CHAPTER 1

INTRODUCTION

1.1 INFORMATION TECHNOLOGY SCENARIO IN INDIA

Since the early eighties, Information Technology (IT) awareness and related developments have been taking place in India at a galloping pace. Many engineering colleges including Indian Institutes of Technologies, National Institutes of Technologies, Universities and affiliated engineering colleges and many private non formal computer training institutes started offering computer courses and thereby produced IT specialists galore. The competence of Indian computer specialists have been since acclaimed universally and many of them were absorbed in high paying jobs in foreign countries mainly in the US, UK, Australia and a few others.

The recent economic slowdown and substantial job cuts for Indian IT professionals mainly in the US seemed to have acted as a dampener for IT enthusiasts. Nevertheless, things aren't as gloomy as many pundits would have us to believe. Several domestic companies have posted excellent results. The slowdown has not had any repercussions at all on several companies.

Presently, IT application in India is much lower compared to China and far eastern countries. Tele-density in India is only 2.6 per hundred compared to a world average of about 15. Lack of bandwidth, low speed leased lines and untimely servicing are some of the impediments that presently beset the IT sector. Unless tele-density increases significantly, a genuine IT revolution would not be possible to usher in the country.

(Indian Scenario of SNS, Vizisense, 2010,
The main hurdle in spreading IT and to increase the computer literacy base, is the huge investment that is required to bring about the improvement. In India, most people can't afford to buy computers and only substantial investment can ameliorate the scenario in telephony, power and internet and provide a wider section of our society with its benefits. While countries like India have a telephone density of about 1.5 per hundred inhabitants, advanced countries like US and Sweden report around 50% homes with computers, phones and internet connection.

The Personal Computer (PC) base is around 5 million, owned mostly by professionals or in the corporate sectors. Encouragingly students are increasingly using the Internet as an information source and an educational tool. Voting for elections using Internet is still a distant dream (UK has already done it) and even e-commerce couldn't flourish because of low internet penetration. A study by National Association of Software Services Companies (NASSCOM) of India has predicted a significant increase in both these areas in the near future.

The e-learning market is expectedly huge in India. Corporate training and coaching for examinations are in-demand areas of the e-learning sector. It is statistically shown that the region's schools and universities produce far less IT professionals than the current demands in the market. Hence, India should produce more quality IT professionals as huge demands still exists in many Asian and European countries besides the domestic requirements of India.
India, with its software expertise can be projected as the ideal centre for American and European companies for outsourcing even for e-content developments. Foreign firms could save more than 50% by doing work in India. Summing up, investment is required to upgrade inefficient existing facilities. Higher bandwidth can result with laying of fibre optics cable which in turn will help e-commerce and e-learning. Industry should play a more active role and work in collaboration with the Govt. for overall IT development including e-learning. Despite these issues IT Education is bound to grow in India, whilst software products are being developed or dealt with by IT companies that would also grow particularly for e-resource development.

1.2 SELF INSTRUCTIONAL MATERIALS (SIMs) FOR LEARNING: ADVANTAGES AND DISADVANTAGES

When compared to 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 graphic will be displayed along with bulleted text as an audio narration provides the primary content. Video clips can be used to show human behaviors 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 to 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 and burnt on a CD medium, it would be sold as a merchandize to buyers. Once the content is implemented through a CD as a merchandize and dispatched to prospective buyers, there might not be any binding on the content between the developers and the users (of course, there is a warranty on the merchandize). Therefore the information of the SIM cannot be changed once it is burnt and dispatched, whereas the contents of a web site can be dynamically changed.

Finally, SIM based programs present a challenge when it comes to student tracking. Because 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.

1.3 WEB FOR LEARNING: ADVANTAGES AND DISADVANTAGES

The general benefits of Web-based training (WBT) when compared to 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, results in increased retention rates, and has reduced costs associated with student travel to an instructor-led workshop.
When compared to 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, among them:

- **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 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**

  Because students complete their training while they are connected to the network, it is easy to implement powerful student-tracking systems. 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 who has accessed the courseware and what are their assessment scores to detailed information including how they answered individual test questions and how much time they spent in 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 to create entire modules and distinct lessons. But 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 to WBT, and both will be overcome only in the next five to ten years as high bandwidth network connections become as common as telephones. The first drawback, when compared to 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 doesn't 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 to 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. But in most cases, even if students have a high-bandwidth Intranet connection, corporate information technology departments don't 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.

1.4 NEED FOR E-LEARNING

The world has undergone a transition from the Industrial Age to the Information Age to the present Knowledge Age. In the Knowledge Age, wherein the economy is knowledge-based, continuous learning will decide the success or failure of every organization and individual. e-learning marks 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 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 just in time. Gone are the days when after the stipulated years of education an individual was consider to be fit for the job. The process of formal learning stopped after one started working. Today, people have a life long learning cycle. One has to keep learning to cope with changes in technology and in the way business is transacted.
Organization is finding it difficult to retain skilled employees, as the movement 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 the walk of all these changes, the Internet has played the 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 organization.

E-learning has evolved over the years, becoming increasingly accessible and gaining credibility as a learning medium. E-learning (learning through the internet or CD-ROMs) is on its way making learning of every type easier and accessible to people across the world. The fact that learners can access educational content anytime, anyplace, seems to be the biggest advantage that e-learning has brought to the world of education. Apart from the classical arguments of cost and consistency, e-learning has also made education accessible to students, especially in the higher education arena.

1.4.1 E-Learning initiatives in India

E-learning or electronic 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. They find online education very convenient, as the nature of the course work does not require them to attend regular classes. Moreover reputed institutes like Indian Institute of Management, Indian Institute 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 like engineering, medical, management etc. For example, the India time’s group has introduced the 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

1.4.2 Academic bodies associated with e-Learning in India

Talking of e-Learning and academic bodies in India it is imperative to mention the UGC-INFONET. The chairman of the University Grants Commission (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.

In the United States, ASTD (American Society for Training & Development), the world's largest association dedicated to workplace learning offers various courses in e-Learning such as e-Learning Courseware
Certification along with CEC, an inter university centre of UGC is offering scripting, an e-course in scriptwriting for films and television. For enhancing the ICT skills of teachers' organizations like the NCERT (National Council of Educational Research and Training), and NCTE (National Council for Teacher Education) etc. has been launching schemes from time to time. UGC too 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.

1.5 NPTEL*

Yet another project to provide 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, was launched in September 2006. Significant infrastructure has been set up for production of video-based teaching material by the Indian Institutes of Technology (IIT), Bangalore based Indian Institutes of Sciences (IISc) and Technical Teacher Training Institutes (TTTI).

* The copy right of NPTEL however records: “the copy right shall not apply for placing this information in the concerned Institute's library, departments, hostels or any other place suitable for academic purposes in any electronic form purely on non-commercial basis”. In addition, the contents’
properties display ‘can be copied and used for academic purposes free of cost’. Hence taken the content of NPTEL for case study.

The Ministry of Human Resource Development (MHRD) of Government of India which 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 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, Govt of India enterprise), the education service provider of Govt. 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.

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:

- Make 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.
- Create 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.
- Create a website for NPTEL activity.
- Make 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.

**Lacunae in the Instructional strategies of NPTEL**

The existing e-content of NPTEL has been introduced above. It explained the contents of Phase I of NPTEL. Phase II of NPTEL has brought out improvement over phase I. For quality improvement over Phase I the Government of India has introduced Phase II of NPTEL. One of the missions for this introduction is quoted below as stated by the Implementing Agency:

“The Mission shall work on the philosophy of encouraging all the scholars and academicians to generate e-content. This may even result in generation of more than one set of e-content on one topic in any given discipline. This philosophy has been adopted because of pedagogical considerations and the fact that different kinds of learners have different learning aptitude, therefore, one kind of e-content can be appreciated in a better way by one set of learners and the other kind of e-content by other sets of learners.”

1.6 **CRUX OF THE PROBLEM**

Plethora of e-contents of CSE subjects is available in the www. Most of these e-contents are found to be in the style and form of text books. Besides, no course objectives have been found spelt out for most of these e-contents. It is thus observed and believed that many users of e-contents do not seriously utilize for rigorous learning. They found to be viewing these e-contents for reference only. As seen from several published research works, that learner characteristic is a very important component needed for the design of these kinds of e-contents. Literature also show that e-learning should be objective driven. In that case this should pose some basic questions like what
kind of instructional model for e-learning would fit in well for particular learner characteristics. How to validate such instructional models? How to quantify learning abilities in existing e-contents? etc. These cruxes have led to take up this research work. Chapter III elaborates the selection procedure adapted for e-content development research on the Computer Application subject (course) on ‘Computer Graphics (CG)’. The research is delimited to the subject area of CG.

1.7 RESEARCH QUESTIONS

1. What is the learner’s view of being instructed by an efficient e-content managing package?

2. What kind of instructional components should suite well for efficient e-content development?

3. What would be a suitable instruction model for e-learning of Computer Applications?

4. What conclusions could be drawn from these observations?

1.8 RESEARCH OBJECTIVES

- To investigate the effectiveness of instructions in existing e-contents of CG.
- To determine the extent of appropriate and effective e-learning components.
- To evolve an effective e-learning model for Computer Application courses.
- To establish the proposed instructional model through validation.
1.9 THESIS ORGANIZATION

The thesis is divided into eight chapters as detailed below:

1. This first chapter dealt with an introduction pertaining to the broad research areas along with the research objectives and research questions.

2. The second chapter deals with a thorough literature survey on the related areas of the research.

3. The third chapter presents the research methodology, sampling techniques and actual samples adopted for the research.

4. The fourth chapter presents quantitative content study results performed on existing NPTEL’s CG contents. The quantitative values of learning abilities would be of immense value for further research.

5. The fifth chapter details instructional strategy components that are needed for the design of instructional model.

6. The sixth chapter introduces the proposed instructional model designed by the researcher. An experiment conducted on the model is also presented in this chapter.

7. The seventh chapter details the validity of the model that was again performed through a social study.

8. The last chapter (VIII chapter) presents the outcome of the entire research through conclusions, findings and recommendations, including suggestions for future research.

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 problem.