The significance of open source tools in online education system

[1]**Iqrar Ahmad,** [2]**Dr. Mohammed Alamgeer**

[1] Lecturer, Department of Information System, King Khalid University, KSA
[2] Assistant Professor, Department of Information System, King Khalid University, KSA [1]

Abstract

E-learning allows to share and manage knowledge and skills of the professionals and to get the right information to the right people whenever they need it. E-learning is defined as pedagogy empowered by digital technology which involves learning done at a computer, usually connected to a network, giving us the opportunity to learn almost anytime, anywhere. There are many software systems available that provide distance learning environment. This software is in both forms, commercial and open source software (OSS). Blackboard is one of the Open source tool that have been increasingly gaining worldwide popularity in e-learning system. This paper is highlights the significance of open source tools in online education system. The popularity of open source tools day by day increases. A huge number of Students are linked and gaining degree in feasible mode.

Keywords: blackboard, online education, E-learning, open source software

1. Introduction

Online education is becoming more popular as more and more households obtain personal computers. Many schools have developed the idea of the virtual classroom to a high degree. One instructor located at a central place and using video equipments can teach simultaneous classes in several satellite locations. This becomes a reality through E-Learning. E-Learning is a type of Technology supported education/learning where the medium of instruction is through computer technology. E-learning can be CDROM based, Network-based, Intranet based or Internet based. It can include text, video, audio, animation and virtual environments. Some other terms frequently interchanged with e-Learning include, on-line learning, online education, distance education, distance learning, technology-based training, web-based training, computer based training. E-learning helps in memory and recall because of its combining images with words, combining sounds (or voice) with images, using multimedia, its colour combinations and using layouts that flow with the natural movement of the eye.

E-learning, which is the application of information and communication technologies in a wide array of solutions, improve knowledge and performance. The integration of IT supported learning helps workers to acquire the necessary skills and knowledge for their job [1][2]. The past 10 years have seen dramatic changes in Higher Education in terms of increased access to education, lifelong learning, increased choice in areas of courses and the personalization of learning [3][4]. Unlike traditional face-to-face learning environments, technology inserts a layer of mediation between course interactions [5]. This lack of a shared environment occurs because elearning appears to lack a shared learning space similar to that created in a traditional classroom [6]. Horton considers an e-learning course as the combination of mainly lessons, activities, and collaboration mechanisms [9]. Jonassen establishes that knowledge is elaborated individually and socially by the students on the basis of the interpretations of their experiences. He defines the constructivist learning environments to conceive a problem or an example as the centre of the environment [7]. To use of the open source tools as an educational delivery medium (e-learning) provides the students with the

opportunity to develop an additional set of communication, technical, teamwork and interpersonal skills that mirror the business environment in which they will work [8]. Students may react differently to the online learning environment, depending on their own level of understanding and attitude [9]. Online collaborative teams face many challenges due to the lack of face-to-face communications or shared social context [10]. With a variety of information and communication technologies, it is very important yet challenging to select and utilize appropriate medium for different tasks [11]. For ensuring that users in the near future as well as the longer term have access to the best available applications, these Open Source software applications is been built on open standards.

2. New technologies in teaching and learning
2.1 Weblogs
Initiated by Jorn Barger in 1997, a log of the web (= Weblog, short blog) is in its simplest form a website with data entries, presented in reverse chronological order [12]. The word blog is both a noun and a verb. The owner of a blog is called blogger and writing a contribution is called blogging. The number of existing blogs are rapidly growing and there seems to be no end in the near future. From a technological view Blogs seem to be not very new or interesting. But what is the reason for such a boom?
1. Personality: My Blog belongs to me. It is my personal site and I can write my thoughts or meanings there. People can read and comment on it. With other words a new kind of homepage.
2. Usability: The crucial factor of all Web 2.0 Applications is usability. Since now everyone is able to contribute to the WWW by clicking on his/her weblog, register and writing with the help of a WYSISWYG-Editor. The high number of Weblogs leads to enormous increasing information. To avoid a personal overflow RSS (Really Simple Sindication) technology is used. With the help of XML structure, so called RSS-Reader can provide feeds of subscribed Blogs or other applications. The big advantage is that new information can be read without opening a site. Further the possibility of using Aggregators and Search functions help to make the information consumption more efficient.

2.2 Wiki
The concept of Wikis was introduced by Bo Leuf and Ward Cunningham in 1995 [13]. The name Wiki was derived from the term wikiwiki, which means quick expressed by the Hawaiian language.

A wiki system is an online platform which allows each and every user to create, edit, revise or link articles. All work can be done online. The aim of Curringham was to develop an easy to use knowledge management system enabling effective and efficient online collaboration [14]. Wikipedia is the famous and most known Wiki system of the world. More than 4 million articles in 100 languages, outnumbering all other encyclopedias is the incredible success story [15]. The main difference between a Weblog and Wiki is that Weblogs are personal. Wikis mainly used for collaborative work. For example if people work on the same documentation, a wiki system should preferred.

2.3 Podcast
The next part of the social network applications is Podcast. A podcast is a multimedia file that is distributed by subscription (paid or unpaid) over the Internet using syndication feeds, for playback on mobile devices and personal computers. In the beginning the multimedia files were equal to audio files (.mp3). Nowadays also Video Files are distributed via Podcasts. Similar to Weblogs the technology behind is rather simple. With the help of RSS, the easy production of my own podcast and the widespread bandwidth of the internet connection (which make bigger downloads possible) together with the availability of mobile devices podcasts get their popularity. Additionally to the speech recording also the screen is captured by the software. The end product is running for example on a usual iPod Video device. There are some further examples who describe the use of podcast in Education [16], [17]. It seems that this technology is nowadays widely used.

2.4 Web Sharing Applications
With the aid of this applications user can upload, view and share
• Pictures (for example Flickr www.flickr.com)
• Videos (for example YouTube www.youtube.com)
• Bookmarks (for example http://del.icio.us/)
There are of course further applications like sharing audio files video files or other data, but the concept of all applications are similar. A high number of users can share their audio or video clips, make comments or rate them. The basis of web sharing tools is the community itself. Without the people behind which are delivering the content for free, no tool would have any success.

2.5 Screen Casting

Screen casting tools allow the users to create screen casts directly from their browser and make the video available online so that the viewers can stream the video directly. The main advantage of such tools is that it gives the presenter the ability to show his ideas and flow of thoughts rather than simply explain them. Example: YoHelpOnline.

2.6 RSS

Rich Site Summary or Really Simple Syndication pulls specified contents from web sites and feeds it automatically to user's computers where it can be stored and later viewed by the user.
Example:
http://www.webopedia.com/TERM/R/RSS.html.

2.7 Digital Storytelling

The art of creating a powerful dialogue by narrating a story, weaving images, video and voice using the power of digital media design. The sharing of these stories with others can connect people in special ways. Example: Photostiry Tool: http://users.chariot.net.aul%7Emichaelc/els/mystory _sample_wmv.

2.8 Voice Applications

Voice applications help in making free phone calls throughout the world. 'Skype' is free and simple software through which free phone calls can be made to anywhere in the world. 'Skype' uses P2P (peer-to-peer) technology to connect you to other users. http://skype.com

3 Open source tools
3.1 Desire2 learn 8.1

Desire2Learn Inc. is a world-leading provider of enterprise eLearning systems that enable organizations to create teaching and learning environments that reflect their vision, values, goals, pedagogical approaches, and branding. Desire2Learn supports over 4 million learners worldwide and clients include schools, higher education, as well as associations, government, and other leading organizations [18]

Desire2Learn Inc., a world-leading provider of mission-critical enterprise eLearning systems, has recently unveiled the latest version of their Enterprise eLearning Suite including: Learning Environment 8.1, Learning Repository 3.5, and Live Room 4.0. The product suite will be featured at EDUCAUSE 2006 in Dallas, TX.

Desire2Learn provides the solutions for clients to meet their increasing needs to measure and assess organizational effectiveness as well as learner-outcomes. This is made possible by a comprehensive set of reporting and competency tracking tools. In addition, clients will gain significant time savings as a result of new features that enable quicker course development, greater collaboration, and content sharing.

Desire2Learn's Learning Environment 8.1 introduces the following new features:

- **Competencies and Learning Outcomes** – Structures the definition and tracking of learning outcomes to measure organizational effectiveness and student success
- **Rubrics** – Reduces administration time by creating a consistent means of measurement and evaluation while improving student learning
- **Reporting and Data Warehouse** – Provides the ability to gather and present information on countless metrics in a meaningful way
- **Quizzing/Self-Assessment/Surveys** – Provides new options for assessing and measuring student learning and gathering feedback, including cross-course surveys or quizzes
- **Blogging** - Increases communication and collaboration

3.2 Moodle

Moodle (abbreviation for *Modular Object-Oriented Dynamic Learning Environment*) is a free source e-learning software platform, also known as a Course Management System, Learning Management System, or Virtual Learning Environment (VLE). As of October 2010 it had a user base of 49,952 registered and verified sites, serving 37 million users in 3.7 million courses. Moodle was originally developed by Martin Dougiamas to help educators create online courses with a focus on interaction and collaborative construction of content, and is in continual evolution [19].

Moodle has several features considered typical of an e-learning platform, plus some original innovations (like its filtering system). Moodle is very similar to a learning management system. Moodle can be used in many types of environments such as in education, training and development, and business settings.
Some typical features of Moodle are
- Assignment submission
- Discussion forum
- Files download
- Grading
- Moodle instant messages
- Online calendar
- Online news and announcement (College and course level)

- Online quiz
- Wiki

3.3 Sakai

The Sakai Project is developing free/open source educational software under the Educational Community License. The Sakai Project's aim is to create a unique course management system or Learning Management System that both competes with and complements commercial systems[20]

In addition to the course management features, Sakai is intended as a collaborative tool for research and group projects. To support this function, Sakai includes the ability to change the settings of all the tools based on roles, changing what the system permits different users to do with each tool. It also includes a wiki, mailing list distribution and archiving, and an RSS reader. To use Sakai, no knowledge of HTML is necessary.

Sakai's software tools are designed to help instructors, researchers and students create websites on the web. For coursework, Sakai provides features to supplement and enhance teaching and learning. Here is a list of their features…

1. Announcements Tool
2. Assignments Tool
3. Chat Room Tool
4. Discussion Tool
5. Drop Box Tool
6. Email Archive Tool
7. Grade book
8. Help Tool
9. Home
10. Membership Tool
11. Message Center
12. My Workspace
13. News Tool
14. Permissions and Roles
15. Preferences
16. Resources Tool
17. Schedule Tool
18. Syllabus Tool
19. Synoptic Tool
20. Tests and Quizzes
21. WebDAV
22. Wiki Tool
23. Website Information Tool Website Setup Tool

3.4 OLAT

OLAT offers a flexible online course system along with extensive features to guarantee learning and teaching independent of time and place. It has been created especially for public institutions such as universities, academies or colleges, but it is also suitable for other businesses [21]

Fig1. Shows some features of OLAT 5.OLAT has been developed course-based to offer didactic freedom at the preparation of learning contents. The vast user and group management and a multitude of collaborative tools permit you to realize any teaching scenario without restriction.

Course Elements OLAT offers

- Wiki, Blog and Podcasts
- Single pages with integrated WYSIWYG HTML editor
- Include external pages or sites via tunneling
- Both SCORM 1.2 and IMS Content Packages (+ CP editor)
- Forums and "file dialog" element to discuss papers
- Folders for download material
- Tasks with drop box, sample solution and scores
- Topic assignment: Distribute and manage projects or bachelor thesis

Fig1.Wikis were one of the new features in OLAT 5

3.5 eCollege

eCollege develops and hosts e-Learning software applications and support services for colleges, universities and virtual schools. These institutions use eCollege's learning management system to deliver and manage online courses for students [22]. Client schools include the University of Colorado Denver, DeVry University, The Art Institutes, Village Academy Schools (Powell, Ohio) and Kaplan University.

eCollege provides the following products.

- Course Management System

- Content Management
- Program Administration System
- IT Infrastructure
- Support Services
- Digital Portfolio
- Live Video Conferencing

3.6 Dokeos

Dokeos is an open source online learning suite. It provides all the features needed for e-learning and blended learning management. Dokeos is a company dedicated to open source Learning Management Systems. Its main product is a SCORM-compliant open source learning suite used by multinational companies, federal administrations and universities. [23]

Dokeos operates on a professional open-source business model based on open code, community development, professional consulting, quality-assurance services, and subscription-based customer support.

Fig2. Shows some important modules of Dokeos. Dokeos implements a mix of instructional design and social/constructivist approaches. It was built corresponding to the traditional instructional design, and its structure is very close to traditional teaching (set of tools clearly marked as content creation tools), but extends this base by providing tools that encourage constructivism (forums, blogs, wikis, chat, file exchange, personal messaging, etc.).

The instructional design generally improves the simplicity of use by using known teaching strategies and allowing teachers to extend on this known base by adding social tools step by step. Dokeos offers
- SCORM Courses authoring
- Rapid learning
- Templates-based document production
- Tests : multiple choice, fill-in-the-blanks, matching, open questions, hotspots
- Interaction : forums, chats, groups
- Web conferencing (available on Pro and Medical editions)
- Conversion of PowerPoint and Impress presentations to SCORM courses (available on Pro and Medical editions)
- Surveys
- LDAP and Open ID authentication
- Grade book
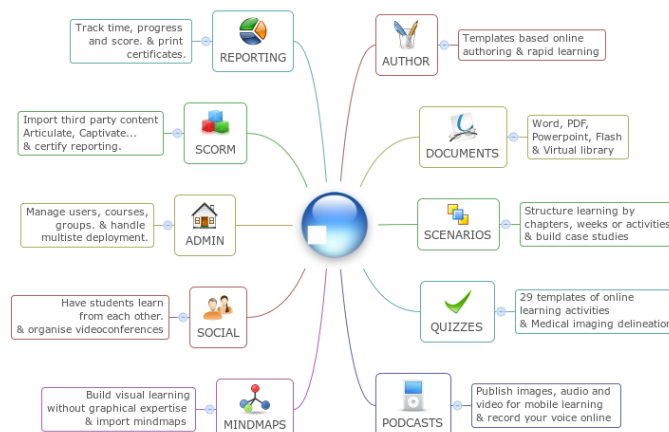- Reservations
- Users sessions

Fig2. Some modules of Dokeos tool

4. Open source tools architecture

his section will discuss Moodle architecture in order to indicate weak and will focus worth points which could be possible threats and vulnerabilities. Covering many collaborative and learning fields, Moodle is composed from independent modules; plug-ins. In order to ensure better understanding of a whole Moodle architecture, these modules will be presented in groups according to their purpose or use. From this perspective, there are six groups of modules are [24].

4.1 Communication Module

These modules are backbones of all intra and extra communication features. These modules include file exchange, internal and external email discussion forums, and real time chat. Among other possibilities, while using discussion forums, users can include in their post, images and direct URLs and different attachments. This feature, as well as file exchange feature which allows assignment submission, should be taken into consideration and observed as possible week point for a few threats. Due to possible insecure communication intruder could come into possession of any data that is sent in any private communication channel. Furthermore, insecure direct object reference could allow intruder to come into possession of any document he is not authorized for.

4.2 Productivity Modules

These modules include search module, calendar module, help module, progress and review modules. While these modules seem not to be threats, one issue must to be annotated. Information leakage has to be firmly banned, because otherwise anyone can see important data, or search results he is not authorized for. For example student could see (accidentally or with purpose) grades of his

colleagues. Besides this insecure direct object reference, information leakage could also cause problems.

4.3 Student Involvement Module
Student involvement module includes workshop module and group work module, along with student portfolio module and self-assessment. After performing any earlier mentioned illegal action intruder could either come into possession of others' data or change student or group relevant data on server. In addition, any system side threat should also be carefully taken care of.

4.4 Administration Modules
Administration module must probably be most carefully considered and paid attention to, because gaining access into these modules results in having access in all other modules. The well known authentication, course and user authorization, registration integration and any other hosted services module goes into this group. The authentication modules allow Moodle to use POP3, NNTP, LDAP, IMAP and other databases as sources for user information. Discovering and fixing all security-related bugs in these modules becomes crucial in any LMS development. Intruders mostly attack modules in this group, often using any known method and vulnerability. All encountered threats should be taken into consideration in implementation of authentication and other related modules.

4.5 Course Delivery Module
Course delivery modules are usually only authorized by administrators and teacher for use and are probably second most vulnerable group of modules. Representative modules in this group are helpdesk module, online grading tools, course management module, students tracking module and finally automated and testing modules. Beside Omni-present authentication attack threats, discussing course delivery modules, we will focus on integrity attacks while these have the purpose of unauthorized data change. Course management module and online grading module should be considered to be security safe on possible integrity attacks in particular.

4.6 Curriculum Design Modules
This is finally last group of modules, used in curriculum creation. Customization modules and course templates are main representatives. As last group of modules presented, they also have least negative impact as result of possible attacks. Data changes reflect on curriculum design are easily recognized and attackers usually do not have any particular interest in compromising these modules, while they work is usually acknowledged as more or less damaging or malign joke.

5. Conclusion
A new teaching approach is presented for effective teaching through open source tools. These tools incorporate method to address the difficulties faced by students in learning different course. Use of Matlab ensures that students understand the underlying concepts, the animated videos helps in easy recalling and the questionnaire keeps learner attentive. Thus by improving efficiency of classroom teaching and offering a new method of teaching-learning for a mathematical subject like DSP, reduces the effects of diversity at curriculum level and improves individual's interest in the subject. Therefore ideal classroom experience should be amalgamated with Elearning so that everyone will be prepared for full participation and no one slows down the rest of the class. Further by integrating the course contents in open source tools, enables a teacher to assess and track each of the student's progress. This is simply not possible in a traditional classroom environment constrained by time and space. Some students are likely to be left behind.

Today it is estimated that there are already more than 250 providers of commercial Learning Management Systems. In addition, there were recently identified more than 40 open source LMS offerings (some of the most well known are Moodle , OLAT, Desire2 Learn and SAKAI). For ensuring that users in the near future as well as the longer term have access to the best available applications, these Open Source software applications is been built on open standards.

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