

A New Paradigm for Distance Education Tools for Sustainability in Small States

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Abstract

Delivery of distance education in an efficient and economical manner has been on the agenda of many small states and institutions for several decades. Many have experimented with various modes of delivery and have experienced various levels of success in various areas. During the last two decades, technology has improved extensively. Societies have experienced improvement that has brought about changes in the way we communicate, the way we transport or ship things, and perform many other tasks. Technology has improved to the extent where societies across the world are questioning the validity of traditional modalities and are making rapid changes towards embracing these new developments.

This paper presents a view on the use of computer technology in delivering distance education, particularly in small states. An attempt is made to identify and describe the elements and their ingredients that are considered critical for such a system to operate in an efficient manner. For distance education to become sustainable, persons involved must be adequately prepared for their involvement. The paper introduces the term 'peopleware' as critical and addresses various aspects of human characteristics and involvement in a sustainable distance education delivery system for small states.

Introduction

According to Penfield and Larson (1996)

The creation of a strong distance learning capability requires enormous coordinated investment in supporting infrastructure, both physical and intellectual. The physical infrastructure includes compatible 'electronic classrooms' equipped with video conferencing, television, computer, and multimedia technologies suitable for recording and perhaps transmitting the class off campus.

The faculty, they claim, "must become enthusiastically committed" if the distance education intervention is to be successful. When using information technologies to construct interactive learning systems, the technical components and the pedagogical components cannot be separated. Both the information technology engineers and the educators should work closely in constructing these systems. The technologist will provide the system framework and functional blocks upon which the learning courseware can be developed (Sun and Chou, 1996).

Shen et al. (1999) suggest that remote distant interactive learning is an important emerging educational trend. The Internet, they claim, is an ideal medium for remote instructional purposes. Recent developments in computer technology and software engineering have made it possible not only for delivering instructions but also for conducting laboratory experiments via the Internet. Adding experimental components on the Internet can immensely enhance instruction in distance education, especially in small states such as countries in the Caribbean, where access to facilities is limited.

Formerly, instructors/teachers engaged in distance education were unable to effectively address various learning styles outside the classroom. Students were limited to paper-based courseware in which materials were primarily presented in a sequential manner according to the instructor's perception of the organization of the material. This may address the needs of some students but the needs of many others may not be satisfied because the presentation of the course material differs significantly from students' preferred learning style.

The use of the Internet may provide some solutions to this problem. A series of hypertext, multimedia, and hypermedia tools would be required as the basis for the course delivery. However, one must incorporate mechanisms to ensure that students can proceed through the course materials smoothly. Instructors/ teachers would therefore need to plan appropriate lesson presentations for individual students. Students would learn more efficiently because they would be able to absorb the materials rapidly, since they would be more receptive to the method of presentation.

What is Distance Education?

The term *distance education* implies education from a distance. The basic idea is that the teachers

are apart from the learners (Garrison, 1989). Several generations of distance education are evident. Garrison (1989) categorized these in terms of the information technologies and the media employed, as follows:

- a) Printed materials delivered by mail.
- b) Analog audio and visual messages delivered by signal transmission - broadcasting.
- c) Digital data delivered by the use of microcomputers and network systems.

The first two generations of technologies employed for distance education were basically one-way communications. Teachers had to make special arrangements and efforts to receive feedback from students and no arrangements were made for students to communicate with each other during lessons. The microcomputer, in earlier stages of its development, provided opportunities for students to work more interactively with learning materials. Today, the rapid evolution of the information technology industry is enabling students to interact synchronously online and enables real-time interactions. This development challenges the academic arena to keep pace in providing students with education via modern technology.

Interacting in a Distance Education System

This paper will attempt to identify a system based on certain criteria that would facilitate effective and efficient distance teaching and learning in small states. This would constitute the basis upon which electronic classrooms should be formulated. With the availability of the necessary facilities such as computers connected to the Internet, video on demand, two-way communication, and other facilities for distance education, the students should be able to do the following from any location and at their convenience:

- a) Attend all classes.
- b) Access all information/resources.
- c) Access and use all multimedia facilities.
- d) Conduct an experiment in a school laboratory.
- e) Submit assignments on time, online.
- f) Sit an examination.
- g) Communicate with all members of the class.
- h) Communicate with the teacher.
- i) Make a contribution to the class and be recognized.
- j) Receive timely feedback from the teacher.
- k) Share ideas and information with others in the class.
- l) Visit selected online libraries.
- m) Print documents.

The foregoing suggests that preparing for distance education will be a challenging task. There are five major issues that must be addressed if distance education in small states is to be successfully implemented:

- a) Readiness of both teachers, students and support staff (people-ware)
- b) Availability of suitable equipment and facilities (hardware)
- c) Availability of appropriate instructions and content (software)
- d) An interesting and informative web site
- e) Adequacy and reliability of the Internet Service Provider (ISP)

Peopleware

Irrespective of a technologically sophisticated system, the absence of people or personnel who will interact intelligently with that technology will

impact significantly on the usefulness of that system or technology. The distance education programme will experience success if the persons involved are interested in and motivated to learn from the system. Persons involved in such a programme will be expected to interact with computers and peripherals as well as audiovisual and other devices. In small states it is imperative that the right personnel be deployed for selected tasks in order to optimise on the benefits of using this technology and ensure some level of sustainability.

A positive attitude towards the use of technology on the part of persons involved in distance education is important if this system is to be successful. Some persons continue to think that face-to-face/lecture is the most effective mode of instruction, although this opinion may be based on what they experienced during their academic career rather than any valid assessment procedure. Some teachers who may be willing to change or experiment with teaching strategies often find themselves locked into the 'lecture mode' (Zielinski and Shibata, 1996).

Highly motivated and competent people are required for the development and implementation of a successful distance education programme. There is need for persons involved to develop specific skills in order to effectively interact in the system or with technology. Skills such as basic keyboarding, manipulating computer software, and installing input and output peripherals on the computer are considered critical. In addition, skills for accessing and using the Internet and other computer systems in an effective way cannot be overlooked. Specialized training may be required to ensure that participants in the distance education programme are equipped to participate effectively.

Instructional design skills and creativity on the part of teachers/instructors would be highly

desirable, since teachers would have to understand technology and be able to integrate technology using interesting methods to motivate students. Teachers are expected to develop, select and utilize appropriate software to meet learning objectives.

Highly motivated and self-directed students are critical in distance education. It is not only desirable but also imperative that students are motivated to the extent that they will access the system on their own and do whatever is necessary to move ahead without prompting from teachers. Sun and Chou (1996) cited one of the major design issues in distance education as how to motivate students to learn not only actively, but also interactively. They incorporated Moore's (1993) three types of interaction in distance education - (1) the interaction between learners and learning content; (2) the interaction between learners and teachers; and (3) the interaction between learners and learners - in their CORAL (COoperative Remotely Accessible Learning) system by including the following:

- a) A course overview before each course for students.
- b) Self-test questions at the end of each instructional node.
- c) Multimedia presentations of the content.
- d) A post window for both students and teachers to leave messages.
- e) An audiovisual window to communicate with teachers and other students.
- f) An electronic whiteboard for students to exchange information online.

Persons responsible for ensuring that the system works in an efficient manner are critical. Because of the diversified nature of the technology involved it is imperative that technical personnel

are equipped with a diversified background of skills that will enable them to be efficient at maintaining the system. In addition to technical skills and competencies these persons will be required to equip themselves with interpersonal and communication skills, since they may be required to communicate with users using telephone or other two-way communication devices to solve technical problems.

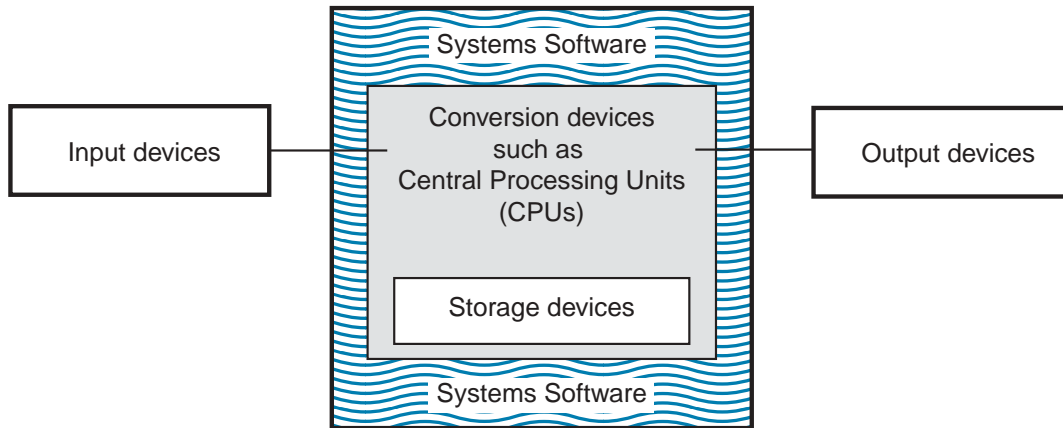
Hardware

Distance education cannot be implemented without inclusion of some basic hardware elements. In general, for any system, hardware can be considered to include the following elements (see Figure 1):

- Input devices (keyboard, mouse, scanner, CD-ROM, bar code reader, joystick, touch panel, microphone) which create or input information. The origin of the information is not important. The information may be generated by the device or input from the external world directly or indirectly by the user of the system.
- Output devices that receive information then deliver it to the external world, such as monitors, printers, speakers, projection panels, and graphics plotters.
- Storage devices such as hard disk drives, removable disk drives, floppy disks, and magneto-optical disk drives that receive information and then, at a later time provide the same information upon request.
- Conversion devices such as the central processing unit (CPU) and the arithmetic logic unit (ALU) that receive information, convert it, and then provide the converted information when requested.

To implement an efficient and effective distance

Figure 1 • Elements of Hardware



education system, all the hardware elements outlined must be included. It is imperative that proper hardware be used since these elements will determine the effectiveness of the intervention. Both students and teachers will need to submit and access information from remote locations, thus state-of-the-art facilities and equipment will be required. Access to appropriate equipment/hardware is a critical factor in the implementation of this type of education. It would be desirable for both teachers and students to have hardware available in their homes. This would provide greater access and hence more involvement in the learning process. However, many persons may not own equipment; consequently, public facilities would be required to provide the appropriate level of accessibility.

A major problem faced by educators where hardware is concerned is cost. High quality hardware is expensive and in many cases may be inaccessible by many students. Implementers of distant education systems, especially in small states where dollars are scarce, must be cognisant of this limitation and ensure that implementation is not plagued by unavailability of funds. An implication of high cost is that students may be denied access

to equipment because of a claim that “the equipment is too expensive to allow students to destroy them.” Much value and benefits will be derived from effectively used equipment.

The selection of hardware for use in distance education in small states is a critical concern. It is imperative that the right hardware be selected for the right task. Consideration should be given to criteria such as cost, obsolescence, age, impact, size, complexity, technology, materials used to manufacture, efficiency, function, durability, speed, power consumption, operational requirements, and maintenance needs. The most expensive may not necessarily be the most appropriate. The device may be too complex for the situation or the brand name may be influencing the cost. The equipment may be old but not obsolete; conversely, it may be brand new yet obsolete. There may be a mismatch in technology as, for example, digital versus analog. The hardware may just not work because of this mismatch in technology. The materials used for manufacturing the hardware may not be appropriate. Some materials could pose health problems because of their carcinogenic nature. The operational requirements and maintenance needs may be

outside the scope of the organization. Technical personnel required to maintain and repair devices may be unavailable in the state, thus causing extended delays when there is malfunction of equipment.

Software

Software is the instruction given to hardware to carry out functions. Hardware can do nothing without instructions. Irrespective of the sophistication of hardware employed, these will be useless without appropriate software.

Computers require two different types of software, namely systems software and applications software. The systems software makes the computer perform basic operations such as starting up and reading disks. The applications software are programmes written to instruct the computer to perform tasks that humans want to do, such as word processing, calculations, etc. The computer will simply not operate without software; consequently these are considered the 'fuel' for hardware. Software may either be developed and marketed commercially or developed domestically for specific purposes.

In small states, the selection and use of appropriate software is of great importance. Invariably, several software packages are available with various advantages and disadvantages. In many cases, software is purchased because of one's previous knowledge of it, it is simply the one available, or the purchaser was influenced by someone who was exposed to it without critically analysing the usefulness of it. It is necessary to give careful consideration to needs before selecting software. Knowledge of one's requirements and needs is the critical basis on which the appropriate software should be selected.

A critical issue is that of cost. Most software is

extremely expensive, especially special purpose software such as those needed to make distance education possible. In many instances, the cost of a software package may far exceed the hardware cost. In addition, the cost of maintenance and training needs of the software may be far in excess of the initial cost of the software. The question about maintenance of the software must be answered before it is purchased, since this may be unaffordable. Software programmes are constantly being upgraded and will need maintenance support. In addition to cost, the issue of availability should not be underestimated. Some developers will readily sell the first issue of a software programme to just about anyone because in most cases it is already outdated. The problem in small states is that some developers may not want to sell their most current software to foreign users. Others simply develop less adequate versions for international use and save the best for themselves.

The issue of pirating is another concern. Although many software developers have put measures in place to make pirating difficult, most software can still be easily copied and used. In many instances, persons in small states experience difficulties purchasing certain software because they are simply not available for purchase outside of the United States, Canada or other "first world" countries. This usually results in pirating, since this may be the easiest method for accessing the software.

Internet Service Provider (ISP)

The Internet is a wide area network system that links computers all over the world. This system constitutes computers in various types of organizations, including banks, libraries, museums, television stations, radio stations, departments in universities, industries, marketing companies, and numerous other organizations connected in one

major network. Persons worldwide, including those in small states, can access computers from remote locations to get information, send messages, conduct meetings and conferences, purchase goods and perform many other functions. The Internet has become an integral part of the daily activities of many persons. In fact, as Ball (2000) wrote, "These days it seems like everything you see and hear is E-SOMETHING this and .COM that. Our nation has fallen in love with its newest toy . . . The Internet."

During the past decade, the Internet has placed students and teachers in a unique teaching/learning situation. According to Zielinski and Shibata (1996), the Internet has proven to be an ideal system for the marriage of technology and education. They further claimed that the major impact of the Internet on learning and instruction would be realized from the rapid growth of course materials and learning scenarios to supplement or replace text and/or handouts. Through the Internet teachers now have the potential to enhance and revolutionize the education of students at all levels.

The ISP is critical to the proper functioning of distance teaching and learning, since it is through this service that most, if not all, communication and interaction will take place. A critical issue in small states is the availability of adequate bandwidth (the channel through which information is sent) to facilitate rapid interaction within the system. It is imperative that the ISP provides a service with adequate bandwidth, since the speed of access is proportional to the number of persons accessing the Internet at any time. As the number of persons accessing the Internet increases, the efficiency of the system deteriorates, thus making access to information a very slow, tedious and boring task. It is the responsibility of the ISP to provide an economical and reliable service with adequate bandwidth to enable reasonably fast interaction with the network.

Web Site

The location on the Internet at which the distance education materials will be housed is called a *web site*. Web site construction in which pedagogical principles are to be addressed is a major issue. According to Zielinski and Shibata (1996), most persons creating web sites are not conversant with the literature about learning styles and effective teaching techniques. Some teachers simply translate lecture notes to pages, which is not a good practice.

Zielinski and Shibata (1996) suggest that web site creators must consider the various learning styles and the stages of development of students as they interact with course materials. The web site creator must also address the challenges presented by rapidly changing technology. Good web sites, they claim, must contain more than a set of graphic, presentation-type images with one or two lines of text. Distance education will require high quality, content-rich, self-paced, interactive materials with clear instructions that are available on demand from any location.

The material should approach a topic from several perspectives and answer the needs of students with different learning styles and at different levels of mastery. Links should be established to content areas at appropriate levels. Reading lists and problem sets should also be provided for the students to undertake off-line work. The work should be challenging and allow the students to navigate and discover for themselves.

Distance Education in the Making

An example of a distance education programme that utilizes the Internet can be found at web site <http://www.jbte.edu.jm.1105/jbte-vu>. The University of the West Indies Institute of Education (IOE) has implemented the "virtual university" concept, which gives students the opportunity to

participate in classes, access course materials, submit course assignments, etc. at this location on the Internet. TeleLearning Network Centres of Excellence in Canada developed this innovative teaching tool.

The Joint Board of Teacher Education (JBTE) in IOE is utilizing this technology to deliver master's courses to teachers across Jamaica in particular, and teachers across the world in general. Having successfully delivered three courses (Inside Classrooms, Teaching at the Primary and Secondary Levels, and Theory and Practice of Teacher Education), the JBTE is now poised to expand this delivery system. According to Professor Linda Harasim, President of TeleLearning Network, this type of delivery and training puts Jamaica at the forefront of using educational technology and ensures that the skills that are being developed will make the country not only a user but a producer of the technology.

Conclusion

Distance education is an emerging paradigm where learners, teachers and equipment may be at different locations. To implement successful distance education programmes in small states requires careful thought and planning. According to Ball (2000), "If you fail to plan, you plan to fail." There is need to plan and develop new tools and strategies in order to interact with and benefit from development. The key ingredients for success include motivated people, adequate hardware, appropriate software, an informative web site and an efficient Internet Service Provider (ISP). Using the Internet in distance education programmes opens endless possibilities in teaching-learning situations. Consider a science class having students distributed all over the world - how fascinating this would be?

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