3. DESIGN AND DEVELOPMENT OF COMPUTER BASED TEACHING AND TRAINING MODULES

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1.0 Introduction

Education system has undergone dramatic and far reaching changes. Huge increase in students number of more diverse and demanding student groups, on-pouring new technologies etc., have increased the pressure and complexity of academic work, creating a need for more strategic approaches to teaching and learning and improved human resource development to help both the teachers and learners to cope with the new learning environments.

Gibson in his book "Future Directions in Educational Technology Design", defines education technology as "the systematic application of people, ideas, materials and equipment to the solution of Educational problems...... the process by which the learning materials are selected and produced and by which modes of communication are designed and arranged in the learning environment". This cybernetic definition of educational technology is a much more prescriptive approach rather than a descriptive definition that concentrates on information technology in education.

Computer based learning most often means an approach to facilitate and enhance learning through the use of devices based on computer and communications technology. Such devices would include personal computers, CD-ROMs, Digital Television, P.D.A.s and Mobile Phones. E-learning is increasingly converging with other tools, providing people with a unified view of all teaching including students and faculty considerations. In future training technologies will become so smart and intuitive that technology will no longer be the focus. The computers will be built into just about everything we use with applications that are so intuitive and advanced that people will not focus on the fact that a computer is even involved.

2.0 Computer based teaching and training

The reasons to get started in the new direction are:

1. We live in a world in which developments in technology are affecting everything about the way we live and work. Words like "Tele working, Telematics, Interactive Television, Video on demand and information super high way" are now part of every day vocabulary.

2. Increasing number of students and their ability and background are forcing us to redesign the curriculum and teaching methods. The use of technology can and does provide solutions to some of these problems.

3. There are pressures such as teaching quality and research audits which are forcing us to consider ways in which technology can improve the quality and effectiveness of what we do at a lower per capita cost.

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Computer technology offers many new dimensions for the provision of support for teaching and learning. Until recently, the creation of more effective and more efficient individualized and group learning systems like computer assisted learning, computer based training and computer mediated communication techniques were emphasized and realized successfully. Computer based methods that could be used to develop, maintain and deliver electronic lectures as part of a more holistic approach to electronic course delivery could be thought about. Electronic Lectures undoubtedly offer a cost effective way of delivering instructional material.

Computer technology can therefore be used in order to:

1. enhance and augment lectures;

2. increase their accessibility (not only to local, campus-based students but also to distant learners); and

3. improve their quality from both staff and student perspectives. Essentially, the electronic lecture is one in which the computer based projection system is used to augment (or indeed replace) the use of OHP transparencies or a slide projector. Multi media resources incorporating text, sound, pictures, animation and video material are used. Various materials needed to create these lectures can be retrieved from a wide range of resources.

The advantages of computer based teaching and training modules are:

1. Cost effective solution with global presence.

2. Reduction in travel, boarding and lodging expenses to be incurred for both the trainee and the trainer.

3. Computer based training constitutes, for the first time, a tool that enables internationally active companies to train their associates on a global basis, always to the same standard.

4. Optimizes the time available and affords flexibility in training schedules thereby not interfering with the routine work.

5. The highly interactive quality of the computer based training (CBT) modules allows the trainee to optimize his/her training time thus cutting training time and reducing training costs.

6. Research studies show that there was significant reduction in training time.

7. The Self paced instructional program allows for mastery of the material as there is no time constraint.

8. The bookmark function of the CBT allows the trainee to interrupt the program to answer an important call or situation and can go back to the program again.

9. The modules can be customized with built in learning models that support various learning styles and abilities.

10. CBT captivates your audience with stimulating explanations that make use of cutting edge multimedia techniques including graphics, photographs, animation, sound, motion video and simulations.

11. Individualized learning: e-learning can provide an individualized learning experience for all learners, including those who are disadvantaged, disabled, exceptionally gifted, have special curriculum or learning needs, or who are remote, or away from their usual organization.

12. Personalized learning support: personalized information, advice, and guidance services help learners find the course they need, with seamless

transition to the next stage of their learning, including online application or enrolment and an electronic portfolio of their learning to take with them.

13. Collaborative learning: e-learning offers a wide range of online environments (school, college, home or work) to work with and learn from other individuals or groups of learners as well as tutors, and develop cognitive and social skills of communicating and collaborating.

14. Tools for teachers and learners to innovate: e-learning offers a wide range of design tools to enable teachers and learners to be innovative, creating and sharing ideas, or customizing digital learning resources for their own use.

15. Virtual learning worlds: learners can take part in active and creative learning with others through simulations, role-play, remote control of real-world tools and devices, online master classes, or collaboration with other schools or organizations.

16. Flexible study: e-learning can offer flexible learning on demand, anytime or anywhere, blending traditional and innovative methods to meet learners' needs on or off campus, at home and school, at work or in a community leisure venue.

17. Online communities of practice: the Internet can bring learners, teachers, specialist communities, experts, practitioners and interest groups together to share ideas and good practice, contributing to new knowledge and learning.

18. Quality at scale: e-learning achieves economy of scale through wide access to digital resources and information systems, combined with quality through shared tools and resources, and common standards of design and effectiveness.

Computer based learning is not, however, the be all and end all to every training need. It does have limitations such as the following:-

● Up-front investment required for an e-learning solution is larger due to development costs.

● Technology issues that play a factor include whether the existing technology infrastructure can accomplish the training goals, whether additional expenditures can be justified, and whether compatibility of all software and hardware can be achieved.

● Cultural acceptance is an issue in organizations where student demographics and psychographics may predispose them against using computers at all, let alone for e-learning.

●· Technology issues of the learners are most commonly technophobia and unavailability of required technologies.

● Portability of training has become a strength of e-learning with the proliferation of network linking points, notebook computers, PDAs, and mobile phones, but still does not rival that of printed workbooks or reference material.

● Reduced social and cultural interaction can be a drawback. The impersonality, suppression of communication mechanisms such as body language, and elimination of peer-to-peer learning that are part of this potential disadvantage, are lessening with advances in communication technologies.

The pro's and con's of computer based learning vary depending on program goals, target audience and organizational infrastructure and culture. But it is beyond argument that e-learning is rapidly growing as form of training delivery and most are finding that the clear benefits to e-

learning will guarantee it a role in their overall learning strategy.

3.0 System requirements for development of modules

1. Domain Expertise includes the expertise in the theoretical aspects of the subject of interest, view of industrial experts and best industrial practices.

2. Technical Expertise includes video capturing, downloading, editing and embedding, audio recording, synthesizing and embedded content editing, creation of graphics and animation.

3. Hardware requirements are : processor, operating system, adequate RAM, CD-ROM drive, 16K-color display, free hard disk space, Sound Blaster-compatible sound card, AVI, QuickTime, Video Camera, Mikes, Audio Cables, Aver media download kit.

4. Software packages needed to develop the modules are:

- Open source systems : Open Office

- Microsoft Products: MS-Windows 98/XP/2000, MS-Office professional, Front Page.

- Adobe products: Adobe Photoshop, Adobe Acrobat, Adobe Premiere

- Macromedia products: Flash, Director, Dream weaver, Author ware

- Other Products: Sound Forge, Audio Grabber, 3D Studio MAX

4.0 Creating Learning Objects with e-learning Tools:

Macromedia Flash MX products can be used for authoring Learning Components, or Objects. across key products used for learning. E-Learning content developers can use the fully integrated development environment of Macromedia Flash MX to combine a variety of media and external applications to build rich, immersive online learning experiences. They can also quickly and easily, create media-rich Flash-based courses, complete with integrated interactions, quizzes, and tests.

HTML editors such as Dreamweaver and FrontPage are great tools for creating e-learning course content. However, for creating test questions and bookmarks, one will have to spend several weeks of programming with JavaScript. Documented source code for these essential e-Learning capabilities can be got with the HTML Course Development Toolkit.

Macromedia Dreamweaver is a powerful application for creating Web-based learning content and interactive Web pages. With Dreamweaver, one can quickly create engaging web sites and compelling web-native learning content and deliver them across multiple platforms and browsers.

Macromedia Authorware is the leading visual rich-media authoring solution for creating Web and online learning applications. As a training developer, instructional designer, educator, or subject matter expert, one can create engaging rich-media learning applications; deliver them to employees and customers on the Web, LANs, and CD-ROM, and track student results and the return on training investment.

5.0 Design and development of modules – A case study

This paper is a result of the development of four computer based teaching and training modules in the areas of manufacturing systems design, facilities planning & design, industrial engineering and total quality management.

5.1 Development Methodology

The development of the CD modules consists of the following major activities:
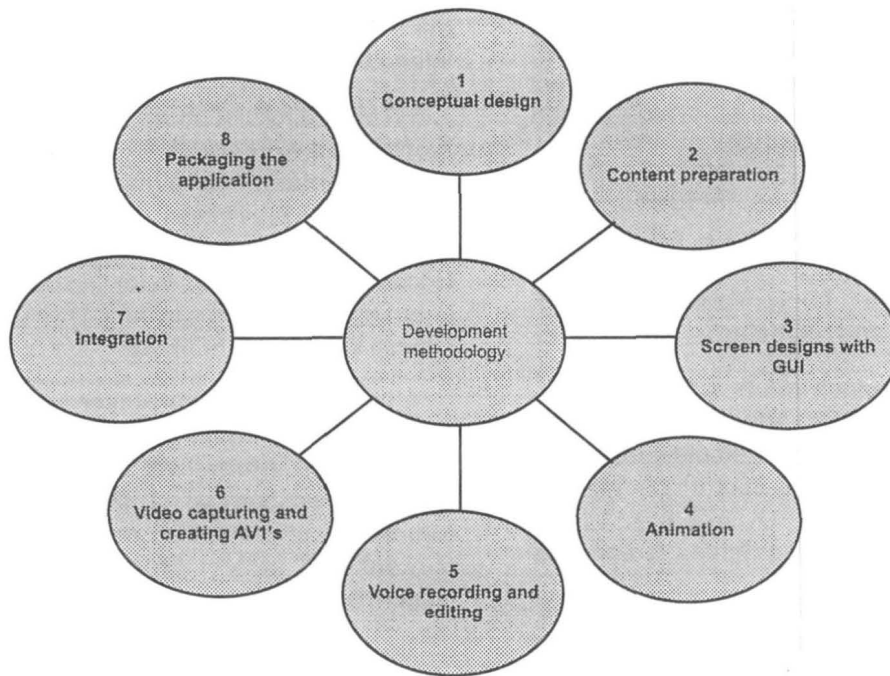
Figure 1 : Steps in development of modules

1. Conceptualization: The required / anticipated product is to be conceived in advance with all the inputs to the system and the final design of expected product.

2. Content preparation: The textual content has been identified and has been converted to the compatible format.

3. Screen Designs with GUI: As per the requirement, the screens have been designed to suit the concept using the Adobe Photoshop embedding relevant graphics.

4. Animation (2D/3D animations) : Relevant graphical presentations have been created using Macromedia Flash. The Walk throughs have been designed using the 3D Studio MAX.

5. Voice recording and editing: The script for the vocie over has been prepared and the audition tests were made to identify the apt voice. The recording of the voice over is carried over using Sound Forge, the same has been grabbed, edited, synthesized and created 'WAV' files.

6. Video capturing, downloading, editing and creating AVI's: On-Site Video capturing of the interviews with experts and the manufacturing processes has been done using the video camera. The same has been downloaded on the system. The video has been cut, edited and exported to smaller clips of AVI.

7. Interation of the Text, Graphics, audio and video by providing user interface: After all the basic requirements are sufficed, the integration processes involve embedding all these components in the required places with

proper scripts for activation. The separate 'DIR' files are created for different components / chapters and then these 'DIR' files are linked to the master file. The packaging process involves converting all these files into a single exe files for execution.

8. Packaging the application into CD media with proper labeling: Finally this 'EXE', other required external components and the system support files are written onto a CD. A relevant label is created and pasted / printed on the CD.

Each module consists of text material in HTML format - chapter wise, videos of best industrial practices, case studies, audio recording on introduction to chapters and video recording of expert interviews. The CDs promote self learning and are user friendly for operations.

6. Conclusion:

The modules were developed to help the students of industrial engineering and management in learning different courses in a better way. This has augmented the traditional learning. Further scope of work exists in extending this technology to develop other courses. These modules can also be published on the web with certain modifications. This will benefit a large community of students.

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