

2nd International Conference on Energy and Power, ICEP2018, 13–15 December 2018,
Sydney, Australia

Utilization of Learning Management Systems (LMSs) in higher education system: A case review for Saudi Arabia

Abdulaziz Aldiab, Harun Chowdhury*, Alex Kootsookos, Firoz Alam, Hamed Allhibi

School of Engineering, RMIT University, Melbourne, 3000, Australia

Abstract

There is a strong global trend toward utilising Learning Management Systems (LMSs) in academic institutions as a part of their educational management system to improve the teaching and learning experience in higher education system. Most of the universities in US, UK, Canada and Australia including 28 universities of Saudi Arabia are using different LMS systems for their academic activities. All LMS systems fully depended on the existing information and communication technology (ICT) infrastructure and using computer technology to use the system. This paper reviews different features of commercially available and mostly utilized modern LMS systems including a comparative analysis. A case study focused on the universities of Saudi Arabia was also carried out.

© 2019 The Authors. Published by Elsevier Ltd.

This is an open access article under the CC BY-NC-ND license (<https://creativecommons.org/licenses/by-nc-nd/4.0/>)

Selection and peer-review under responsibility of the scientific committee of the 2nd International Conference on Energy and Power, ICEP2018.

Keywords: Learning Management Systems; LMS; Moodle; Blackboard; Canvas; D2L; higher education system; Saudi Arabia;

1. Introduction

This is since there are many benefits for the students, academic staff and institutions themselves. Most universities around the world use LMSs beside their traditional classrooms. In the past, this use was limited and simple like an assistant tool, while the current use has become more advanced and accepted many requirements to be in one system. For example, a student can review lectures, answer exams, receive feedback, submit assignment and discuss with

* Corresponding author. Tel.: +6199256103.

E-mail address: harun.chowdhury@rmit.edu.au

peers. In fact, there are many reasons behind this advanced distribution of eLearning concepts. One of the most important reason is the dramatic improvement of the information and communication technology (ICT). This improvement allows many academic institutions to easily use some of new features that relay on ICT, such as broadcast high definition videos, video conferences and virtual classrooms. In Saudi Arabia case, it is like the global case as it recently improved its ICT infrastructure and all the 28 public universities use LMSs as a part of their educational process.

LMSs have passed through some important stages until they become to their form today. Many refer to the history of LMSs from some points in the beginning of 1900's. Although there were some significant points at that old time and cannot be ignored, it is an important to focus on LMSs from the point view of it is a web-based software or a cloud-based software. That means to look at LMSs as the internet is the main medium of connection, which exclude the other sort of communication in the learning process. The very first LMS software was FirstClass which was founded by SoftArc in 1990 [1]. This was a client-server software that has some useful features, such as email, discussion board and online conferences. FirstClass was compatible to run in different operating systems like Windows, Linux and macOS. Some other advanced LMSs came later than that date as a result of open competition. Such of these LMSs are Blackboard LLC that was founded by Michael Chasen and Matthew Pittinsk in 1997 [2]. Moodle which was founded by Martin Dougiamas in 2001 [3], Canvas that was founded in 2008 by Josh Coates, [4] and D2L which is referred to as Desire2Learn that was founded by John Baker in 1999 [5].

Learning Management System (LMS) is a broad term used commonly to describe various systems providing online educational services for students, teachers, and managers. Learning Management System (LMS) is a broad term that is used for a wide range of systems that organize and provide access to online learning services for students, teachers, and administrators. Generally, these services contain some fundamental facilities such as limited access control to authorised people, provide different types of learning content and provide different types of communication tools. Online learning platform is another an alternative expression sometimes used to refer to LMS [6].

Kaplan-Leiserson [7] provides the following definition for LMS: "LMS (learning management system): Software that automates the administration of training events. The LMS registers users, tracks courses in a catalogue, and records data from learners; it also provides reports to management. An LMS is typically designed to handle courses by multiple publishers and providers. It usually doesn't include its own authoring capabilities; instead, it focuses on managing courses created by a variety of other sources."

Student Management System (SMS) is usually an essential online software in an academic institution. It is made to control and manage students' information and data [6, 8]. "students, faculty, courses, applications, admissions, payment, exams, and grades" are some examples of fundamental services, that SMS provides, and Two examples of commercial SMS systems are PeopleSoft and Banner [6].

Learning Content Management System (LCMS) is another type of educational systems. It can be defined as a software that is used to create, edit and control eLearning content "(courses, reusable content object)" [9]. It is possible to use LCMS alone to build and distribute the learning content in or it can be the creator role while publishing by an LMS in an academic Institution [9]. The outcome of LCMS can be found in various forms such as LMS platform, printed materials, WEB sources and on computers like an audio or video clips [6].

Although there are studies [10-11] performed on different LMS, however, no work has been done on the comparing all recently available LMS such as Canvas and D2L. So, the primary objective of this paper is to study the features of all LMSs and the current statues of the utilization of them in Saudi public universities.

2. Features of LMSs

LMSs provide many benefits for the educational processes. The first feature is the concept of discarding the physical location. LMS can be used as an effective tool for students belonging to the same university and studying in different campuses [12]. Some universities have multiple campuses that might be national and international campuses which basically may have different time zone. LMS is used to gather all these different students in one virtual place enhancing all their interactions, discussions and feedbacks. In fact, using LMSs or eLearning is beneficial for all students generally, and particularly for those students who have some difficulties such as living in places far from the original physical campus (rural areas or different country) or having health problems as it is a continues educational proses regardless of the location and time [13].

Accessibility is another feature of applying LMSs in academic sector. In the past few years, personal computers (PCs) and laptops were the main devices that many students use. Davis et al. [14] state that there is an increase using in digital devices among students and teachers inside their schools as a part of the educational process, such as Bring Your Own Device (BYOD). That includes the new generation of smartphones, tablets and phablets. As a result, most LMSs have increased their accessibility and allow their users “students and instructors” to login via various ways such as using any internet browsers from computers or the official app of that LMS as most LMSs have their own app in different operating systems (that are Android, IOS and Windows Phone (WP)).

The next feature is that LMSs are attractive Environments. In some cases, eLearning generally and LMSs particularly be an attractive environment especially for young students. Using gamification or video games for educational purposes might attract the school-age children as well as adolescences, that is in their performance and the final outcomes [15]. In fact, many LMSs support this optional feature and the implementation of it is depending on a decision from a management of an academic institution.

Finally, most LMSs can be integrated with any missing contents. LMSs developers try to provide all the available features in their software for two main reasons, that are to get more satisfied current customers and for seeking for new customers. This can be done by keep updating and improving in frequent phases. This happens in both open source and proprietary LMSs. Sometime, a missed feature could be found due to different users’ needs and requirements. LMSs can be integrated with some common features in order to match the users’ requirements. In some cases, LMSs can integrate with professional features such as virtual laboratories or remote laboratories [16].

3. Selection of LMS

Khairudin et al. [17] present 5 main criteria for the Human Capital perspectives. They also mentioned some indicators under each criterion. One example under each criterion is provided;

1. strengthen lecturers' knowledge of contemporary technology. An example of its indicator is to provide essential training and supporting based on available software to academic staff in continuing stages.
2. Increasing students' contributions in collaborative interaction in learning. For example, the effort to achieve a higher percentage of students who participate in online discussions.
3. strengthen students’ academic integrity. For instance, provide online submission component for assignments which will reduce the number of late submission assignments.
4. Providing more chances for students’ contribution and student obligation level in distance learning courses. An illustration of this is the features of accessibility which can enhance the contribution and online activity, particularly for distance learning courses.
5. strengthen technical operators’ proficiency. For example, require some IT members to join some technical short-courses on their new LMS.

As a result, universities prefer to choose LMS that helps in their educational prosses to more enhanced, efficient, flexible and powerful. It is important to all universities to focus on the benefits associated with approved any LMS, such as the students’ performance during a course and the students’ outcomes after they finished a course. It is important to highlight that supporting both computer and mobile phone devices is another feature of universities preference.

4. Commercially used LMS systems

Currently, most of the universities are using several commercially and open sources available LMSs packages such as, Moodle, Blackboard, Canvas and D2L (Desire to Learn). A short descriptions of each LMS are given below:

4.1. Moodle

Moodle was originally founded by Martin Dougiamas in 1999 and the first version (Moodle 1.0) was launched in 2002. The term Moodle is an abbreviation of Modular Object-Oriented Dynamic Learning Environment. The server that was used at that time was at the Science and Mathematics Education Centre at Curtin University of Technology in

Perth, Western Australia [18]. The last version of this software is Moodle 3.6.1 (December 2018). Moodle is a free open source LMS that does not require a registration fee or yearly renewed fee [18].

Table 1. Comparison of some selected LMSs (adopted from [10])

Attribution	Moodle	Blackboard	Canvas	D2L
Page	Yes	Yes	Yes	Yes
URL	Yes	Yes	Yes	Yes
File	Yes	Yes	Yes	Yes
Folder	Yes	Yes	Yes	Yes
Legend	Yes	Yes	Yes	Yes
Book	Yes	Yes	Yes	Yes
Lecture	Yes	Yes	Yes	Yes
Syllabus	No	Yes	Yes	Yes
Dictionary	Yes	Yes	Yes	Yes
Lesson plan	Yes	Yes	Yes	Yes
Video	Yes	Yes	Yes	Yes
Integration	Yes	Yes	Yes	Yes
Discussion	Yes	Yes	Yes	Yes
Chat	Yes	Yes	Yes	Yes
Reports	Yes	Yes	Yes	Yes
Inquiry	Yes	No	Yes	Yes
Comments	Yes	Yes	Yes	Yes
Blogs	Yes	Yes	Yes	Yes
Survey (question form)	Yes	Yes	Yes	Yes
Quick mail	Yes	Yes	Yes	Yes
Task	Yes	Yes	Yes	Yes
Tests	Yes	Yes	Yes	Yes
Workshop	Yes	Yes	Yes	Yes
Safe Assignment	No	Yes	Yes	Yes
Group mode	Yes	Yes	Yes	Yes
Wiki	Yes	Yes	Yes	Yes
Virtual classroom	No	Yes	Yes	Yes
Internal mail	Yes	Yes	Yes	Yes
Calendar	Yes	Yes	Yes	Yes
Tracking	Yes	Yes	Yes	Yes
Statistics	Yes	Yes	Yes	Yes
Database	Yes	Yes	Yes	Yes
Language adjustment	Yes	Yes	Yes	Yes
Certificates	Yes	Yes	Yes	Yes

4.2. Blackboard

Blackboard LLC was started in 1997 by both Matthew Pittinsky and Michael Chasen. Between 1998 and 2004, Blackboard LLC had purchased some companies that worked in the same field such as MadDuck and Prometheus while it merged with other competitors such as CourseInfo LLC and WebCT. Unlike Moodle, Blackboard is a commercial LMS that requires a registration fee, yearly renewed fee [19] and some features might need a payment in order to activate them.

4.3. Canvas

Canvas was founded in 2008 by Josh Coates and the first Canvas was introduced in 2011. In the following year that is 2012, Canvas Network. Canvas was known previously as Instructor and the founders decided to change it name at a later stage. Canvas is considered as an open source software [20].

4.4. D2L

John Baker was the founder of D2L (Desire2Learn) in 1999. It is a cloud-based software and is an open source software. D2L has an official representatives' offices around the world in many countries [21]. This LMS has reached some significant achievements since their establishment. One of the most notable one is that in 2016, D2L was the first LMS to be accepted into National Federation of the Blind (NFB) new Strategic Nonvisual Access Partnership (SNAP) program and the second partner after Target Corporation [22].

Table 1 shows a comparison between some selected LMSs based on their popularity in the global as well as their popularity in Saudi Arabia. Canvas was included because its popularity has recently increased as it recorded 33% of newly installed systems among academic institutions in Europe [23]. In general, LMSs provide similar features for example discussion board, assignments submission, final results and lectures review. However, some features might be unique for some LMSs such as safe assignment submission that is available only in Blackboard [10].

5. LMS systems used in Saudi Arabia

Kuran, Pedersen and Elsner [23] show the percentage of the global usage of LMSs divided by the geographical location. The study shows that US and Canada region Blackboard 33%, Moodle 20% and Canvas 20%. Figure 1 shows these percentages. In addition, [23] provide the case of the European region as Moodle is the most popular LMS by 65% while Blackboard has only 12%. Furthermore, there were some countries nominated as they have different popular LMSs from the percentage presented above. These are It's Learning in Norway, Stud.IP in Germany, Olat in Switzerland and D2L in Canada [23]. In Saudi Arabia case, there are 28 public universities in Saudi Arabia and Blackboard is the most popular system in public universities, as 25 universities use it, which constitutes a percentage of 89%. This is followed by Moodle which is used by two universities, that is 7%. The remain university uses D2L which represent only 4%. Canvas has not been shown in Saudi Arabia yet.

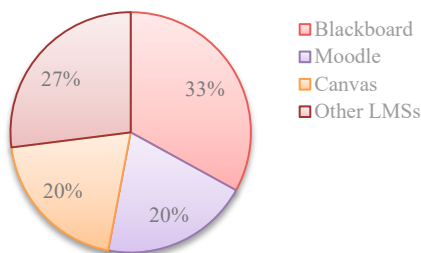


Fig. 1. LMSs percentage in the US (adopted from [23]).

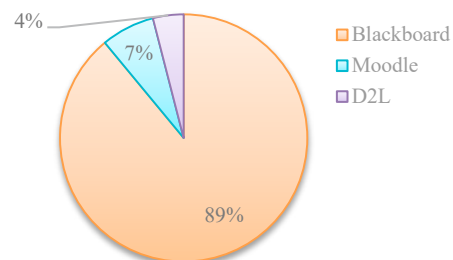


Fig. 2. LMSs percentage in public universities in Saudi Arabia.

6. Discussion

Recent data indicate that Blackboard LMS dominates other LMSs in Saudi public universities. This significant percentage might be due to several reasons. In Saudi Arabia, King Abdulaziz University at first introduced an eLearning system in 2006 by using Blackboard as the main LMS [24]. It seems like other universities followed the lead by King Abdulaziz University and apply Blackboard for their own universities. Another reason might be that these universities prefer to apply the commercial LMSs as they are configured and supervised by their original companies [25]. The final reason might be the professional advertisement by Blackboard Inc. among Saudi public universities which resulted in persuading around 90% of Saudi public universities to use Blackboard.

In virtual laboratories general case, Alkhaldi, Pranata and Athauda [16] reviews a numerous type of different virtual laboratories divided them by the original disciplines. For example, they refer to virtual laboratories in physics, chemistry, biology, computer and engineering. It is not easy to include the concept of virtual laboratories in each LMSs as each practical course requires different materials and laboratories. It is mentioned above one of the features of LMSs is the integration with some other components. In addition, Attardi and Rogers [26] demonstrate the use of virtual laboratory using Blackboard while de la Torre et al. [27] refer to another experiment using Moodle with Easy Java Simulations (EJS). Furthermore, Ak et al. [28] prove an experiment using a remote laboratory on LMS. Furthermore, as Aldiab et al. [29] highlight the importance of utilizing engineering courses in Saudi Arabia based on the available eLearning tools, further researches are recommended to focus on how to introduce experiments of engineering courses using virtual laboratories as well as the current states of telecommunication infrastructure and its capacity in Saudi Arabia if it accepts the bandwidth of that implementation.

7. Concluding remarks and recommendations

Most of the universities (around 90%) in Saudi Arabia use Blackboard LMS for their teaching and learning activities. Every LMS has similar features for communication and management for a course, however, currently there is no feature or tool available in any LMS to assist students or teacher to perform laboratory experiment in a distance learning platform. As the laboratory experiments are essential for most engineering and science courses, a feature for virtual laboratory needs to be developed and implemented via these LMSs.

References

- [1] Chaubey, A. Bhattacharya, B., Learning management system in Higher education. *International Journal of Science Technology & Engineering*, 2(3), pp.158-162 (2015).
- [2] Walker, D. Lindner, J. Technologies in Knowledge Sharing (2015).
- [3] Unal, Z. and Unal, A. Investigating and comparing user experiences of course management systems: BlackBoard vs. Moodle. *Journal of Interactive Learning Research*, 25(1), pp.101-123 (2014).
- [4] May, J.T. and Jacobs, S.E. The Predatory Pedagogy of On-Line Education: Ten Arguments for the Opposition (2013).
- [5] Roy, S. Characterizing D2L Usage at the U of C (Doctoral dissertation, University of Calgary) (2017).
- [6] Paulsen, M.F. Online education systems: Discussion and definition of terms. *NKI Distance Education*, 202 (2002).
- [7] Kaplan-Leiserson, E. E-Learning Glossary. 2000. viewed 1 October 2018 <<http://www.learningcircuits.org/glossary.html>>.
- [8] Pui, H.Y. Student management system (SMS) (2014).
- [9] Mahnegar, F. Learning management system. *International Journal of Business and Social Science*, 3(12) (2012).
- [10] Poulouva, P., Simonova, I. and Manenova, M. Which one, or another? Comparative analysis of selected LMS. *Procedia Soc. Behav. Sci*, 186, pp.1302-1308 (2015).
- [11] Cavus, N. and Zabadi, T. A comparison of open source learning management systems. *Procedia-Social and Behavioral Sciences*, 143, pp.521-526. (2014).
- [12] Holmes, K.A. and Prieto-Rodriguez, E. Student and Staff Perceptions of a Learning Management System for Blended Learning in Teacher Education. *Australian Journal of Teacher Education*, 43(3), pp.21-34 (2018).
- [13] Alam F, Hadgraft R and Alam Q, eLearning – Challenges and Opportunities. In: Alam F, editors. *Using Technology Tools to Innovate Assessment, Reporting, and Teaching Practices in Engineering Education*. New York: IGI Global; p.409 (2014).
- [14] Davis, L.L., Kong, X., McBride, Y. and Morrison, K.M. Device comparability of tablets and computers for assessment purposes. *Applied Measurement in Education*, 30(1), pp.16-26 (2017).
- [15] Simões, J., Redondo, R.D. and Vilas, A.F., A social gamification framework for a K-6 learning platform. *Computers in Human Behavior*, 29(2), pp.345-353 (2013).

- [16] Alkhaldi, T., Pranata, I. and Athauda, R.I. A review of contemporary virtual and remote laboratory implementations: observations and findings. *Journal of Computers in Education*, 3(3), pp.329-351. (2016).
- [17] Khairudin, N., Khairudin, R., Hamid, M.N.A., Hancock, P., McGill, T. and Zamani, Z.A. The Importance of Human Capital Perspective In The Learning Management System (LMS) Decision Making Process At Universities. *Jurnal Psikologi Malaysia*, 30(2) (2016).
- [18] Moodle. About Moodle, (n.d) viewed 1 October 2018 <<https://docs.moodle.org/36/en/History>>.
- [19] Bradford, P., Porciello, M., Balkon, N. and Backus, D. The Blackboard learning system: The be all and end all in educational instruction? *Journal of Educational Technology Systems*, 35(3), pp.301-314 (2007).
- [20] Canvas. About Us. (n.d). viewed 2 October 2018 < <https://www.canvaslms.com/about-us/>>.
- [21] D2L. About D2L. (n.d). viewed 5 October 2018 < <https://www.d2l.com/en-mea/about/>>.
- [22] D2L. D2L Partners with National Federation of the Blind to Help Make Learning Accessible to All. (2016). viewed 24 October 2018 < <https://www.d2l.com/newsroom/releases/d2l-partners-national-federation-blind-help-make-learning-accessible/>>
- [23] Kuran, M.Ş., Pedersen, J.M. and Elsner, R. Learning management systems on blended learning courses: An Experience-Based observation. In *International Conference on Image Processing and Communications* (pp. 141-148). Springer, Cham (2017).
- [24] Binyamin, S., Rutter, M. and Smith, S. The Students' Acceptance of Learning Management Systems in Saudi Arabia: A Case Study of King Abdulaziz University. Valencia, Spain, *International Academy of Technology, Education and Development (IATED)* (2017).
- [25] Ninoriya, S., Chawan, P.M. and Meshram, B.B. CMS, LMS and LCMS for elearning. *International Journal of Computer Science Issues (IJCSI)*, 8(2), p.644 (2011).
- [26] Attardi, S.M. and Rogers, K.A., 2015. Design and implementation of an online systemic human anatomy course with laboratory. *Anatomical sciences education*, 8(1), pp.53-62.
- [27] de la Torre, L., Guinaldo, M., Heradio, R. and Dormido, S. The ball and beam system: A case study of virtual and remote lab enhancement with moodle. *IEEE Transactions on Industrial Informatics*, 11(4), pp.934-945 (2015).
- [28] Ak, A., Topuz, V., Altıkardes, A. and Oral, B., 2018. Development of a Remote Laboratory Infrastructure and LMS for Mechatronics Distance Education. *EURASIA Journal of Mathematics, Science and Technology Education*, 14(6), pp.2493-2508.
- [29] Aldiab, A., Chowdhury, H., Kootsookos, A. and Alam, F., 2017. Prospect of eLearning in higher education sectors of Saudi Arabia: A review. *Energy Procedia*, 110, pp.574-580.