E- Learning as a a means of teaching through technology

Chatura Ranaweera, Harvir Bansal and Gordon McDougall

Abstact

E-learning is a means of education that incorporates self-motivation, communication,efficiency, and technology. Because there is limited social interaction, students must keep themselves motivated. The isolation intrinsic to e-learning requires students to communicate with each other and the instructor frequently to accomplish their assigned tasks. E-learning is efficient as it eliminates distances and subsequent commutes. Distance is eliminated because the e-learning content is designed with media that can beaccessed from properly equipped computer terminals, and other means of Internet accessible technology. E-learning is a flexible term used to describing a means of teaching through technology. The different types of e-learning are based on:

• Means of communication

• Schedule

• E-learning class structure

• Technologies used

The E-Learning Evolution

Dan Hoffmaster

Up until about ten years ago, training was not done in front of a computer, but in theclassroom with a qualified trainer. As technology improved, companies began to integrate training with the computer and the field of e-learning began to take shape.

In the early 1990s, many companies were using videotape-based training for their employees. At this point, the industry “...represented a very small market and lacked the 'scalability' that is so important in today's applications.” (Cooke, 2004) The idea of putting training on video was a good idea, though it was lacking in a few areas Customization based on needs of users, Expensive to maintain and Could not be upgraded easily. There is also the issue of employees having to hunt down the properequipment in order to watch the videos. These videos often had limited interactions which lead to the nearly

impossible task of tracking progress and assessment. (Cooke, 2004)Since it was obvious that video was not the best solution, a new form of training evolved,

CBT or Computer Based Training. “Windows 3.1, Macintosh, CD-ROMs, PowerPoint marked the technological advancement of the Multimedia Era” (Kiffmeyer, 2004). CDROMs could be cheaply produced so that the problem of checking in and out videos was eliminated. Employees would also be able to simply pop in a CD to their personal computer at their desk and complete the training. Although the CD-ROM Computer-Based Training made advances toward the better, it still lacked the ability to track employees' performance in a central database and was alsonot as easy to upgrade. All these problems would disappear with the use of the Internet asa means of delivering content. The problem was, when the content was placed on theweb, it was simply text to begin with and maybe a few graphics. “No one really cared about the effectiveness of this new medium – it was just really cool.” (Cooke, 2004)

People in the field of e-learning began to realize that you simply can not put information on the web without a learning strategy for the users. “...In order for technology to

What is E-Learning?

improve learning, it must 'fit' into students' lives…not the other way around. As a result, e-learning was born.” (Clark, 2002)

One of the first innovations in actual e-learning was the LMS or Learning Management System. “The first Learning Management Systems (LMS) offered off-the-shelf platformsfor front-end registration and course cataloging, and they tracked skills management and reporting on the back-end.” (Clark, 2002) This enabled schools and companies to placecourses online and be able to track students' progress, communicate with students effectively and provide a place for real-time discussions.

The eClassroom evolved shortly after, which are “...web-based synchronous events with integrated CBT and simulations.” (Clark, 2002) Centra is a great example of an eClassroom that is used quite often today. eClassrooms are often called Live InstructorLead Training or ILT. “Live instructor-led training (ILT) via the Web can be combined with real-time mentoring, improved learner

services, and up-to-date, engaging "born on the Web" content to create a highly-effective, multi-dimensional learning environment."(Kiffmeyer, 2004)

E-learning has come a very long way since its early days of being text-based via the Web or CD-ROM. So what does the future hold? There really is no saying where the field is headed. As long as training is continually geared towards the learners and strategies are used in the training, there is no end in sight for e-learning.E-learning is commonly referred to the intentional use of

networked information and communications technology in teaching and learning. A number of other terms are also used to describe this mode of teaching and learning. They include online learning, virtual learning, distributed learning, network and webbased learning. Fundamentally, they all refer to educational processes that utilize information and communications technology to mediate asynchronous as well as synchronous learning and

teaching activities. On closer scrutiny, however, it will be clear that

these labels refer to slightly different educational processes and as

such they cannot be used synonymously with the term e-learning [2]

The term e-learning comprises a lot more than online learning ,virtual learning, distributed learning, networked or web-based learning. As the letter "e" in e-learning stands for the word" electronic", e-learning would incorporate all educational activities that are carried out by individuals or groups working online or offline, and synchronously or asynchronously via networked or

standalone computers and other electronic devices. where an individual learner is accessing learning resources such as a database or course content online via an Intranet or the Internet .A typical example of this is a learner studying alone or conducting some research on the Internet or a local network.Individualized self-paced e-learning offline refers to situations

where an individual learner is using learning resources such as a database or a computer-assisted learning package offline (i.e ,.while not connected to an Intranet or the Internet). An example of this is a learner working alone off a hard drive, a CD or DVD .Group-based e-learning synchronously refers to

situations where groups of learners are working together in real time via an Intranet or the Internet. It may include text-based conferencing, and one

or two-way audio and videoconferencing. Examples of this include learners engaged in a real-time chat or an audio-videoconference .Group-based e-learning asynchronously refers to situations where groups of learners are working over an Intranet or the Internet where exchanges among participants occur with a time delay (i.e ,.not in real time). Typical examples of this kind of activity include on-line discussions via electronic mailing lists and text-based

conferencing within learning managements systems.Contemporary trends in e-learning The growing interest in e-learning seems to be coming from

several directions. These include organizations that have traditionally offered distance education programs either in a single, dual or mixed mode setting. They see the incorporation of online learning in their repertoire as a logical extension of their distance education activities. The corporate sector, on the other hand, is interested in e-learning as a way of rationalizing the costs

of their in-house staff training activities. E-learning is of interest to residential campus-based educational organizations as well .

They see e-learning as a way of improving access to their programs and also as a way of tapping into growing niche markets.

The growth of e-learning is directly related to the increasing access to information and communications technology, as well its

decreasing cost. The capacity of information and communications

technology to support multimedia resource-based learning and

teaching is also relevant to the growing interest in e-learning .

Growing numbers of teachers are increasingly using information

and communications technology to support their teaching. The

contemporary student population (often called the “Net Generation”, or “Millennials”) who have grown up using information and communications

technology also expect to see it being used in their educational experiences (Brown, 2000 ;Oblinger, 2003; Oblinger and Oblinger, 2005). Educational

organizations too see advantages in making their programs accessible via a range of distributed locations, including on campus, home and other community learning or resource centers.

Despite this level of interest in e-learning, it is not without constraints and limitations. The fundamental obstacle to the growth of e-learning is lack of access to the necessary technology infrastructure, for without it there can be no e-learning. Poor or insufficient technology infrastructure is just as bad, as it can lead to unsavory experiences that can cause more damage than good to teachers, students and the learning

experience. While the costs of the hardware and software are

falling, often there are other costs that have often not been

factored into the deployment of e-learning ventures. The most

important of these include the costs of infrastructure support and

its maintenance, and appropriate training of staff to enable them

to make the most of the technology (see Naidu, 2003.(

Attributes of e-learning

There is a growing body of literature on e-learning technologies

we discuss only the critical and unique attributes of these technologies. These are: a) the flexibility that information and communications technologies afford; and b) electronic access to a variety of multimedia-based material that they can enable.The flexibility that e-learning technology affords A key attribute of information and communications technology is its ability to enable flexible access to information and resources. Flexible access refers to access and use of information and resources at a time, place and pace that is suitable and convenient to individual learners rather than the teacher and/or the

educational organization.The concept of distance education was founded on the principles of flexible access (Willems, 2005). It aimed to allow distance

learners, who were generally adult learners in full or part-time employment to be able to study at a time, place, and pace that suited their convenience. The goal of distance education was to free these learners from the constraints of conventional residential educational settings. They would not be required to live or attend lectures in locations away from where they may be living and

working. The printed distance study materials, which each distance learner received, would carry the core subject matter content they would need including all their learning activities and assessment tasks. Students would be required to complete these tasks, submit their assignments and take their examinations within a set time frame. While these printed study materials

allowed distance learners a great deal of freedom from time, place and pace of study, it had its limitations. For one thing, non-printed subject matter content and simulations etc. could not be easily represented in print form.

Access to information and communications technology changed all that as it offered a range of possibilities for capturing and delivering all types of subject matter content to learners and teachers in distributed educational settings. This meant access to subject matter content and learning resources via networked information and communications technologies across a range of

settings such as conventional classrooms, workplaces, homes, and various forms of community centers (Dede, 2000; 1996).

Contemporary educational institutions, including conventional distance education providers, often pride themselves in being able to meet the learning needs of their students and staff at a time,place and pace that is most convenient to them.They have been able to do this with the help of information and communications technologies which afford learners access to upto-date information as and when they need them, and also the opportunity to discuss this information with their peers and teachers at their convenience. This is becoming increasingly affordable and palatable with a wide range of software applications and computer conferencing technologies for collaborative inquiry among students and asynchronous discussion

. Networked information and communications technologies enable access to this content in a manner that is not possible within the spatial and

temporal constraints of conventional educational settings such as the classroom or the print mode (Dede, 2000). In the context of this

distributed setting, users have access to a wide variety of educational resources in a format that is amenable to individual approaches to learning (Spiro, Feltovich, Jacobson & Coulson, 1991), and accessible at a time, place and pace that is convenient to them (Pea, 1994). Typically, these educational resources could include hyper-linked material, incorporating text, pictures,

graphics, animation, multimedia elements such as videos and

simulations and also links to electronic databases, search engines,

and online libraries.[1]

Instructional Design Models for E-Learning

Robert Dunkleberger

“To a large degree, Instructional Design is the process whereby learning, not technology, is kept at the center of e-learning development.” (Siemens, 2002)

At the root of Instructional Design and/or Instructional Design Models, is a systematic process that Instructional Designers should follow in order to achieve the creation of efficient and effective instruction. Or more simply put, Instructional Design (ID) “is a framework for learning” (Siemens, 2002). This framework asks the Instructional Designer to assess the desired outcomes of the learning and begin to apply an ID model that is most appropriate to assist in achievement of these desired outcomes. Despite some ID models being quite generic in nature, they are incredibly popular and capable because they present a very effective, yet general, model to build various types of instruction to meet different objectives in learning.

Below you will see a variety of popular models listed. These items do not attempt to outline the specifics of any Instructional Design model, but rather serve to convey the variety and possible application of these models to your specific instructional task. As you may notice, or soon come to learn, most of these models can be modified to meet your specific needs. Their systematic frameworks allow you to borrow from their strengths and retrofit several models to meet your differing needs.

ADDIE (Assess – Design – Develop – Implement –Evaluate)

• Very generic, yet very successful

• Probably one the most followed models

Algo-Heuristic

• This theory suggests all cognitive activities can be analyzed into operations of an algorithmic (measure of complexity), semi-algorithmic, heuristic (computational method), or semi-heuristic nature.

• Once these operations are determined, they can form the basis of instructional strategies and methods.

• “Don't just teach knowledge, but the algorithms and heuristics of experts as well.”

Dick and Carey Model

• Breaks instruction down into smaller components

• Used to teach skills and knowledge

Robert Gagné's ID Model

• Gagné's Nine Events of Instruction

1. Gain Attention

2. Inform learners of objectives

3. Stimulate recall of prior learning

4. Present the content

5. Provide learning guidance

6. Elicit performance (practice)

7. Provide feedback

8. Assess performance

9. Enhance retention and transfer to the job Minimalism

Minimalism

• Developed by J.M. Carroll

• Framework to design instruction specific to computer users

• Learning tasks should be meaningful and self-contained activities.

• Learners should be given realistic projects.

• Instruction should permit self-directed reasoning and improvising.

• Training materials and activities should provide for error recognition and recovery.

• Provide a close linkage between the training and actual system.

Kemp, Morrison, and Ross

• Nine step instructional design model

1. Identify instructional problems.

2. Examine learner characteristics.

3. Identify subject content.

4. State instructional objectives.

5. Sequence content within each instructional unit for logical learning.

6. Design instructional strategies.

7. Plan the instructional message and delivery.

8. Develop evaluation instruments to assess objectives.

9. Select resources to support instruction and learning activities.

Rapid Prototyping (Rapid E-Learning)

• Learners and/or subject matter experts interact with prototypes and instructional

designers in a continuous review and revision process.

• Development of a prototype is the first step.

• Analysis is continuous throughout the process.

Empathic Instructional Design

• 5-step process (Siemens, 2002)

1. Observe

2. Capture data

3. Reflect and analyze

4. Brainstorm for solutions

5. Develop prototypes [2]

User Interface Design for Effective, Engaging E-Learning

The user interface is, of course, a crucial part of a user's experience with any piece of software. Elearning interface design is especially critical, as the learning effectiveness and interface design are substantially intertwined. In addition, a trend toward ensuring "usability," particularly among large

corporations in the U.S., has led to a "usability-first" way of thinking about e-learning design, in which ease of use is considered to be the top design priority. While on the surface this argument seems valid, such an approach is actually in opposition to sound design principles—a designer following

such a method becomes focused primarily on making a product easy to use and in doing so, does not focus sufficiently on whether people learn from it and are motivated to use it.

I suggest in this paper that e-learning interface design should be a core, integrated component of the overall design of an e-learning product, and that interface design should be determined by how people learn and the tasks they need to perform in the program. This is in contrast to other approaches

which view the interface design process as separate from the learning design, often led by a graphic designer with no specialized knowledge of or experience in learning theory. In my view, the right question for an e-learning designer to

ask is “what should the learner be able to do?”, rather than “how can I make it clear what the learner should do next?”

In this paper I describe an approach to e-learning interface design that focuses on the goals, audience, and learning, and explore examples that demonstrate the success of this approach.[3]

The Futures of Standards for E-Learning Technologies

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. As it happens with every community, e-learning is now shifting from the

chaotic “no standards” stage, to the phase of rules’ and standards’ definition in an attempt to

avoid the Babel syndrome. 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. International

consortia comprising standardization

organizations, institutes and software

houses undertake the coordination of

players in the e-learning market chain.

They collect user requirements, issue

specifications for e-learning systems,

develop and test applications, which

validate the user requirements and

convert the approved specifications into standards.

In order to boost the gains of e-learning market we must develop learning components (Namuth,.Fritz, King, & Boren, 2005) that interoperate and co-operate. An e-learning process comprises conceptual and physical components and procedures that should be both standardized in terms of procedures and technologies. Development, through the whole lifecycle of e-learning process,

must be done in the basis of widely adopted standards (Lytras & Sicilia, 2005). As far as it concerns the conceptual background of an e-learning application the issues that must be well defined are: a) the design of the e-learning process, b) the definition of learners' competencies, c) the framework for the co-operation among teachers and educates. The physical components

comprise: a) the learning content and its packaging and deployment, b) the learners' profile, c)the assessment activities, d) the metadata structure and e) the system architecture. International organizations, software houses and universities develop standards that cover all aspects of e-learning. However, such standards usually fit to the needs of specific applications and are inadequate for supporting the interoperability of e-learning (Friesen, 2005). The development of proprietary tools that use custom standards and protocols should be discouraged since it generates confusion and decelerates the growth of e-learning communities, as it was the case with multimedia technologies.

The definition and adoption of complete and sound e-learning standards will help the e-learning market achieve some key goals:

• Users of e-learning applications will be able to shift between programs and platforms, to find those that fit their needs with minimal transition cost. Moreover, the learners gain in flexibility since the attained knowledge can easily migrate to future e-learning platforms that follow the same standards. To put it simple, once the user familiarizes with a standardized e-learning

technology it becomes easier to familiarize with any variation of this technology.

• Learning content producers will focus on the development of content in a standard format instead of developing the same content into many formats for different platforms and applications.

• Tool vendors will not spend money for the development of interfaces that glue their tools to e-learning platforms and systems. Lower development costs imply less expensive tools of better quality and subsequently an increase in the size of the potential market.

• Application and platform designers are able to choose from a large storehouse of reusable content, systems and tools and assembled a competitive and effective e-learning platform. They can also populate the storehouse with new modules of content and applications.

The main objective of this work is to define the framework for the development of global elearning standards that support interoperability of e-learning systems. To achieve this, it is essential to understand the innermost of e-learning process: its lifecycle and its infrastructures as presented in the next section. Next it is necessary to judge on the usability and re-usability of

existing work on standards and present the general steps of our approach. Finally, it is important to understand how standards adhere to the interoperability of e-learning systems. This is explained in the fourth section, which presents the most important e-learning interoperability

standards. In the conclusion we present a roadmap for the creation of widely accepted e-learning standards

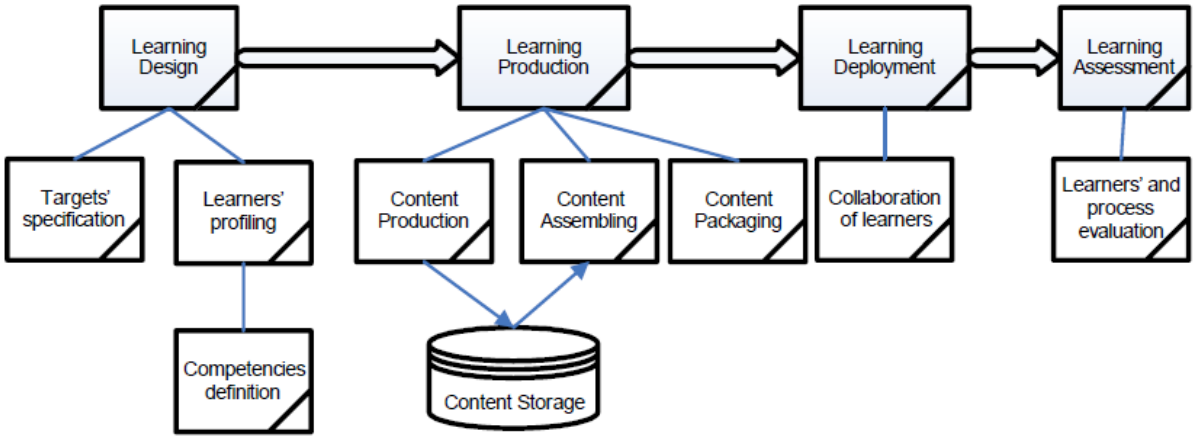

Figure 1. The life cycle of the e-learning process

The Conceptual Model behind Learning Objects

The conceptual model of content object (Bohl, Schellhase, Senler, & Winand,, 2002) to which the learning objects perfectly fit describes a hierarchy of granular content (Figure 2, based on (Masie, 2002)). Within a series of levels of granular content, very small raw content assets (individual fact, principle, concept, example, procedure, etc.) can be assembled into a "just right" Learning Object. Each content asset is selected and assembled to match the unique needs of each person and situation, then presented just the right way, in just the right medium, at just the right time.

This requires from content objects to be self-contained, self-descriptive and mutable (Pukkhem & Vatanawood, 2005). More specifically, the conceptual model of content object describes:

• A component based approach.

• Structured content based on a hierarchical model.

• Metadata at each level of the content hierarchy.

• A process methodology.

• A technical infrastructure for developing, assembling and managing re-usable granular content objects that are written independent of delivery media and accessed dynamically through a database.

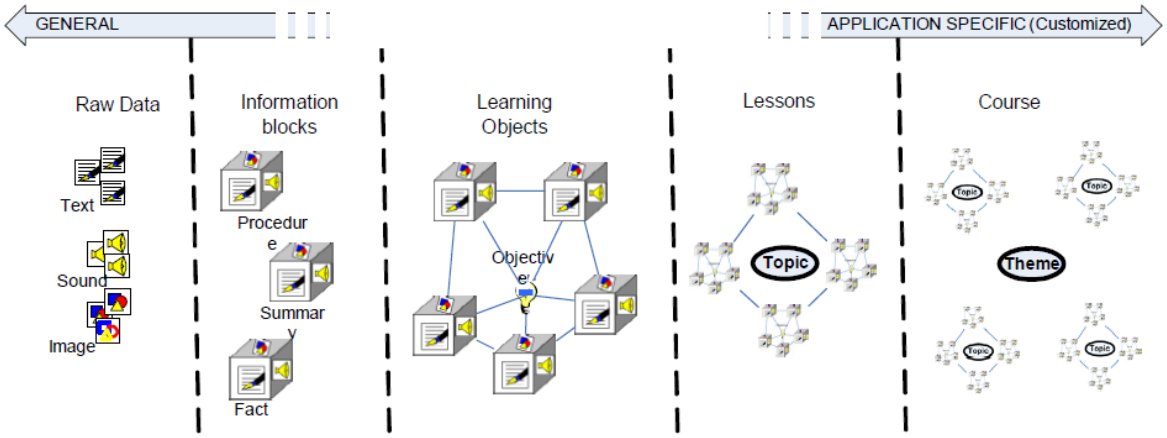

Figure 2. Content Object Model

E - Learning Functional Model

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).

The functional model of e-learning comprises of the ***Production*** and ***Dissemination*** phases. A ***Management*** phase runs in parallel.

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. [4]

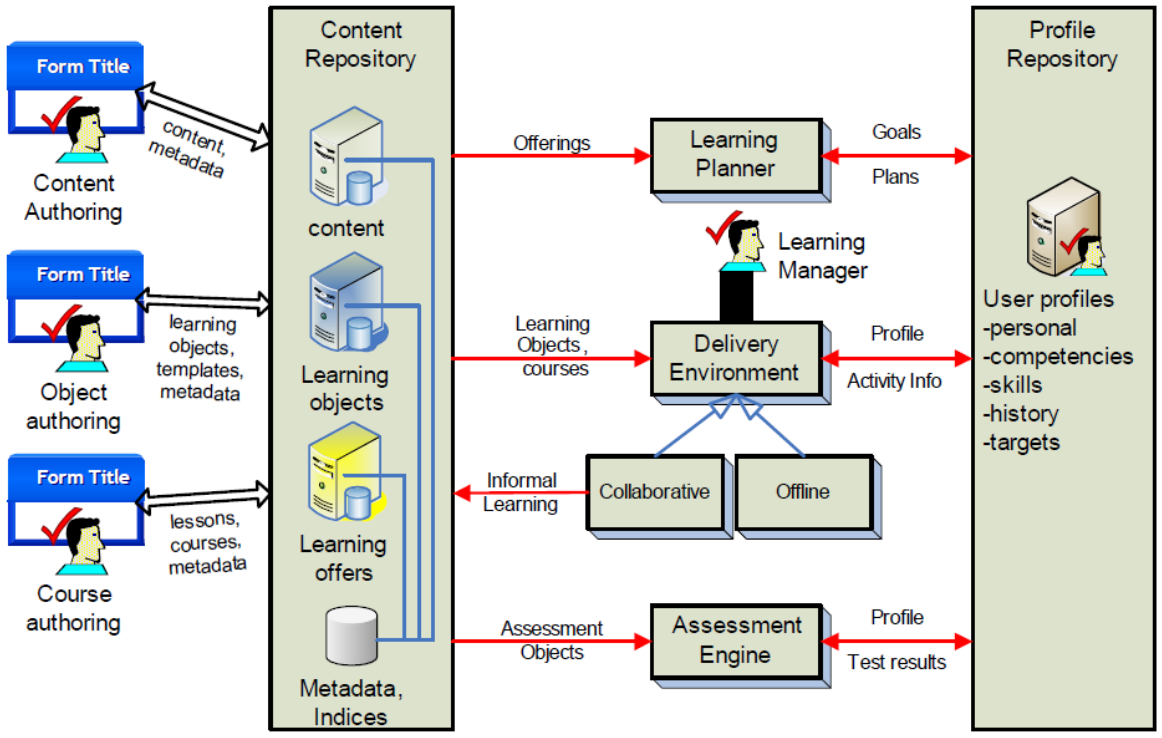

Figure 4. e- Learning Functional Model

E-Learning Model Web Technology

E-learning is not just concerned with providing easy access to learning resources, anytime, anywhere, via a repository of learning resources, but is also concerned with supporting such features as the personal definition

of learning goals, and the synchronous and asynchronous communication, and collaboration ,between learners and between learners and instructors

One of the hottest topics in recent years in the AI community, as well as in the Internet community, is the Semantic Web. It is about making the Web more

understandable by machines. It is also about building an appropriate infrastructure for intelligent agents to run around the Web performing complex actions for their users Furthermore, Semantic Web is about

explicitly declaring the knowledge embedded in many web-based applications, integrating information in an intelligent way, providing semantic-based access to the

Internet, and extracting information from texts

Ultimately, Semantic Web is about how to implement reliable, large-scale interoperation of Web services, to make such services computer interpretable, i.e., to create a Web of machine-understandable and interoperable services that intelligent agents can discover, execute, and compose automatically .[

Unfortunately, the Web was built for human consumption, not for machine consumption, although everything on the Web is machine-readable, it is not

machine-understandable We need the Semantic Web to express information in a precise, machineinterpretable form, ready for software agents to

process, share, and reuse it, as well as to understand what the terms describing the data mean. That would enable web-based applications to interoperate both on the syntactic and semantic level .

Note that it is Tim Berners-Lee (inventor of the WWW, URIs, HTTP, and HTML) himself that pushes the idea of the Semantic Web forward. The

father of the Web first envisioned a Semantic Web that provides automated information access based on machine-processable semantics of data and heuristics that use these metadata The explicit

representation of the semantics of data, accompanied with domain theories (ontologies), will enable a Web that provides a qualitatively new level of service,such as: intelligent search engines, information

brokers, and information filters .[Researchers from the World Wide Web Consortium) W3C) already developed new technologies for web friendly data description. Moreover, AI E-Learning Model Based On

Semantic Web in the following subsections, based on the Semantic

Learning content and Assessment content

. Each content has different types of services such as：

•Learning services: provide registration, online course, interactive tutorial, course documents (is a repository for files that the instructor have made

available to the student as a part of your course ,(announcements (displays information to the students that the instructors of the course want him to know ,(links (displays a list of useful URL links that have been identified by the course instructors), student papers (students can post/upload requests files to the instructor), and Semantic search (helps the student to

search for resources.(

•Assessment services: provide exercises and quizzes for evaluation of the student knowledge .During the learning process, a dynamic selection

presentation of both contents will be accomplished .On other hand, our e-learning system allows instructors to create his course websites through a browser, and monitoring the students performance. they have many

services and tools such as: publish documents in any format (Word, PDF, Video, ...) to the students, manage a list of useful links, compose exercises/quizzes ,make announcements, and have students submit

papers .To illustrate the services architecture, we will go through an e-learning scenario. A student first searches for an online course: the broker handles the

request and returns a set of choices satisfying the query. If no course is found, the user can register with a notification service. Otherwise, the user may find a

suitable course among the offerings and then makes a final decision about registering for the course .Proposed model for web-based e-learning

system Processing the registration can be seen as a complex

service involving registering with the system ,creating a confirmation notification, creating a student account (authentication/ authorization), and

providing learning materials. Once all these in place ,the student can start the course. As part of the course ,a student will be logging on and checking his

learning agenda (e.g. next assignment due). This request is answered by combining several sources of information, such as course schedule, current date)[5] and student progress to date (e.g. completed units.(

Instructional model The e-learning instructional model is based on the fact that the training should enable learners to apply the concepts learned at their workplace and evaluate the results.

That is, it should provide the pragmatic level and the practical tools for the learners to be able to put into practice what they have learned.

The aim is for learners to be engaged by the e-learning contents to the extent that they get to understand things that they did not comprehend before. This will make them ready to practice and take action to perform new activities. But by acting, they will realise that their actions do not always produce the right results, leading them to reexamine their actions to see whether they need to act differently or not. By means of this reflection on their performance and understanding, learners will come to be able to make judgements and devise designs. Thus, learners will start to internalise the knowledge that they have learned. By this stage, learners are no longer just engaged, they are well and truly committed. These commitments, in turn, lead them to seek out

new engagements with new contents, which point them in the direction of new understanding and practices.

This instructional model is based on the systematic development of instruction and learning and is composed of seven phases (Figure 1): analysis, design, development, implementation, execution, evaluation, and review. The model includes a series of psychopedagogical prescriptions that further the learning process.[6]

E-learning processes

Like any learning process, e-learning depends on effective communication

of human knowledge, whether this occurs in a face-to-face classroom or

across the Internet. Electronic technologies can no more guarantee effective

communication than they can transform ‘jxiqwop’ into a meaningful word .

The medium alone does not create the message .

The effectiveness of e-learning also depends on establishing two-way communication between teachers and learners, and among learners themselves. Unfortunately, when e-learning was fi rst popularised, it was widely promoted as a means of minimising costs by delivering pre-packaged content to large populations of learners by means of electronic networks or CD-ROMs. Such an approach relies on one-way communication from teacher to learner, attenuating the learning experience. It views learners as atomised individuals and fails to take into account the social context in which learning occurs. Above all, it does not engage learners actively in the process of learning .

On the other hand, online technologies can also be used to foster interactive and collaborative engagement. This can be either synchronous or asynchronous: learners and instructors may either have regular, scheduled sessions whether they all 'meet' simultaneously online, or (more commonly (use electronic forums to exchange ideas in their own time .

The most familiar form of synchronous electronic communication is realtime two way text-based online chat, which is widely used in e-learning. More sophisticated forms of synchronous instruction include virtual classrooms , which use information and communication technologies to mimic a traditional classroom environment. This may involve video-conferencing or the use of shared electronic whiteboards, which allow learning materials to be created and modifi ed in real time, either by the instructor or the learners In many cases, exchanges during synchronous instruction can be archived so

that learners can review them later .

The use of virtual classrooms has considerable cost advantages for many organisations. The logistics of organising face-to-face classroom training can account for as much as 40 per cent of corporate training budgets (Koolen .(5 :2001On the other hand, virtual classrooms have several drawbacks . They require learners to have access to fast, reliable networks and reasonably sophisticated computing facilities. Learning in a virtual classroom also tends to be instructor-led rather than based on participatory, two-way communication. Above all, virtual classrooms share many of the limitations of the conventional classroom in that they require learners to be online at a particular time. This negates one of the major advantages of electronic communication, which is its ability to offer fl exible access .

By contrast, asynchronous instruction allows participants to control their own timetables and fi t learning around their other commitments. This is a major bonus, especially for adult learners who lead complicated lives . Many of the technologies used in asynchronous e-learning also permit twoway communication between learners and instructors, or multi-directional , collaborative communication among learners themselves

[7]

Conclusion

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,
low, customs etc.).
The roadmap to achieve standardization of e-learning technologies comprises the following steps:
1. First we should overview the e-learning process as a whole. We must define the operations included in the e-learning process, the information exchanged (input, results etc). In this step we should stabilize the existing practices and record the existing standards and needs.
2. The second step is to locate the main standardization bodies and have them work for the common aim. International boards must decide on the standards by taking into account the needs reported by the national fora.
3. The third step concerns the thoughtful definition of specifications. The specifications should cover all possible needs of e-learning systems and avoid redundancies.
4. The final step comprises the dissemination of specifications and their stabilization into standards. Once they are defined, the specifications are communicated to the community for testing. Additional requirements or modifications are covered in this step. Once approved,
the specifications become standards.

The main contribution of this paper is our new model for e-learning system, using the Semantic Web technology. Our model including various services and

tools in the context of a semantic portal, such as:

course registration, uploading course documents and student assignments, interactive tutorial ,announcements, useful links, assessment, and simple

semantic search. A metadata-based ontology is introduced for this purpose and added to our model.

The OWL language is used to develop our ontologies.In these ontologies, the actual resources and properties specified in the RDF models are defined. The Protégé 2000 ontology editor is used to create the e-learning

ontology classes and properties .

A list of the technologies used in the implementation of our web-based e-learning system includes PHP Platform, Apache Web Server, MySQL database, and RAP Semantic Web Toolkit .

We believe that there are two primary advantages of our Semantic web-based model. One is that the proposed model, which contains a hierarchical contents

structure and semantic relationships between concepts ,can provide related useful information for searching and sequencing learning resources in web-based elearning systems. The other is that it can help a developer or an instructor to develop a learning sequence plan by helping the instructor understand the why and how of the learning process.[5]

REFERENCES

[1] J. Campbell, "Speaker recognition: a tutorial," *Proc. IEEE*, vol. 85, pp. 1437–1462, Sept. 1997.

[2] D. A. Reynolds, T. Quatieri, and R. Dunn, "Speaker verification using adapted Gaussian mixture models," *Digital Signal Processing*, vol. 10, no. 1–3, pp. 19–41, 2000.

[3] D. A. Reynolds, "Comparison of background normalization methods for text-independent speaker verification," in *Proc. Eurospeech*, 1997.

[4] D. A. Reynolds and R. C. Rose, "Robust text-independent speaker identification using Gaussian mixture speaker models," *IEEE Trans. Speech Audio Processing*, vol. 3, no. 1, pp. 72–83, 1995.

[5] J. L. Gauvain and C.-H. Lee, "Maximum a posteriori estimation for multivariate Gaussian mixture observations of Markov chains," *IEEE Trans. Speech Audio Processing*, vol. 2, pp. 291–298, Apr. 1994.

[6] E. Bocchieri, "Vector quantization for the efficient computation of continuous density likelihoods," in *Proc. Int. Conf. Acoustics, Speech, Signal Processing*, 1993, pp. 692–695.

[7] K. M. Knill, M. J. F. Gales, and S. J. Young, "Use of Gaussian selection in large vocabulary continuous speech recognition using HMMs," in *Proc. Int. Conf. Spoken Language Processing*, 1996.

[8] D. B. Paul, "An investigation of Gaussian shortlists," in *Proc. Automatic Speech Recognition and Understanding Workshop*, 1999.

[9] T. Watanabe, K. Shinoda, K. Takagi, and K.-I. Iso, "High speed speech recognition using tree-structured probability density function," in *Proc. Int. Conf. Acoustics, Speech, Signal Processing*, 1995.

[10] J. Simonin, L. Delphin-Poulat, and G. Damnati, "Gaussian density tree structure in a multi-Gaussian HMM-based speech recognition system,"

[11] T. J. Hanzen and A. K. Halberstadt, "Using aggregation to improve the performance of mixture Gaussian acoustic models," in *Proc. Int. Conf. Acoustics, Speech, Signal Processing*, 1998.

[12] M. Padmanabhan, L. R. ahl, and D. Nahamoo, "Partitioning the feature space of a classifier with linear hyperplanes," *IEEE Trans. Speech Audio Processing*, vol. 7, no. 3, pp. 282–288, 1999.
in *Proc. Int. Conf. Spoken Language Processing*, 1998.

[13] R. Auckenthaler and J. Mason, "Gaussian selection applied to text-independent speaker verification," in *Proc. A Speaker Odyssey—Speaker Recognition Workshop*, 2001.

[14] J. McLaughlin, D. Reynolds, and T. Gleason, "A study of computation speed-ups of the GMM-UBM speaker recognition system," in *Proc. Eurospeech*, 1999.

[15] S. van Vuuren and H. Hermansky, "On the importance of components of the modulation spectrum of speaker verification," in *Proc. Int. Conf. Spoken Language Processing*, 1998.

[16] B. L. Pellom and J. H. L. Hansen, "An efficient scoring algorithm for Gaussian mixture model based speaker identification," *IEEE Signal Processing Lett.*, vol. 5, no. 11, pp. 281–284, 1998.

[17] J. Oglesby and J. S. Mason, "Optimization of neural models for speaker identification," in *Proc. Int. Conf. Acoustics, Speech, Signal Processing*, 1990, pp. 261–264.

[18] Y. Bengio, R. De Mori, G. Flammia, and R. Kompe, "Global optimization of a neural network—hidden Markov model hybrid," *IEEE Trans. Neural Networks*, vol. 3, no. 2, pp. 252–259, 1992.

[19] H. Bourlard and C. J. Wellekins, "Links between Markov models and multilayer perceptrons," *IEEE Trans. Pattern Anal. Machine Intell.*, vol. 12, pp. 1167–1178, Dec. 1990.

[20] J. Navrátil, U. V. Chaudhari, and G. N. Ramaswamy, "Speaker verification using target and background dependent linear transforms and multi-system fusion," in *Proc. Eurospeech*, 2001.

[21] L. P. Heck, Y. Konig, M. K. Sonmez, and M. Weintraub, "Robustness to telephone handset distortion in speaker recognition by discriminative feature design," *Speech Commun.*, vol. 31, pp. 181–192, 2000.

[22] A. Dempster, N. Laird, and D. Rubin, "Maximum likelihood from incomplete data via the EM algorithm," *J. R. Statist. Soc.*, vol. 39, pp. 1–38, 1977.

[23] K. Shinoda and C. H. Lee, "A structural Bayes approach to speaker adaptation," *IEEE Trans. Speech Audio Processing*, vol. 9, no. 3, pp. 276–287, 2001.

[24] K. Fukunaga, *Introduction to Statistical Pattern Recognition.* New York: Academic, 1990.

[25] J. C. Junqua, *Robust Speech Recogntion in Embedded Systems and PC*

[26] U. V. Chaudhari, J. Navrátil, S. H. Maes, and R. A. Gopinath, "Transformation enhanced multi-grained modeling for text-independent speaker recognition," in *Proc. Int. Conf. Spoken Language Processing*, 2000.

[27] Q. Lin, E.-E. Jan, C. W. Che, D.-S. Yuk, and J. Flanagan, "Selective use of the speech spectrum and a VQGMM method for speaker identification," in *Proc. Int. Conf. Spoken Language Processing*, 1996.

[28] S. Raudys, *Statistical and Neural Classifiers: An Integrated Approach to Design.* New York: Springer, 2001.

[29] D. E. Rumelhart, G. E. Hinton, and R. J. Williams, "Learning internal representations by error propagation," in *Parallel Distributed Processing*. Cambridge, MA: MIT Press, 1986, pp. 318–364.

[30] [Online] Available: http://www.nist.gov/speech/tests/spk/index.htm.

[31] J. Pelecanos and S. Sridharan, "Feature warping for robust speaker verification," in *Proc. A Speaker Odyssey—Speaker Recognition Workshop*, 2001.

[32] B. Xiang, U. V. Chaudhari, J. Navrátil, N. Ramaswamy, and R. A. Gopinath, "Short-time Gaussianization for robust speaker verification," in *Proc. Int. Conf. Acoustics, Speech, Signal Processing*, 2002.

[33] G. R. Doddington, M. A. Przybocki, A. F. Martin, and D. A. Reynolds, "The NIST speaker recognition evaluation—overview, methodology, systems, results, perspective," *Speech Communication*, vol. 31, pp. 225–254, 2000.

Bing Xiang (M'03) was born in 1973 in China. He received the B.S. degree in radio and electronics and M.E. degree in signal and information processing from Peking University in 1995 and 1998, respectively. In January, 2003, he received the Ph.D. degree in electrical engineering from Cornell University, Ithaca, NY.

From 1995 to 1998, he worked on speaker recognition and auditory modeling in National Laboratory on Machine Perception, Peking University. Then he entered Cornell University and worked on speaker recognition and speech recognition in DISCOVER Lab as a Research Assistant. He also worked in the Human Language Technology Department of IBM Thomas J. Watson Research Center as a summer intern in both 2000 and 2001. He was a selected remote member of the SuperSID Group in the 2002 Johns Hopkins CLSP summer workshop in which he worked on speaker verification with high-lelvel information. In January, 2003, he joined the Speech and Language Processing Department of BBN Technologies where he is presently a Senior Staff Consultant-Technology. His research interests include large vocabulary speech recognition, speaker recognition, speech synthesis, keyword spotting, neural networks and statistical pattern recognition.

Toby Berger (S'60–M'66–SM'74–F'78) was born in New York, NY, on September 4, 1940. He received the B.E. degree in electrical engineering from Yale University, New Haven, CT in 1962, and the M.S. and Ph.D. degrees in applied mathematics from Harvard University, Cambridge, MA in 1964 and 1966, respectively.

From 1962 to 1968 he was a Senior Scientist at Raytheon Company, Wayland, MA, specializing in communication theory, information theory, and coherent signal processing. In 1968 he joined the faculty of Cornell University, Ithaca, NY where he is presently the Irwin and Joan Jacobs Professor of Engineering. His research interests include information theory, random fields, communication networks, wireless communications, video compression, voice and signature compression and verification, neuroinformation theory, quantum information theory, and coherent signal processing. He is the author/co-author of Rate Distortion Theory: A Mathematical Basis for Data Compression, Digital Compression for Multimedia: Principles and Standards, and Information Measures for Discrete Random Fields.

Dr. Berger has served as editor-in-chief of the IEEE TRANSACTIONS ON INFORMATION THEORY and as president of the IEEE Information Theory