Analysis and Comparative of Virtual Learning Environments

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Abstract: - In this paper we are going analyze existing platforms to create online learning communities and so, promoting online learning. These tools are basic for new models of education because the fundamental idea is to reduce the number of hours face-to-face in the classroom and to promote remote individual work. This is the basic idea of the new European models given by the Bologna process. Then, from a previous study, we are going to expound the most popular platforms and we are going to give the details of their features and main differences between them. In the last part of the paper, we will show the study we have done about this type of educational social software. This study involves a questionnaire to some lecturers of our university, Polytechnic University of Valencia. Our analysis presents most important results.

Key-Words: - LMS, e-learning, educational platforms, LCMS, CMS, open source software

1 Introduction

The word e-learning (electronic learning) defines a type of learning based on information and communication technologies. This way to learn makes easier to create, adopt and contents distribution. Independently of time-limit or geographical limits, this way allows students exchange opinions and information by TIC (information and communication technologies).

There are many tools to compose this new educational strategy; however some of them are remarkable: utilities to present contents (texts, animations, graphics, videos…), tools for asynchronous or synchronous communication between students and teachers like for example, e-mail, chat, forums, blogs, wikis…

In short, e-learning can be traduced by “virtual learning” and it is the future of remote education based on telematic networks connected usually to Internet.

An e-learning solution is built by three basic components: platform, contents and communication tools.

Platform is hardware and software environment designed to automate and manage development academic formation activities. It is known like online platform or LMS (learning management system).

A LMS is a software program installed in a server and it is used to administer, distribute and check activities for face-to-face formation o e-learning in an organization.

The main functions of a LMS are: manage and register users, resources and formation activities, access check, control and monitoring learning process, doing evaluations, informs, managing communication services like forums and teleconference amongst others.

Generally, a LMS doesn’t include possibilities to create its own contents, but it is in charge of administrating contents created by different sources. A LCMS (Learning Content Management Systems) is used to create contents for courses [1].

Most of LMSs work with Internet technology (web pages).

Nowadays, there are a lot of commercials and open source code platforms. In the academic field we can find: Sakai and Moodle (open source) and Blackboard merged with WebCT (commercial), .LRN and much more.

Regarding contents, the quality is a necessary condition although; it isn’t sufficient condition for a successful formation programs.

The design of contents should be done by experts on didactic methodology and, taking into account this idea, contents ought to be designed using the following characteristics:
- Adjustment to necessities and possibilities of pupils
- Quality and quantity of presented information
- Interactive
- Appropriate structure for its good and easy assimilation

In this point, we have a platform and content but; can we run an online course only with these
elements? The answer is negative. Communication tools are a fundamental part in this academic environment. They allow interaction between different agents of learning-teaching process. The interaction aforementioned is necessary to do work groups, exchanging experiences, providing help by a tutor, resolving doubts, etc.

There are two groups of tools depending on whether or not the communication is in real time:
- Communication synchronous tools: telephone, chat, webcam, videoconference, electronic blackboard, shared online documents.
- Communication asynchronous tools: they are basic for an e-learning environment (“anytime, anywhere”). Forums, groups of news, e-mail and nowadays, blogs and wikis.

If we base our classification in free code e-learning platforms we can choose between: ATutor, Bodington, Claroline, Dokeos, KEWL, ILIAS, LRN, LON-CAPA, Moodle, Sakai Project, LogiCampus, etc.

We can also find commercials e-learning platforms such as: NetCampus, Angel Learning, VerticeLearning, Blackboard, WebCT, e-ducativa, Scholar360, FirstClass and Desire2Learn.

This paper is structured in five sections. Section 2 will give the details of some platforms that we have decided to explain after a previous analysis. In section 3, we compare the platforms aforementioned at a technical level. In section 4, we will explain the questionnaire sent to the university teachers. We have used them to do the study about the platforms based on their opinions about this type of educational software. In section 5, we will analyze and discuss the obtained results. Conclusions are summarized in the last section of the paper [2].

2 Description and study of educational platforms
This study is useful to decide what platforms of all platforms aforementioned are the best for our research. This study shows us which of them are more cited on Internet. Platforms with major impact factor, deduced from the popularity parameter, will be studied and analyzed. The popularity parameter has been measured from the number of entrances in two different web searchers. We have based on the following relation: the more times is mentioned a term by a web searcher the more impact it has. And so, it is more famous.

The web searchers used to do the study have been Google and Yahoo because they are the most popular searchers at this moment.

We can see in figure 1, that the most famous platforms are: in the first place, Moodle (much more advanced than others), in second place, the merge of WebCT and Blackboard and, in third place, Sakai according to Yahoo and Dokeos according to Google. Because of text limitation, we have considered analyze Moodle, Blackboard/ WebCT and Sakai. We have opted for Sakai because of its impact and present expansion.

2.1 Moodle
Moodle is a course management system (CMS); a free package designed using known pedagogical principles to help the educators to create effective online learning communities.

Moodle is provided freely as Open Source software under the GNU Public License. This means Moodle is copyrighted, but you are allowed to copy, use and modify Moodle provided that you agree to: provide the source to others; not modify or remove the original license and copyrights, and apply this same license to any derivative work.

Moodle can be installed on any computer that can run PHP, and can support a SQL type database (e.g. MySQL). It can run on Windows and Mac operating systems and many distributions of Linux (e.g. Red Hat or Debian GNU). There are many Moodle Partners to assist you, even to host your Moodle site.

The word Moodle was originally an acronym for Modular Object-Oriented Dynamic Learning Environment, which is mostly useful to programmers and education theorists.

Moodle is an active and evolving work in progress. Its development was started by Martin Dougiamas, a system administrator of WebCT installation in Curtin University of Thechnology, who continues to lead the project [3].

The main characteristics of this platform are:
- Promotes social constructionist pedagogy (collaboration, activities, critical reflection, etc).
- Suitable for 100% online classes as well as supplementing face-to-face learning.
- Simple, lightweight, efficient, compatible, low-tech browser interface.
- Easy to install on almost any platform that supports PHP. Requires only one database that it is shared.
- Full database abstraction supports all major brands of database (except for initial table definition).
- Course listing shows descriptions for every course on the server, including accessibility to guests.
- Courses can be categorised and searched, one Moodle site can support thousands of courses.
- Emphasis on strong security throughout. Forms are all checked, data validated, cookies encrypted etc.
- Most text entry areas (resources, forum postings etc) can be edited using an embedded WYSIWYG HTML editor.

It has three types of management: site management, user management, and course management, and it has several modules to improve interaction between users: assignment module, chat module, choice module, forum module, glossary module, lesson module, quiz module, resource module, survey module, wiki module and workshop module.

Moodle has a large and diverse user community with over 330,000 registered users only in http://moodle.org, speaking over 70 languages in 196 countries [4].

2.2 Sakai

Sakai is a free and open source product that is built and maintained by the Sakai community. Sakai's development model is called "Community Source" because many of the developers creating Sakai are drawn from the "community" of organizations that have adopted and are using Sakai.

Sakai is an online Collaboration and Learning Environment. Many users of Sakai deploy it to support teaching and learning, ad hoc group collaboration, support for portfolios and research collaboration.

Sakai is a set of software tools designed to help instructors, researchers and students to create websites on the web. For coursework, Sakai provides features to supplement and enhance teaching and learning.

For collaboration, Sakai has several tools to help to organize communication and collaborative work on campus and around the world. Using a web browser, users choose from Sakai's tools to create a site that meets their needs. To use Sakai, no knowledge of HTML is necessary. Here are some examples of websites made with Sakai:

- A worksite where an instructor or project director can make announcements and share resources, such as electronic documents or links to other websites.
- A worksite that serves as an online discussion board.
- A course worksite where students can work on and submit assignments electronically.

The Sakai Project was founded in University of Michigan and Indiana University. Later MIT and Stanford Universities joined them, together with Open Knowledge Initiative (OKI) and Consortium uPortal. The project was consolidated with the help of Mellon Foundation.

The aim of the Sakai Project is to create collaboration and learning environment to the higher education, so it can be competed with its similar commercials platforms (Blackboard or WebCT) or it can improve others open source solutions like Moodle.

The foundation Sakai has been created to manage the Project. More than a hundred of universities belong to the foundation. Some of them stand out for courses’s number and users: Indiana University, University of Michigan, Yale University, Stanford University and Polytechnic University of Valencia.

Using a web browser, users can choose among several tools of Sakai to create a place of work appropriated to do courses, projects and research collaboration. In order to do a course, Sakai offers features to support and stimulate education and learning. To carry out team projects, Sakai has several tools to organize the communication and collaboration work in the campus and around the world.

The Sakai software has several options for communication among teachers and students, reader news RSS, distribution teaching content, to do exams, management of works, etc.

A set of generic collaboration tools forms the core of Sakai: Announcements, Drop Box, Email Archive, Resources, Chat Room, Forums, Threaded Discusión, Message Center, Message of the Day, News/RSS, Preferentes, Presentation, Profile / Roster, Repository, Search, Schedule, Search, Web Content, WebDAV, Wiki and Site Setup.

The core tools can be augmented with tools designed for a particular application of Sakai.

The Sakai community is actively developing new Sakai tools: IMS Common Cartridge, SCORM, blog tool, shared whiteboard, shared display, multipoint audio, multipoint audio, pod-casting, IMS Tool Interoperability, and others [5].

### 2.3 Blackboard and WebCT

WebCT (Course Tools), now owned by Blackboard and being phased out, is an online proprietary virtual learning environment system which is sold to colleges and other institutions and is used in many campuses for e-learning. Instructors could add to their WebCT courses tools such as discussion boards, mail systems and live chat, along with content such as documents and web pages.

WebCT was originally developed at the University of British Columbia by a faculty member in computer science, Murray W. Goldberg. In 1997 Goldberg created a company, WebCT Educational Technologies Corporation, a spinoff company of UBC.

In February 2006, WebCT was acquired by Blackboard Inc. As part of the merger terms with Blackboard, the WebCT name will be phased out over time in favor of the Blackboard brand.

WebCT was notable for being the first commercially successful virtual learning environment.

WebCT had long been criticized for being the most difficult of the course management systems to use. This criticism partly reflected the flexibility and power of the system - where other systems present a single way of organizing or adding course material, WebCT offered several options with more of the structure left to the individual instructor.


Blackboard develops and licenses software applications and related services to over 2200 education institutions in more than 60 countries. These institutions use Blackboard software to manage e-learning, transaction processing and e-commerce, and online communities. Blackboard's product line includes:

- The Blackboard Academic Suite, consisting of
  - The Blackboard Learning System, a course management system.
  - The Blackboard Community System, a community and portal system.
  - The Blackboard Content System, a content management system.

- The Blackboard Commerce Suite, consisting of
  - The Blackboard Transaction System, a Transaction Processing System tied to university IDs.
  - The Blackboard Community System, an e-commerce front end for the Transaction System.
  - Bb One, a network of commercial and retail business that accept Blackboard-powered debit card transactions.

- The former WebCT Inc's products, including
  - Blackboard Vista, a course management system.
  - Blackboard Campus Edition, course management system.

Though Blackboard software is closed source, the company provides an open architecture, called Building Blocks, which can be used to extend the functionality of Blackboard products. The Blackboard Vista and Campus Edition products are extensible through a technology called PowerLinks [6].

### 3 Technical comparative of platforms

Moodle and Sakai also stacks up well against the feature sets of the major commercial systems.

In Table 1, it is compared the features in the four leading commercial CMS: Moodle, Sakai Blackboard and WebCT.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Blackboard</th>
<th>WebCT</th>
<th>Moodle</th>
<th>Sakai</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upload and share documents</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Create content online in HTML</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Online Discussions</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Grade discussions/participation</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Online Chat</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Student peer review</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Online Quizzes/Surveys</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Online Gradebook</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Student submission of documents</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Self-assessment of submission</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Student Workgroups</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Student journals</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Embedded glossary</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 1. Feature Comparison
You can see that Moodle and Sakai already has all of the major features of the commercial systems, and a few that they don’t [7].

4 Questionnaire for educational platforms valuation

To know the level of knowledge of this type of learning management systems in the academic environment, we have carried out a survey with different members of the Polytechnic University of Valencia. This University uses PoliformaT, a support platform for teaching. PoliformaT is member of Sakai project and it is based on it.

The items of this survey are as follows:
1. Could you tell me if your college has educational platforms?
2. If so, Could tell me what is the platform name? (Sakai, Moodle…)
3. Can you value level of difficulty to bring up to date contents for your lessons in this platform? Where 0 is equivalent to say “Not difficult at all” and 10 to “Very difficult”
4. Can you value level of satisfaction of the following items of the platform that you use? Where 0 is equivalent to say “Not satisfied at all” and 10 to “Very satisfied”.
   - Ease of use
   - Download Speed
   - Variety of contents
   - Contents quality
   - Contents update
   - Attractive design
   - Online assistance
   - Global satisfaction
5. Do you know or do you use the following online learning platforms? Angel, Blackboard, CourseCompass, Desire2Learn, eCollege, Moodle, Sakai, WebCT, ATutor, ILIAS, Dokeos, Claroline, LRN (Dot Learn).
6. How often do you use it?
7. Can you value the degree of satisfaction of each platform that you have used. Number 0 is equivalent to “Not satisfied at all” and 10 to “Very satisfied”
8. If you aren’t satisfied with the use of these systems, please, could you tell me what the main reasons are?
9. What items do you agree in the following affirmations? 0 is equivalent to say “I don’t agree at all” and 10 to “I absolutely agree”:
   - Teachers are in the habit of using new technologies to improve teaching quality.
   - Students are in the habit of using new technologies to achieve their studies rightly.
   - Use of technology will allow a better development for your future theoretical lessons
   - Use of technology will allow a better development for your future practice lessons
   - New virtual technologies will become fundamental for higher education
10. Which functions would you add to the platform you are usually using?
11. What contents or functions would you remove or modify because of level of difficult or useless associated?
12. To conclude, could you tell me what subjects do you teach?

5 Questionnaire results and their Analysis

In this section the obtained results are shown.

Attending to the information shown in figure 2, we can say that the 30% of the surveys haven’t been answered and the 20% of the participants know nothing of these educational platforms.

The 50% remaining of the participants have answered the survey. We can conclude that the 70% of them know just two platforms, and the 30% of the participants only know the platform that they are using in the University. Sakai is the most popular in our university known by the 100% of the people, Moodle is quite known too with 60% and WebCT is the least famous with 10%. The 10% of answers consider that Moodle is much more suitable than any other platform due to its easy use, its large deployment and because it has many applications.

Everyday teachers use platforms to improve their subjects and upload new information for lessons. All the teachers bet on this type of tools and they consider them very useful to improve education and promote learning. Generally, teachers think that the level of difficulty to use them is low; it is shown in figure 3. They mark an average with two points in a set of values one to ten and, on the other hand, they mark global satisfaction with a seven.

According to the results shown in figure 4, we consider that the results are a little ambiguous with regard to the teachers’s habit to use new technologies and so, improving teaching quality. There are very different answers, somebody says they are in the habit of using them and others say quite the contrary. Generally, this is like that because of the age of participants, the youngest participants are more prone to use them and elderly people considerer it more difficult. On the other hand pupils, in general, are more familiarize with new technologies to reach their studies as well (see figure 5).
In spite of that, all the teachers say that new applications can improve education system and the practices and the theoretical lessons can be reinforced and improved due to the tools that are turning up.

Teachers have contributed with some new ideas to improve these systems, e.g.: creating a similar tool to the messenger with the possibility of using webcam, possibility of adding online animations, doing more calculus with pupil’s notes or doing a personal virtual tutor session.

Finally, all the teachers agree about the necessity of increasing easiness the use of these platforms and so, promoting their utilization and increasing their efficiency and dynamism. Besides, they think these systems have to be efficiency and dynamism.

6 Conclusions

These tools are the future in the academic field, not only at superior education but also at secondary education, where they are being introduced.

These tools are used by all universities and every day new applications are added at platforms of open source. The objective is to improve the efficiency and the interaction between their users.

In spite of its large utilization and expansion, the study shows that many teachers don’t have too much knowledge about this type of applications. Because of that, many available tools aren’t used by teachers. They only use indispensable applications like upload notes or send an e-mail.

These systems are the basic tools to transform and update present educational system. But they should continue improving existing applications and creating new of them.

References: