

A survey paper on e-learning based learning management Systems (LMS)

Chirag Patel, Mahesh Gadhavi, Dr. Atul Patel

Abstract— In the era of globalization, knowledge becomes necessary. Today it is very easy to share and disseminate knowledge due to evolution in technology. In this paper, we have included study of numerous e-learning based learning management systems(LMS). Each system is classified as per the parameters such as technology, features and platform-tools. Base on these parameters a new unified cloud based system is proposed with all these parameters and other new features.

Index Terms— Cloud based learning management system (CLMS), e-learning, Learning management System, Moodle

1 INTRODUCTION

After invention of Internet and WWW, the world has become a global village. Earlier it was very difficult to spread knowledge globally. But today it is very easy to share and learn by using the Internet. Internet has helped education system a lot by introducing concept called e-learning based Learning Management System (LMS). Many institutes started using these systems for serving different department needs. A traditional e-learning based learning management system (LMS) [2], [14], [16] is shown in fig.1. Generally, an LMS contains different components or modules. A course management module provides facilities of adding new courses, managing or updating existing courses, assigning teachers to courses and other course related details. Student management module contains student enrollment, student registration for regular and elective courses. This is very important module in order for other module to work properly with accuracy. Online examination module is generally used to automate the process of student evaluation and it is very helpful to a teacher as it saves lot of time. As no human intervention is required in this module, it provides 100% accuracy. In online assessment module, student can upload the assignment electronically so there is no need for submitting it by using paper. Therefore, it saves lot of papers. A teacher can upload tutorials, videos and other useful materials using online course material management module. By using this module student can view and download these materials for study. In feedback management module students are able to give feedback for each subjects and teachers and only authorized person can view the feedback. This is very helpful module for teacher assessment. It provides prompt and efficient output as compared to manual feedback system. There are certain LMS systems which are based on cloud [13], [15], [16] Bayesian network [1], ontology [3], [7], artificial intelligence [4], multi-agent [9], fuzzy knowledge [12], multimedia assisted teaching environment (MATE) [18], model driven approach [29]. The e-learning based LMS system can be helpful in project management [20], shared content management [24] also.

The remainder of this study is structured as follows. Section 2 presents related work in existing e-learning LMS.

After learning precedent systems' pros and cons, conclusion is included towards end of this study.

2 RELATED WORK

There are numerous e-learning softwares available in the market. It leads to confusion of choosing right system for particular institute. A web based LMS proposed by Nadire [4] is known as Easy Way to Evaluate LMSs (EW-LMS). It is mainly decision support system (DSS), which can help users to choose the best LMS system depending on their needs and their type of usage. It also provides DSS using smart and flexible algorithm, which saves time and efforts of users. The system is developed by using proprietary tools. Generally, most of LMSs are based on open source technologies. A web based LMS is proposed by Hamsiah Mohd Dahalan and Raja Maznah Raja Hussain [5] to help in assessment of teaching and learning. This system is developed using open source software Moodle [30]. Some LMSs are designed for providing virtual environment [6] to users for serving various purposes. An LMS system based on multi instance learning is proposed by Amelia Zafra et al. [8], to classify students in learning management systems. It mainly focuses on three activities: Quizzes, Assignment and Forum for the student classification. An adaptive learning system based on multi-agent system, Sharable Content Object Reference Model (SCORM) and semantic Web ontology for learning content storage, sequencing and adaptation is proposed by Mahkameh Yaghmaie and Ardeshir Bahreininejad [9]. To assess the qualitative information of e-learning system, Mona Alkhatabi et al.[10] proposed a framework by using web-mining approach. This framework could be helpful to the developers as well as the users of the system. These days e-learning is easily used in schools also. To provide e-learning environment in schools Kotzer Shulamit and Elran Yossi [11] proposed a system that is based on Moodle. It provides facilities like assigning teachers for different courses in a flexible manner. To facilitate teaching and learning the concepts of system design with UML and patterns

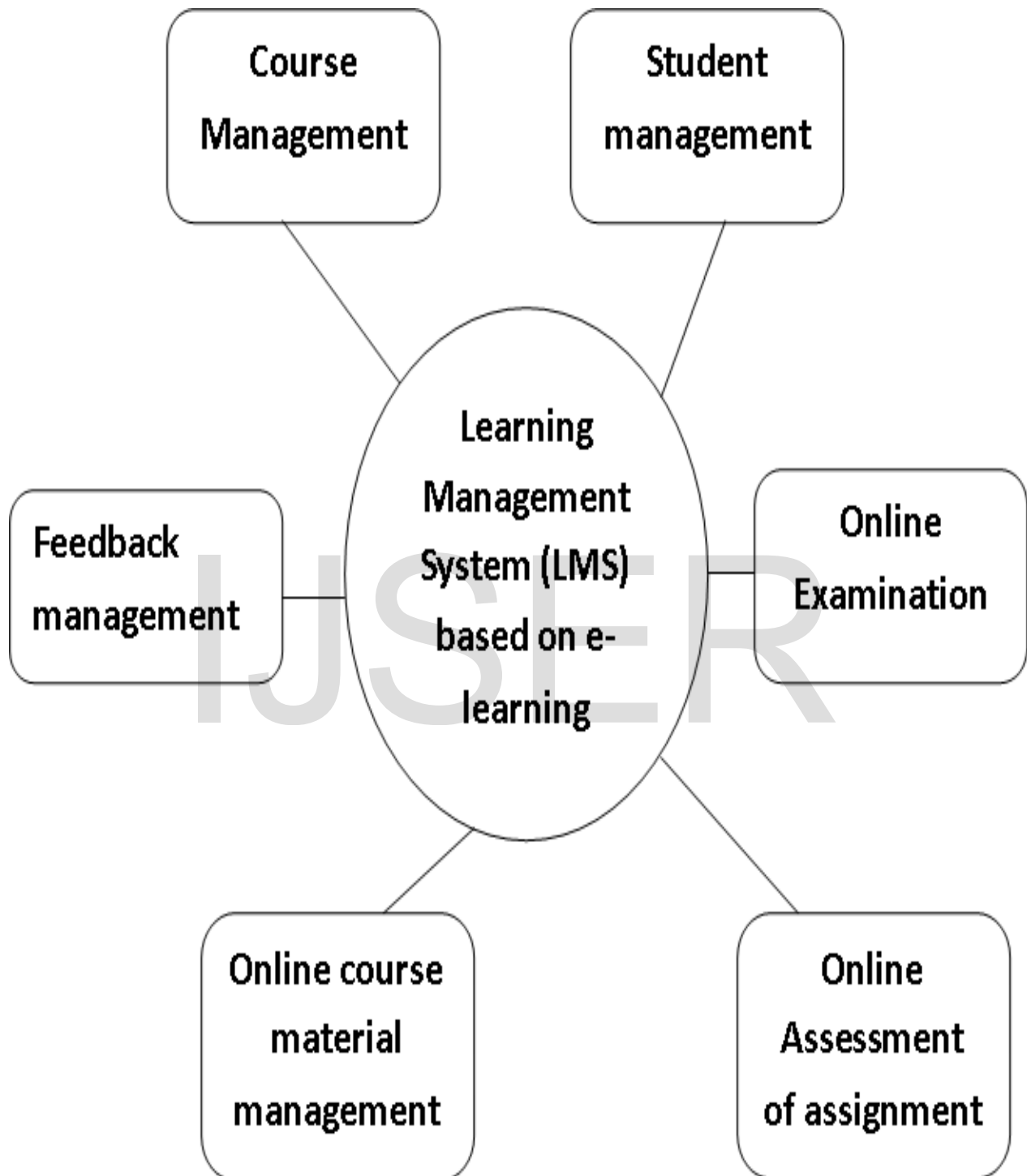


Fig. 1. Traditional LMS based on e-learning

Jacob L. Cybulski and Tanya Linden [18] developed a system known as multimedia assisted teaching environment (MATE). The system is mainly helpful to the students to learn and de-

velop good understanding of UML diagramming while developing software using object-oriented process. For distance learning of laboratory experiments of electric and electronic

Table 1. Comparison of different e-learning based LMS systems

Ref	Technologies	Features	Platforms and Tools
[4]	MS-Visual Studio.NET, MS-SQL Server	Tracking of learning, Testing, Registration, Online course material, Delivery, Offline course material, communication	Not Reported
[5]	Moodle	Assessment	Moodle
[6],[11], [28]	Moodle	Moodle features	Moodle
[8]	Not Reported	Quizzes, Assignment, Forum	Not Reported
[9],[10]	Java programming	Not Reported	Not Reported
[19]	C, C++, Java, XML, SOAP	Account Management, Security Protection, Collaborative Learning, Student Activity Tracking, Feedback Collection, Online electronic Experiment.	Pentium IV 2.80GHz, 512MB RAM, Window 2003 server
[21]	Stand-Alone, Web Based, Adaptive hypermedia, Semantic Web	Person and group information, person's profile and learning history, assessment, groupings of learning content, dynamic content sequencing, learner competencies, learning activities, searching across federated databases, connecting diverse eLearning tools.	Not Reported
[22]	Not Reported	Not Reported	CSCL tools: Collage and Gridcole
[23]	PHP5, Mysql, HTML, Javascript, XHTML, CSS	Carry out practical, assignments in astronomy, automatic control, chemistry, image processing, robotics, and real-time operating systems.	Ciclope software, Apache
[25]	Not Reported	Face to Face (F2F) Learning over internet, Discussing on forum, studying lessons, solving self test, creating seminars, course creation, examination, evaluation	AHyCo Tool
[26]	Moodle	Student motivation and Interaction patterns.	Apache
[27]	Moodle	share education institutes learning object repositories	LOP2P Plug-in, Java language with JXTA framework
[29]	Not Reported	Course access, video and animation, quiz, virtual classroom,	Adobe Connect Professional, Adobe Presenter, Adobe Captivate software, Adobe Flash, 3ds Max Studio.
[32]	Not reported	Virtual Lab Experiment For Power System Education	LabView Player, LabView Environment
33]	PHP, XML	laboratory experiments in automatic control, biomechanics, and fluid mechanics	SysQuake Remote
[34]	Not reported	Learning management system features, online virtual experiment	Active Document (AD) system

measurement courses Sergio Rapuano and Francesco Zoino [19] developed an LMS with the facility of remote access of the laboratory instruments. This system is able to integrate with old LMS system also. Students are able to perform practical from remote location by using a web browser. Knowledge should not have boundary. An LMS should be able to work beyond the boundary. To achieve this objective Dagger, D et al. [21] suggested service oriented e-learning platform for designing flexible LMS. To understand concept of network management using LMS Hernandez-Leo et al.[22] proposed collaborative learning strategies. It helps teacher to use the authorization during collaborative work. This system could help Collage and Gridcole for the design and enactment of a distance collaborative learning environment. To reduce paucity of resources Raquel Cedazo et al. [23] suggested free software project for solving lack of practical assignment problem in technical Universities. The authors proposed a modular structure design based different modules and plug-ins that are easy to install, configure, and extend as per the requirement of a teacher. This project is open source and it comes under GNU license. Natasa Hoic-Bozic [25] proposes a model for face-to-face (F2F) and online learning management. The authors used proprietary tool named as AHyCo for active and interactive learning environment to motivate the students. Sometimes students need motivation for actively concentrate on learning activities. Due to lack of motivation, they can face many problems in their studies and they might not be able to perform well during evaluation. By considering this factor, Mario Muñoz-Organero et al. [26] proposed an LMS as motivation predictor to understand student behavior and interaction patterns. By using this system, a teacher can identify motivational level of students based on their emotions identified by the system. So using these data a teacher can improve teaching methodology. The authors interacted with 180 students of six different universities in three consecutive years. Sometimes it becomes inevitable to share learning repositories among different institutes using LMS. The Architecture for Learning Objects Sharing among Learning Institutions–LOP2P is proposed by Rafael de Santiago and Andre´ L.A. Raabe [27] to achieve this objective. The architecture contains two main components: plug-in as working LMS and Mediation layer for communication among LOP2P networks and LMS. It decides what should be available to share different learning objects among different institutes. To learn basic course of computer architecture María A. Trenas et al. [28] suggested new Moodle module called CTPracticals to improve teaching of practical of basic computer organization. It contains various modules for teachers and students for practical assessment. For Mechatronics Education Özgür Yılmaz and Koray Tunçalp [29] suggested a web based mix learning approach model. The authors

studied effect of perception methods like reading, listening, and speaking, and practice methods developed in accordance with the characteristics of the students who are from different disciplines. To conduct remote experiment by using virtual laboratory Mihaela M. Albu et al. [32] developed efficient system based on Internet. The system is multiuse and developed in LabView environment. The main benefit of this system is that the students can access their laboratory equipments from anywhere across the globe. The main goal of the system is to conduct practical of power engineering using this virtual laboratory. A collaborative system for engineering education is presented in [33]. The system is flexible for selected pilot courses in engineering education. The authors introduced a PHP scripting based tool called SysQuake remote for preparing experiments and analyzing results. Using SysQuake students can analyze their experimental data stored in either eJournal or loaded from the local disk, identify a nonparametric frequency response, and match the coefficients of a continuous-time transfer function. Similar approach is reported in [34]. This system is divided in three parts: prelab, lab and postlab. In prelab phase, students can use virtual lab from their home in collaborative manner by using simulation. In lab phase student can solve problem in real sense. In postlab phase, students can use virtual environment and learning is done by reflecting. It can help students to develop abstract concept. The focus of this system is to gain understanding of chemistry experiments. Remote laboratories have become more popular these days. There are many benefits of remote laboratories as it is discussed in this section. Martyn Cooper and Jose´ M.M. Ferreira [35] provide valuable insights about virtual laboratory systems such as Practical Experimentation by Accessible Remote Learning (PEARL), Labs on Web and Lego Mindstorm-Based Remote Labs.

The detailed comparison of different LMS is shown in table 1. There are many LMS available for serving different purposes. Many of the systems are based on Moodle and contain different features like course management, account management, security protection, virtual classroom, face to face learning over internet, feedback management, and many other common features, which are mentioned in table 1. However, none of these systems is unification of all the feature i.e. there is no LMS available in which all the features discussed in table 1 are combined together.

3 CONCLUSION AND FUTURE WORK

We have presented comprehensive study of different e-learning based LMSs. This study would help researchers involved in development of e-learning based LMS.

In the world of cloud computing, there is a need to

Using this feature, workshop of different educational sub-



Fig. 2 Architecture of Cloud based Learning Management System (CLMS)

develop a cloud based learning management system (CLMS) which can incorporate all the features discussed in previous section and new features like automatic assignment evaluation with the integration of plagiarism detector and keyword matching, web based virtual workshop management and single sign on. The proposed system is presented in the following fig 2. The novel features such single sign on, virtual workshop management and automatic assignment evaluation are explained as follows:

- Single Sign on
Using this feature a user can access the system by using his/her existing institute user account. We do not need to create new user account for any institute user in our pro-

jects could be conducted for rural area, institutes and schools where subject expert cannot go and educate directly. Therefore, the main purpose of this feature is to provide global education to the students of rural area and they can have the chance to interact with different subject experts across the globe without meeting them personally.

- Automatic evaluation of assignments
This feature is very useful to reduce teacher efforts to evaluate a student assignment. By integration of plagiarism detector software system can decide what amount of text is plagiarized. And using approximate text matching and plagiarism system can evaluate and give marks / grades to a student. So no human is required to evaluate

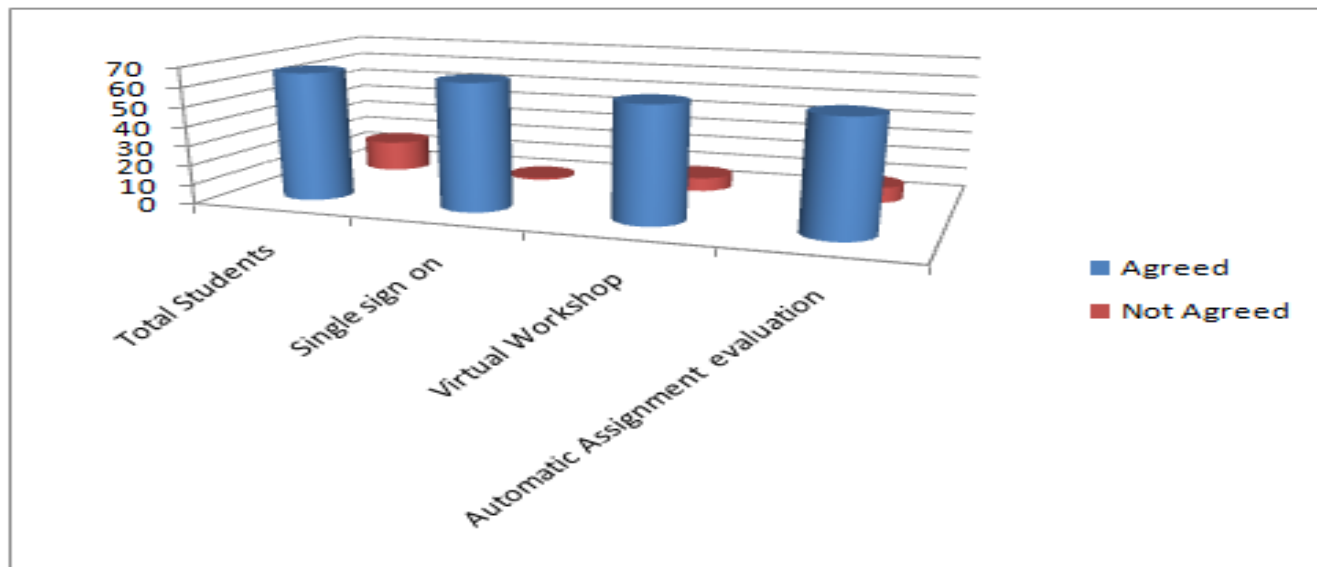


Fig. 3 Number of student agreed and not agreed on three novel features student assignment.

- Virtual workshop management

We have also conducted survey based on above three novel features among Masters Students of Computer Application

from our institute. We know that survey results are not authentic because of type of people providing feedback for the survey. To solve this problem we conducted this survey after counseling students for 30 minutes about these novel features. We have obtained the interesting results shown in fig 3, which is shown in the form of graph. Out of 66 students, 98.48% agreed to have single sign on feature, 89.39% agreed to have virtual workshop feature and 87.88% agreed to have automatic assignment evaluation in CLMS.

It is quite evident that the cloud-based system would help the educational institutes or Universities to share and disseminate knowledge among students, teachers and researchers.

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