Chapter 2: Evolution in e-Learning

In this era of information, people of all age groups are exposed to rapid advancements in science and technology. They are becoming technology savvy, in habit of seeking and receiving prompt information right on the click of a button. In context of learning too, they expect the same treatment. As learners, they expect to get bits of learning content on demand, as per their requirements. Traditional learning environment seems to lag behind technology enhanced learning or e-learning in this respect. E-learning equipped with advanced infrastructure serves this purpose and provides conducive environment to the learners even in the absence of direct interaction between learners and instructors. This chapter begins with a discussion on the differences between traditional learning and e-learning environments. The evolution in development of content dissemination tools of e-learning is discussed next. The chapter concludes by introducing the perspective of infusing social opinion in the content designing process.

2.1 Introduction

Learning is a lifelong process of acquiring knowledge, skills and values. Learning can broadly be categorized into traditional classroom based learning and e-learning. There has been an ongoing argument on the superiority of one form of learning over the other. A common perception is that traditional learning is the best way of maintaining a learning process. Other models are always considered to be inferior or less efficient. However, there is no finding to support this argument, and research shows that e-learning models are at least as good as traditional learning (Rashty, 1995). Each mode of learning has its own set of advantages and disadvantages. The differences between building blocks of traditional classroom based and e-learning are discussed by Hamid (Hamid, 2002), illustrated in Figure 2.1.
A traditional learning setup provides opportunity of direct association among teachers and students. In this setup, teachers meet students on a regular basis. They provide pedagogically appropriate instruction to the students, issue reminders about due dates and offer one-on-one assistance with completing assignments. They are physically present as motivators helping students in completing their courses. On the other hand in an e-learning environment, instructors are separated from the learners by cyberspace. The instructors are available for the learners, but only through technological mediation. Also, the online learners have to be self motivated to complete the work and take the initiative to contact the instructors. Thus, there is always a need for a robust infrastructure and validated software applications to provide content to the learners. The content must also be vivid and self explanatory,
so that the learners are able to imbibe it with minimal support. This makes the content block a very crucial component of e-learning systems.

Due to this split in affordances of the two environments, traditional learning setup had always been favoured over e-learning till recent past, when the latter did not possess the ability to adapt, realign, or change according to the learners’ needs. However, movement from traditional learning to e-learning has been fast. Researchers have worked relentlessly towards bridging up the gap between traditional classroom based learning and e-learning. Their continuous efforts have made evident the advantages of e-learning that were being undermined till now. The technology is being augmented in light of newer perspectives over the years to bring the advantages of traditional learning to e-learning. Development of multimedia enriched computer-based training, web-based learning, virtual classrooms, and digital collaborations via internet, intranet, and extranet has led to increase in popularity of e-learning (Sajja, 2008).

E-learning offers a more flexible schedule than traditional learning. It provides time for digesting the information and responding, enhanced communication among the learners, the ability to conduct an open discussion, where each learner gets more of an equal standing than in a face-to-face discussion, access to information around the clock with no restrictions, a higher motivation and involvement in the process on the part of the learners (Rashty, 1995). The advent of the Web has supported this endeavour in a considerable manner. The intrinsic capability of online environment to provide easy communication and interaction to the learners has increased the usage of Web in education multifold since its inception (Anderson, 2004).

Learning in online setup happens according to the convenience of the learners. Putting e-learning to even better use of learners requires fostering cooperation and collaboration among learners; between learners and instructors; and other knowledge sources and stakeholders (Mersham, 2009) so that the learners are prepared for lifelong learning (Koschmann, 2008; Bereiter 2002). Active interaction leads to overall development of learners by spawning a constructive thought process and enhancing the learning process in due course. The constructivist approach to learning
lays emphasis on constructing knowledge through socio-contextual learning. In socio-contextual learning, a learner applies personal context to the inert information received from grounded interactions with other persons and transforms it into knowledge (Anderson, 2004; Brown and Adler, 2008). Thus, learner-centered frameworks are the needed that allow active participation and purposeful interaction of learners in knowledge creation within communities, organizations, territories and society, at large (Vladoiu and Constantinescu, 2011).

The interactivity offered by mobile technology has influenced the thought process of learners towards e-learning in a significant way. Mobile technology allows the learners to actively participate in the process of knowledge construction through collaboration, rather than playing the role of mere information receivers. Naismith et al (2004) emphasized the fact that the potential of mobile technologies lies in embedding the usage of individual devices in the learning process inside or outside the classroom to facilitate effective learning. Access to information within as well as outside the bounds of traditional classroom has lessened the gap between formal and informal education.

In past, the emphasis had been on ‘e’ or the technology of e-learning. Gradually a need was felt to shift the emphasis from the ‘e’ to the learning in e-learning (Hamid, 2002). E-learning has come a long way since then from instructor-centered to content-centered to learner-centered adaptive e-learning. This shift required a closer look at content development. The next section reviews the evolution in development of content designing and dissemination tools over a past few decades.

### 2.2 Content Creation and Dissemination Tools in e-Learning

Various tools have been developed over the years for creation and dissemination of e-learning content. The tools range from stand alone authoring packages to integrated content management systems. There is a variety of open source as well as proprietary tools available in the market. The characteristics of these tools are discussed below.
2.2.1 Authoring Packages

Authoring packages are the readymade software packages that give the instructor the flexibility to design courseware. The instructor can put the ready content into the software without worrying about the programming part. In addition, these packages include Graphical User Interface and other multimedia tools to give quality to the product. Various commercial authoring packages like Macromedia Director, Macromedia Authorware, Macromedia Dreamweaver and so forth are available for the creation of the learning material. Programmed Instruction, Learning or Teaching (PILOT), one of the initial programming languages was developed in the 1960s. There is a limited interactivity for learners in these packages. They can interact with the system but cannot participate in live discussions with the instructor and other learners.

2.2.2 Content Management System

A Content Management System (CMS) is a software package that allows publishing, editing, cataloging, tracking, modifying and maintaining content from a central interface. The main objective of a CMS is to integrate the processes involved in efficient and effective delivery of online content following the principle of information re-use. It uses a database of content, is assigned keywords and extensive search capabilities, to help users locate the desired content easily. The system also aims for abstracting the complex details of the underlying system from the users. A product qualifies to be called as a CMS if provides three core functions—versioning, workflow and integration (Browning and Lowndes, 2001).

Alfresco, Drupal, Joomla!, Elxis CMS and Cotonti are some of the popular open source CMSs. Though a CMS efficiently looks into the needs of content creation and maintenance but lacks the interactivity with the other stakeholders of the system.

2.2.3 Learning Management System

A Learning Management System (LMS) is a platform where the learning content can be assembled and delivered on the fly. The primary objective of LMS is to manage learners, keeping track of their progress and performance across all types of training
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activities (Brandon Hall Research Group, 2007). It also provides a centralized administration of the system and its users—learners, instructors and course providers. In order to ensure smooth deployment of the learning content, LMS supports portability and quality standards also.

Chamilo, Claroline, ILIAS (Integrated Learning, Information and Work Cooperation System) are some of the popular open source web-based LMS. Blackboard Learning System is a popular proprietary LMS. Though an LMS provides an integrated platform for managing user activities and deployment of learning material, it does not provide an easy environment to create the tailor made courses according to the needs of the specific learner group (Robbins, 2002).

2.2.4 Learning Content Management System (LCMS)

A Learning Content Management System (LCMS) or a Virtual Learning Environment (VLE) is an environment where the instructors, subject matter experts or the content designers having limited know how of the technology, can design, create, store, reuse, manage, deliver learning content from a central object repository (Brandon Hall Research Group, 2007; Robbins, 2002). It also provides facility for evaluating learner performance.

The most important factor that goes in favor of an LCMS is its ability to reuse the content by creating learning objects. The Learning Object Model (LOM) grants content re-usability across the systems, and results in content modularity also, that ensures easy deployment of the courseware across the networks. The content is stored using XML in a central database repository. Searching of content at the topic level, as well as advanced searching across all objects in the repository is made possible due to the tagging facility. It also includes a delivery engine for serving up content, automatically adapting to user or group profiles, adding navigation controls, collaboration tools, utilities, and look and feel (Browning and Lowndes, 2001).

Moodle (Modular Object-Oriented Dynamic Learning Environment), is the most popular open source Web-based LCMS. According to Moodle statistics (Moodle, 2012), it has a user base of 70,793 registered and verified sites, serving 63,204,814
users in 6.7+ million courses with 1.2+ million teachers. ATutor, eFront are other popular LCMS.

Although a pure LCMS system is a sophisticated corporate version of the course management systems that were initially developed for higher education, yet the approach of these systems is focused more towards the content part of e-learning only. To have a more personalized system that takes care of the needs of the users (learners, instructors, content providers and administrators) the approach should be to move towards the adaptive systems. The next section brings to light the research conducted in adaptive e-learning techniques.

2.3 Adaptive e-Learning

Adaptive e-learning is an educational method which uses computers as interactive teaching devices that adapt the presentation of educational material according to students' learning needs. It works on the paradigm of learner-centered methodology where the learner is in focus and the content offered is woven according to her/his needs. The motivation is to allow electronic education to incorporate the value of the interactivity afforded to a student by an actual human teacher or tutor. The technology encompasses aspects derived from various fields of study including computer science, education, and psychology. Adaptive e-learning has been driven by a realization that tailored learning cannot be achieved on large-scale, using traditional and non-adaptive approaches. Adaptive learning systems endeavor to transform the learner from passive receptor of information to collaborator in the educational process (Paramythis and Loidl-Reisinger, 2003). Adaptive e-learning systems have been designed as both desktop computer applications and web applications, as discussed in the following subsections.

2.3.1 Adaptive Educational System

An Adaptive Educational System (AES) is a class of tools built with three interdependent modules— a domain model, a user model and an adaptation module (Triantafillou, Pomportsis and Demetriadis, 2003). The Domain Model contains several concepts that stand as the backbone for the content of the system. Each
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concept has a set of topics that represent individual pieces of knowledge for each domain and the size of each topic varies in relation to the particular domain. Additionally, topics are linked to each other forming a semantic network. This network is the structure of the knowledge domain. The User Model consists of a personal profile (comprising static data, e.g., name and password), a cognitive profile (adaptable data such as preferences), and a student knowledge profile. The Adaptation Module displays information to the user based on his or her cognitive preferences. For instance, the module will divide a page's content into chunks with conditions set to only display to certain users or preparing two variants of a single concept page with a similar condition. ELM-ART, InterBook, Personal Reader, LearnFit, Smart.FM, Knewton, Carnegie Learning and AHA! are some examples of AESs.

2.3.2 Adaptive Web-Based Educational System

An Adaptive Web-Based Educational system (AWBES), a recognized class of Adaptive Web systems (Brusilovsky and Maybury, 2002), attempts to fight the ‘one size fits all’ approach to online learning. There are adaptive textbooks (Brusilovsky, Eklund and Schwarz, 1998) that help students learn faster and better. Adaptive quizzes (Rios et al, 1999) evaluate student knowledge more precisely with fewer questions. Intelligent solution analyzers (Weber and Brusilovsky, 2001) can diagnose solutions of educational exercises and help the student to solve problem. Adaptive class monitoring systems (Oda, Satoh and Watanabe, 1998) give the teachers a much better chance to notice when students are lagging behind. Adaptive collaboration support systems (Soller and Lesgold, 2003) can enhance the power of collaborative learning. If compared with LMS, it is provided with a wealth of existing or newly created learning materials, while the typical LMS expects teachers to develop all learning materials themselves.

In spite of many such features, only few systems are being used in real life teaching. This is because of the lack of integration and lack of reuse support. Thus, a distributed architecture, referred to as Knowledge Tree (Brusilovsky, 2004), based on the re-use of intelligent educational activities was designed with the following components—a learning portal, an activity server, value adding service and a student
model server. The Learning Portal represents the needs of course providers and teachers. It provides a course-authoring interface for the teacher and maintains a runtime interface for the student. The Activity Server supports both the learning content and learning support services. These services are provided through the portal by multiple distributed activity servers. It is centered on reusable content and services. The Value Adding Service combines the features of a portal and activity server. Like a portal, it is able to query activity servers and access activities. Like an activity server, it can be queried and accessed by a portal. The Student Model Server represents the needs and prospects of students in the process of e-learning and making it highly personalized. Overall the architecture reflects the move from a product-based to a service-based Web economy.

While going through the literature, it was observed that most of the existing adaptive e-learning systems are based on learner-centered approach but movement from content-centered to learner-centered approach has lead to closed learning environments where content still does not cater to the requirements of society. This thesis proposes to study the notion of social opinion and introduce this perspective into the domain of e-learning content designing. Content creation plays a major role in building the acceptance of an e-learning course and in turn leveraging the e-learning system as a whole. Yet, the process of content designing is an area of concern. The issues and significance of inclusion of social opinion into content designing are discussed in the next section.

2.4 Social Opinion in Content Designing: A New Perspective

A learning institution has a significant influence on the society. It affects all social clusters which may or may not be the integral part of the system but are getting affected. Learners getting enrolled to an institution study a course to meet the expectations of their future employers. However, the employers usually retrain the new recruits with the latest skills required by the job resulting in their unlearning of prior knowledge. This process is time consuming and frustrating for the learners who spend their money and efforts on acquiring the skills from an institution but are not
able to put them to good use. Thus, courses must be designed, keeping in mind, the current requirements of the course takers as well as prospective recruiters in the society.

An e-learning institution is more ubiquitous than a traditional one due to its farther outreach through the Web. Thus, a stronger need is felt to build socially aware e-learning systems that make learners informed of the social applicability of the knowledge being acquired by them (Angehrn, Nabeth and Roda, 2001). A lot of research is going on to improve upon e-learning systems but not much has been done for inclusion of social opinion into content designing.

Kamel Boulos and Wheeler (2007) are optimistic in suggesting that contribution of the stakeholders in content designing promotes a sense of community, empowerment and ownership in them. It also leads to the growth of ‘collective intelligence’ in the system. Adelakun and Jennex (2002) testified the positive effect of involving stakeholders in all phases of information system designing and evaluation. However, Capuruco and Capretz (2009) opine that current systems have not made the most of the rising power of social computing to assimilate the knowledge available in the communities of practice. There are instances where recommendations of immediate stakeholders (learners and instructors) have been taken into consideration in learning environment also (Koehler et al, 2004), yet the views of indirect beneficiaries of the system (people not necessarily in direct association with the system, but potential contributors as a part of knowledge society) have not been taken into account.

The next chapter introduces the idea of knowledge management (KM) and proposes to integrate social opinion with KM processes, for content designing, through a knowledge based framework KMeLS that forms the foundation of the research work conducted in this thesis.