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A Comparative Study Between E-Learning Features

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1. Introduction

Nowadays, there is an increasing demand for methodologies and technologies, especially, for e-learning. E-learning has been defined as interactive learning in which the learning content is available online and provides automatic feedback to the student's learning activities. While recognizing that the world at large will continue to use terminology in different and often ambiguous ways, the term of e-learning is used to refer to the "online" interactions of various kinds that take place between learners and tutors (Dougiamas, 2011; Yuuichi et al., 2006; Tortora, et al., 2002 and Bruce & Curson, 2007).

The main purpose of this chapter is to study, analyze, and explore the right decision when choosing a suitable VLE platform to meet the requirements of Qassim University. It has focused on a comparison between Moodle and other VLE systems, and is based on two kinds of comparison. The first study compared Moodle with nine VLE platforms based on features and capabilities of VLE tools, as in Section 2.1. The second study compared Moodle with other VLE platforms based on the technical aspects of VLEs, as in Section 2.2.

This study has proved that the best platforms are Moodle and Sakai, which have missed just two out of forty features. The second study has strongly recommended choosing Moodle as the optimal VLE platform for Qassim University. The first and second studies have proved that Moodle has the best results. In addition, it has the advantages mentioned in Section 3.3, and we therefore strongly recommend Moodle as the best choice for higher education generally, and for Qassim University in particular.

This chapter is structured as follows. A comparative study between e-learning features is presented in Sections 2, which is the most important section in this chapter. In Section 3, a literature review of Moodle as a selected platform is presented, including the reasons for choosing Moodle together with its limitations, the architecture of Moodle and explains most of its components. Sections 4 and 5 focus on the e-learning tools of Moodle and an assignment activity respectively. Section 6 describes some of the websites that are using Moodle across the world. Finally, the summery of this chapter is in Section 7.

2. Comparative study between e-learning features

An important resource for higher education, especially universities, is VLE, which has been enhancing students' progress with high quality learning around the world. This section will

propose a suitable e-learning system to consider it as a specific area of study through a comparative study of the most well-known e-learning systems. It is an important to make a comparison study between VLE products to select the suitable one and test it with our approach and also explore their strengths and limitations. This comparative study is in two phases. The first phase is based on the features and capabilities of VLE tools, and the second is based on the technical aspects of the systems of VLEs.

2.1 Comparative study based on features and capabilities of VLE tools

VLEs have many features and capabilities such as forums, content management, quizzes with different kinds of questions, and a number of activity modules. Moodle has an additional number of contributed modules, including SCORM WebQuest and the Document Management System (Martin, et al., 2004). In this section, we have selected 10 VLE products, including Moodle, to make comparisons between them, and our first comparison is based on the features and capabilities of VLE tools. I am very thankful to the EduTools website (EduTools, 2006), which lists more than 80 VLE products and has performed a comparison of 42 VLE features and capabilities, as in Table 2.

Our comparison focuses on two kinds of products. The first is commercial e-learning systems and comprises Desire2Learn 8.1, ANGEL Learning Management Suite (7.1), TeleTOP Virtual Learning Environment, The Blackboard Learning System (V7) and Scholar360. The second is OSS and comprises LON-CAPA, Sakai 2.3, dotLRN/OpenACS, ATutor 1.5.4 and Moodle 1.8. The comparison has two answers, Y or N. Y means the product has the feature and N means the product does not. Table 4.3 displays information about the ten VLE software packages used in the first comparison. VLE Tools are criteria-based products that enable developers to evaluate and select the best VLE product. No single VLE product can possibly meet all these criteria and may not be the best for interface, technical, functional, or cost reasons. These criteria are described below in Table 2 (Dougiamas, 2011 and Al-Ajlan, et al., 2008).

No	Product	Developer name	Date	URL
1	LON-CAPA	Gerd Kortemeyer	Oct/2006	LON-CAPA Project
2	Desire2Learn 8.1	Desire2Learn Inc.	Oct/2006	Desire2Learn Inc.
3	ANGEL Learning 7.1	ANGEL Learning Inc	Oct/2006	Angel Learning
4	TeleTOP VLE	TeleTop B.V.	Oct/2006	TeleTop
5	Blackboard (V6.2)	BlackBoard	Nov/2006	Blackboard LSE
6	Sakai 2.3	Sakai 2.3	Nov/2006	Sakai
7	dotLRN/OpenACS	dotLRN	Jan/2007	dotlrn.org
8	Scholar360	Scholar360	Jan/2007	www.scholar360.com
9	ATutor 1.5.4	University of Toronto	April/2007	atutor.ca/atutor/index.php
10	Moodle 1.8	Moodlerooms	April/2007	www.Moodle.org

Table 1. General Information about the Selected Products.

VLEs as an e-learning system have many features and capabilities. For simplicity, we have divided these features and capabilities into three phases, which are Learner Tools, Support Tools and Technical Tools, as in Table 4.4. Chapter 3 "Virtual Learning Environments As E-learning Systems" has more details about these tools. Table 2 lists the features and capabilities of VLE tools that we have used in our comparison in this chapter.

1) Learner Tools	2) Support Tools	3) Technical Specifications
1. Communication Tools ▪ Discussion Forums ▪ File Exchange / Internal Email ▪ Online Journal/Notes ▪ Real-time Chat ▪ Video Services / Whiteboard	**1. Administration Tools** ▪ Authentication ▪ Course Authorization ▪ Registration Integration ▪ Hosted Services	**1. Hardware/Software** ▪ Client Browser Required ▪ Database Requirements ▪ Server Software ▪ UNIX Server ▪ Windows Server
2. Productivity Tools ▪ Bookmarks ▪ Orientation / Help ▪ Searching Within Course ▪ Calendar / Progress Review ▪ Work Offline/Synchronize	**2. Course Delivery Tools** ▪ Course Management ▪ Instructor Helpdesk ▪ Online Grading Tools ▪ Student Tracking ▪ Automated Testing and Scoring	**2. Pricing/Licensing** ▪ Company Profile ▪ Costs ▪ Open Source ▪ Optional Extras ▪ Software Version
3. Student Involvement Tools ▪ Groupwork ▪ Self-assessment ▪ Student Community Building ▪ Student Portfolios	**3. Curriculum Design** ▪ Accessibility Compliance ▪ Course Templates ▪ Curriculum Management ▪ Customized Look and Feel ▪ Instructional Standards Compliance ▪ Instructional Design Tools ▪ Content Sharing / Reuse	

Table 2. Summaries of the Features and Capabilities of VLE tools.

2.1.1 Learner tools

This phase contains three kinds of tools: Communication Tools, Productivity Tools and Student Involvement Tools. Each Learner Tool has some features and capabilities as in Table 2 above.

These tools contain three kinds of tools, which are Communication Tools, Productivity Tools and Student Involvement Tools. Each kind of Learner Tool contains various features and capabilities, and each product has some of them, as in Table 1.

As we can see in Table 3, the comparison between the VLE products is based on Learner Tools. Four products are shown to be the best with almost the maximum number of features 15 out of 16 features or capabilities of Learner Tools. These products are Moodle, Desire2Learn, ANGEL Learning Management Suite, and Sakai.

As we can see in Table 3, all products have all features and capabilities except Scholar360, TeleTOP Virtual Learning Environment and The Blackboard Learning System (V.7). This means that Moodle and the other remaining products are strong on Learner Tools.

The Learner Tools in Table 3 have many features and capabilities, and to understand what they mean, please visit the EduTools website. We have also listed them in Table 2.

2.1.2 Support tools

These tools contain three kinds of tools: Administration Tools, Course Delivery Tools, and Content Development Tools, and all of these tools have features and capabilities.

As we can see in Table 4, this comparison between the VLE products is based on Support Tools. In this phase, all products have all features and capabilities except Scholar360,

No	1	2	3	4	5	6	7	8	9	10
Product Name / Tools	LON-CAPA	Desire2Learn 8.1	ANGEL Learning Management Suite	TeleTOP VLE	The Blackboard Learning System	Sakai 2.3	dotLRN/OpenACS	Scholar360	ATutor 1.5.4	Moodle 1.8
1. Learner Tools										
1.1. Communication Tools										
Discussion Forums	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Discussion Management	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
File Exchange	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Internal Email	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Online Journal/Notes	N	Y	Y	N	Y	Y	N	Y	N	Y
Real-time Chat	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Video Services	N	N	N	N	N	N	N	N	N	Y
Whiteboard	N	Y	Y	Y	Y	Y	N	N	Y	Y
2. Productivity Tools										
Bookmarks	Y	Y	Y	Y	N	Y	Y	Y	N	N
Calendar / Progress review	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Orientation/Help	Y	Y	Y	Y	Y	Y	N	Y	Y	Y
Searching Within Course	Y	Y	Y	Y	Y	Y	Y	N	Y	Y
Work Offline/Synchronize	Y	Y	Y	Y	Y	Y	N	Y	Y	Y
1.3. Student Involvement Tools										
Groupwork	Y	Y	Y	Y	Y	Y	Y	N	Y	Y
Student Community Building	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
Student Portfolios	Y	Y	Y	Y	Y	Y	Y	Y	N	Y
Total Features	16	16	16	16	16	16	16	16	16	16
Total Available Features	11	15	15	14	14	15	11	12	12	15
Total Missing Features	5	1	1	2	2	1	5	4	4	1

Table 3. The Comparison between Selected VLE Products based on Support Tools.

TeleTOP Virtual Learning Environment and The Blackboard Learning System (V.7). This means that Moodle and the other remaining products are strong on Support Tools.
The Support Tools in Table 4 have many features and capabilities, and to understand what they mean, please visit the EduTools. We have also listed them in Table 2.

2.1.3 Technical specifications tools
These tools contain two kinds of tools: Hardware/Software Tools and Pricing/Licensing; all kinds of Technical Specifications Tools have some features and capabilities, as in Table 5. The costs feature is different from other features because if the product has no cost, it means that product has an advantage and we will calculate it as Yes (Y). For example, in Table 5, Moodle has two N and we calculated N of cost as Y, so in the final score Moodle has missed just one feature.

No	1	2	3	4	5	6	7	8	9	10
Product Name　　　　　　　　　　Tools	LON-CAPA	Desire2Learn 8.1	ANGEL Learning Management Suite (7.1)	TeleTOP VLE	The Blackboard Learning System (V 7)	Sakai 2.3	dotLRN/OpenACS	Scholar360	ATutor 1.5.4	Moodle 1.8
2. Support Tools										
2.1. Administration Tools										
➢ Authentication	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
➢ Course Authorization	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
➢ Hosted Services	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
➢ Registration Integration	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2.2. Course Delivery Tools										
➢ Test Types	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
➢ Automated Testing Management	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
➢ Automated Testing Support	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
➢ Course Management	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
➢ Online Grading Tools	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
➢ Student Tracking	Y	Y	Y	Y	Y	Y	Y	N	Y	Y
2.3. Content Development Tools										
➢ Accessibility Compliance	Y	Y	Y	N	Y	Y	Y	Y	Y	Y
➢ Content Sharing/Reuse	Y	Y	Y	Y	N	Y	Y	Y	Y	Y
➢ Course Templates	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
➢ Customized Look and Feel	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
➢ Instructional Design	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
➢ Instructional Standards Compliance	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Total Features	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**
Total Available Features	**16**	**16**	**16**	**15**	**15**	**16**	**16**	**15**	**16**	**16**
Total Missing Features	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**1**	**0**	**0**

Table 4. The Comparison between Selected VLE Products based on Support Tools.

As we can see in Table 5 below, the comparison between the VLE products is based on Technical Specifications Tools. In this phase, the best product is ATutor 1.5.4, Moodle 1.8, Scholar360 and The Blackboard Learning System, which missed only 1 out of the 8 Technical Specifications Tools. The weakest product is LON-CAPA, which missed 5 out of the 8.

The Technical Specifications in Table 5 have many features and capabilities, and to understand what these features and capabilities mean, please visit the EduTools. We have also listed them in Table 2.

No	1	2	3	4	5	6	7	8	9	10
Product Name / **Tools**	LON-CAPA	Desire2Learn 8.1	ANGEL Learning Management Suite (7.1)	TeleTOP VLE	The Blackboard Learning System (V7)	Sakai 2.3	dotLRN/OpenACS	Scholar360	ATutor 1.5.4	Moodle 1.8
3. Technical Specifications										
3.1. Hardware/Software Tools										
Client Browser Required	N	Y	Y	N	Y	Y	N	Y	Y	Y
Database Requirements	Y	Y	Y	N	Y	Y	Y	Y	Y	Y
Unix Server	Y	N	N	Y	Y	Y	Y	Y	Y	Y
Windows Server	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
3.2. Pricing/Licensing Tools										
Company Profile	N	Y	Y	N	Y	Y	N	Y	Y	N
Costs	N	Y	Y	Y	Y	N	N	Y	N	Y
Open Source	Y	N	N	N	N	Y	Y	N	Y	Y
Optional Extras	N	Y	Y	Y	Y	N	N	Y	Y	Y
Total Features	8	8	8	8	8	8	8	8	8	8
Total Available Features	3	6	6	4	7	6	4	7	8	7
Total Missing Features	5	2	2	4	1	2	4	1	1	1

Table 5. The Comparison between VLE Products based on Technical Specifications Tools.

2.1.4 The final result of the comparison between the ten VLE products

From Table 6 below, we can see the final result of the comparison between the ten VLE products. The best product is Moodle 1.8, which has missed just 2 out of 40 features and capabilities, and the second products are Desire2Learn 8.1, ANGEL Learning Management Suite (7.1) and Sakai 2.3 equally, which have missed 3 out of the 40. Also, Moodle is the best of the OSS products. The weakest product is LON-CAPA, which has missed 10 out of the 40.

No	1	2	3	4	5	6	7	8	9	10
Product Name / **Tools**	LON-CAPA	Desire2Learn 8.1	ANGEL Learning Management Suite (7.1)	TeleTOP Virtual Learning Environment	The Blackboard Learning System (V 7)	Sakai 2.3	dotLRN/OpenACS	Scholar360	ATutor 1.5.4	Moodle 1.8
Total Features	40	40	40	40	40	40	40	40	40	40
Total Available Features	30	37	37	33	36	37	31	34	35	38
Total Missing Features	10	3	3	7	4	3	9	6	5	2

Table 6. The Final Result of the Comparison between Ten VLE Products.

We use the GraphPad Prism software to analyse, graph and present scientific data of VLE products because it is a powerful combination of basic biostatistics, curve fitting and scientific graphing in one comprehensive program. More than one hundred scientists in over one hundred countries rely on Prism to analyse, graph and present their scientific data.

Since 1984, created by scientists for scientists, Prism's intuitive programs have provided researchers worldwide with the tools they need to simplify data analysis, statistics and graphing (Jolla, 2008). Figure 1 shows the comparison between the ten products of VLE systems. The total features are 40 but no product has reached this number. In Figure 1, P1, P2 etc mean the VLE product as mentioned in Table 4.8 above respectively.
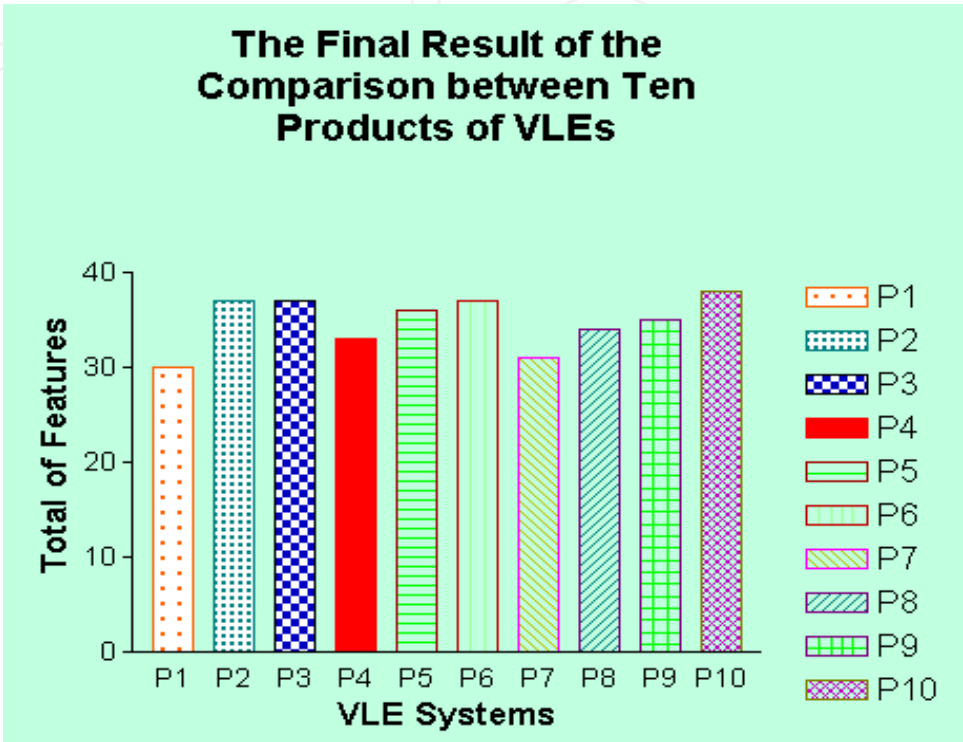

Fig. 1. The Total Features of the Ten VLE Products.

As in Figure 1, the best VLE product is P10 (Moodle 1.8), which has 38 out of 40 features and capabilities, and the weakest is P1 (LON-CAPA), which has 30 out of the 40. P10 (Moodle) has 38 out of the 40 features and capabilities and is the number 1 out of the 10 VLE products. It is number 1 out of the OSS products, which itself has missed just 2 out of the 40 features and capabilities (Al-Ajlan, et al., 2008).

2.2 Comparison based on focusing on the technical aspects of the VLE systems

In this session, the comparison between the systems is based on technical categories. All VLE systems will be compared with the Moodle system as part of our study. As in our literature review, we have selected three studies focusing on this kind of comparison.

2.2.1 First study

As in (Wharekura-tini, et al., 2004) Moodle has limitations, notably it lacks SCORM support, and its roles and permissions system is limited. However, these limitations can be fixed, and are part of the project roadmap in Moodle site.

Table 7 reveals that ATutor, while strong in features and usability, has serious architectural limitations, and although some features in ATutor warrant further investigation, it may be that candidates will opt for Moodle.

Product Category	ATutor	ILIAS	Moodle
Architecture	Weak	Complex	Good
Implementation	Weak	Complex	Good
Interoperability	Bad	Good	Average
Cost of ownership	Medium	High	Low
Strength of the community	Low	Medium	High
Licensing	GPL	GPL	GPL
Internationalization	Weak	Average	Good
Accessibility	Excellent	Bad	Average
Document transformation	No	Average	No

Table 7. Comparison based on focusing on the technical aspects of the VLE systems.

ILIAS, while promising, has a complex architecture with tight coupling that is hard to work with and debug. The code is new, and lacks maturity. The developer community of ILIAS is small outside the core team. Nevertheless, some features in ILIAS deserve to be reviewed before opting for Moodle.

Moodle has a good architecture, implementation, inter-operability, and internationalization, and also has the strength of the community. It is free and its accessibility is average. On the other hand, it has limitations, as mentioned above.

2.2.2 Second study
Table 8 shows the comparison between 4 products of VLE systems. The comparison is based on categories as (Graf, and List, 2005) determined. This study has proved that Moodle outperforms all other systems and scored 4.467 out of 5. In contrast, Boddington gained the lowest score, at 2.439.

Product Category	Moodle	Sakai	ATutor	Boddington
Functionality	1.25	.75	.25	.25
Usability	.8	.8	.6	.65
Documentation	.645	.465	.54	.54
Community	.6	.384	.24	.288
Security	.42	.34	.28	.42
Support	.4	.15	.35	.15
Adoption	.352	.336	.208	.336
Total Score (out of 5)	4.467	3.225	2.468	2.439

Table 8. Comparison based on focusing on some Features and Categories of VLEs.

Moodle has nearly the maximum score because it has many of the features expected from an e-learning platform, including forums, resources, quizzes with different kinds of questions, and a number of activity modules. Furthermore, Moodle is very beneficial for language teaching and learning because the interactive tools, such as wiki, discussion forums, and quizzes, can be selectively employed to meet the objectives of the course and to motivate students.

2.2.3 Third study
In (Alvarez, 2008) the study reports that the result of the evaluation shows that Moodle has the best rating in the adaptation category; it can be seen in Table 9 as the best system

concerning adaptation issues. It dominates the evaluation by achieving the best value five times. The strengths of Moodle are the realization of communication tools, the creation and administration of learning objects, the comprehensive didactical concepts and the tracking of data. In addition, the outstanding usability of Moodle leads to the maximum evaluation value in the usability category. Concerning the other platforms, ILIAS obtained the best values in the categories for technical aspects, administration, and course management.

	Product Feature	Adaptability	Personalization	Extensibility	Adaptively	Ranking
1	ATutor	|	#	#	|	3
2	Dokeos	|	0	*	+	2
3	dotLRN	+	+	*	0	2
4	ILIAS	+	#	*	0	2
5	LON-CAPA	+	#	#	|	2
6	Moodle	#	+	*	|	1
7	OpenUSS	#	#	#	0	2
8	Sakai	0	0	*	0	3
9	Spaghettilearning	+	#	+	0	3

Table 9. Results of the Adaptation Category.

Moodle has gained the best results, especially in the specific adaptation evaluation as in Table 9. It supports an adaptive feature called "lesson" where learners can be routed automatically through pages depending on the answer to a question after each page. Furthermore, the extensibility is supported very well by a documented API, detailed guidelines, and templates for programming. In addition personalization and adaptability features are present in Moodle (Alvarez, 2008).

2.2.4 Fourth study

In (Cole, 2005), the study reports the percentage of universities that are developing or using e-learning frameworks. The result of e-learning survey conducted the use of web-based learning management systems for higher education. This study discussed with some members of the scientific community on this field in the Department of Computer Science at the University of Oviedo.

As we can see in Figure 2, Moodle is the best product that has 34.55% and the second product is WebCT/Blackboard that has 27.27%. The weakest product is Sakai and dotLRN that have same percentage 10.91%.
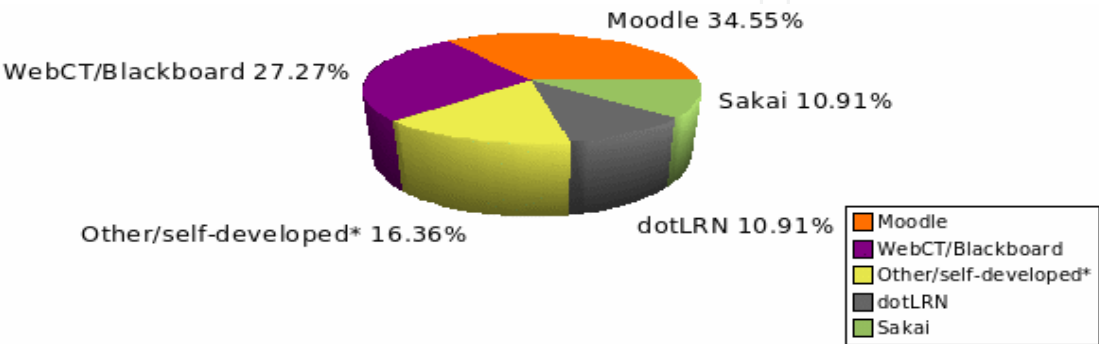
Fig. 2. Chart of use of web-based e-learning systems in Universities.

3. Moodle as a selected platform

According to the comparison study above, we have chosen Moodle as the suitable platform for this project. In this section, we will present the literature on Moodle including its architecture, benefits and limitations and tools, as well as we will mention more reasons for choosing this platform. Moodle is the most user-friendly and flexible free open-source courseware products available all over the world. Moodle is a VLE that lets teachers provide and share documents, assignments, quizzes, forums, chats, etc. with students in an easy-to-learn and user-friendly interface (Dougiamas, 2011; Cole, 2005 and Wharekura-tini, 2004).

Moodle is CMS designed to help educators who want to create quality online courses. It has excellent documentation, strong support for security and administration, and is evolving towards Information Management System/Shareable Content Object Reference Model (IMS/SCORM) standards (Zenha-Rela, et al., 2006 and Cole, 2005). Moodle has a strong development and large user community and users can download and use it on any computer they have at hand (Berry, 2005; Brandl, 2005 and Al-Ajlan, et al., 2008).

3.1 The definition of Moodle

An important feature of the Moodle is the Moodle.org web site, which provides a central point for information, discussion and collaboration among Moodle users, who include system administrators, teachers, researchers, instructional designers and of course, developers. Like Moodle, this site is always evolving to suit the needs of the community. Moodle is now used not only in universities, but also in high schools, primary schools, non-profit organizations, private companies, and by independent teachers and even home-schooling parents. A growing number of people from around the world are contributing to Moodle in different ways (Dougiamas, 2011; Yuuichi et al., 2006, and Dougiamas, 2004).

Moodle is based on Social Constructionist Pedagogy (SCP), which is a learner-oriented philosophy and most VLE modules are based on it. They are largely concerned with how course contents are delivered, in which students are involved in constructing their own knowledge (Graf, et al., 2005 and Cole, 2005). The learner-oriented philosophy of learning is that learners actively construct new knowledge by tinkering and experimenting, and they learn even more by explaining what they have learned to others and by adopting a more subjective stance to the knowledge being created. These ideas run parallel to the way open-source development works, in which the developers also are often users, everyone is free to tinker with the software and code is re-constructed or adapted, peer-reviewed and refined by the means of open discussion (Berry, 2005 and Chavan, et al., 2004).

3.2 The history of Moodle

Moodle was created by Martin Dougiamas while working on a postgraduate degree at the Curtin University of Technology in Australia. In 2002, he was a Webmaster of a university and a system administrator of WebCT installation. He started to develop Moodle to solve some problems with WebCT. The original version was targeted for small classes and a case study, but steadily many features were added by developers and other contributors from all over the world (Martin, et al., 2004; Dougiamas, 2004 and Koh, 2006).

Abhijeet Chavan and Shireen Pavri have said, "Moodle was born out of a need to scratch an itch. Frustrated by proprietary alternatives, Martin, then a PhD candidate in Education with

a background in computer science, started Moodle in 1999. In 2002, Version 1.0 was released. Since then, Moodle has continued to evolve at a rapid rate, managed by Martin and propelled by an active world-wide community of users and developers" (Chavan, and Pavri, 2004). The Moodle Company "Moodle.com" has been providing managed hosting and consulting services since 2003. Currently, Moodle has a large and diverse user community with over 1,077,969 users on this site, speaking 86 languages in 212 countries around the world (Al-Ajlan, et al., 2008).

3.3 The reasons for choosing Moodle

OSS is rapidly developing, and new alternatives for non-profit organizations are emerging and maturing. Additionally, open-source learning environments such as Moodle are becoming widely adopted by university and educational institutions. Managing an LMS can be a complex task. Moodle does not hide this complexity and its detailed on-line help, examples and sensible defaults assist users in installing, administering and using the LMS. Moodle allows users to post news items, assignments, electronic journals and resources, and to collect assignments etc. The greatest strength of Moodle is the community that has grown around the project. Both developers and users participate in Moodle's active discussion forums, sharing tips, posting code snippets, helping new users, sharing resources and debating new ideas. Thus, we have chosen the Moodle software to be the area of study and analysis. We want to understand Moodle's environment to explore its functionalities and limitations in order to develop practical examples of the use of VLEs over the world. We list here the most important reasons for choosing this package: (Dougiamas, 2011; Yuuichi et al., 2006; Berry, 2005; Zenha-Rela, et al., 2006; Cole,2005; Dougiamas, 2004; Chavan, et al., 2004; Koh, 2006; Williams et al., 2006; Itmazi, 2005; Shearer, 2003; Wharekura-tini, et al., 2004; MacKenzie, et al., 2006; Chao Su, 2005; Al-Ajlan, et al., 2008 and Massy, 2004).

1. Moodle is OSS, which means users are free to download it, use it, modify it and even distribute it under the terms of GNU;
2. Moodle is CMS & VLE, and lets teachers provide and share documents, graded assignments, quizzes, discussion forums, etc. with their students in an easy-to-learn manner and to create quality online courses;
3. Moodle can be used on almost all servers that can use PHP;
4. The key to Moodle is that has been developed with both pedagogy and technology in mind. One of the main advantages of Moodle over other systems is a strong grounding in social constructionist pedagogy with good educational tools;
5. It works well with languages and is currently being used in 86 languages in 112 countries;
6. Users can download and use Moodle on any computer they have at hand;
7. It has excellent documentation, and strong support for security and administration and easy to upgrade from one version to the next;
8. It has many user-friendly features such as easy installation, customization of options and settings, good support/help and good educational tools;
9. It demonstrates the use of OSS in creating a high quality e-learning environment that incorporates many other subjects;
10. Moodle is the LMS most often recommended of all the OSS packages , as well as being the most popular;
11. The credibility of Moodle is very high. At present, there are 52289 web sites from 193 countries that have registered with it ;

12. The importance of Moodle is its good reputation according to good reports, grade of admission in the community and number of places, existing languages, etc ;
13. Moodle should be able to be used in conjunction with other systems. It keeps all files for one course within a single, normal directory on the server. Administrators allow the provision of seamless forms of file-level access for each teacher, such as SMB, FTP, and so on. Currently, there is work on more features planned for Moodle in future versions, such as export and import data using XML that can be integrated visually into other web sites. In addition, has presented a good solution for this integration, enabling more VLEs to work together by using Web services and related techniques (Al-Ajlan, et al., 2008);
14. Moodle runs without modification on Unix, Linux, Windows, Mac OS X, Netware and any other systems that support PHP;
15. Data is stored in a single database: MySQL or PostgreSQL are best but it also supports Oracle, Access, Interbase, ODBC and others;
16. Some universities integrate Moodle with other VLE products, such as Oxford University which has integrated two OSS learning environments, Bodington VLE and Moodle although they are slightly different to each other.

3.4 The limitations of Moodle

Moodle's low cost, flexibility and ease of use helps bring LMS technology within the reach of those with limited technical and financial resources. Moodle is a fine example of how and why open source works (Williams et al., 2006). On the other hand, Moodle has some disadvantages and we will mention some of them, as follows:

1. OSS is only for IT experts and is too difficult for normal users to install and use; more than 66% users of Moodle have identified themselves as teachers, on-line learning researchers or educational administrators (Chavan, et al., 2004, Koh, 2006);
2. Lack of simple-to-obtain support. The forum has a great deal of information, but nearly all forums are in the English language (Chavan, and Pavri, 2004);
3. It requires that someone on staff takes responsibility for making it work, you cannot just telephone Moodle technical support;
4. Although good with languages, some developments may be needed for vigorous handling of MathML and enhanced tracking features. Still, this program receives a high recommendation (Wharekura-tini, et al., 2004, Koh, 2006);
5. The Moodle website states that the steps required for getting Moodle up and running on a web server are very simple, but in practise this is not the case. There have been many problems that we have had to overcome, which required a technical understanding of the underlying technology and the way it all hangs together (Shearer, 2003);

3.5 The architecture of Moodle

The strength of Moodle is its simple, but solid design and architecture developed by Martin Dougiamas. The architecture of Moodle sets an excellent foundation, following good practices of low coupling and high cohesion, which the other LMSs fail to achieve. This yields a system that is simple, flexible and effective and easily accessible to developers (Dougiamas, 2011). Figure 3 illustrates the architecture of the Moodle site and its components.
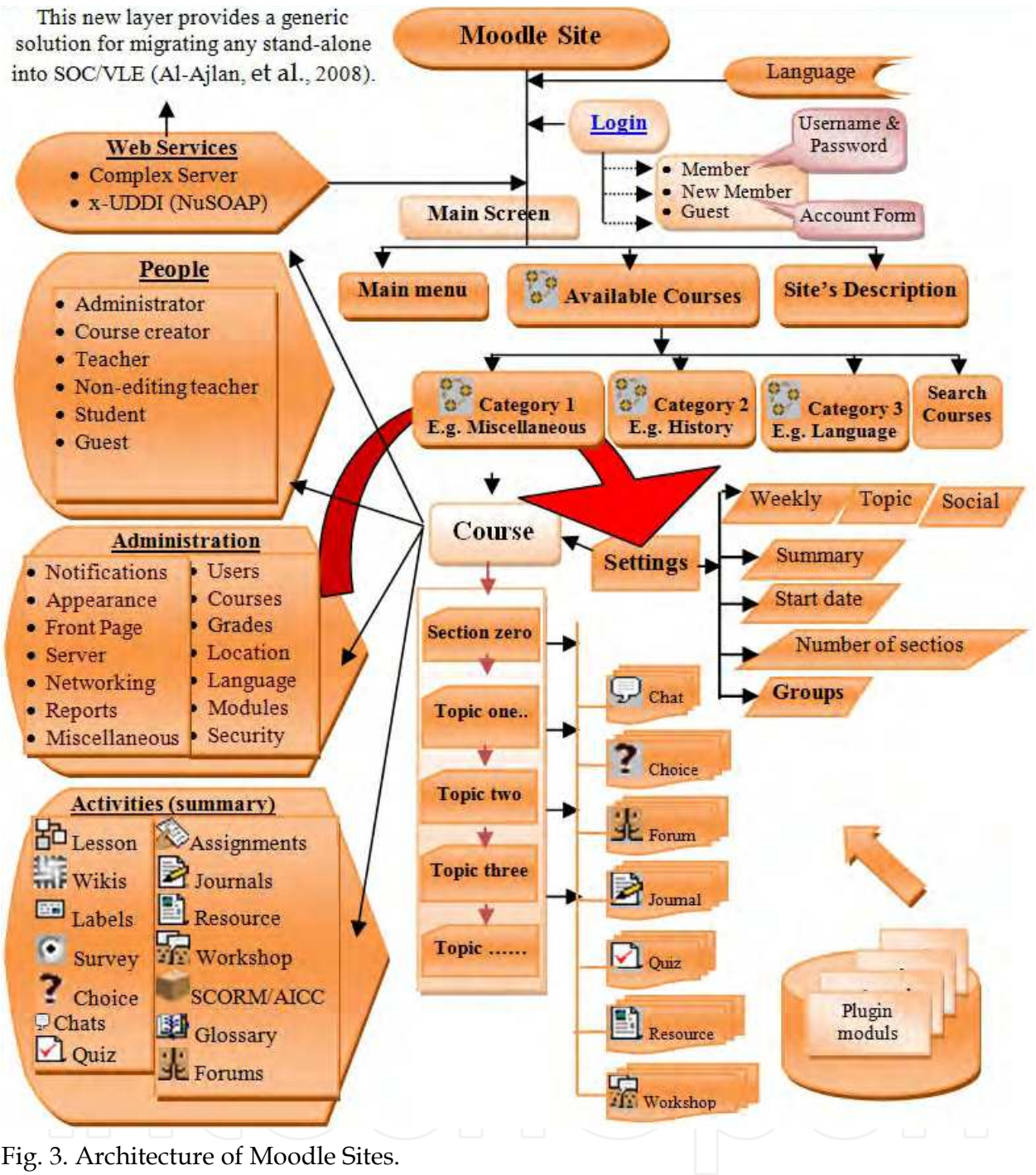
Fig. 3. Architecture of Moodle Sites.

Moodle is a huge VLE software and it is difficult to focus on all parts in this chapter. Therefore, we will focus on the most important components, as in Figure 4.1 above, and these components are:

3.5.1 People

The different kinds of users in any VLE platform and especially in Moodle are described in Table 10. These users need especial authorization depending on their level in Moodle, as in Figure 4. For example, an administrator has the full permission to do anything in the Moodle site and can control users and courses.

No	User	Description
1	Administrator	This kind of user is the most important user and has the full permission to do anything in Moodle, especially in courses. It has the responsibility to manage the site and control all users.
2	Course creator	This user can create new courses and mange them as well as teach these courses.
3	Teacher	Can do anything within a course, including changing the activities and grading students.
4	Non-editing teacher	Can teach in courses and grade students, but may not alter activities.
5	Student	Students generally have fewer privileges within a course.
6	Guest	Has minimal privileges and usually cannot enter text anywhere.
7	Authenticated user	All logged in users.

Table 10. The Users in Moodle Sites.

The authorization for users in Moodle is divided into six levels, as in Figure 4. Every user has some level of permission that Moodle permits, and Figure 4 displays this permission in percentage terms. Administrator has 100% and can do anything in the site. In contrast, Guest has just 10%, such as looking at available courses and sharing in general forums.
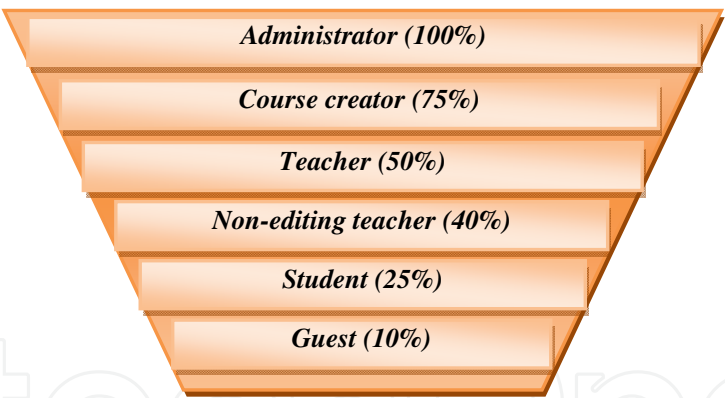
Fig. 4. The level of Authorisation in Moodle Sites.

Figure 5 below shows the users of Moodle in one course at Ajlan's High School. This school has many categories, each with many courses, as in Figure 9. By assigning a role to a user in a context, users are granted the permissions contained in that role for the current context and all lower contexts (site/system, course categories, courses and blocks and activities).

For example, if an administrator grants a student a role in a course, that student will have permission to access that course and all blocks and activities inside it. Their actual permissions may depend on other roles and overrides that have been previously defined. Figure 5 shows the assigned roles of one course in Ajlan's High School, which has 7 kinds of users.

Fig. 5. The Assign Roles of Users in Ajlan's High School.

3.5.2 Administration

Administration has many tools related to course, as in Figure 6. An administrator can control the course through the administration tools but can only control these tools by the permission granted, as in Figure 6. In our example, all these tools appear for the administrator in the administration site in Ajlan's High School, as in Figure 6.

Fig. 6. Tthe Tools of Administration in the Main Screen and Course in Ajlan's High School.

No	Tool	Description
1	Turn editing on	This tool enables the user to open and activate a course.
2	Settings	To create a new course.
3	Assign roles	To add users for the level of authorisation as in Figure 4.2.
4	Groups	The group mode can be defined at two levels: course level and activity level, and each can be sub-divided into three: no groups, separate groups and visible groups.
5	Backup	To save and backup data in user's computer
6	Restore	This allows users to restore files to a course.
7	Import	To upload files that have been saved in a computer with the export feature.
8	Reset	This tool allows users to empty a course of user data, while retaining the activities and other settings.
9	Reports	These are available for each participant and they show their activities in the current course. Teachers always have access to these reports, using the button visible on each persons's profile page. Student access to their own reports is controlled by the teacher via a course setting
10	Questions	Questions five types multiple choice, short answer, true/false, matching and numerical. These questions have an option that is activated by clicking on the checkbox.
11	Scales	Teachers can create new custom scales to be used in a course for any grading activities.
12	Files	To upload files
13	Grades	Many of the activities allow grades to be set. By default, the results of all grades within the course can be seen in the Grades page, available from the main course page.
14	Unenrol me from 1101	This means take a user out of course.

Table 11. The Tools in Administration Form in Course in Moodle Sites.

3.5.3 Activities
Moodle contains a wide range of activity modules, which are activity modules, resource types, and open source and they can be used to build up any type of course. All these activities are under course in the Moodle architecture, as in Figure 3.

3.5.4 Category
This tool enables administrators and teachers to arrange their courses in levels of categories, as in Ajlan's High School in Figure 7. The main category is 'المرحلة الابتدائية' and then the sub-category is 'الصف الاول ابتدائي', which has 7 courses. It is possible to make more than one main category and more than one sub-category.

Fig. 7. The Category Tool in Ajlan's High School.

3.5.5 Login
This page enables all users of Moodle to access their account. If the user does not have a username and password, this page enables him/her to register and open an account.

Fig. 8. The Login Page in Ajlan's High School.

3.5.6 Main screen
This screen is the main page of the Moodle site, and the administrator can control this page by the Front Page button. This screen has choices that the administrator can offer Moodle's users; options such as site administration, categories, courses, calendar and upcoming events, as well as the option to write an introduction.

Fig. 9. The Main Screen in Ajlan's High School.

3.5.7 Language
Moodle is an excellent VLE platform for languages; it is being used in over 86 languages in 112 countries around the world. An administrator can control the language by using the Language Button as in the left top in Figure 9. This button has three options: Language Settings, Language Editing and Language Packs. Users can choose the language that best suits their needs by using the selection bottom as in the right top in Figure 9.

3.5.8 Web services
Web services are a new technology and they have made important contributions to knowledge, especially to the e-business field. Therefore, it is important to use this technology in non-profit organizations such as e-learning. Ajlan has succeeded in using Web services together with VLE platforms, by using Moodle as a case study (Al-Ajlan, et al., 2008).

3.6 Virtual learning environment tools of Moodle
VLEs enable teachers to build resources fast and without the need to develop technical skills. VLE tools are criteria-based, and they enable developers to evaluate and select the

most suitable VLE product. No single product can possibly meet all these criteria, and the most suitable within a specific context may not be perfect for interface, technical, functional, or cost reasons. Table 2 describes the tools and features in any VLE product (Britain, et al., 1999; Cheng, et al., 1998; Dougiamas, et al., 2002 and Perrie, 2003):

This section presents the main tools of Moodle, which are activity modules and resource types. The manage activities page enables the administrator to manage Moodle's Tools for the entire site. This includes standard modules and contributed modules that have been added by the site administrator.

3.6.1 Activity modules

Moodle contains a wide range of activity modules that can be used to build up any type of course. They provide a central point for information, discussion and collaboration among Moodle users. The current activates as in version 1.8 are as follows (Dougiamas, 2011):

No	Activity Modules	Description
1	Assignments	The assignment module enables a teacher to allow students to upload and prepare any digital content for grading.
2	Chats	It allows participants to have a real-time synchronous discussion via the web. This is a useful way to get a different understanding of each other and the topic being.
3	Choices	These enable teachers to ask questions, and they specify a choice of multiple responses.
4	Forums	These are where the most discussion takes place between users. Users comfortable with informal communication styles.
5	Glossary	This allows participants to create and maintain a list of definitions, and enables teachers to export entries from one glossary to another within the same course.
6	Journal	This is private between student and teacher and each journal can be directed by an open question. For each particular journal, the whole class can be assessed on one page in one form [20].
7	Labels	It allows users to insert text and graphics among the other activities on the course.
8	Lesson	This delivers content in an interesting and flexible way. It consists of a number of pages; each page normally ends with a question and a number of possible answers.
9	Quizzes	This module allows the teacher to design and set quiz tests, consisting of multiple choices, true/false and short answer questions.
10	Resources	These contain information that the teacher wants to bring into the course.

Table 12. Activity Modules in Moodle Product.

3.6.2 Resource types

Moodle, as any VLE system, supports a range of different resource types that allow users to insert almost any kind of web content into courses, and these resources are under course (Dougiamas, 2011).

No	Resource Types	Description
1	Text Page	This is a simple page written using plain text. A number of formatting types are available to help turn plain text into attractive web pages.
2	HTML Page	It is easy to develop a complete single web page within Moodle, especially when users are using Moodle's WYSIWYG HTML editor.
3	Files and Web Pages	These allow users to link any web page or other file on the public Internet as well as any web page or other file that users have uploaded into the course files area from their own desktop computer.
4	Directory	This can display a whole directory (and its subdirectories) from the course files area. Students can then browse and view all of those files.

Table 13. The number of websites using Moodle in some countries around the world.

4. Websites are using Moodle all over the World

Moodle has a large and diverse user community with over half a million registered users, speaking 86 languages, and currently 53,794 Moodle sites from approximately 112 countries have been registered (Dougiamas, 2011, Brandl, 2005). Table 14 shows 48 countries, chosen from those 112 countries, that have sites and have registered with Moodle.

No	Country	No of Sites	No	Country	No of Sites
1	United States	9530	25	India	384
2	Spain	4800	26	Russian Federation	374
3	Brazil	3751	27	Indonesia	327
4	United Kingdom	3331	28	Venezuela	304
5	Germany	2490	29	New Zealand	282
6	Portugal	1923	30	Sweden	263
7	Australia	1475	31	Turkey	253
8	Canada	1343	32	Malaysia	246
9	Mexico	1306	33	Hungary	234
10	Italy	1219	34	Belgium	200
11	Poland	1020	35	Greece	190
12	Colombia	943	36	South Africa	177
13	Thailand	914	37	Iran	149
14	Taiwan	834	38	Ukraine	134
15	France	795	39	Egypt	120
16	Austria	736	40	Romania	120
17	Netherlands	714	41	Korea	120
18	Chile	706	42	Saudi Arabia	113
19	Japan	692	43	Denmark	109
20	Peru	657	44	Hong Kong	101
21	Argentina	651	45	United Arab Emirates	84
22	Switzerland	542	46	Bulgaria	87
23	Finland	440	47	Morocco	54
24	China	414	48	Lebanon	29

Table 14. The number of websites using Moodle in some countries around the world.

The highest number of sites using Moodle is in the United States (US), where there are more than 9530sites. In Spain, Brazil and the United Kingdom, there are more than 4800, 3751 and 3331 sites respectively that have installed and are using Moodle. In contrast, in Lebanon there are only 29 sites using Moodle. Figure 10 illustrates Moodle on a map of the world. We can see from this map that Moodle is concentrated in Europe and the US.
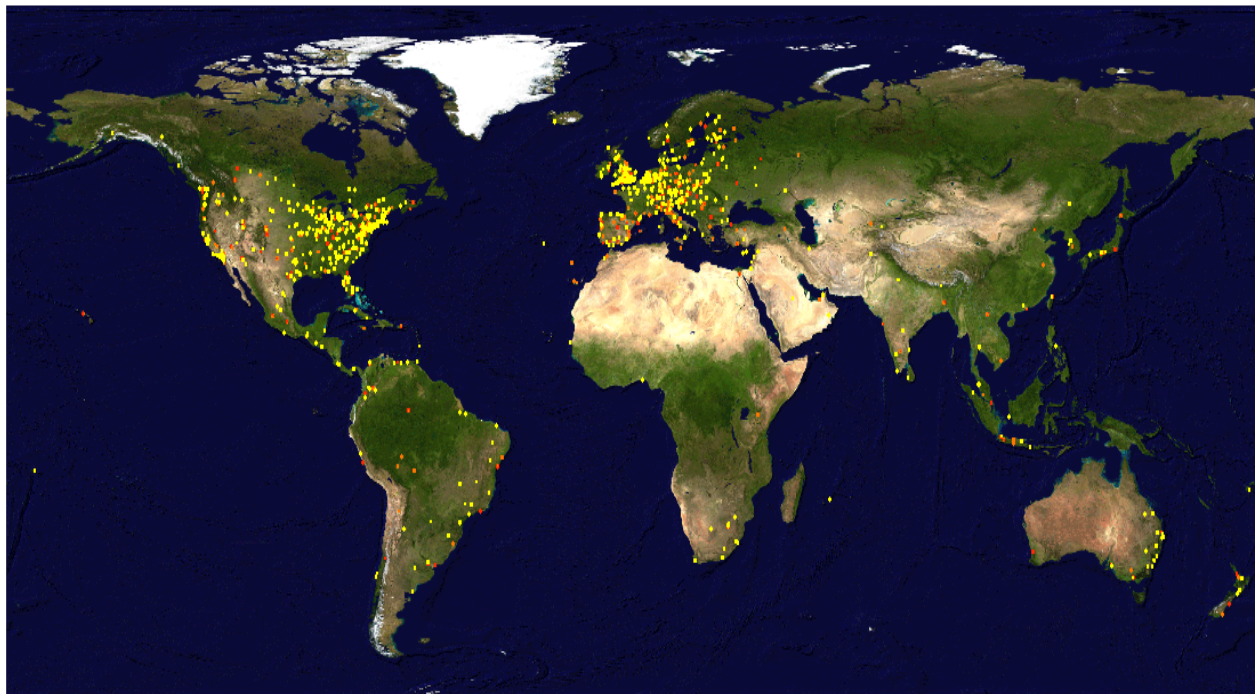

Fig. 10. Moodle Sites that have registered with Moodle across the world.

5. Discussion

This chapter is aimed at taking the right decision when choosing a suitable VLE platform to meet the requirements of Qassim University. This is a large university and needs a strong VLE that meets all its needs. This is an initial study to aid Qassim University in that search for the best VLE system. It has focused on a comparison between Moodle and other VLE systems, and is based on two kinds of comparison. The first phase is based on the features and capabilities of VLE, and the second is based on the technical aspects of the VLE tools.

The first study compared Moodle with nine VLE platforms based on features and capabilities of VLE tools, as in Section 2.1. This study has proved that the best platforms are Moodle and Sakai, which have missed just two out of forty features. The weakest product is Claroline 1.6, which missed 8 out of 40 features. Desire2Learn and ANGEL Learning Management Suite have taken the number two spot equally as they both missed three features. Blackboard Learning System and OLAT are number four equally as they both missed five features and capabilities.

The second study compared Moodle with other VLE platforms based on the technical aspects of VLEs, as in Section 2.2 In general, this study has strongly recommended choosing Moodle as the optimal VLE platform for Qassim University.

The first and second studies have proved that Moodle has the best results. In addition, it has the advantages mentioned in Section 2.1, and we therefore strongly recommend Moodle as the best choice for higher education generally, and for Qassim University in particular.

6. Conclusion

Moodle is a kind of VLE and it is now widely used all over the world by schools, institutes, universities, companies, independent educators, and home schooling parents. It has great potential for creating a successful e-learning experience by providing an abundance of excellent tools that can be used to enhance conventional classroom instruction in any VLE system. Moodle can scale from a single-teacher site to a more than 50-thousand-student University.

This chapter has made a comparative study between Moodle and other VLE systems, and this was based on two kinds of comparison. The first phase was based on the features and capabilities of VLE tools, and the second one was based on the technical aspects of VLE systems. From this study, we aimed to discover the best and most suitable choice of VLE systems that would meet the requirements of Qassim University. In this, our initial assessment, we have succeeded in finding that optimal VLE platform, and it is Moodle.

This chapter has presented the work that has been done to date. The future work is to work hard within Moodle and to test it with a sample by using departments in some colleges at Qassim University in order to discover all possible problems that could occur when using it. Initially, there will be a survey for obtaining information directly from different sources, including participants who are in a position to provide such information. Many variables will be considered at this point and the study will attempt to identify the relationships among such variables.

7. Acknowledgment

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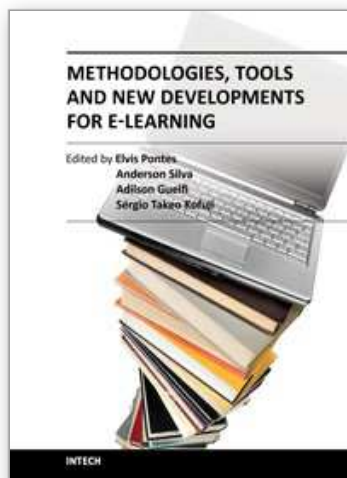
Methodologies, Tools and New Developments for E-Learning
Edited by Dr. Elvis Pontes

With the resources provided by communication technologies, E-learning has been employed in multiple universities, as well as in wide range of training centers and schools. This book presents a structured collection of chapters, dealing with the subject and stressing the importance of E-learning. It shows the evolution of E-learning, with discussion about tools, methodologies, improvements and new possibilities for long-distance learning. The book is divided into three sections and their respective chapters refer to three macro areas. The first section of the book covers methodologies and tools applied for E-learning, considering collaborative methodologies and specific environments. The second section is about E-learning assessment, highlighting studies about E-learning features and evaluations for different methodologies. The last section deals with the new developments in E-learning, emphasizing subjects like knowledge building in virtual environments, new proposals for architectures in tutoring systems, and case studies.

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