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Analysis and Classification of Prospective Learning Management Systems

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ABSTRACT: The shifting face of education and technology has spawned a slew of new ideas, and today's top educational technologies come in a variety of shapes and sizes. The major goal is to include students and figure out how to make the most use of current digital resources to help them learn more effectively. One such technology that is pushing education to the next level is the Learning Management System. Academic institutions are attempting to discover the perfect mix of students, faculty, procedures, and systems to administer their learning programmes in today's environment. Learning Management Systems (LMS) are becoming an interface for course registration, course material management, student assessment through assignments, quizzes and examinations, institute administration, evaluation, and report generating. Indian educational institutes are likewise interested in incorporating LMS into their teaching and learning processes. This paper provides a comparative examination of a number of prospective Learning Management Systems (LMS) that might be used for teaching and learning activities in Higher Education Institutions.

I. INTRODUCTION

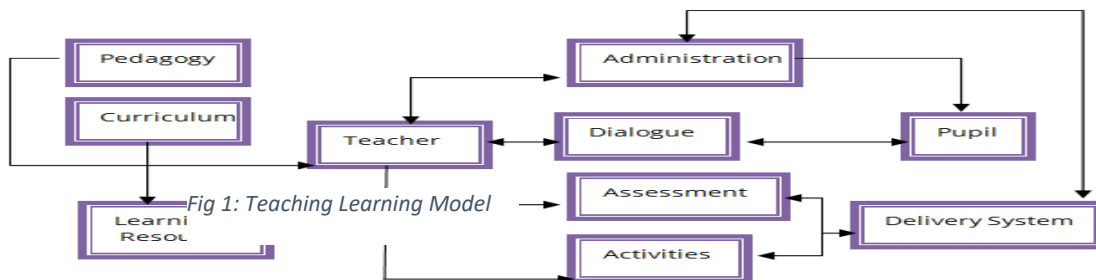
As a result of the e-revolution, India's educational system is undergoing a huge shift. Because of the rapid expansion of Internet technology and its wide range of applications, the usage of a learning management system (LMS) in education has become a realistic and cost-effective alternative. The total number of Internet users in the country has risen from 795.18 million at the end of December 2020 to 825.30 million at the end of March 2021, registering a quarterly growth rate of 3.79 per cent, showed data by the Telecom Regulatory Authority of India (TRAI) released on Friday [1a]. The Learning Management System (LMS) has been utilised in a variety of institutions to connect students and lecturers outside of the traditional classroom, and it has had a positive influence on students. Earlier studies conducted at universities throughout the world have proved the benefits of using a Learning Management System in a higher education setting.

Learning management systems (LMS) are a set of tools and partial software applications that can be used to simulate a real teaching/learning environment and allow students to study at their own pace 24 hours a day, seven days a week, 365 days a year. Information and communication technology (ICT) are utilised to support both cognitive and psychological education processes. The source code of a software that is widely available to the public for extension and modification based on the user's demands is known as open source (OS). Because there are so many open source LMSs available, it can be difficult to choose one that meets the teachers' requirements. The internet is readily available and accessible in this era of information technology, especially in urban regions, which are home to the majority of schools and institutions. The internet is a large computer network that connects smaller computer networks all over the world. It includes commercial, educational, governmental, and other networks that all use the same set of communications protocols. Most of the respondents used the Internet more frequently, with 70 percent of them indicated using it daily, 16 per cent of them more than two or three times in a week, 12 per cent of them once a week and 2 per cent of them occasionally [1].

II. TEACHING LEARNING MODEL

In an academic institution, a well-managed information flow can help to raise academic standards and promote greater equity. The intellectual community's information-seeking activities and access to information have gotten considerably easier, faster, and more cost-effective with the arrival of the Internet.

The common features of any education learning management system are listed below:[2]



1.Content management: Lecture notes and other course materials Soft copies of the suite could be included and uploaded in tandem with classroom instruction.

2.Assessment and testing: All tasks will be distributed and submitted via LMS, and quizzes and tests will be graded immediately.

3.Curriculum Planning: The LMS will be used to create the course plan and lecture schedule.

4.Reports generation: LMSs provide useful reporting tools, including the ability to modify student reports.

5.Communication and collaboration: Some learning management systems include communication features such as chat and forums, as well as collaborative tools such as wikis, blogs, and glossaries.

6.Classroom and college announcements: In the LMS, announcements display all classroom and college news in the form of updates.

III. WORKING OF LMS

The LMS is defined as “a set of tools and a structure that enables the relatively simple construction of online course content, as well as the subsequent teaching and management of that course, including various interactions with students enrolled in the course.” A learning management system (LMS) is a collection of pedagogical devices, human interactions, learning content, and evaluation tools that support and advance traditional learning in schools and higher education. A learning management system (LMS) is a useful content distribution system that allows instructors to share course materials and communicate with students remotely. The LMS will assist lecturers in providing learning materials as well as interactive tools including thread discussions, shared files, and forums. As previously said, LMS also helps with management tasks including delivery and tracking, examination, planning, virtual live classrooms, and many statistical analysis. This may save lecturers a lot of time and effort without making any substantial change in teaching process [3].

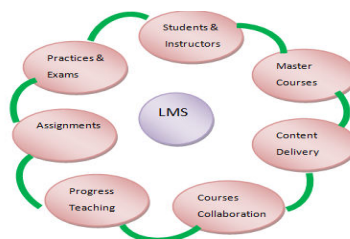


Fig 2 :LMS Modules

Students can use the LMS to interact with one another. As a result, the key elements of an LMS include threaded conversations, video conferencing, and discussion forums. The purpose of a learning management system (LMS) is to track students' progress and performance. The LMS is seen as more than simply an instructional trend; it is also a tool that benefits its users. The LMS, as a web-based learning platform, allows for access to learning content and administration at "any time, any place, at any speed". LMS can also help students to access learning information via course guidelines, uploading assignments and downloading marks, active interactions between students and lecturers, interactions between students and learning tools, sharing knowledge, and taking online exams and quizzes [4].

Based on a literature review of past studies, LMS can be categorised into three main types: learning skills tools, communication tools, and productivity tools. Learning modules, which generate exercises and acquiring tools for students, are an example of a tool for learning skills. Quizzes, online presentation tools, and assignments are examples of these tools. A quiz module would contain a number of features, including a question database, a response facility, a marking scheme, and a way to help students do better. Meanwhile, the online presentation tool facilitates presentation to be uploaded to the LMS or linked from websites like YouTube.

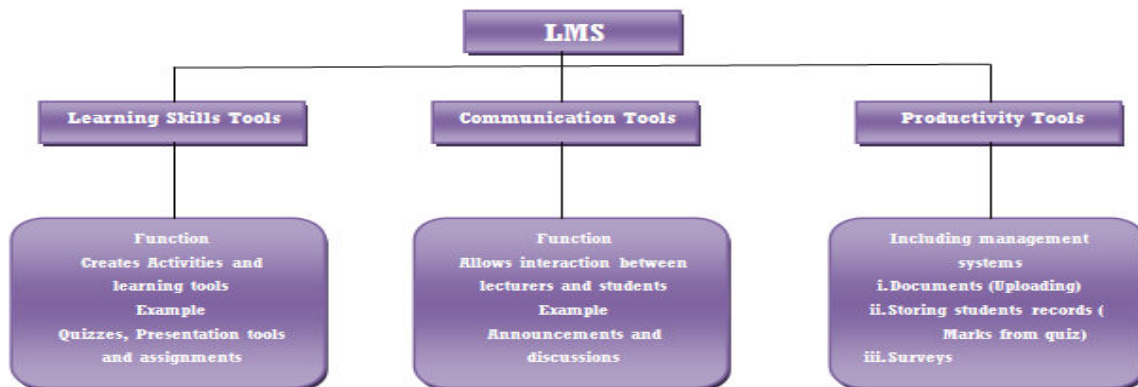


Fig 3 LMS Categories

The lecturer will post the assignment to the LMS, students will complete the assignment online, and they will be able to revise or send the assignment at any moment until the deadline.

Communication tools are the second group. These tools allow professors and students to interact, as well as students to interact. The most popular communication medium is announcements, which are used to communicate any information about the course to all students, including the most recent news and forthcoming activities. Furthermore, conversations are incorporated as communication tools, allowing both students and lecturers to publish and reply to messages, as well as view other users' remarks.

LMS productivity tools, including as document management systems, calendars, and surveys, are available. Lecturers and students can upload and download files from any computer with an internet connection using document management solutions. Other LMS management solutions collect data on how often students use the LMS and how well they do. Students can get a report of their total performance, including grades for each assignment, quiz, and test, on several LMS.

IV. E-LEARNING SYSTEM CATEGORIES

Learning Management Systems (LMS), Learning Content Management Systems (LCMS), Learning Design Systems (LDS) and Learning Support Systems (LSS) are the four main categories of e-learning systems [5]. Learning Management System (LMS) is concentrated in this paper, which is an e-learning system utilised by institutions all over the world. Examples of LMS are Moodle, i-Folio, Claroline, MyGuru2, Learning Care, iLearn System, Learning Cube, Blackboard, PutraLMS and MyLMS, which integrate various pedagogical and course administration tools. Because LMS platforms are open source, each one has its unique characteristics and may be customised by the institution to

meet its own demands. A Content Management System (CMS) can be defined by three dimensions: content, process, and technology or software [6]. Reference [7] states that the content on a CMS can be text, graphical, animation, sound, video, or any media system.

CMS Enterprise, CMS Component, CMS Web, document management, record management, and other forms of CMS are available. CMS Enterprise is a strategy, set of tools, and processes that allow all employees in a firm to access, manage, and verify documents, templates, media, and other data assets. CMS Component, on the other hand, is a database and software programme that enables users to save, update, and manage content subject levels. Because it controls the connections between millions of components, it is frequently used for DITA content (XML). CMS Web is an LMS that is designed to enable publishing web content one site where content creators can edit, send and present their content without needing to be familiar with Hypertext Markup Language (HTML) [8].

The main purpose of LCMS is to manage the digital assets that are used to develop the learning products. Learning content repository objects are databases in these systems that store the lecturer's works exclusively for learning purposes. Furthermore, the same lecturer or other lecturers can use these systems for new learning development purposes, such as the provision of appropriate work-charts to update content, the ability to write courses, cooperation tools that allow the lecturer and students to collaborate, several basic LMS functions, and ways to compose and administer exams and quizzes. In addition, most LMS, CMS and LCMS use the Shareable Content Object Reference Model (SCORM) standard, which controls how the online learning content and learning management systems communicate with each other. Reference [9] states that SCORM is a set of technical standards for the production of e-Learning software. SCORM instructs programmers on how to develop code that may be utilised with other e-Learning platforms. In a word, SCORM governs the communication between online learning content and learning management systems.

V. LEARNING MANAGEMENT SYSTEM – A STUDY

An LMS is a web-based software package for planning, implementing, and evaluating learning, as well as facilitating student engagement, providing feedback, and managing students' activities. The capacity to optimise learning quality and design an interactive learning system is one of the most significant features of an LMS. There are two sorts of hosts for commercial LMS platforms: server-based and cloud-based. Data is saved in a local network that is the organization's server for server-based LMS, which can be updated according to the LMS. Meanwhile, because Cloud-based LMS store data in the cloud, internet access is required to enter the system and view it from anywhere.

There are two sorts of LMS: open source and commercial, and each company must decide whether to use open source or commercial software. Because each platform has its own set of perks and advantages, LMS platforms should be selected depending on the users' requirements. Commercial LMS are simple to design and use, but they come at a premium price. Meanwhile, open source LMS are free, but there will be a price for maintenance and improvement. The features of an LMS that fulfil their demands and make it easier to use are the most important factors that influence student happiness. For example, one of the strengths of an elearning system is its ability to integrate with other complementary systems. For example, an information management system provides systematic and interactive elements that can easily be managed in the LMS and supported by its flexibility and student centeredness, allowing it to provide more meaningful learning experiences for students. The criteria listed above may have an impact on a university's decision to utilise an LMS. These features are critical for the administrator to understand in order to select the best platform decision for the students' needs, teaching and learning objectives, and facilitating a social learning environment for students.

Each LMS has its own set of criteria, thus when deciding which system to use, each criterion must be considered in light of the needs of the users and the course. The first phase is to evaluate user and course demands; the second is to consider the LMS's purpose; and the third is to ensure that the LMS is user-friendly, versatile, and able to interface with other systems that assist students in managing their learning and personal needs. Following that, the LMS platforms must be evaluated. For example, if only one course leader is responsible for sending and revising content, a simple system may be all that is required. LMS software automates administrative functions at any institution, such as registering students, tracking courses in a specific semester or branch, maintaining student records, charting student progress, and delivering e-learning to students. Faculty, students, and management can all operate more efficiently and effectively with the best LMS.

VI. LMS PLATFORMS

LMS platforms are divided into two categories: open source and commercial. Moodle, Sakai, ATutor, Claroline, MyGuru2, and MyLMS are just a few examples of open source platforms. Meanwhile, commercial LMSs include Blackboard, SuccessFactors, SumTotal, Litmos, Angle learning, Geo learning, Cornerstone, and Connect Edu, to name a few.

Claroline:

In the year 2000, the Université catholique de Louvain developed this open source LMS system. As a result, the Claroline Consortium was founded in 2007 and now includes 15 universities, the majority of which are from Belgium and France. This is why the system's primary language was French, with English serving as a secondary language. The LMS's main advantages are its user-friendliness, consistent implementation of single functions, and ease of management. Within the learning curriculum, topics are organised into files that can be viewed individually or compressed if multiple files are uploaded in one folder. This feature is viewed as a system flaw since technological difficulties may arise when accessing the materials. The outcomes of various types and modes of testing reflect standard requirements that are equivalent to those of other LMSs. Czech language command is not available, which is considered the strongest disadvantage. [10]

Moodle:

Moodle (Modular Object-Oriented Dynamic Learning Environment), which was first released in 2002, was created to enable a social and constructive approach to education. It can be used to support full-time, part-time, and remote learning programmes. It is distributed as free and open software under the GNU General Public License and can be used on any computer, tablet, or smartphone with a web browser that is connected to the Internet. Moodle is the first open source platform to consider. The acronym Moodle stands for Modular Object-Oriented Dynamic Learning Environment. It is a learning management system (LMS) that was created in 2001 and is founded on the notion of social constructionist pedagogy. It was created under the provisions of the GNU General Public License (GPL), which means that any changes to the source code are permissible as long as the original licence is not altered [11]. The Moodle platform is known for its user-friendliness, accessibility, and flexibility. There is also a list of students on each course that allows the lecturer to see when each student last accessed the platform, the ability to integrate Moodle into other systems, the ability to allow synchronous and asynchronous interaction, a personal area for draught writing and journaling as well as managing personal and private information, and content that evolves based on the teaching and learning environment.

Its strengths were detected in following features: [12]

- ✦ Because it is based on the template idea, it has a user-friendly interface with simple navigation. The learning content is organised into discrete units within larger topics, such as on a weekly basis.
- ✦ Access to selected files might be time-limited by the administrator or password-protected. Students' activities are automatically logged, and they can track their academic progress.
- ✦ Contents and sources can be presented in a variety of ways as text, html, graphics formats, video- and audio-formats.
- ✦ Traditional kinds of evaluation and testing (e.g., fill-ins, multiple-choice, true-false, matching, short-answer) can be time-limited and/or password-protected.
- ✦ Cooperative learning, which is based on the social-constructive learning theory, takes place in groups or pairs, and uses asynchronous communication methods such as Wikis. Teacher-learner and learner-learner contact is mediated using discussion panels.

Sakai:

The Sakai platform was created for community and learning management system (LMS) objectives, and the software was created to assist learning, teaching, research, and collaboration. Sakai 10.5, released in 2014, is the most recent version of the programme, which was created in 2004. Sakai was made available under an open source licence. [13]. User-friendliness, ease of use, flexibility, and connectivity with Web 2.0 tools are all features of the Sakai platform. Sakai's features are bolstered by a teaching design tool and an e-portfolio. Furthermore, this software has been translated into over 20 languages, supports synchronous and asynchronous interaction, and has a personal section for draught writing, journaling, and keeping personal and private information. Other users' personal messages can also be sent and received by users.



ATutor:

The ATutor platform is an LMS that is based on opensource web technology used to develop and present onlinecourses [14]. Under the terms of the GNU General Public License, the leader can copy, distribute, and alter the ATutor (GPL). The accessibility of ATutor is its defining feature, since it allows users to participate in activities as students, instructors, and administrators. Furthermore, using IMS/ISO for assistance allows students to customise the environment and material to meet the needs of their classes. Users can send and receive personal messages from other users, and instructors and students can manage their ATutor courses. Each user has his or her own file storage utility, which may be shared with other users.

Blackboard :

Blackboard is the first commercial platform to be evaluated. Blackboard is a learning management system (LMS) that caters to the needs of students, instructors, and the institution[15]. This system is a licenced system, and institutions that utilise it must renew their licences every year. The price of Blackboard depends on the needs of the institution. The expense of maintaining or improving Blackboard will be charged to the university. Other systems cannot be connected with Blackboard. Despite the fact that this system is somewhat sophisticated and costly, it is well-equipped and offers a wide range of tools and services in the Blackboard suite. The Blackboard LLC company was founded in 1997 and specialises in on-line education consultancy and technical standards. This strategy involves a user-friendly environment that emphasises the presentation of study materials, references, and syllabuses, among other things. In 2005, the BlackboardInc Corporation combined with the WebCT Corporation. Over 20 million people in more than 60 countries use Blackboard for online education. More than 20,000 educational institutions use the system, which is available in more than 50 languages.

Blackboard strengths include following features:

- ✦ Increased Availability of the system available on the Internet and easy access were detected in the survey in 2004 formed at Duke University, USA by 85 % students.
- ✦ Learning information is organised into items, files, and folders in a variety of forms.
- ✦ The calendar is used to regulate the course of education.
- ✦ Another quality noted in the poll was quick feedback for students in the form of ten different sorts of assessments, either automatically or tutor-corrected.
- ✦ Teachers and students have access to a wide range of communication methods, including typical asynchronous ways and the virtual classroom for group collaboration.
- ✦ Tracking, acquiring statistical data about students' activities in the course, and showing their performance in the Gradebook are all tasks that must be completed.
- ✦ Bradford also presents some disadvantages or limitations of the Blackboard system
- ✦ Using a specific Operating System can limit some functions (options).
- ✦ Microsoft NT should be utilised with Blackboard.
- ✦ The cost of using this LMS is regarded exorbitant, since a yearly licence might cost between 200,000 and 400,000 dollars if more features are employed.

SuccessFactor :

The next commercial platform is SuccessFactors, which is an LMS that makes easy the development, utilisation, and management of learning courses [16]. This Cloud-based system includes features such as automatic assignment profiles, structured programmes, and e-signature capabilities. SuccessFactors has a lot of features, is versatile, and makes it easy for users to understand. This system is appropriate for human resource management. Depending on how the course progresses, the administrator can restrict user access or assign specific roles to many individuals.

SumTotal:

SumTotal is the third commercial platform. This system's primary function is in the field of human resources. SumTotal is available in four different versions: SumTotal Learn, SumTotal Talent, SumTotal Work, and SumTotal HR. SumTotal Learn is a learning management system (LMS) that provides personalised and contextual learning to help employees perform better at work[17]. SumTotal Talent can assist individuals discover hidden talents and abilities, as well as give tools to help them become more productive. SumTotal Work's goal is to make all areas of labour management, including compensation and spending management, more efficient and effective. SumTotal HR

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HR provides a comprehensive analysis of a company's human resources data. elix HR's purpose is to extend and connect information about HR operations, as well as to combine data, systems, and processes from various HR and business applications to give a comprehensive view of the workforce.

VII. FINDINGS

Commercial as well as Opensource LMS has diverse characteristics. Even they have common functionalities, each differs in some features. All LMS listed are Flexible, easy to use and access. ATutor, SumTotal, Blackboard and Success Factors are based on cloud storage. Moodle, Sakai and SumTotal are able to integrate easily with other systems. The software is not able to adapt and manage the courses in all except ATutor. The stored files cannot be shared with other users and backing up of the entire content is not possible in all except ATutor. When compared to a commercial platform that requires licencing fees per user, as well as a subscription and maintenance fee to ensure your LMS is kept up to date, open source platforms are becoming a popular choice for every institution because they benefit users by allowing platforms to be modified according to user requirements, and because of the low costs charged to get a better service. Moodle is the open source platform that is suggested since it has a lot of features that satisfy the demands of students and has over 80 million users. Blackboard is recommended for colleges with higher budgets who want to use an LMS that meets all of the requirements.

VIII. CONCLUSION

The E-learning Concept has given Indian higher education a new dimension both within and outside the classroom, and it is still seeking for new ways to become more useful through ICT tools such as LMS and other emerging technologies. Many notable academics and developers believe that multimedia-rich E-learning activities enable students to learn with rather than from computers. As a result, future research should be performed to determine the current state of E-learning and LMS in India, as well as the course quality, and efforts should be made to make LMS as popular in India. Learning Management System (LMS) can be used to improve teaching and learning on a larger scale.

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