CHAPTER 1

INTRODUCTION

1.1 OVERVIEW OF E-LEARNING

The world has undergone a transition from the Industrial Age to the Information Age and to the present Knowledge Age in a rapid way. In this era, wherein the economy is knowledge-based, continuous learning will decide the success or failure of every organization and individual. E-learning, it is believed, would mark the zenith of the evolution of learning. Socio-economic changes in the world have been causing drastic changes in the way people look at education and training as we have progressed from the agriculturist mode of economy to the information age. Education and training have transformed themselves to answer the needs of the day. Today, people want to learn in a real time. Gone are the days when after the stipulated years of education, an individual was considered fit for a job. The process of formal learning stopped after one started working. Today, people have a lifelong learning cycle. One has to keep learning to cope with changes in technology and in the way business is transacted. Organizations are finding it difficult to retain skilled employees, as the mobility of people has become a reality in every business. People have to learn quickly, at their own business, without having to assemble at the venue of the training and remain competitive. In view of all these changes, the Internet has played the big role of a bridge between learners and learning. E-learning seems to be the panacea for all the learning issues faced by individuals as well as organizations.

However, on the other hand, E-learning which heavily depends upon gadgets, has evolved over the years along with development of technology, becoming increasingly accessible and gaining credibility as a learning medium. The
fact that learners can access educational content anytime, anyplace, seems to be heavily dependent on the nature, type and capacities of the gadgets e-learners use. Therefore, the classical argument arises as to whether cost and consistency play a vital role in designing e-learning environment. Gadgets may vary from computers to network hardware and related software to the design and development of e-contents. While e-learning as such is a highly talked about subject, the cost and consistency parts it demands are not projected to that level of its usages. The cost may have a direct impact on the sale of these components; the consistency would depend on the level of usage of these contents. Nevertheless, a deep study with respect to nature of usage, say nature of users, and the cost versus performance is certainly needed to be looked into.

1.2 SELF INSTRUCTIONAL MATERIALS (SIMS) AND ONLINE E-LEARNING

When compared with instructor-led programs, the features and benefits of SIM based training include all those shared by other types of technology-based training, namely,

- self-paced
- highly interactive
- increased retention rates
- reduced costs

On the other hand, when compared with Web-based training, the benefits largely come from the fact that SIMs usually provide a more engaging learning experience, with text, audio, video, and animations all used to convey information. Typically, a graphics will be displayed along with bulleted text as an audio narration which provides the primary content. Video clips can be used to show human behaviours or complex operations. This use of multiple media means that learning is optimized for all three learning styles: auditory, kinaesthetic, and visual.
One of the disadvantages of SIM based training, when compared with *instructor-led* delivery, is the lack of peer-to-peer learning opportunities. After all, good instructors are really supposed to be *facilitators*, who bring out experience-based lessons and realizations from the students themselves. Additionally, there are other benefits from the socialization that takes place in a physical classroom, including higher motivation, team building, and creation of relationships that can be supportive long after the training is over.

The biggest drawback of SIM-based training when compared with *Web-based* training is the difficulty in updating or changing the content. Once a SIM is created, the information on it cannot be changed. If a widget manufacturer uses SIMs to train its sales force and they create a better widget, a new training SIM will have to be created, duplicated, and distributed to the sales force. Depending on the size of the sales force, distributing new SIMs could cost thousands of rupees. More important than the higher cost is the additional time required in the process. Once the training program itself is updated, it typically takes around three weeks for a duplication company to complete an order, and it is likely to take another week to pack, address, and ship the CDs to the sales representatives.

Finally, SIM based programs present a challenge when it comes to student tracking. Since the CD is a distributed system without a direct link back to a training manager, other types of media must also be used for the reporting of student scores and completion certificates.

The general benefits of Web-based training (WBT) when compared with traditional *instructor-led training* include all those shared by other types of technology-based training. These benefits are that the training is usually self-paced, highly interactive, result in increased retention rates and have reduced costs associated with student travel to an instructor-led workshop (Deborah R. Campeau et al. 1995).

When compared with *SIM based training*, the benefits of Web-based training stem from the fact that access to the content is easy and requires no
distribution of physical materials. This means that Web-based training yields additional benefits, which are:

*Access is available anytime, anywhere, around the globe:* Students always have access to a potentially huge library of training and information whether they are working from home, in the office, or from a hotel room. As cellular modems become more popular, students will even be able to access training in a place that doesn't have a traditional phone line or network connection.

*Per-student equipment costs are affordable:* Almost any computer today is equipped with a modem and free browser software can access the Internet or a private Intranet. The cost of setup is relatively low.

*Student tracking is made easy:* Since the students complete their training while they are connected to the network, implementation of powerful student-tracking systems becomes easy. Unlike with SIMs that requires students to print reports or save scores to disk, WBT enables the data to be automatically tracked on the server-computer. This information can be as simple as one which has accessed the courseware and what their assessment scores are, or to detailed information including how they have answered individual test questions and how much time they have spent on each module.

*Possible “learning object” architecture supports on demand, personalized learning:* With SIM based training, students have access only to the information that can be held by one SIM. The instructional design for this type of delivery, therefore, has been the creation of the entire gamut of modules and distinct lessons. However with WBT, there is virtually no storage limitation and content can be held on one or more servers. The best WBT is designed so that content is "chunked" into discrete knowledge objects to provide greater flexibility. Students can access these objects through pre-defined learning paths, use skill assessments to generate personal study plans, or employ search engines to find exact topics.

*Content is easily updated:* This is perhaps the single biggest benefit to WBT. In today's fast-paced business environment, training programs frequently change. With
SIM and other forms of training, the media must be reduplicated and distributed again to all the students. With WBT, it is a simple matter of copying the updated files from a local developer's computer onto the server-computer. The next time students connect to the Web page for training, they will automatically have the latest version.

There are only two real disadvantages with WBT. Both of these will be overcome only in the next five to ten years as high bandwidth network connections become as common as telephones. However, this needs to be studied with reference to various factors. The first drawback, when compared with live instruction, is the lack of human contact, which greatly impacts learning. WBT is better than SIM based learning in this regard. Students can use their Web connection to e-mail other students, post comments on message boards, or use chat rooms and videoconference links to communicate live. While this type of interaction is helpful, and an improvement over SIM based learning, it still does not have the impact of a live workshop. With higher speed connections and improved conferencing software, one day students around the world will be able to communicate in real time with each other through full-screen video.

The second major drawback is the lack of multimedia in many WBT programs. The use of audio and video is critical for creating compelling metaphors, realistic job simulations, and accommodating different learning styles. Full multimedia delivered over corporate Intranets is possible, and many companies are doing it. However, in most cases, even if students have a high-bandwidth Intranet connection, corporate information technology departments do not want large media files used because it slows down the entire network. The result is that most WBT programs are still comprised of text and graphics alone. Once again, the bandwidth problem will be solved in the near future with advancements in network protocol standards and software compression.

1.3 E-LEARNING INITIATIVES IN INDIA

E-learning in India is gaining prominence slowly, but indeed steadily. The tremendous growth of the economy in the recent past has also helped in the
growth of online education in India. This is due to the fact that more than half the population of India today is below 25 years of age and the numbers of Internet users are growing continuously. Most youngsters find online education more promising, as the nature of the course work does not require them to attend regular classes. Moreover, reputed institutes like Indian Institutes of Management, Indian Institutes of Technology, Indian Institute of Foreign Trade are today offering e-learning courses. Thus, e-learning in India makes it possible for the learners to pursue their education from reputed institutes without much hassle. The scope of online education in India is actually much wider. Apart from proper course works, some e-learning portals in India are also conducting mock tests for various competitive examinations for entering into engineering, medical, management etc. For example, the India Time’s group has introduced Mindscape test center where one can appear for mock IIT-JEE (Indian Institute of Technology – Joint Entrance Examination) online for making self-assessment. The ‘Gurukul online Solutions’, apart from providing various courses, set up a Jobs and Careers Centre (JCC), which, not only provides job-oriented vocational education in a variety of domains, but also provides career enriching courses via e-learning. They also offer Live Virtual Classroom connectivity to over 175 cities across India. Some E-learning portals in India are also providing tutorials for school students. Thus, the reach of E-learning in India has expanded from adults to teenagers. The future of E-learning industry seems to be very bright in India as number of Internet users is growing in the country at quite a satisfactory pace and more and more reputed players are showing their interest in the e-learning business. This clearly indicates, education is slowly but steadily transforming its image as service sector to business sector. It is thus evident that cost, ie., economy and of course usages would certainly play a vital role.

1.4 ACADEMIC BODIES ASSOCIATED WITH E-LEARNING IN INDIA

Talking of e-Learning and academic bodies in India, it is imperative to refer to the University Grants Commission (UGC) - INFONET. The chairman of this UGC in 2002 decided that the universities and colleges should also reap the benefits, which ICT had in store for them. The deliberations of the various committees led to the setting up of the UGC-INFONET towards the end of 2004. UGC also joined this crusade of introducing e-learning. Wholly funded by UGC,
UGC-INFONET provides electronic access to scholarly literature available over the Internet in all areas of learning to the university sector in India. UGC conducts IT / ICT orientation programmes for university and college teachers through Academic Staff Colleges. ‘Brihaspati’, an e-learning platform was developed by IIT, Kanpur as open source freeware since January 2003 supported by Ministry of Communication and Information Technology, Govt. of India. Faculties are using this platform to post the lecture notes, handouts, and reference material on the Intranet for supporting the classroom teaching, benefiting over 75 Universities / Institutes across India, and the list is growing. It is thus clear that ‘e-learning’ needs to cater to learner characteristics for specific purpose subject content. Once again, it would be clear that such specificity will have direct impact on the technical aspects with respect to economical aspects.

1.5 NPTEL

Yet another project that provides Web based training is the National Programme on Technology Enhanced Learning (NPTEL), which is being funded by the Ministry of Human Resource Development (MHRD) and was first conceived in 1999 to pave the way for introducing multimedia and Web technology to enhance learning of basic science and engineering concepts, which launched in September 2006 (Srivathsan K.R. 2004). Significant infrastructure has been set up for production of video-based teaching material by the Indian Institutes of Technology (IIT), Bangalore based Indian Institute of Sciences (IISc) and National Institute of Technical Teacher’s Training and Research (NITTTR).

The Ministry of Human Resource Development (MHRD) of Government of India is the only funding agent and owner of this NPTEL Project. For the first phase of development of NPTEL, MHRD invested a huge amount for the three years development period from June 2003 till June 2006. Due to the complexity and the heterogeneous nature of the partner institutions with respect to multimedia and video production capabilities, the first phase of project development was completed in June 2007. In addition to this NPTEL project, MHRD has developed a separate digital library project which is independent of NPTEL. In addition, MHRD’s Indian Institutes of Management have been provided additional funding for distance
education in core areas of management, which is again independent of NPTEL. Seven IITs and the IISc have been working together in Phase I of NPTEL to develop Web and video-based material for basic undergraduate science and engineering courses in order to enhance the reach and quality of technical education in the country. In order to facilitate the distribution of the course material, two modes of operation have been suggested, namely, digital video lectures of courses and Web based courses. 110 video based courses and 129 Web based e-courses have been designed and implemented in the NPTEL for distribution to Institutions in India by December 2007. The courses have been made available from July 2006 as and when they are complete with video lectures being broadcast through the ‘Eklavya’ channel provided by ‘Gyan Darshan’ (‘Door Darshan’ Television, Government of India enterprise), the education service provider of Government of India. These Web courses are currently available through the official NPTEL website http://nptel.iitm.ac.in. Efforts are underway to provide free access to video lectures through Google-YouTube as video-on-demand for anyone having broadband connectivity.

The Oversight Committee on the Implementation of the New Reservation Policy in higher educational institutions has chosen this model to emulate. Sharing resources from NPTEL, in the South, the Kerala Education Grid (www.edugrid.ac.in) portal has been designed to increase and facilitate access to education resources by the educational community and to facilitate collaboration, sharing of knowledge and best practices to improve the quality of education and learning (Srivathsan K.R 2008).

The broad aim of the project NPTEL is to facilitate the competitiveness of Indian industry in the global markets through improving the quality and reach of engineering education. The operational objective of NPTEL is to make high quality learning material available to students of engineering institutions across the country by exploiting the advances in information and communication technology. The target group for this project consists of students and faculty of institutions offering undergraduate engineering programmes in India.
The educational goals are:

- Preparation of video lectures in a format appropriate for broadcasting that would provide quality content through the Technology channel named the ‘Eklavya’ channel by the previous Honorable Minister for Human Resource Development in recognition of the first student of distance education named in the great Indian epic ‘Mahabharata’ thousands of years ago.

- Creation of Web-based (e-learning) material and make it available in the form of a portal / DVDs that would be tailored to meet the needs of engineering students across the country.

- Creation of a website for NPTEL activity.

- Making e-learning material available in the Web for the video lectures to supplement class room teaching.

- Advise target institutions with regard to the software/hardware requirements for benefiting from the national project.

1.6 PROBLEM FORMULATION

Exhaustive literature is found to exist on e-learning. Even though there has been much talk about either technical aspects or instructional issues of e-learning, very little research work is seen on studies related to both aspects. Chapter II elaborates study related to these issues.

1.7 CRUX OF THE PROBLEM

It is seen from literature (next chapter) that economy along with instructional efficiency for e-learning is very vital now. While e-contents are exploding, little works have been reported on economical aspects which do not forgo efficient instructional aspects. It is also evident, once usability and economy are warranted for any research study, local conditions need to be considered for the study, so as to determine appropriate research objectives as well as for the purpose
of validation. Therefore, from a vast amount of literature studied, the problem for this research area has been focused on and delimited to the study of e-content development that is based on economy akin to instructional efficiency.

1.8 BASIC PARAMETERS OF RESEARCH

1.8.1 Research Questions

a. What types of technical and instructional components would suit an efficient and economical e-content managing package?

b. What is the learners’ view of being instructed by an efficient e-content managing package?

c. What would be a suitable instruction model for e-learning with specific reference to economy akin to efficient instruction?

d. What conclusions could be drawn out of these observations?

1.8.2 Research Objectives

- To investigate the effectiveness of instructions in existing e-contents of the subject ‘OPERATING SYSTEMS’.

- To determine the extent of appropriate and effective e-learning components with reference to economy complementing effective instructions.

- To evolve an effective e-learning strategy for ‘OPERATING SYSTEMS’ e-content.

- To establish the proposed instructional strategy through validation.

1.8.3 Scope of Research

The research is delimited to and focusing on:

- Technical aspects of e-learning
- Pedagogical aspects that affect technical aspects of e-learning
- Subject contents restricted to ‘Operating Systems’ of Computer Science curriculums
- Case study restricted to NPTEL e-contents
- Technical aspects limited to computational speed and data storages
- Media components including graphics and texts

1.9 THEESIS ORGANIZATION

The thesis is divided into six chapters as detailed below:

- The First Chapter deals with introduction pertaining to the broad research areas along with the research objectives and research questions.
- The Second Chapter deals with a thorough literature survey on the related areas of research.
- The Third Chapter presents the fundamentally needed instructional components for economically reusable objects. Content analytical results are presented in this chapter.
- The Fourth Chapter determines the economic and technical components needed for e-learning strategies.
- The Fifth Chapter elaborates the design and development of instructional modules in the form of reusable and independent entity called ‘objects’. This chapter also presents the validation of this proposed method for developing objects.
- Chapter 6 presents the analytical study made on the results of content study made on NPTEL modules as well as the experiments conducted on the researcher’s model. According to the research
objectives, the technical feasibility akin to economic viability has been reported in this chapter.

- The outcome of the entire research through conclusions, findings and recommendations, including suggestions for future research have been presented in the last Chapter 7.

The study and analysis on the findings reported by many researchers are elaborated in the next chapter, which has led to the emergence of this research.