

# A Study of Role of E-Learning in the Functioning of Virtual Expert System for Health Awareness Program

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**Abstract**—This paper studies the e-learning technologies from the standardization aspect with a glimpse on future changes. The generic model of e-learning is presented without emphasis on specific software and hardware solutions. The most popular infrastructure models are presented in details and the related committees and organizations involved in the standardization process are referenced. A lot of people have heard of terms such as distance education or distance learning, yet with the introduction of e-learning, distance education took on a whole new meaning. With e-learning, the possibilities for getting knowledge and information out to the learner at her/his own pace opened a whole new world for knowledge transfer. In recent years terminology changed and it went from using such terms as “technology-supported learning, distance learning and distance education” to “online learning and web-based training” to “e-learning”. Today, e-learning allows us to share and manage knowledge and skills of the professionals who work in our colleges and universities, and to get the right information to the right people, when and how they need it. Although there are various applications of Expert system in various fields, right from agriculture to the diagnosis of diseases of patients, it has potential for extensive contribution in digital learning. The main objective is to focus and highlight the new trends of e-learning system and by integrating Expert System tools with it, how the system will be more effective and beneficial in nature and how the system will work as an Expert E-learning interface. Adaptation of the E-learning system according to cognitive characteristics of the students is a relatively new direction of research on the conjunction of technical and pedagogical aspects. It is particularly important that the E-learning systems are able to integrate different paces of content and navigation in order to be able to respond to diverse needs of the students. In the presence of great social diversity in India, it is difficult to change the social background of students, parents and their economical conditions. Therefore the only option left for us is to provide uniform or standardize teaching learning resources or methods. For high quality education throughout India there must be some nation-wide network, which provides equal quality education to all students, including the student from the rural areas and villages. The one and only simple solution to this is Web Based e-Learning. This discussion refers to the ‘availability of eLearning resources and service’ while prospects denote ‘futuristic expectations about the role of information and communication technologies (ICTs) in higher education institutions (HEIs). The use of Information and communication Technology (ICT) in higher education has created totally a new environment which is fundamentally different from the traditional learning methods.

**Index Terms**—E-learning, ICT, ICTS, e-teaching, e-pedagogy, e-courses, opportunities, Web based learning, instructional design model, computer-aided lecture design, computer programming, system architecture, Problem based learning, Adaptive Learning, Personalized learning, Intelligent tutoring system, Expert system, reusability, interoperability, learning objects.

## I. INTRODUCTION

India is a country of millions of youth minds, seeking knowledge to move ahead in contrary to their limit. This time is important for India to get prepare for the future hence requiring education in full fledged. Though, we have many schools, enough teachers and facilities for students and teachers. But the great variation in the quality of education is found due to some factors like social background of students, parents, different standards of teacher training programs, all teachers cannot deliver the same message to all learners. This fetches the need of WBEL (Web Based e-Learning). This can be done by introducing or using Information Technology (IT) and

related tools in school education or by using World Wide Web (WWW) as education delivery medium. The WWW is used not only to disseminate information but it also provides a great opportunity to extend learning outside space and time boundaries. The Web Based Education / Learning have the potential to meet the perceived need for flexible pace, place and face. The web allows education to go to the learner rather than the learner to their education. As per as India is concerned there are many problems that one will face to use IT in education like funds, infrastructure etc [1].

It is a global network and gives the concept of global classroom where any number of students can interact with each other at any time. Goodbye classes, goodbye books and goodbye teachers are all possible with the WBeL. This is an interactive experience with access to on line tutors and can be done from any computers once you have your password. WBeL has become popular amongst educationists because of its inherent strengths and advantages it provides to the instructional process such as, the ability to have multimedia documents, the hypertext/hypermedia capability, WWW network basis, allowing for distance learning. Access is through web browsers such as Internet explorer and Netscape Navigator. With Web Based Learning, training is organized in the form of modules. The modules are approximately one hour session that focuses on specific subject of training. Using WBeL the training can be brought right to your desktop. This makes technical training more convenient. During the live WBeL module, participants will have the ability to ask the instructor questions, get answers and interact with other students — all on line [2-3].

The term e-learning was first introduced in 1999. E-Learning and online learning applications based systems are new modes of learning that are completely changing the scenario of the expert systems in virtual education of awareness. This system offers flexibility and accessibility i.e. one can have access to the information when and where required. Since 1999, the advances of e-learning have taken a number of different forms. E-Learning has removed the geographical and time barriers to acquire the information about any activities. It allows systems to integrate the learning with education and awareness. E-Learning is cost effective i.e. it can help organizations to save money through improved competencies and skills and reduction in learning times.

In the era of information abundance, diversity and distribution it is crucial for individuals and organizations to put things in order by defining standards for everything. Following the trend, the developers, vendors and users of e-learning systems develop, support and adopt standards for the overall learning process. From the first moment of this phase, pioneers of the e-learning community cooperated in order to define standards, protocols and architectures for the development of e-learning content, services and products. An e-learning process comprises conceptual and physical components and procedures that should be both standardized in terms of procedures and technologies. As far as it concerns the conceptual background of an e-learning application, the issues that must be well defined are:

- the design of the e-learning process,
- the definition of learners' competencies,

- the framework for the co-operation among teachers and educates.

The physical components comprise:

- the learning content and its packaging and deployment,
- the learners' profile,
- the assessment activities,
- the metadata structure and
- the system architecture.

It is purely technology-enhanced learning via internet and customized intranets. Because of the technological revolution, the education system has got tremendous changes in the later part of 90s. E-learning, by virtue of its unique, distributed and asynchronous nature, significantly improves the entire educational system. It creates a new dimension of learning that eliminates barrier of time, distance and socioeconomic status. Though e-learning have different prospect in different point of view like from learner side, content repository and management, metadata management and indexing, there is a potential benefits in Adaptive Learning Environments (ALEs). The awareness of ALEs is going high in recent years. To manage all these there is a need of standardizing the whole system, by coordinating emerging technologies and capabilities. Many E-learning standards like SCORM, LOM are available now in market and they are accepted by many academia, institutions, and various Govt. and Non-Govt. organizations. Researchers are also introducing various types of implementable architectures in this field in different periods of time. Most of such standard gives more emphasis on content management of learning procedure by integrating different attractive tools like graphics, animation, videos etc. to make the system more impressive and interactive [4-6].

## II. VIRTUAL EXPERT SYSTEM

An expert system is a computer program that works in accordance with human expertise and based on knowledge and reasoning techniques. It can solve problems and can give advice in a specialized domain area. It operates as an interactive system to respond questions, asks for clarification, makes recommendations, and generally aids the decision making process. So, we can say an ES is a decision maker, problem solver, analyser, and can use as a guide for them who does not have access to expertise. ES provides expert advice and guidance in a wide variety of activities, from computer diagnosis to delicate medical surgery. Instead of simply manipulating data sets, an ES can draw a conclusion which is the main advantage and difference from traditional database programs. It contains both declarative and procedural knowledge. An ES has reasoning

capability to arrive at conclusions from stored and supplied facts. A very important kind of ES called Fuzzy ES is used to collect fuzzy membership functions and rules which allow more than one conclusions per rule. Here user has to give his/her confidence also with their inputs. Like the system also give conclusions with confidence level. The basic advantage of using such Expert Systems is that there is no restriction on input data on their limits and the data not necessarily defined clearly in advance. It can give several alternative solutions, either ranked or unranked.

There are several promising areas of E-learning. Among them content management and web security are main for which several companies have introduced several standards. The application of ES is rapidly increasing in learning environment to make the system more interactive. One such popular application is the information filtering agent to analyze the learner's web surfing habits and preferences. It filters exactly the information wanted by the learner from unwanted data which saves time and effort of searching from huge amount of data. ES determines what contents to present to the learner. ES can understand learner better and can think better way to make decision. Because of its performance, many decision support systems named as Expert System.

AXSYS is an intelligent system for e-learning having visual interface with graphical representations of knowledge. This helps the teaching staff even if they do not have any technical background and arrange the system without any additional technical support. LCDS, The Microsoft Learning Content Development System is an expert system that creates high quality, interactive, online courses. It is a free tool that allows anyone in the Microsoft Learning community to publish e-learning courses. Its recent rank is 7 on the list of best free applications from Microsoft and is available now in seven languages. AAA is an ES of America Accounting Association provides information on Rutgers Accounting web as well as Newsletter, Teaching material and more.

EZ Xpert 3.0 is an end-user development environment with speed and accuracy. It offers a menu-driven, fill-in-the-blank interface with extensive Wizard support and presents an ordered list of tasks that need attention, leading the user through the building of the system. EXSYS Corvid is a decision-making expert system allows non-programmers to easily build interactive Web applications that capture the logic and processes used to solve problems and deliver it online, in stand-alone applications and embedded in other technologies [7-8].

### III. FUTURE ASPECTS OF THE VIRTUAL EXPERT SYSTEM IN HEALTH WARENESS

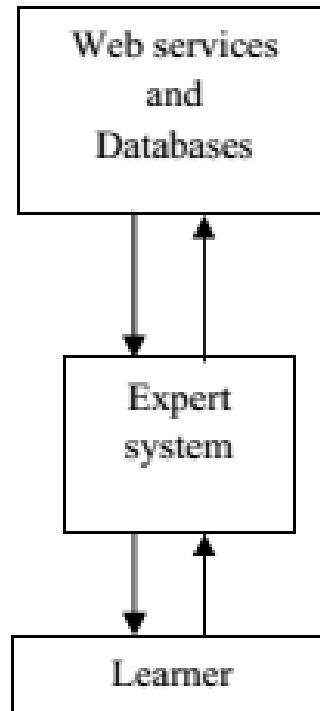


Figure 1: Block diagram of System [9]

It is seen that, most of the ES for E-learning are used to manage the contents of SLM. Most of the works are still going on to make the system more attractive and interactive for user. According to Teo and Gay, most E-learning systems are still limited to just being online repositories and lack of personalization learning system [10]. So, one adaptive and assistive learning system for digital learner is very much important in this field. Based on the information about user-access pattern and use behavior, a designer can improve the site organization and presentation. Adaptive sites can monitor visitor's activity and browsing patterns and learn from them some relevant information. In e-learning environment also an ES can work as a kernel for learner and the learning system. ES can be the expert control system for both learner and the environment that can form an Expert Learning System (ELS).

The life-cycle of the e-learning process from the planning and preparation of a course to the consumption by the learners is depicted in Figure 2. The life cycle, as presented in Figure 1, comprises of four phases, namely: the design phase, where the targets and requirements are specified, the production phase, where content is produced, assembled and packaged for distribution, the deployment phase, which requires the collaboration of learners in order to distribute the appropriate content per

case, and the assessment phase, where the outcome of the whole process is evaluated [10-12].

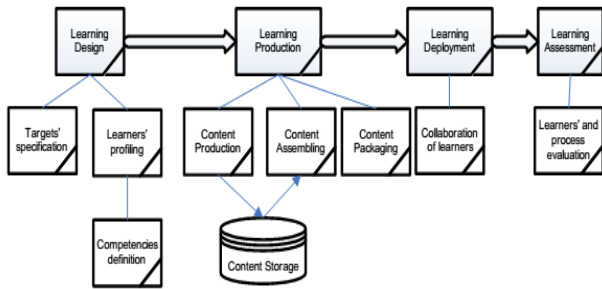


Figure 2: Life Cycle of Virtual Expert System [13]

For the successful design of a learning process one should first define the required features of learners' profile and the recommended competencies. It should also specify in detail the educational targets to be achieved by the end of the learning process. The production phase integrates the production of content modules, their build up based on the initial design, and the packaging of the content to be delivered. The deployment phase that follows should consider the ability of users to access the content and collaborate during the learning process. The learning process ends up with the assessment of learners through tests and other activities and of the process itself through evaluation forms. At the end of every phase useful information is collected and fed back to every previous phase of the process. This facilitates the improvement of the whole process and leads to better solutions for learners and educators. As an example, the information gathered during the deployment phase, which concerns actual learners' needs and level of satisfaction is used as an input in the production phase, in order to reassemble learning objects and produce more competitive packaged solutions [14].

IV. FUNCTIONALITIES OF VIRTUAL EXPERT SYSTEM USING E-LEARNING TOOLS

The elementary particles of an e-learning system are the "learning objects" (Wiley, 2002). They are the key definition to understanding an e-learning system structure as well as the core of reusability, interoperability and adaptability. From an operational perspective, learning objects are chunks of data that are used by e-learning system. They are authored, stored, indexed, assembled, delivered, and evaluated. A more realistic approach is to think of a learning object as a digital part of a course ranging in size and complexity from a single graphic to an entire course itself. According to earlier methodologies, learning was organized into lessons and courses with predefined objectives. Recent paradigms require the breaking of content into much smaller, self contained pieces of information that can be used alone or

can be dynamically assembled into Learning Objects (Cohen & Nycz, 2006) to meet the "just enough" and "just-in-time" requirements of a learner (Bransford, Brown, & Cocking, 2000) [15-16].

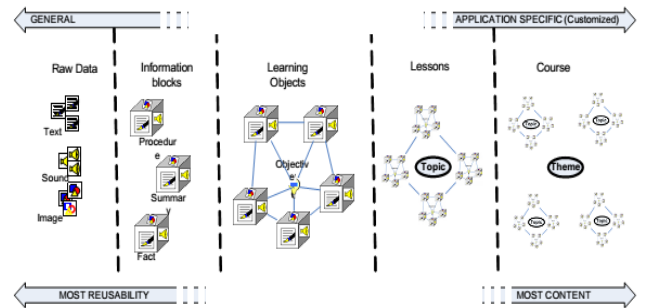


Figure 3: Content Object Model of the System [17]

Once the building blocks of the learning process have been defined we should explain how they are used, which tasks are dedicated to their creation, assembly, delivery, consumption and evaluation and which tools are employed in every task (O'Droma, Ganchev, & McDonnell, 2003). All the tasks, tools and users are the components of the e-learning environment and the learning objects are the entities that must be transferred among them. In Figure 4 a conceptual model that positions e-learning products and their functionality in terms of an e-learning environment is provided (based on Robson, 2003).

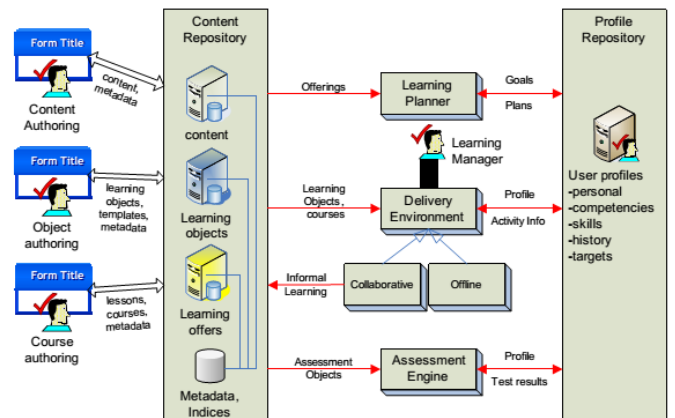


Figure 4: Learning Functional Model of the System [18]

The main components of the production phase are:

- Content Repositories: they index commercial and custom learning objects that can be retrieved and served to people and systems. They support content management functions such as version control, check-in/check-out, import, export and transfer functions etc.
- Metadata: they are used for indexing and retrieval tasks, especially for non textual content. *Learning object metadata* is used to describe the structure

and location of learning objects and facilitate retrieval. This allows learning objects to be stored on multiple servers with different characteristics.

- Content Authoring tools and services (RELOAD, 2004) allow education experts and instructional developers to create and modify fundamental learning entities.
- Learning Objects Authoring tools support the assembly of content entities into cohesive learning modules. Assets from the repository are used to fill content templates (Halm, 2003) and create new learning objects. Templates are empty of content and are used from education experts to guide professional teachers in assembling successful learning objects and lessons. Assembly of learning objects and templates is strongly linked with other components and tasks of the learning experience such as educational discussion forums (Harman & Koohang, 2005) and collaboration environments.
- Packaged course authoring tools (Horton, & Horton, 2003) support the composition of learning objects into courses (with the inclusion of assessment components) Packaged course solutions are based on learning plans (Stark & Lowther, 1986) (degree paths, certification paths and skill development curricula) and compose learning objects into complete learning solutions which are put on the showcase.
- Learning Offerings. Packaged course products are indexed and priced (Fallon & Brown, 2002) based on the accounted market needs so as to become offerings (Vossen & Westerkamp, 2003). Every small and large educational organization (Pöyry, Pelto-Aho, & Puustjärvi, 2002) uses catalogues that allow authorized individuals to make learning available and to set access rules, restrictions, prices, and so on. [19-20]

attribute in the LO metadata standards which is required to support the concept of student model or the dimension of the learning styles. Smart E-learning environment is composed of two processes: teacher apprentice for authoring (TAA) and tutor apprentice for delivery (TAD). Bloom’s instructional design theory is used to adjust the course objectives and organize course materials where as Felder and Silverman learning style theory is used for adapting course delivery according to each individual student model. Hypermedia domain ontology incorporates all the six level of bloom’s taxonomy [22-27].

### V. CONCLUSIONS & DISCUSSION

An ES tools can be used to understand a customer better, either as a group or as an individual. ES is such a tool that it enables a computer to give advice concerning an unstructured or semi structured decision that is normally made by a human expert. ES or knowledge based system usually act as a consulting experts in a specific domain areas based on its collection of knowledge. Since e-learning is a promising area of research, and ES is a technology by which one can solve and think a problem better than a human expert, integrating ES with E-learning system is the good suggestion to improve the existing system and make the system more useful and more interactive. A decision support e-learning environment for learners is also possible to work as an Expert E-learner. It is important to emphasize the fact that learning technology standards implement a certain level of interoperability. In order to achieve the smooth co-operation of all e-learning components we should impose standards in every procedure. Standardization committees should define standards that cover all aspects of the educational procedure and do not cover each other. A major complaint about e-learning standards is that products claiming conformance do not work together without further tweaking. This translates into lost time and expensive service engagements. As a result of this challenge, there is an increasing emphasis on developing conformance tests and certification programs. It is necessary that e-learning standards must be adopted by everyone without any customization or modification (i.e. based on differences in language, country, law, customs etc.). Now a day’s offering E-learning courses are increasing at an unrestrainedly pace. However, the learning experience is often perceived by the user as a one-way highly constrained communication process, where the computer is only the mechanical device that conveys the content. Self regulated learning [19] help students to develop learning habits. In order to increase student’s learning motivation and to develop practical skills, problem based learning is considered to be one of the most appropriate solution. The art of designing good E-learning systems is

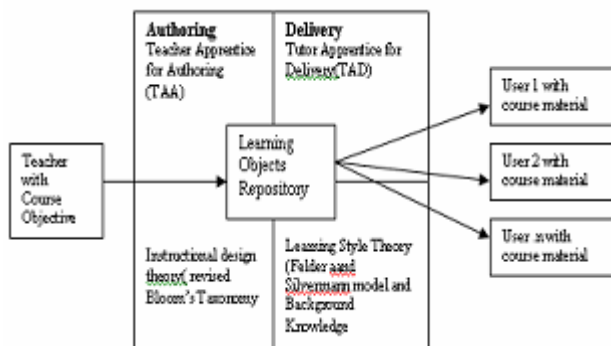


Figure 5: Smart E-learning Expert System [21]

Smart E-learning can be achieved through extra

difficult and is of great challenge for the human mind. The way this is done is also dependent on the learning culture in each country. The key issue is to facilitate new learning modalities for younger generations. Future Investigating methods in an E-learning system are to support students with special needs such as super intelligent, retarded, etc. To develop that knowledge-bases (technologies and LORs) which are available automatically from instructor's submitted multimedia learning material

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