Survey on Most LMS Problems Caused by Lack of Infrastructure

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***Abstract*—One of the technological developments that has produced better prospects for e-learning and become essential is cloud computing. Since e-learning significantly relies on technology, learning management systems hosted on cloud computing platforms must adopted in order to provide alternatives to the outdated infrastructure of education institutions. In this paper, we used quantitative methods, including a Likert scale questionnaire and statistical analysis of the data gathered, to determine how the university's teachers dealing with Learning Management Systems (LMS). We found that, on average, teachers use 80% of LMS's features, and that, on average, they have 48% of the system's problems that teachers face while using LMS.**

***Keywords*—cloud computing, E-learning, Learning Management Systems (LMS), Moodle**

I. Introduction

Several universities try to shift their e-learning platforms to the cloud systems. Especially those in developed countries with inadequate facilities shortages of infrastructures [1]. To deliver on-demand services, it is now possible to dynamically deploy computer, networking, and storage resources. Dynamic resource management has therefore received a lot of attention in an effort to enhance performance, accessibility, energy, and economy for both cloud computing consumers and providers [2].

Users can share resources, data, and applications in a cloud environment using the cloud computing platform, which is an Internet-based computing environment. There are four categories for the Cloud based on the type of deployment model: private cloud; public cloud; Community Cloud; Hybrid Cloud. There are five main actors who define their responsibilities and functions in the cloud ecosystem: users, providers, brokers, operators, and audits. There are three types of services available in the cloud: software as a service (SaaS), platform as a service (PaaS), and infrastructure as a service (IaaS) [3].

E-learning emerged as a result of distant education, rising internet usage, and other digital communication networks. It uses a range of formats and features that could be beneficial for the kids. In information technology, e-learning and virtual classrooms are gaining popularity. While asking questions to identify the most often utilized features of the LMS (Moodle as case study) and the most common issues teachers encountered when using the system, the pros and cons of cloud-based education were examined in our study through reviews of other research in this area.

The following are the main two research questions:

RQ1: What are the most tools and functions used in Moodle system?

RQ2: What is the problem cased because the low infrastructure in the education instruction?

II. Related Work

Several research has been done in this area, Al-Hunaiyyan in order to gather more information about instructors' perceptions of LMS, their usage of LMS tools and features, as well as any barriers that would prohibit GUST academics from efficiently using LMS, a questionnaire was developed and produced as part of the study's quantitative approach. The questionnaire was reviewed and modified with the assistance of industry experts. Four components make up the questionnaire: Section I, which asks about demographic data, Section II, which inquiries about instructors' opinions of learning management systems, Section III, which inquiries about instructors' usage of the tools and features provided by LMS, and Section IV, which inquiries about the use of LMS. The items on the questionnaire were of the 5-point Likert variety. 15 teachers participated in a pilot test to evaluate the instrument's dependability [4].

Zaim study used quantitative technique and is descriptive in nature. The study's main subject was the LMS of SMKN 2 Padang. The population of the study consisted of XI grade accounting students. Six English teachers make up the Taro Yamane Formula sample's 144 participants, leaving 138 of them to be students. The instrument consisted of two questionnaires that were distributed to English teachers and students at SMKN 2 Padang. The tool utilized to collect data for this study was the USE Questionnaire program. The 30 questions in the USE Questionnaire package address four main themes: usefulness, usability, learning accessibility, and satisfaction. The Likert scale models will be used to produce five survey replies. The researcher has already developed a set of questions for the second questionnaire to further understand students' perspectives of LMS in English learning [5].

Nguyen in his study association between the study's components should be evaluated using a quantitative approach. The fundamental idea behind this technology is data assumption forecasting. The quantitative approach was

employed at International University (IU-VNU HCM) to assess the variables influencing students' satisfaction with Blackboard and Edusoft. The quantitative consists of three components: The first segment would contain demographic information; the second would contain surveys measuring four independent factors that affect students' pleasure through an intermediary factor; Questions using a five-point Likert scale would be included in the survey's second and third sections. (1) Strongly disagrees, (2) disagrees, (3) neutrally agrees, (4) agrees, and (5) strongly agrees. There are 38 items in the questionnaires [6].

Mohammadi, the qualitative study approach was used to disprove the administrative staff's claims about the drawbacks of utilizing the Higher Education Learning Management System (HELMS) and to identify possible factors that may affect how both educators and students use "HELMS". The following six aspects, which are classified as being related to corporate culture, technical, service quality, skill, as well as policy and governance, were found to be the primary areas of analysis for determining the obstacles associated with using HELMS. The data was provided by four public universities in Afghanistan. These universities were among those who started utilizing HELMS as their main teaching strategy during the COVID-19 pandemic. The interview questions were directed at the university management, teachers, and students. Following the collection of data, 40 members. According to the data, eight major factor groups infrastructure, economy, university administration, ICT and HELMS literacy, performance expectations, content quality, LMS quality, and lecturers' behavior, all had an effect on how frequently students used HELMS. In contrast to many studies in developing countries, the results show that basic influencing factors like infrastructure (internet, electricity, and hardware), economics (the cost of internet and associated hardware), and ICT skill have a significant impact on the use of learning management systems among students in Afghanistan [7].

Zdravev suggested a backup of a Moodle instance's files and database. We later used these files and the database backup when restoring our Moodle instance on Azure. We created a Virtual Machine Scale Set (VMSS) for Azure. The initial instance of the VMSS is a virtual machine running the Linux Ubuntu 18.04 LTS operating system, with two CPU cores and seven gigabytes of RAM. From the old Moodle instance to the new one, we transferred the frontend files. After that, the Load Balancer (LB) was created and attached to VMSS. The LB distributes incoming traffic among the VMSS instances. As a result, there is a decrease in effort and proper management of consumer needs. We set up a MySQL server (version 5.7 of MySQL) and restored the database backup from our [8].

Shetu according to their study report, the system will be used throughout the nation's rural areas and will be linked to the Internet by a website. Teachers, students, and administrators will all use the website that the programmers construct. The programmers can update the domain and make changes to the web pages as needed. Teachers, pupils, and administrators have access to their profiles and can log in to the service to access the user Database (DB) and carry out their duties [9].

Elmasry and Ibrahim in their paper suggested that the university's systems and services be connected to other cloud service models. In contrast to the PaaS and IaaS cloud models, which are used for applications and hardware and operating systems, respectively, the SaaS cloud model is utilized for services like Virtual Classroom, Video on Demand, LMS, and Mailing System. It was found that academic use of the hybrid cloud, a flexible structure that combines the advantages of both public and private clouds is best. After considering the advantages and disadvantages of various cloud computing implementations, this decision was made [10].

III. Cloud Computing Service Levels

Cloud computing services divided into three parts firstly, Software as a Service (**SaaS**), secondly, Platform as a Service (**PaaS**) and thirdly Infrastructure as a Service (**IaaS**) [11].

1. Software as a Service (SaaS): In this type, customers access cloud-based applications remotely while also using local server and computer programs. The kind that the client sees is that kind. Software as a service (SaaS) applications use "thin clients"—either software or hardware—to connect. They consist of online services like Facebook, Google Maps, and cloud storage, as well as those that websites can integrate into their apps, like PayPal [11].

2. Platform as a Service (PaaS): In this case, the customer uses some tools, such as programming languages given by a cloud provider, to develop apps on the cloud infrastructure. Making a user-friendly web interface using the (PaaS) is an illustration of this. Such a platform can include hosting and development tools to facilitate the development, testing, and use of a web application. The user manages the platform-based applications while the provider controls and maintains the infrastructure, including networks, servers, and platform upgrades [11].

3. Infrastructure as a Service (IaaS): Customers who use (IaaS) have access to fundamental computer resources that they can use anyway they see fit. Users can install, utilize, and control any operating system, computer, or local server. The provider protects the cloud infrastructure. IaaS, or infrastructure as a service, is a scalable and economical method of delivering IT services [11].

IV. Cloud Computing Deployment Model

Public cloud, private cloud, community cloud, and hybrid cloud are the four main ways that cloud services can be deployed. Using the cloud deployment concept, cloud services are deployed through the Internet. Each form of cloud deployment has been specifically created for a specific kind of solution.

1. **Public Cloud:** This kind of cloud computing involves a third party, the service provider company, providing the service. The provider company manages services including servers, storage spaces, and applications, all of which may be accessed via the browser by following a few simple instructions and paying the applicable fee. Microsoft Azure, AWS, and Google's Gmail are examples of public clouds.

2. Private Cloud: Large corporations typically keep their data and work on servers that are only accessible within the corporation. Sometimes, these businesses host a portion of their data with another service provider, or they lend a portion of their servers to provide people or organizations access to the cloud. Some examples of private clouds are those from IBM, Microsoft, and open stack [11].

3. Community Cloud: Government cloud is an example of a community cloud. It is similar to a private cloud, but the infrastructure is set up for restricted access by a particular group of users.

4. Hybrid Clouds: Most medium-sized and small businesses cannot afford private servers to store data and conduct business, so they utilize a hybrid cloud, which combines public and private cloud services. To conserve space and money for the private part of the cloud, which is more expensive, these businesses preserve their data and sensitive work that requires a high level of security in the private half and publish the remainder of their work on the public part.

The hybrid cloud model and the multi-cloud model have notable differences. One platform is created for on-premises operations by a hybrid cloud. A multi-cloud design consists of two or more public cloud providers, but no on-premises infrastructure. AWS, Microsoft, and Google all provide private resources in addition to public cloud resources [11].

V. Cloud Services' Impact on Education

Higher Education Institutions (HEIs) that provide college- and graduate-level instruction must stay current with technology advancements. These organizations used to spend a lot of money on Information Technology (IT), but they were also expected to provide the community with high-quality, affordable educational offerings. Recent outbreaks of the Coronavirus 2019 (COVID-19) pandemic in several nations have altered how education is provided globally. It is crucial to use new technologies to address the problems caused by this epidemic [12].

Additionally, some nations, including developing nations, have difficulty providing education on a broad scale because the majority of their regions, especially rural ones, lack basic university educational services. As a result, these nations have started looking for alternatives to provide education in these regions.

It is even more crucial that HEIs concentrate on providing high-quality services in order to meet the current difficulties. Finding innovative ways to use infrastructure to ensure service quality is so essential.

For instance, by combining cloud computing deployment with the necessary software, infrastructure, and storage, institutions can attain sustainability. Virtual collaborative learning, which is a significant benefit of cloud computing, is advantageous for both teachers and students who want to integrate computer-based technology into their pedagogies to enhance cooperative learning strategies and boost student enthusiasm. E-learning platforms, data monitoring, and data archiving capabilities are additional benefits of cloud computing. Cloud computing technology not only saves money but also energy since infrastructure is used concurrently for the purposes of teaching, learning, and research by multiple stakeholders [12].

VI. Services of Cloud-based Education

Cloud-based learning is the biggest trend in the educational industry. The flexibility it offers to create, share, and collaborate from anywhere, at any time, in any location, is at the heart of everything. Several colleges have already adopted cloud computing to create adaptable learning environments [13].

1. **Saving and Publishing**: Teachers can preserve and due to the limitless storage capacity of the cloud, teachers can share their instructional resources with pupils. Updated and shared files can be found on the cloud.
2. **Universal Accessibility:** Students can access the internet utilizing cloud computing rather than books and other things. Due to programs being housed on cloud servers, cloud learning also offers low-cost terminal access. The underprivileged world will greatly benefit from this.
3. **Collaboration:** Through convenient interactions, learners can cooperate to build knowledge in the cloud. They can monitor their academic progress and results. Interaction enables the full utilization of knowledge.
4. **Students Come First:** Humans are the main focus of cloud learning. It satisfies the demands of the learners. When using the cloud, students can pick the right resources and monitor their unique processes and results.

VII. Approach Taken in This Research

Table 1. Question and objectives

Obj.1	To discase the functions and tools that used in Moodle.
Q1	Use assignment.
Q2	Chatting with my students.
Q3	Use quizzes function.
Q4	I upload files via Moodle.
Q5	I share URL links for video and file in Moodle.
Obj.2	To discase the Problem caused by low infrastructure serve
Q1	I can't login to the Moodle in some time.
Q2	Problems faced by students when performing quizzes.
Q3	Problems faced by students when answering assignments.
Q4	I cannot make quizzes for a large number of students at one time.
Q5	System hangs while doing quizzes for a number of students.
Q6	The system takes a long time to allow all students to enter a particular event.
Q7	The size of the files allowed to be uploaded to Moodle is small.
Q8	The system cannot perform a recovery when a system failure occurs.

To obtain the research objectives we created and constructed a questionnaire as part of the study's quantitative methodology to learn more about educators opinions about LMS, their use of LMS features and tools, through this questionnaire, a set of questions were asked, divided into two groups. The first part

consists of five questions. The aim was to identify the amount to which teachers use a set of the most important functions provided by the Moodle learning management system. As for the second part of the questionnaire, it consisted of eight questions, the aim of which was to identify some of the problems that teachers face while using the system, and the focus was on problems that occur due to poor infrastructure and the server that works to manage the Moodle learning management system. Participants in the study were a group of teachers at the university, since the teachers are the most people who deal with the system constantly and face the problems that occur, as well as they are aware in the event of any problem from the students in the classroom. The number of participants in the study is 28 teacher giving lessons for various degrees for bachelors and master's degrees. Table 1 shows the questions that were asked in the study, divided into two groups according to the objectives

Through the first part consisting of five questions, the most important functions provided by the Moodle learning management system were presented as in Fig. 1, and the increased use of them may cause problems due to the inability of the server to accommodate the large number of users.

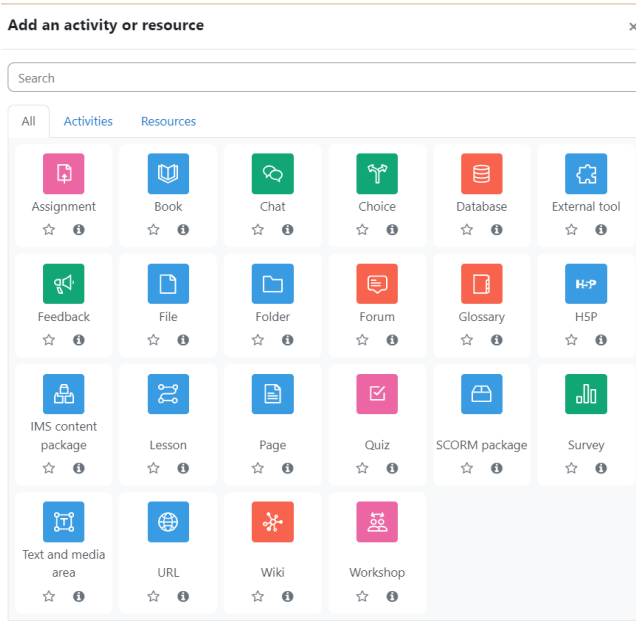

Fig. 1. Important functions provide by the Moodle LMS.

In the second part, most of the problems that could occur to the system during the increased use and the increase in the number of users were addressed, through eight questions that cover some of these problems. The questions designed with a five-point Likert scale. (1) Strongly disagrees, (2) disagrees, (3) neutrally agrees, (4) agrees, and (5) strongly agrees.

VIII. Result and Discussion

By analyzing the results obtained from the questionnaire it is revealed,

1) The first part of the questionnaire concerned with the extent to which teachers use the most important functions provided by the Moodle system.

Table 2. Important functions used by teacher

Obj1	**strongly agrees**	**agrees**	**neutrally agrees**	**disagrees**	**strongly disagrees**	100%
Q1	46%	36%	18%	0%	0%	86%
Q2	7%	21%	46%	14%	11%	60%
Q3	36%	39%	7%	14%	4%	78%
Q4	75%	25%	0%	0%	0%	95%
Q5	39%	39%	14%	7%	0%	82%
Average						80%

Through the results shown in Table 2, the percentage of use of each of the functions provided by the Moodle system is shown, assignment (86%), Chatting (60%), quizzes (78%), upload files (95%), and share URL (82%). The process of uploading files to the system is one of the most used functions by teachers, as each teacher uploads the courses for each subject, whether it is the method of delivering lectures electronically or in the classroom, so it is necessary to provide sufficient space to upload these files. The total percentage of this axis, which represents the percentage of using these functions (80%), it is considered a relatively high percentage that must be taken into account in the event that there are problems facing teachers in one of these functions.

Table 3. Standard deviation of used function

Questions	Q1	Q2	Q3	Q4	Q5
MEDIAN	4.0	3.0	4.0	5.0	4.0
STD. DEV.	0.8	1.1	1.2	0.4	0.9

Table 3 shows the amount of standard deviation relative to the median and average for each question, as it was found that question (4) has the largest deviation value from the normal reading, with the rest of the values varying for each question, as shown in Fig. 2.

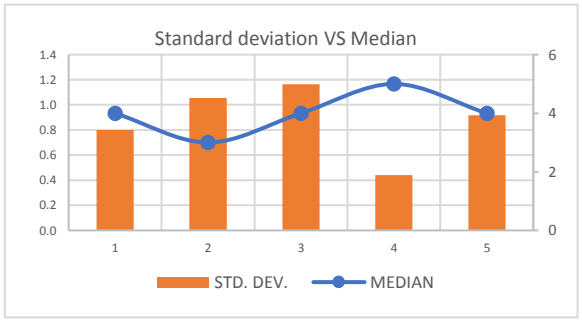

Fig. 2. Standard Deviation VS Median.

The standard deviation of the first axis indicates that the percentage of deviation for the questions asked is within the acceptable percentage. Question No. 4 indicates that there is a significant deviation from the normal level.

2) The second part of the questionnaire consists of eight questions and is concerned with the expected problems that will arise when the number of users on the system increases and the server is unable to accommodate all users.

Table 4. Percentage of acceptance for each question

Q#	strongly agrees	agrees	neutrally agrees	disagrees	strongly disagrees	100%
Q1	4%	4%	21%	46%	25%	43%
Q2	0%	21%	32%	39%	7%	54%
Q3	0%	0%	25%	64%	11%	43%
Q4	0%	18%	18%	57%	7%	49%
Q5	7%	14%	21%	50%	7%	53%
Q6	0%	14%	36%	32%	18%	49%
Q7	11%	0%	25%	46%	18%	48%
Q8	0%	4%	25%	54%	18%	43%
Average						48%

Table 4 shows the percentage of acceptance for each question regarding the problems that teachers face while using the system, login problem (43%), quiz (54%), assignments problem (43%), problem when large number want enter quiz (49%), System hangs (53%), long time process (49%), small storage space(48%), recovery problem (43%). The total percentage for problem faced by teachers (48%), this number Indicates a problem in server in processing (CPU and RAM) and problem in storage space must be solved to avoid any problem faced by teacher and student and avoid system hangs during perform examinations and lost the data.

Table 5. Mean and SD for each question

#	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
MEDIAN	2.0	3.0	2.0	2.0	2.0	2.5	2.0	2.0
STD. DEV.	1.0	0.9	0.6	0.9	1.1	1.0	1.1	0.8

Table 5 shows the mean and standard deviation for each question in this axis, Fig. 3 shows these values more clearly.

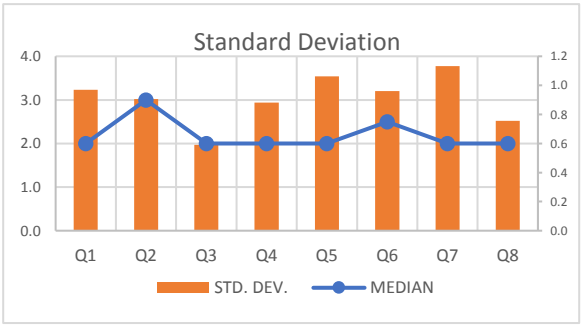

Fig. 3. Mean and SD vs Median.

The standard deviation of the second axis shows that the percentage of deviation for the questions asked is within the acceptable percentage. It is shown through the graph that question No. 7 has the largest deviation from the normal level.

IX. Conclusion

Capabilities of institutions and e-learning platforms are crucial issues in education. Universities are investigating the use of virtual learning as a substitute for conventional education. Despite the lack of infrastructure and the limited resources available to them, there is an increasing need for educational institutions, particularly those in developing countries, to employ e-learning methods. This is creating disconnect between what is needed and what is possible, which could lead to subpar learning services. By hosting Learning Management Systems and other educational applications, cloud computing can help close the gap. To deliver top-notch learning services, cloud-based learning management systems offer a productive environment for service-learning. This paper disease the most problem the faced by the teachers and student throw using LMS and identifying percentage of each problem using questioner with Likert scale and statically analysis. The rustle shows from the section one of questioner there is percentage 80% that teachers use the function provide by Moodle LMS, from Section II in the study shows that percentage 48% there is problem in server this cased some problem in Moodle system during use and when increase the student number. In the future study, we aim to expand the target segment of the questionnaire by asking questions to students and (LMS) administrator at the university to obtain more accurate results, diagnose problems and propose solutions.

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