develop sustainable delivery models, often using relatively low-cost technologies, that have significant scalability and replication potential. Literacy and technical/ vocational programs are a stated priority of COL.

Project Description

COL has initiated a major pilot program in Zambia and India with funding support from the British Department for International Development (DFID). The broad goal is to assess ways in which adult literacy programs can be enhanced through the application of technology. The defining feature of the model is the establishment of technology-based community learning centers through which learners can access both traditional and technology-enabled learning programs and resources. The centers also serve as resource centers for the development of locally produced literacy materials that are used in outreach programs in each of the regions. The specific goals of the project are:

- to enhance knowledge of what constitutes appropriate and sustainable use of information and communications technologies in literacy training;
- to train a cadre of tutors who are knowledgeable in using ICTs in literacy education, and are aware of global media-based resources;
- to significantly improve the knowledge and skills of the participating learners in reading, numeracy, and the use of ICT appliances;
- to collect data regarding the role of ICT-based community learning centers in education delivery;
- to produce a set of materials for training literacy workers; and
- to produce learner literacy materials in a variety of media.

The project in Zambia has been launched in partnership with the University of Zambia and the Ministry of Community Development. Four centers have been established using existing facilities: two in Kabwe in the central region; one in Katete in the rural eastern region; and one at Monze in the southern province. These main centers will each, in turn, support five satellite centers that deliver community-based programs with materials developed at the main centers. A manager, an operations officer and a cadre of tutors / literacy instructors staff each major center. Staffing at satellite centers comprises a supervisor, tutors/literacy instructors and a community literacy committee. The primary target groups for the project are adults and out-of-school youth who require improved functional literacy skills in order to improve their access to the labor market or who wish to access more advanced vocational training programs. Community surveys have been used to establish programming priorities in the areas of farming, health, basic education relating to income generation, business English for the SME sector, and ICT literacy and usage. The content strategy is to import,
adapt, and translate learning resources into local languages and to train the staff to develop new
resources in a variety of instructional media.

The establishment of the Centers in Zambia was delayed due to substantial upgrades required for the
physical facilities. Programming has now commenced and it is anticipated that 60 classes will be
offered during the pilot phase to approximately 1200 participants.

**Learning Technology Description**

The ICT infrastructure of the centers is relatively basic, but also relatively affordable, and comprises:
- 4-5 computers and printers
- photo-copiers
- television sets
- video cameras
- digital scanners video and audio recorders
- dial-up Internet access

The centers’ infrastructure is used both for literacy training and by the staff to produce locally
developed curriculum materials in local languages.

**Project Costs / Financing**

DFID contributed, through the Commonwealth of Learning, a grant of US$ 750,000 to support
project development, implementation and evaluation in Zambia and India. Zambia’s share of the total
is approximately US $220,000. COL, the University of Zambia and the Zambia Department of
Community Development are making additional in-kind and cash contributions of approximately
$100,000. The set up costs per main center in Zambia, including site improvements and ICT
infrastructure, are approximately $25,000.

Fees are not presently being charged to participants. It is anticipated that user fees plus revenues from
a range of other services that can leverage off the ICT infrastructure will be generated in order to
move the Centers toward sustainability once external funding is exhausted. Business plans being
developed for the Centers that will define new products and services and general strategies for
revenue generation.

**Evaluation Outcomes**

A comprehensive, project evaluation is to be conducted by an evaluation team comprising an expert
from the British Open University, representatives from the University of Zambia, and COL. The
formal evaluation will be completed by the end of 2002.

**Summary and Implications**

The Zambia Literacy project is a relatively low-cost approach for functional literacy training that
blends traditional instructional strategies with the use of affordable ICTs in a community learning
center setting. It addresses what is perhaps the most challenging and critical human development
issue in the Sub-Sahara region: illiteracy. Traditional approaches to literacy training in this region
have produced mixed results over the past several decades and there is a clear need to assess newer
technology-enabled approaches to determine whether they are effective, sustainable and scaleable.
While the Zambia project is still in its implementation phase and no formal evaluation results are yet
available, we can at this early juncture identify some preliminary features and potential weakness in the model.

Features
- The learning center model provides mechanism to overcome the “digital divide” by providing community access to technology resources.
- Integrating traditional instruction with technology-enabled approaches in a supportive, community center setting is an effective model for literacy training.
- The implementation model promotes the development of local partnerships and the active participation of the community.
- The project incorporates an outreach mechanism to enable the capabilities and resources of the centers to be extended to the surrounding region and communities.
- The project places considerable emphasis upon the local development of curriculum and resources. This increases relevance for the learner, builds capacity, and enhances longer-term sustainability.
- A comprehensive, external evaluation has been incorporated into the project.

Challenges
- The technology infrastructure can be difficult to maintain and support in a developing country.
- Relatively low connectivity to the Internet limits its application as an instructional tool.
- Significant economies of scale are difficult to achieve in a learning center model (i.e. increasing the numbers of learners requires the addition of additional centers).
- Achieving financial sustainability through revenue generation is likely to prove difficult in a highly depressed economy.

Potential Opportunities
- The experience gained through a technology-assisted approach to functional literacy development in Zambia has the potential to benefit similar initiatives in the region. For example, the World Bank has recently financed a US$ 32 million functional literacy project in Ghana that, with the exception of one component using radio broadcasts, does not incorporate the use of ICTs to serve the target population.
- There may be an opportunity to broaden the mandate and reach of the existing centers through the integration of more vocational / technical content reflecting local labor market demand.
- There may be opportunities to establish telecommunications/ technology linkages between centers in order to facilitate sharing of resources and the introduction of distributed delivery models.  

---

51 A $25 million program for reforming Zambia’s TVET system is currently in the World Bank pipeline.
Appendix 1

Case Study 3

Program/ Project Name: Community Learning Centers (Benin & Ghana)

Sponsoring / Implementing Organizations:
USAID / Academy For Educational Development / Center for the Development of People, Central Region Economic Development Commission, Partners for the Internet in Education (Ghana) / Songhai Centre (Benin)

Content Focus: Information Technology Skills

Situational Analysis

One of the fundamental dilemmas that have emerged alongside the development of new information and telecommunications technologies is how to ensure equitable access to the benefits of those technologies. In most developing countries, it is not reasonable, for a long time to come, to expect that the industrial world’s model of private ownership of computers will prevail. In the meantime, it behooves us all to help ensure that even poor people have access to computers and to the benefits that come from their use. We cannot afford to live in a world in which the dominant technology widens the gap between rich and poor. The problem before us is to find a way for people who do not own their own computer to participate fully in modern societies and economies.52

The countries of Benin and Ghana in West Africa face innumerable problems in modernizing their economies and reducing crippling levels of poverty. The development of their human resources and, in particular, the skills of their labor force through improved technical and vocational training is essential.

A very unskilled, largely rural labor force, low educational attainment levels, high illiteracy rates (approximately 70%) and employment concentrated in the agricultural and informal sectors, hampers Benin’s development. The current public technical / vocational system is poor and less than 5 percent of the labor force has had access to any type of training programs. For example, it is estimated that, out of a labor force of 2.5 million, only 15,000 workers received any kind of training in 1998. The result is a low skill, low productivity, poverty trap for the labor force. In 1998 the Government developed, with financial assistance from the World Bank, The National Vocational Training Policy that is intended to reform and expand the countries public and private vocational training system. A key objective of the initiative will be to improve accountability and quality and ensure that vocational training corresponds to the requirements of the labor market. The introduction of competition through greater use of the private sector as a delivery vehicle is also a major objective. There is no specific reference in the Bank’s loan preparation documentation to the application of distance learning strategies to increase access or improve flexibility. The loan preparation documentation does acknowledge, however, that structural adjustments efforts, beginning in 1989 and targeted at reforming the public sector and developing a competitive private sector, have been hampered by the lack of a skilled workforce that is able to use modern technologies.53

---

52 Mary Fontaine and Dennis Foote, Ghana: How you can use a computer without owning one, TechKnowlogia, September/October, 1999, (http://www.techknowlogia.org/)

World Bank (Africa)
Like its neighbor Benin, Ghana has a largely agriculture-based economy, a rural population, and a labor force that is largely engaged in subsistence farming. Its industrial base compared to other countries in the region is relatively advanced including textiles, oil refining, milling, consumer goods and car and truck assembly. Tourism has recently become one of the largest foreign income earners. Telecommunications infrastructure within the country is poor, but improving, as a result of privatization of the state monopoly. The Ghana labor force has very low levels of educational attainment and is largely unskilled. The country suffers from an adult illiteracy rate of 52 percent with the highest concentration among women and people in rural areas. The technical/vocational education system is underdeveloped with little in the way of innovation, access, or use of information and telecommunications technologies.

Project Description

The Academy for Educational Development, with financial support from USAID, has established three Community Learning Centers in each of Benin and Ghana. The Centers have been established to address the digital divide by providing access to ICTs and related skills training for low-income populations in both countries. In Ghana the centers have been established in Accra, Kumasi and Cape Coast, and are each operated by a separate NGO (Partners For Internet In Education, The Centre For the Development of People, The Central Region Development Commission) All three centers in Benin (Porto Novo, Savalou and Parakou) are operated by the Songhai Center, a sustainable, agricultural NGO.

The primary focus of the centers is on providing skills training related to the use of information technologies. Courses are relatively short (3 hours/day for 10 days) and of a highly practical nature. Ongoing needs assessment strategies have been put in place to ensure that courses offered are responsive to market demand. These include such topics as typing, word processing, spreadsheets, computer literacy, and use of the Internet. The centers in Ghana have recently expanded their programs to include more advanced, technical subjects, including computer networking and database management. In addition, the centers are beginning to offer specialized seminars in a variety of topics such as “The Internet and its Benefits to Society” and “The Computer as a Tool in Medicine”.

Clients of the centers tend to be predominantly male with the majority between 18 and 40 years of age. They typically include students, teachers, business people, staff from NGO’s, medical practitioners, merchants, local officials, and agricultural workers. The Centers are also catering to unemployed persons seeking to develop entry-level IT skills. All participants pay fees that are generally 10–20 percent lower than comparable programs offered through private sector schools. Additional revenues are generated on a fee-for-service basis for photocopying, resume preparation, printing, designing stationary, letterhead and business cards. In Ghana, the most important income generating activity to date is from the provision of e-mail accounts and Internet access. These revenues, that leverage the ICT infrastructure, are regarded as critical for achieving the longer-term financial sustainability.

The majority of the curriculum used has been developed locally or adapted from other sources. The instructional strategies for the centers vary but all generally rely on a model that blends multimedia-based instruction with face-to-face teaching/coaching within small groups. Certificates of completion are awarded to all participants in the name of the Centers. A LearnLink Resident Advisor and project staff in Washington, D.C support local administrative and instructional staff.

Learning Technology Description

The technological infrastructure of the six centers varies to some degree. A typical configuration includes:

- 8 – 14 networked, multimedia computers
- Servers
- 14.4 – 28.8 kbps dial-up Internet access
- telephone system
- photocopiers
- scanners
- audio/visual presentation equipment
Efforts are underway in all centers to secure financing to install dedicated, high-speed Internet connections (i.e. 64kbps +) via a VSAT connection. The unreliability and slow speed of the current dial-up connections are seen as the greatest impediment to the expansion of services and longer-term sustainability.

**Project Costs / Financing**

The capital and initial operating costs for each center have been provided by USAID under a grant contribution administered by the Academy For Educational Development.

**Evaluation Outcomes**

The response to the Centers has been positive. Utilization of the facilities in Ghana, for example, ranges from a low of 50% at one center to over 85% in the other two. An impact assessment prepared on the Ghana centers indicates that approximately 10,000 people nationwide had received services within the first year of operation. Approximately 25% of the clientele were women. The largest service category, at approximately 75%, is the use of the ICT infrastructure (e.g. Internet, telephones, computers). Training in IT-related subjects has been undertaken by roughly 25% of the centers’ clients. Customer surveys conducted by the center management reflect a positive reaction by the clients to the ICT related services and the training offered. A number of the centers in both Ghana and Benin are near financial self-sufficiency, with the majority of revenues being derived from the sale of ICT-related services on a fee-for-service basis.

**Summary and Implications**

The tele-center center concept is, in addition to the Internet, one of the most important developments in distance learning in both the industrialized and the developing world. These technology-enabled facilities are presently being used to deliver a broad range of training ranging from functional literacy through IT training to management development. Although distance / e-learning provides opportunities to individualize, customize, and provide flexible access to an extensive array of interactive training resources, it also has the potential to isolate the learner, undermine motivation, and can result in high levels of attrition. It needs to be acknowledged that, for many individuals, learning remains a social activity. The tele-center, whether established in corporate or community contexts, provides a supported, secure environment for learning in which technology enabled processes can be blended with more traditional methods. For much of the developing world access to ICTs cannot be predicated on ownership. Centers, therefore, are very important tools for creating equitable access to technology within impoverished countries. The LearnLink projects in Benin and Ghana are important distance learning models to assess given their convergence of the tele-center model with the critically important elements of rural / community development, IT skills training, and financial sustainability.

**Features**

- The learning center model provides a mechanism to overcome the “digital divide” by providing community access to technology resources.
- The centers maintain a demand orientation through ongoing market / needs assessments.
- The IT skills focus of the centers is important for economic development / diversification.
- The centers are well equipped and provide a comfortable environment for adult / mature learners.
- The implementation model promotes the development of local partnerships, the active “ownership” of the community and the establishment of private sector linkages.
- The project places considerable emphasis upon the local development of curriculum and resources.
- Opportunities for longer-term sustainability are enhanced through service / revenue diversification strategies (i.e. concept of “social entrepreneurship”).
- A comprehensive, external evaluation and reporting process has been incorporated into the project.
Challenges

- There has been minimal use of the ICT infrastructure to deliver instructional content.
- Relatively low connectivity to the Internet limits its application as an instructional tool and connectivity between centers.
- Significant economies of scale are difficult to achieve in a learning center model (i.e. increasing the numbers of learners requires the addition of additional centers).
- The centers are hampered by unreliable electrical power supply and telecommunications connectivity;
- The centers have cash flow problems, and difficulty in retention of technical / instructional staff.
- Achieving financial self-sufficiency is difficult in low-income countries.

Potential Opportunities

- A technology-assisted, community-learning center-based model of IT skills training development in Ghana and Benin has replication potential in the region.
- There are opportunities to broaden, over time, the mandate and reach of the existing centers through the integration of literacy training and more vocational / technical content that reflects local labor market demand.
- There may be opportunities to establish telecommunications/ technology linkages between centers in order to facilitate sharing of resources, and the introduction of distributed delivery models.
**Appendix 1**

**Case Study 4**

**Program/ Project Name:** Agricultural Extension Officer Training (Jamaica & Ghana)

**Sponsoring / Implementing Organizations:**
Commonwealth of Learning / Jamaica Rural Development Authority / Women in Food and Agricultural Development, Ghana Department of Agricultural Extension Services

**Content Focus:** Agricultural Extension

**Situational Analysis**

Practitioners master a large repertoire of skills and strategies that are strictly required to perform a task. But these skills are usually not verbalized and even less explained in formal situations. Sometimes there is not even full consciousness of the techniques, they are performed but are not brought to the level of conceptualization and description with formal words...Learning a trade means learning this “theory of the practice”, usually with the help of someone who is a master of the trade – but not necessarily able to verbalize this in-between knowledge. This is what is not in books because it is not part of the official “theory”....Hence, good training videos are those that explore this uncharted territory of the little details, the feeling for the job, the in-between knowledge."\(^\text{54}\)

For Jamaica and Ghana, as with most developing countries of the world, agriculture is essential for day-to-day survival and a mainstay of the economies. The majority of Ghana’s workforce is engaged in farming activity which generates approximately 2/3 of all export activity. Agricultural in Jamaica is a less significant, but critically important, sector of the economy contributing approximately 10% of GDP and employing approximately 30% of the labor force. An ongoing challenge in both countries has been to improve the productivity of their agricultural sectors through improving the skills and knowledge of agricultural workers in new agricultural methods and techniques. Both countries have had well-established agricultural extension programs that have produced mixed results due to a variety of barriers. These include the dispersed nature of the target audience in rural areas, illiteracy, multiple dialects, lack of up-to-date content and expertise, and inadequate financial resources.

The Department of Agricultural Extension in Ghana has set up the Women in Food and Agricultural Development (WIFAD) to develop and implement programs targeted at women farmers who require technical assistance in agriculture and agro-food processing. Education and training are a large part of WIFAD’s programs, with primary instructional strategies including one-to-one coaching, group seminars, demonstrations, print materials, and, in some cases, television. The limited reach of these methods for a rural population combined with chronic under-staffing compromises the ability of the service to meet demand. Similarly, the Rural Agricultural Development Authority (RADA) in Jamaica, which has a mandate to provide technical and marketing advice to farmers, has also faced an ongoing challenge of

\(^{54}\) Claudio de Moura Castro, “Why I Love (Good) Training Videos”, TechKnowLogia, September/October, 2000
meeting demand for educational services due to the increasing numbers of farmers and decreasing financial and staff resources. Like WIFAD, RADA uses mostly traditional training methodologies with some limited use of ICTs such as instructional video.

The Commonwealth of Learning has recently implemented a new initiative called Commonwealth of Learning Media Empowerment (COLME). The mandate of the service is to prototype creative and practical models of delivering formal and non-formal education and training in developing countries. A key strategy of the COLME program is to use a systematic approach to the implementation of low-cost projects that have high potential for sustainability, scalability and replication in other jurisdictions.

**Project Description**

Beginning in 1999, COL, in partnership with WIFAD in Ghana and RADA in Jamaica, began the implementation of a pilot project to assess how the informed application of relatively inexpensive and accessible technologies could assist in the delivery of agricultural extension training. The project began with a feasibility study in both countries that examined the nature of training being provided, the available skills, knowledge and pedagogical tools, and the problems faced by the extension workers in performing their jobs. A decision was subsequently made to use locally produced, linear training videos as the core instructional technology. The basis for the decision was the relatively low costs of the technology, the availability of playback appliances, the efficacy of instructional videos for low skilled / illiterate populations, and the dissemination opportunities afforded by low-cost video replication and television re-broadcast.

A unique and innovative feature of the project was to put the capture and editing equipment directly in the hands of the extension workers enabling them to create practical, instructional videos on agricultural extension related topics at the grassroots level. A key component of the project was to train an initial group of extension workers in basic scripting, shooting, and editing techniques, who, in turn, could train their colleagues.

Different strategies were used in each country based on the availability of playback appliances. In Jamaica, where the majority of farmers either have televisions and VCRs, the dissemination strategy includes lending videos to farmers for viewing at home, making videos available through rental outlets, showing them at meetings, seminars and field days, and re-broadcasting on national television. In Ghana, due to the lack of required playback appliances at even the community level, the delivery strategy combines extension workers incorporating the videos into seminars, field demonstrations using portable equipment, and national television broadcasts.

The project is still in the early implementation stages in both Ghana and Jamaica. COL is also now in the process of extending the model in to Dominica and Grenada (agricultural extension), Tobago (forestry extension), and Samoa (technical and vocational education).56

---

55 The information in this case study has been derived from, Walker, David. Technology in the Hands of the Extension Officers – Agricultural Extension in Jamaica and Ghana. Commonwealth of Learning, November 1999 and through further interviews with Mr. Walker who heads up COL’s COLME unit.

56 Samoa Polytechnical Institute is developing instructional videos in a range of trades occupations including electronics, sheet metal, welding, and plumbing. The goal is to reduce the amount of time required for institution-based training by apprentices.
**Learning Technology Description**

The project has been enabled by dramatic improvements in recent years in the price/performance ratio of video production technology. Professional quality video production has traditionally been an expensive undertaking requiring highly skilled technical staff, specialized cameras, and expensive on and off line editing equipment installed in dedicated facilities. Rapid development in digital technology have resulted in simple-to-use cameras and highly portable and computer-based editing systems that enable content experts with moderate levels of training to produce near broadcast quality videos in the field at a fraction of former costs. The basic equipment provided to the extension workers in Ghana and Jamaica included:

- digital camcorders
- tripods, wireless microphones, video tape, VCR and other accessories
- non linear editing system

**Project Costs / Financing**

The projects in Ghana and Jamaica have been funded out of the COL core budget that is, in turn, supported by the member countries. The full costs of the project in each country are approximately US $50,000 of which approximately $19,000 is for equipment.

**Evaluation Outcomes**

A full impact study is planned for the projects and will focus on the volume and quality of productions, the effectiveness of the training and its impact upon agricultural practice, and potential sustainability. It is anticipated that the study will be available by August 2001.

A formative assessment of the project undertaken in Jamaica in October/November 2000 indicates strong levels of support from RADA and, most importantly, a very positive reception by small plot farmers to the videos that have been produced by agricultural extension workers.

**Summary and Implications**

The Agricultural Extension Officer Training Projects in Ghana and Jamaica are good illustrations of the application of a relatively common training technology in important economic sectors. Instructional video remains one of the most widely used instructional media despite the availability of more advanced information and telecommunication technologies in the distance learning field. For example, 1999 data on employer-sponsored training in the U.S. indicate that instructional video tape is used by approximately 69 percent of firms as compared to 54 percent for CD-ROM and 36 percent for Internet. The features that make linear video a viable and attractive option for advanced economies, such as the U.S., make it an even more appropriate option for developing countries such as Ghana and Jamaica. These include ease of use for the learner, low duplication costs, relatively wide access to the playback technology, and educational effectiveness for imparting practical information.

**Features**

- The model has relatively low implementation costs and high potential for sustainability.
- Linear video is a mature technology with widely demonstrated educational effectiveness.
- The model entails the development of highly relevant, instructional content at low costs by field practitioners who understand learner requirements.
- The selected technology is simple to use, and requires low-moderate levels of advance training.

---

57 Training Magazine, 1999 Industry Report, October 1999

---
• The infrastructure and appliances required by learners to access the instructional resources are reasonably accessible.
• The technology has the potential to reach large numbers of learners.
• There are opportunities to add instructional value to linear video through reformatting into multimedia applications (e.g. CD-ROM, web-based training, streaming video).
• Instructional video complements the traditional methodology for agricultural extension.
• The demonstration projects are scaleable and replicable in other developing countries.

Challenges
• As a stand-alone technology, linear video provides no learner interaction.
• Access to playback appliances (i.e. VCR/TV) in many developing countries is still very limited.
• There is limited opportunity to customize / individualize the presentation of instructional content.

Potential Opportunities
• The grassroots production model has the potential to be applied to technical / vocational training in Sub-Sahara Africa.
• The technology can be easily integrated with other technologies, such as print, to provide more comprehensive delivery models.
• The COL model is a low cost / low risk, proven approach that can provide a logical entry-level ICT strategy for many countries in the Sub-Sahara region.
Appendix 1

Case Study 5

Program/ Project Name: Flexible Management Training For Small – Medium Enterprises in Vietnam

Sponsoring / Implementing Organizations: International Finance Corporation / Mekong Project Development Facility / Open Learning Agency

Content Focus: Management Skills for SMEs

Situational Analysis

Vietnam, during the last half of the 1990’s, still continues to experience very difficult times despite significant economic and social progress under the economic renewal “doi moi” program initiated during the late 1980’s. The country’s recent problems have been due to the regional effects of Asian financial crisis, the slow pace of reforms, and the dominance of the largely inefficient, state-owned enterprise sector in the economy. There is an emerging consensus that the small to medium enterprise (SME) sector will be the economic and employment creation engine for the Vietnam economy as it makes the transition to an industrialized, market economy. In addition to the lack of investment and working capital, major impediments to the development and expansion of the SME sector are the lack of business and operational skills at all levels and the lack of market information. Another major impediment is the lack of well-developed business support services including companies and organizations that can provide training and development for the SME sector. Training organizations do exist in Vietnam but they tend to exclusively focus on the joint venture sector where they can generate revenues which reflect their much higher cost structures. The result is that the domestic private sector and, in particular, smaller firms are significantly under-served.

The Mekong Project Development Facility is a multi-donor-funded service managed by the International Finance Corporation. It has been established to promote the establishment and expansion of privately owned SMEs in Vietnam, Cambodia and Laos. MPDF provides, in addition to relatively low-level financing, training and technical services to entrepreneurs in the region. MPDF has concluded that a partial solution to the training supply problem is to apply highly targeted strategic investment to create capacity within Vietnamese business organizations to deliver relevant skills training to the SME sector on a commercial, non-subsidized basis. An initial project was to co-invest with four university business schools in the development of a highly contextualized and modularized curriculum that can be used by the schools and others to serve the SME market. This content has proven to be highly appropriate and the potential demand for training, based on the curriculum, considerable. The key remaining challenge is logistical: traditional training methods, including a recent train the trainer initiative, do not provide sufficient access to the large numbers of individuals and businesses that require training. Consequently, MPDF determined that a further solution would be to develop more flexible and cost-effective strategies/methodologies for the delivery of training to the SME sector.

MPDF contracted with Open Learning Agency to assist in the development of an assessment and an implementation framework, to take the lead in the development of the instructional materials, and to train Vietnamese training suppliers in the flexible use of the training materials.
**Project Description**

The initial planning for the project started in January 2000 and involved focus group sessions with prospective end-users in the SME sector and consultations with MPDF and other key stakeholders. Following the approval of the resulting implementation plan, a scaled Flexible Learning Project was initiated in June 2000. Whereas more advanced ICT-based distance learning models were considered, the very low penetration levels of Internet, multimedia-capable workstations, and even basic telephones in the target sector greatly restricted options. Given the fact that Vietnam has very high literacy levels, a print-based strategy has been deemed to be the most appropriate.

The primary objective of the project is to develop a pilot strategy for the commercial delivery of highly relevant and flexible training to the SME sector in Vietnam, Laos and Cambodia. A secondary objective is to facilitate the development of a responsive, commercial training sector positioned to serve the needs of the SME sector on an ongoing basis. The implementation strategy for the project comprises seven stages:

- original content / curriculum development by the consortium of four universities;  
- re-purposing classroom curriculum into 16 print workbooks within the human resource; management and marketing management subject areas and translation into Vietnamese, Laotian and Cambodian;  
- publishing and distribution of the materials in the region;  
- development and implementation of a training program / seminar for Vietnam training suppliers on terms and conditions for their participation, product orientation, implementation models for SMEs, and potential product enhancement strategies;  
- implementation of a national promotional strategy targeted at training suppliers and SMEs;  
- implementation monitoring; and  
- evaluation

The specific modules re-purposed for flexible delivery were selected largely on the basis of the feedback from the focus group sessions. The 13 modules fall under the broad topic areas of human resource management and marketing for small and medium enterprises.

Open Learning Agency played the lead role in the design and development of the English version of the modules using a team based development model (i.e. project manager, instructional designers, subject matter experts, graphics specialist) All developed materials were vetted by Vietnamese subject matter experts and translation and publishing into Vietnamese, Cambodian, and Laotian is being undertaken locally.

The implementation model places the responsibility for determining specific training delivery strategies on the participating training suppliers and SME clients. It is anticipated that a number of different models

---

58 National Economics University, Ho Chi Minh City University of Economics and Ho Chi Minh City University of Technology developed the original courses in 1998–99. The four courses each comprised 12-15 modules, and each course entailed approximately 36 hours of classroom instruction. The traditional materials included instructor’s notes, participant exercises, case studies, overhead transparency masters and textbook references.

59 The owner-manager and the human resource function, job analysis, job descriptions, specifications, and standards, recruiting, job search and selection, wage and salary systems, human resource planning workbook, introduction to marketing concepts, about customers: gathering information, about customers: information on purchasing processes and trends, target markets, product planning and development, pricing and pricing strategy, promotion and advertising
will emerge including self-study, the incorporation of the workbooks into seminars and workshops delivered off site or in the workplace, and their use in traditional classroom delivery. A MPDF objective is to eventually establish a complementary program that provides financial assistance to public and private training suppliers to enable them to convert the materials to other instructional formats such as CD-ROM.

**Learning Technology Description**

Standard PC and Macintosh-based desktop publishing systems were used at Open Learning Agency to re-purpose the traditional curriculum materials into the flexible workbook format. All data were stored in digital format and draft and final versions of the materials were electronically transmitted to Vietnamese team members, reducing costs and time delays. Standard, high-volume publishing equipment is being used in Vietnam to produce multiple copies for distribution.

**Project Costs / Financing**

The project costs, with the exception of the publishing of the materials in Vietnam, are approximately US $90,000. Under the commercial implementation model, the costs of materials publishing will be borne by the consumer (SME participant and/or training supplier) through their purchase of the materials within the Vietnam market. It is anticipated that the unit costs in Vietnam for workbooks will be approximately $2.00, with series and volume discount options built into the pricing strategy. MPDF / IFC will not attempt to recover the development costs of the project. Public and private training suppliers serving the SME market will add additional fees for training, depending on the nature of the value-added services provided. MPDF may consider, at some point, a complementary financial voucher program available to SMEs to encourage their initial participation.

**Evaluation Outcomes**

A formal evaluation of the pilot project is planned for late 2001. Data will be collected throughout the project through a variety of mechanisms, including an evaluation form that has been incorporated into every published workbook.

**Summary and Implications**

Print still remains the most powerful, pervasive and cost effective of the available learning technologies within both the developed and the developing world. Most distance learning practitioners do not soon anticipate the demise of print components in even the most advanced, technology-based learning systems. Rapid developments in digital conversion, improvements in the price / performance ratio of desktop publishing systems, and just-in-time distribution and printing capabilities continue to further improve the economic efficiency and the educational effectiveness of print as a learning technology.

While the Vietnam SME project is neither fully implemented or evaluated, the basic model has proved successful many times over in both developed and developing countries. Examples include British Open University, National Extension College, New Zealand Open Polytechnic, University of South Africa and Technikon SA.

**Features**

- The project focuses on a sector that is highly strategic for the Vietnam economy.
- Substantial front-end assessment of client requirements and preferences were an integral part of the planning process.
• The program design is flexible, supporting a variety of instructional delivery models.
• The model provides opportunities to reach large numbers of participants at low unit costs.
• The use of high quality print production and IFC/World Bank “branding” conveys to the SME client professionalism and legitimacy.
• The instructional resources developed for the project have a pragmatic content focus (i.e. the primary intent of the model is to improve business processes).
• The materials are formatted in easily digestible segments.
• The instructional design strategy assumes their eventual reformatting for more advanced ICT delivery systems.
• There is an opportunity for sustainability due to the focus on commercial implementation.
• The materials can be adapted for use in other countries.

Challenges
• If used only as a stand-alone technology, print provides little or no interactivity to facilitate learning.
• Creating a commercial, non-subsided implementation model will likely prove difficult in a non-market economy.
• The required resources needed to support full implementation and a comprehensive evaluation may not be available.
• The project implementation model, particularly the component relating to instructional design and re-purposing of content, did not include strategies for knowledge transfer to Vietnam.

Potential Opportunities
• Given the importance of the SME sector in Sub-Sahara Africa, there may be opportunities to replicate some or the entire program implementation model, or integrate it with other strategies in the region.
• The instructional materials developed for Vietnam can be adapted for use in Sub-Sahara Africa.
Appendix 2

Technikon SA

Technikon SA began its life as Technikon RSA on 1 April 1980 as the off-shoot of Technikon Witwatersrand's correspondence wing. It was established to provide correspondence education for police forces at a tertiary level, something no other technikon or university offered. The Technikon was then situated in Braamfontein. At that time, there were only 4000 learners and a staff of 22 lecturers.

By 1989, when the Technikon moved to the Florida campus, learner enrolment had reach 19 215. By this time the Technikon was already offering a diversity of programs which catered for management, business and science, as well as for the police. The 90's became a decade of dynamic change for the institution. In August of 1993, the Technikon launched its present identity with a new name, Technikon SA, and a shift from 'correspondence' to 'distance' learning. Another milestone was reached in August 1995 when TSA's first Chancellor and Vice-Chancellor were inaugurated at a special ceremony at Gallagher Estate. Dr Nthato Motlana became the institution's first Chancellor, and Prof. AJH Buitendacht, Principal of TSA, was installed as the first Vice-Chancellor. At the same time, TSA was empowered to confer degrees, and now offers degree qualifications up to the level of doctorates in its four divisions of Applied Natural Sciences and Engineering, Applied Community Sciences, Applied Management Sciences, and Public Safety and Criminal Justice. A number of academic institutes have also been established at TSA to further academic research.

In the early 1990's, it became apparent that it was no longer viable for any tertiary institution to operate as a traditional correspondence college. Principles of open learning were widely publicized and discussed, both internationally and at home. The South African Institute for Distance Education (SAIDE) was involving many South African institutions, including TSA, in a re-think on distance education. The notion of education for the people called for far greater flexibility of entry and exit, it demanded the provision of quality courseware for market-driven courses, and broader levels of learner support. These are but a few of the areas in which traditional correspondence education had failed to provide learner-centered education. Open and flexible learning required a less rigid approach. It was in this way that TSA's transformation process began, in addition to a more focused affirmative action policy. The document TSA’s Winning Asset for the RDP describes the four freedoms of open learning as free and open access; freedom of pace; freedom of pace and time; and freedom to combine modules from different programs. Other important aspects are the recognition of prior learning (RPL); mobility of learners between institutions; flexibility and opportunity; and the individualization of mass education.

In 1994 the Technikon introduced its model of Integrated Learner-Centred Distance Education (ILCDE) which is aimed at providing quality learner support. It was at this time that regional offices were launched in all of the nine provinces, and that regional directors were appointed. Technikon SA now provides both distance education and flexible learning and caters to learners who are unable to attend residential institutions. Distance education enables them to study at home or at work in their own time, using study material provided by the Technikon; they are encouraged to attend tutorial sessions with their tutors and fellow learners where possible. Flexible learning at Technikon SA provides the learner with a choice of learning strategies as well as the choice of place, pace and time. The learning strategies could include a combination of face-to-face tutorials or lectures, practicums and experiential learning opportunities, access to mixed media instructional material, and input by the employer into the learning process. In some
cases there can be inter-institutional collaboration in the interests of economies of scale. Ideally the learner is able to choose the combination that best suits his/her personal circumstances. Those learners who have access to computers and the Internet are able to access their assignment and examination marks, as well as examination timetables, which are available through the TSA Virtual Campus. In some cases, study material is also accessible via the Internet.

In accordance with the Higher Education Act of 1997, Technikon SA vigorously pursues a policy of equal access for learners of all races and creeds, and is engaged in an ongoing transformation process. In July 2000, TSA inaugurated its first Institutional Forum which is representative of all TSA role-players, including the learner body. This democratically elected structure will steer progress in the transformation drive. In the year 2000 there were 70 000 learners registered at Technikon SA, it has a staff of over 1000, and more than 70 study programs. It is the largest institution for career-specific distance education in South Africa. Most of TSA's learners come from South Africa, but there are registered learners in Namibia, Zambia, Zimbabwe, Botswana, Lesotho and elsewhere in Africa.

Technikon SA welcomes cooperation with other institutions, particularly in the sharing of facilities, research projects and specialist expertise. Technikon SA regards itself as complementary and supportive to other tertiary institutions such as universities, other technikons, technical and community colleges, and is involved in many alliances within the Republic, the most prominent of which is COLISA. The Confederation of Open Learning Institutions in South Africa involves Technikon SA in collaboration with UNISA and Vista University in joint projects aimed at a maximized utilization of resources. A decision has been recently made by the Government of South Africa to combine all three institutions into one organization in 2002.  

(Source: www.tsa.ac.za)

---

60 University of South Africa (UNISA) is the oldest and largest university in South Africa and became the pioneer of distance education at the tertiary level in 1946, when it was the first university in the world to offer its students the opportunity to study at a distance. UNISA offers degrees from undergraduate to doctoral level in six Faculties: Economic and Management Sciences, Arts, Education, Law, Science, and Theology and Religious Studies. The University also offers a variety of diploma and certificate programs. These practical, career-oriented courses, programs and advanced programs address the need to obtain specialized knowledge during a relatively short period of time. The University enrolled 110,600 formal and about 11,541 non-formal students in 1999 - nearly 34 per cent of all South African university students.
Appendix 3

Glossary of Distance / e-Learning Terminology

Amplitude: The amount of variety in a signal. Commonly thought of as the height of a wave.

Analog: A signal that is received in the same form in which it is transmitted, although the amplitude and frequency may vary.

API (application program interface): Operating system services made available to programs that run under the operating system.

Application: The program a user activates to work on the computer. There are many computer programs that fit into the category of application; applications are generally referred to as software.

ASCII (American Standard Code for Information Inter-exchange): A computer language used to convert letters, numbers, and control codes into a digital code understood by most computers.

ASP (application service provider): The third-party organizations that manage and distribute software-based services to companies over the Internet from a central location. ASPs allow companies to save money, time, and resources by outsourcing some or all of their information technology needs.

Asynchronous communication: A learning event in which people are not online at the same time and cannot communicate without time delay. Examples are self-paced courses taken via Internet or CD-ROM, Web presentations, videotaped classes, streamed audio/video presentations, Q&A mentoring, online discussion groups, and email.

Asynchronous training: Training where interaction between teachers and students takes place intermittently, not simultaneously, such as through links to HTML content or email, news, or discussion groups.

ATM (asynchronous transmission mode): A method of sending data in irregular time intervals using a code such as ASCII. ATM allows most modern computers to communicate with one another easily.

Audio bridge: A device used in audio conferencing that connects multiple telephone lines.

Audio conferencing: Voice-only connection of more than two sites using standard telephone lines.

Audiographics: Computer-based technology that permits simultaneous transmission of voice and data communication and graphic images across local telephone lines in a way that is interactive between the instructor and all participants.

Authoring tool: A software application or program that allows people to create their own e-learning courseware. Types of authoring tools include instructionally focused authoring tools, Web authoring and

---

61 This information is based on a glossary that has been developed by the American Society for Training and Development (www.astd.org). The Canada Office of Learning Technologies web site (http://olt-bta.hrdoc- drhc.gc.ca/info/inde.g.html) is an excellent source of information on the numerous glossaries relating to ICTs and learning technologies. The site provides direct links to 23 available online glossaries.
programming tools, template-focused authoring tools, knowledge capture systems, text and file creation and linkage systems.

**Backbone**: A primary communication path connecting multiple users.

**Band**: A range of frequencies between defined upper and lower limits.

**Bandwidth**: The throughput of a network per unit of time, measured in kilobits, megabits, or gigabits per second.

**Baud rate**: See *Bps*.

**Binary**: A computer language with only two letters in its alphabet.

**Bit**: The most basic unit of information on a computer. In accordance with binary code, each bit is designated as either a 1 or a 0; all other information stored on the computer is composed of combinations of bits.

**Bps (bits per second)**: A measurement of a modem's data transmission speed. Synonymous with baud rate.

**Bridge**: A device linking two or more sections of a network.

**Broadband**: Short for “broad bandwidth”, as in a high-speed network able to carry video as well as voice.

**Broadcast**: Television and radio signals designed to reach a mass audience.

**Browser**: Software that allows you to find and view information on the Internet. Internet Explorer and Netscape Navigator are two commonly used browsers.

**Byte**: A combination of 8 bits.

**Cable modem**: Uses two cable TV channels to establish a two-way flow of computer information (up to 10 Mbps) over the coaxial cables used to bring cable TV into the home.

**CAI (computer-assisted instruction)**: Instruction mediated by computer in which the system allows for remediation based on answers but not for a change in the underlying program structure.

**CBT (computer-based training)**: Course or educational material presented on a computer, primarily via CD-ROM or floppy disk. Unlike Web-based training, computer-based training typically does not require that the computer be connected to a network and typically does not provide links to learning resources outside of the course.

**CD-ROM (compact disc read-only memory)**: A computer storage medium similar to the audio CD that can hold more than 600 megabytes of read-only digital information.

**Chat**: Communication between members of an online service using text. The messages are sent between members in real-time as in a conversation by typing in short statements.
Content: The intellectual property and knowledge to be imparted. Different types of e-learning content include text, audio, video, animation, and simulation.

CMS (content management system): Software application that streamlines the process of designing, testing, approving, and posting Web pages.

Codec (coder/decoder): Device used to convert analog signals to digital signals for transmission and reconvert signals upon reception at the remote site, while allowing for the signal to be compressed for less expensive transmission.

Common carrier: A government-regulated private company that furnishes the public with telecommunications services (for example, phone companies).

Compressed file: A computer file that has been reduced in size by a compression software program. The user must decompress these files before they can be viewed or used.

Compressed video: Video signals downsized to allow travel along a smaller carrier.

Connect time: The amount of time that a terminal or computer has been logged on to a computer or server for a particular session.

Content: The intellectual property and knowledge to be imparted. Different types of e-learning content include text, audio, video, animation, and simulation content.

Convergence: A result of the digital era in which various types of digital information, such as text, voice, and video, and their delivery mechanisms--television, telecommunications, and consumer electronics--are combined together in new, more closely-tied forms. Web TV is an example of convergence between televisions and computers.

Cookie: Information stored on a user’s computer after visiting a Web site. Tracks data about that user, can be disabled in the browser.

Courseware: Any type of instructional or educational software program.

CPU (central processing unit): Part of the computer that contains the microprocessor, power supply, hard drive, and disk drives.

Default: A setting that the computer system uses automatically, unless it is changed by the user.

Desktop videoconferencing: Videoconferencing on a personal computer.

Dial up: To open a connection between a user's computer and another computer via a modem.

Digital: An electrical signal that varies in discrete steps in voltage, frequency, amplitude, locations, and so forth. Digital signals can be transmitted faster and more accurately than analog signals.

Digital Divide: The gap that exists between those who can afford and access technology and those who cannot.
Discussion boards: On the Internet or an intranet, forums where users can post messages for other users to read.

Distance education: Educational situation in which the instructor and/or instructional resources and learners are separated by time, location, or both. Education or training courses are delivered to remote locations via synchronous or asynchronous means of instruction, including written correspondence, text, graphics, audio- and videotape, CD-ROM, online learning, audio- and videoconferencing, interactive TV, and facsimile. Distance learning does not preclude the use of the traditional classroom.

Download: The electronic transferring or copying of a file from one computer to another. Files may be downloaded from another connected individual computer, a computer network, a commercial online service, or the Internet.

DS (Digital Signal): Rate and format of digital signal, for example, DS-1 or DS-3. Often used synonymously with \( T \), as in T1 or T3, although the \( T \) technically refers to the type of equipment. See T1 and T3.

DSL (digital subscriber line): Broadband Internet access method that sends data over standard phone lines at speeds up to 7 Mbps. DSL is available to subscribers who live within a certain distance to the necessary router.

DVD (digital versatile disc): Optical disks that are the same size as CDs, but are double-sided and have larger storage capacities.

DVI (digital video interactive): A format for recording digital video onto compact disk allowing for compression and full-motion video.

Echo cancellation: The process of eliminating the acoustic echo in a videoconferencing room.

E-learning: Covers a wide set of applications and processes such as Web-based learning, computer-based learning, virtual classrooms, and digital collaboration. It includes the delivery of content via Internet, intranet/extranet (LAN/WAN), audio- and videotape, satellite broadcast, interactive TV, and CD-ROM.

Email (electronic mail): Messages sent from one computer user to another.

Enterprise-wide e-learning: E-learning that is intended for all or most employees within a company. Often part of a strategic change of direction with a very short timeline. Also used to support a core process such as sales.

Ergonomics: Design principles relating to the comfort, efficiency, and safety of users.

ERP (enterprise resource planning): A set of activities supported by application software that helps a company manage such core parts of its business as product planning, parts purchasing, inventory management, order tracking, and customer service. Can also include modules for finance and HR activities. The deployment of an ERP system can involve considerable business process analysis, employee retraining, and new work procedures.

Ethernet: A type of local area network, originally developed at Xerox, in which computers communicate through radio frequency signals sent over coaxial cable.
**Extranet:** A local-area network (LAN) or wide-area network (WAN) using TCP/IP, HTML, SMTP, and other open Internet-based standards to transport information. An extranet is only available to people inside and certain people outside an organization, as determined by the organization.

**Facilitative tools:** Electronic applications used in online courses as part of course delivery. Examples are mailing lists, chat programs, streaming audio, streaming video, and Web pages.

**Facilitator:** The online course instructor who aids learning in the online, student-centered environment.

**FAQ (frequently asked questions):** A file established for public discussion groups containing questions and answers new users often ask.

**Fax (facsimile):** System used to transmit textual or graphical images over standard telephone lines.

**Fiber-optic cable:** Glass fiber that is used for laser transmission of video, audio, and/or data. This technology has much greater bandwidth capacity than conventional cable or copper wire.

**File server:** Computer with a large storage device on a network, used for storing files and software that can be shared by users on the network.

**Firewall:** Method to give users access to the Internet while retaining internal network security.

**Footprint:** The region on the earth to which a communications satellite can transmit. Also, the floor or desk surface space occupied by a piece of computer equipment.

**Free-space optics:** Also known as wireless fiber. This technology uses lasers and optical transceivers to send signal-bearing photons directly through the air instead of over fiber optical cables.

**Frequency:** The space between waves in a signal. The amount of time between waves passing a stationary point.

**FTP (File Transfer Protocol):** A protocol that allows a user to move files from a distant computer to a local computer using a network like the Internet.

**Full-motion video:** Signal that allows transmission of complete action taking place at the origination site.

**Fully interactive video (two-way interactive video):** Two sites interact with audio and video as if they were co-located.

**GB (gigabyte):** Just over one billion bytes. 1,000 megabytes.

**GIF (Graphics Interchange Format):** File format used to store images developed by CompuServe. GIFs support 256 colors and are often used for Web images because they compress well.

**GUI (graphical user interface):** Computer interface using icons or pictures, pull-down menus, and a mouse. For example, Macintosh and Windows.

**HDTV (high-definition TV):** Television that has over five times the resolution of standard television. Requires extraordinary bandwidth.
**Homepage:** A document with an address (URL) on the World Wide Web maintained by a person or an organization that contains pointers to other pieces of information.

**Host:** A network computer that can receive information from other computers.

**Hosting:** Outsourcing of the technology and commerce parts of a company's Internet-based learning system to an outside organization.

**HTML (Hypertext Markup Language):** The code used to create a homepage and to access documents over the Web.

**HTTP (Hypertext Transfer Protocol):** The protocol used to signify that an Internet site is a World Wide Web (WWW) site.

**Hub:** A network device that connects communication lines together.

**Hypermedia:** A program that contains dynamic links to other media, such as audio, video, or graphics files.

**Hypertext:** A system for retrieving information from servers on the Internet using World Wide Web client software. Hypertext consists of key words or phrases in a WWW page that are linked electronically to other Websites or pages on the Internet.

**ILS (integrated learning system):** A complete software, hardware, and network system used for instruction. In addition to providing the curriculum and lessons organized by level, an ILS usually includes a number of tools such as assessments, record keeping, report writing, and user information files that help to identify learning needs, monitor progress, and maintain student records.

**Infrastructure:** The underlying mechanism or system by means of which voice, video, and data can be transferred from one site to another and be processed.

**Interactive media:** Frequency assignment that allows for a two-way interaction or exchange of information.

**Internet:** An international network first used to connect education and research networks begun by the U.S. government. The Internet now provides communication and application services to an international base of businesses, consumers, educational institutions, governments, and research organizations.

**Internet-based training:** Delivery of educational content via a Web browser over the public Internet, a private intranet, or an extranet. Internet-based training provides links to learning resources outside of the course, such as references, email, bulletin boards, and discussion groups. It provides the advantages of computer-based training while retaining advantages of instructor-led training. Internet-based training is used synonymously with Web-based training and online training.

**Internet Explorer:** An example of browser software that allows you to design a home page and to browse links on the WWW.

**Interoperability:** The ability of hardware or software components to work together effectively.
**Intranet**: A LAN or WAN that transports information. An intranet is owned by the corporation and is only accessible to people working internally in an organization. It is protected from outside intrusion by a combination of firewalls and other security measures.

**IP (Internet Protocol)**: The international standard for addressing and sending data via the Internet.

**ISDN (Integrated Services Digital Network)**: A telecommunications standard allowing communications channels to carry voice, video, and data simultaneously.

**ISO**: International Organization for Standardization.

**ISP (Internet service provider)**: A reseller of Internet access services.

**ITFS (Instructional Television Fixed Service)**: Microwave-based, high-frequency television used in educational program delivery.

**IT (information technology)**: Computers and their information processing capabilities.

**IT training**: Combination of desktop training and information systems and technical training. Includes training in areas such as system infrastructure software, application software, and application development tools.

**JPEG (Joint Photographic Experts Group)**: A standard for compressing digital photographic images.

**KB (kilobyte)**: 1,024 bytes, often generically applied to 1,000 bytes as well.

**Kbps (Kilobytes per second)**: Measurement of data transmission speed.

**KMS (knowledge management system)**: See knowledge management.

**Knowledge management**: Capturing, organizing, and storing knowledge and experiences of individual workers and groups within an organization and making it available to others in the organization. The information is stored in a special database called a knowledge base.

**LAN (local-area network)**: A group of computers and other devices, such as printers or servers, that are located in a relatively limited area, such as an office, and can communicate and share information with each other.

**Learning object**: Modular building block of e-learning content.

**Learning platforms**: Internal or external sites often organized around tightly focused topics, which contain technologies (ranging from chat rooms to groupware) that enable users to submit and retrieve information.

**Learning portal**: Any Website that offers learners or organizations consolidated access to learning and training resources from multiple sources. Operators of learning portals are also called content aggregators, distributors, or hosts.
**Link:** The result of HTML markup, a link signifies to a browser that data within a document will automatically connect with either nested data or an outside source. Used in the design of hypertext.

**Listserve:** A powerful software program for combining and automating mailing lists and discussion groups on a computer network over the Internet. A form of one-to-many communication using email.

**LMS (learning management system):** Infrastructure platform through which learning content is delivered and managed. A combination of software tools perform a variety of functions related to online and offline training administration and performance management.

**Log in/Log on:** The process of establishing a connection over a network or modem with a remote computer so that a user's computer may retrieve or exchange information.

**Log off:** The process of terminating a connection to a computer or network.

**LSP (learning service provider):** A specialized ASP offering learning management and training delivery software on a hosted or rental basis.

**Markup:** Text or codes added to a document to convey information about it. Usually used to formulate a document's layout or create links to other documents or information servers. HTML is a common form of markup.

**MB (megabyte):** 1,000,000 bytes.

**Mbps (megabits per second):** A million bits per second.

**Meta-tag:** An HTML tag identifying the contents of a Website. Information commonly found in the meta-tag includes copyright info, key words for search engines, and formatting descriptions of the page.

**Microwave:** Electromagnetic waves that travel in a straight line and are used to and from satellites and for short distances up to 30 miles.

**Modem:** A piece of equipment that allows computers to interact with each other via telephone lines by converting digital signals to analog for transmission.

**MPEG (Motion Picture Experts Group):** A standard for compressing digital video images.

**MP3:** A format for music file compression that allows users to download music over the Internet.

**Multimedia:** Encompasses interactive text, images, sound, and color. Multimedia can be anything from a simple PowerPoint slide slow to a complex interactive simulation.

**Narrowband:** In data transmission, speeds from 50 bps to 64 Kbps.

**Narrowcast:** The transmission of educational or training content, usually by instructional television or video conferencing, to a limited number of specific receive sites that have specialized equipment for receiving the signal. (As opposed to broadcasting)

**Navigation:** Finding your way from page to page on the World Wide Web.
Nesting: Placing documents within other documents. Allows a user to access material in a nonlinear fashion, the primary requirement for developing hypertext.

Netscape: An example of browser software that allows you to design a homepage and to browse links on the WWW.

Network: Two or more computers that are interconnected in some fashion so users can share files and devices (for example, printers, servers, and storage devices).

Online: The state in which a computer is connected to another computer or server via a network. A computer communicating with another computer.

Online community: Meeting place for learners on the Internet designed to facilitate interaction and collaboration among people who share common interests and needs.

Online environment: Courses, discussions, or other communication occurring in an electronic format via the Internet.

Online learning: Another term for e-learning. Also see internet-based training.

Open platform: A computer and network design concept that dictates that all users of the Internet will have the ability to access, create, and publish information, as well as understand each other's information.

Origination site: The location from which a teleconference originates.

Packet: A bundle of data transmitted over a network. Packets have no set size; they can range from one character to hundreds of characters.

PDA (personal digital assistant): Handheld computer device used to organize personal information such as contacts, schedules, and so forth. Data can usually be transferred to a desktop computer by cable or wireless transmission.

Personalization: Tailoring Web content to an individual user. Can be accomplished by a user entering preferences or by a computer guessing about the user's preferences.

Plug-in: An accessory program that adds capabilities to the main program. Used on Web pages to display multimedia content.

Point-to-multipoint: Transmission between multiple locations using a bridge.

Point-to-point: Transmission between two locations.

POP (point of presence): The geographic location of a particular switch or service.

Portal: A Website that acts as a "doorway" to the Internet or a portion of the Internet, targeted towards one particular subject. Also see learning portal.
**Post:** To place a message in a public message forum. Also, to place an HTML page on the World Wide Web.

**PPP:** A software package that allows a user to have a direct connection to the Internet over a telephone line.

**Private communication:** Electronic communication (email) sent to the personal email mailboxes of one or more individuals as opposed to a public conferencing forum.

**Projection system:** A device for showing video, television, or computer images on a large screen.

**Protocol:** A formal set of standards, rules, or formats for exchanging data that assures uniformity between computers and applications.

**Public communication:** Electronic communication sent to a public conferencing forum, listserv, or mailing list where one message is distributed to all list members.

**Publishing tool:** A software application or program that allows people to publish their own e-learning courseware to a specific location, such as an Internet server.

**Pull technology:** In reference to the Internet or other online services, the technology whereby people using software such as a Web browser to locate and "pull down" information for themselves. Also see push technology.

**Push technology:** In reference to the Internet or other online services, the technology whereby information is sent directly to a user's computer.

**RAM (random-access memory):** Temporary storage for data and program instructions.

**Real-time communication:** Communication in which information is received at (or nearly at) the instant it is sent. Real-time is a characteristic of synchronous communication.

**Receive site:** A location that can receive transmissions from another site for distance learning.

**Resolution:** The clarity of the image on the video display screen.

**Satellite TV:** Video and audio signals relayed via a communication device that orbits around the earth.

**Scalability:** The degree to which a computer application or component can be expanded in size, volume, or number of users served and continue to function properly.

**Scanner:** A device that converts a printed page or image into an electronic representation that can be viewed and manipulated on a computer.

**SCORM:** Sharable Courseware Object Reference Model.

**Screen reader:** Computer software that speaks text on the screen. Often used by individuals who are visually impaired.
Scroll: To move text and images on a computer screen in a constant direction—down, up, right, or left.

Server: A computer with a special service function on a network, generally to receive and connect incoming information traffic.

Simulations: Highly interactive applications that allow the learner to model or role-play in a scenario. Simulations enable the learner to practice skills or behaviors in a risk-free environment.

SLIP (Serial Line Internet Protocol): Allows a user to connect to the Internet directly over a high-speed modem.

Slow scan converter: Transmitter or receiver of still video over narrowband channels. In real time, camera subjects must remain still for highest resolution.

SQL: Database standard employed primarily by Microsoft in its SQL Server product.

Streaming media (streaming audio or video): Allows audio or video files to be played as they are being downloaded over the Internet instead of having to wait for the entire file to download first. Requires a media player program.

Synchronous communication: Communication that allows participants to interact simultaneously in real time through methods such as live chats, electronic whiteboards, or videoconferences.

Synchronous learning: A real-time, instructor-led online learning event in which all participants are logged on at the same time and communicate directly with each other. In a virtual classroom, the instructor maintains control of the class, with the ability to "call on" participants who raise their electronic hands from a distant location. Students and teachers use a whiteboard to see work in progress and share knowledge. Content can also be delivered using audio- or videoconferencing, Internet telephony, and two-way live broadcasts of lectures to students in a classroom.

T-1 (DS-1): High-speed digital data channel that is a high-volume carrier of voice and/or data. Often used for compressed video teleconferencing. T-1 has 24 voice channels.

T-3 (DS-3): A digital channel that communicates at a significantly faster rate than T-1.

TBT (technology-based training): The delivery of content via Internet, LAN or WAN (intranet or extranet), satellite broadcast, audio or video tape, interactive TV, or CD-ROM. Includes CBT and WBT.

TCP (Transmission Control Protocol): A protocol that makes sure that packets of data are shipped and received in the intended order.

Telecommuting: Working at home but connecting to one's office by way of a computer network.

Teleconferencing: Two-way electronic communication between two or more groups in separate locations via audio, video, and/or computer systems.

Touch screen: Input device used to simplify user input and response. The user touches the screen to control the output, working with menus or multiple-choice decision points. Allows some simulation of hands-on training, for example, pointing to parts on a machine.
Training management system: See LMS.

Transponder: Satellite transmitter and receiver that receives and amplifies a signal prior to retransmission to an earth station.

Uplink: The communication link from the transmitting earth station to the satellite.

Upload: To send a file from one computer or server to another.

URL (Uniform Resource Locator): The address of a homepage on the WWW.

Videoconferencing: Using video and audio signals to link participants at different and remote locations.

Virus: A destructive type of computer program that attempts to disrupt the normal operation of a computer, rewrite or delete information from storage devices, and in some cases, cause physical damage to the computer.

Virus detection program: A software program to detect, diagnose, and destroy computer viruses.

Vortal: Vertical portal; a portal that targets a niche audience.

VPN (virtual private network): A private network configured inside a public network.


WAN (wide-area network): A computer network that spans a relatively large area. Usually made up of two or more local area networks. The Internet is a WAN.

WAP (wireless application protocol): Specification that will allow Internet content to be read by almost any wireless device.

WBT (Web-based training): See Internet-based training.

Workstation: A device, often a microcomputer, that serves as an interface between a user and a file server or host computer. A computer or a computer terminal.

WWW (World Wide Web): A graphical hypertext-based Internet tool that provides access to homepages created by individuals, businesses, and other organizations.

XML (Extensible Markup Language): The next-generation HTML that will allow Website designers to program their own markup commands. These commands can then be used throughout the Website as if they were standard HTML commands.
APPENDIX 4

INTERNET RESOURCES ON DISTANCE LEARNING

Australian Flexible Learning Framework – http://www.flexiblelearning.net.au

British Association for Open Learning http://www.baol.co.uk

Canadian Association for Distance Education http://www.cade.aced.ca

Commonwealth of Learning – http://www.col.org

Distance Education in Africa – http://www.communicationculture.freeservers.com/index.html

European Distance Education Network http://www.eden.bme.hu/index.htm

Global Distance EducationNet (World Bank) - http://www1.worldbank.org/disted/

International Center For Distance Learning (Open University) - http://www-icdl.open.ac.uk/

International Council For Open and Distance Education - http://www.icde.org

Institute For Distance Education (University of Maryland) - http://www.umuc.edu/ide/modlmenu.html#overview


Open and Distance Learning Quality Council http://www.odlqc.org.uk/odlqc

South Africa Institute For Distance Education – http://www.saide.org.za/

International Centre for Technical and Vocational Education and Training (UNESCO) - http://www.unevoc.de

United States Distance Learning Association - http://www.usdla.org/

World Wide Web Virtual Library: Distance Education - http://www.cisnet.com/~cattales/Deducation.html
References

African Virtual University web site: (www.avu.org)

Aguti, Jessica N. One Year of Virtual University Experience At Makere University In Uganda. Pan Commonwealth Forum, March 1999.


Bates, A.W. Technology, Open Learning and Distance Education. London and New York: Routledge, 1995.


Butcher, N. The Possibilities and Pitfalls of Harnessing ICTs to Accelerate Social Development. SAIDE: Johannesburg, 1998


Commonwealth of Learning. COL Literacy Project: A Progress Report To The Board of Governors, November 2000, Vancouver, Canada


Darkwa, Osei and Mazibuko, Fikile. Creating Virtual Learning Communities in Africa: Challenges and Prospects. (www.firstmonday.dk/issues/issues5_5/darkwa/)

Diagne, Mactar. The African Virtual University: Bridging the Knowledge Gap for Development. TechKnowLogia, January/February 2000 (www.techknowlogia.org)


Fontaine, Mary and Foote, Dennis. *Ghana: How you can use a computer without owning one*. TechKnowLogia, September/October 1999 (www.techknowlogia.org)

Fontaine, Mary. *High Tech / Grassroots Education: Community Learning Centers (CLCs) for Skill Building*. TechKnowLogia, July/August 2000 (www.techknowlogia.org)


Materu, Peter. African Virtual University, Washington, D.C. Interview, 10 January, 2001


New Zealand Open Polytechnic web site (www.topnz.ac.nz)

Oliveira, Joao and Rumble, Greville. *Vocational Education at a Distance: International Perspectives (New Developments in Vocational Education)*. Kogan Page, 1992


Saint, W. *Tertiary Distance Education and Technology In Sub Sahara Africa*. World Bank, Washington, DC, 1999.

Samara, Noah A. *Affordable Technology For People In Developing Countries*, Transcript of Keynote Presentation at the Pan Commonwealth Forum, March 1999.

South Africa Department of Education’s Center for Educational Technology and Distance Education web site (www.education.pwv.gov.za/teli2/).


Techninkon SA web site: (www.tsa.ac.za/).


Open University, International Center For Distance Learning web site (www.icdl.open.ac.uk)

University of Maryland College Web Site (www.umuc.edu/ide).


