Learning Management System (LMS) Tools used by Universities in the Philippines: A SWOT Analysis

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Abstract— This study is qualitative and descriptive in nature since it uses SWOT Analysis. It is used to examine the historical, theoretical, and time frame perspective, as an effective situation analysis technique that plays an important role in the fields of marketing, public relations, advertising, and any fields requiring strategic planning. In this study, SWOT Analysis is used to evaluate the 'strengths', 'weaknesses', 'opportunities', and 'threats' involved in the adoption of learning management system (LMS) tools. The findings revealed that LMS tools must be economical, efficient, and tailor-fitted to the needs of the students, teachers, and school administrators of a university.

I. INTRODUCTION

The learning environment is evolving as a result of the introduction of technology and students now have more choices than they ever expected (Ezhova, 2021). People nowadays only need a computer and access to the internet (Ezhova, 2021). This happens through emerging technology in education. Emerging technology is one that is not in 'common' use currently in education, but has the potential to be more widely adopted to support improvements in learning and teaching. Many of these technologies have been emerging for a number of years (Education Scotland, 2022). The widespread use of the internet and the revolution in information and communication technology (ICT) have led to new methods of teaching and learning, such as blended learning and e-learning (Asian Development Bank, 2017).

Blended learning (also known as hybrid learning) is a method of teaching that integrates technology and digital media with traditional instructor-led classroom activities, giving students more flexibility to customize their learning experiences (Panopto, 2019). Blended and e-learning can broaden teaching and learning by providing additional tools to explain complex issues or retain student attention. These approaches also expand access to quality education by allowing students to learn anywhere and anytime as well as learn from experts from any part of the world (Asian Development Bank, 2017). All these can be done through the implementation of a Learning Management System (LMS).

The COVID-19 pandemic accelerates these emerging practices around the world. It is not only here in the Philippines that the education system is being drastically and permanently affected by the pandemic (Rojas, 2021). Concerning the continuation of learning in the pandemic period, especially in higher education institutions (HEIs), Commission on Higher Education (CHED) chairperson Prospero de Vera III said in July 2020, "We are ready to open [classes] this August. No ifs, no buts. Learning must continue. We learn as one, we are ready". It is with the clarification that no regular face-to-face classes are not allowed and flexible learning modes would be used (Rocamora, 2020).

To address the issue, Dr. Edmund Centeno, Assistant Professor of the College of Development Communication and an education technology expert at the University of the Philippines-Los Banos (UPLB),

proposed some methods on how to continue remote learning to address the problem. At least ten (10) learning applications that academe practitioners could adapt in the event of a crisis or emergency are included. Zoom, Facebook Messenger, Skype, Edmodo, Google Hangouts, Google Classroom, MOODLE, Canvas, Blackboard Course Sites, and iSpring Learn are among the apps on the list (Tabios, 2020).

With the aforementioned benefits of LMS, the utilization of LMS really helps the education sector such as the university. However, the number of different LMS platforms available causes another problem known as "Choice Overload". Kras (n.d.) described "Choice overload" or "over choice" as a cognitive impairment that occurs during a decision-making process when we are presented with too many options we cannot easily choose between. As a solution, a SWOT analysis is one of the most common tools companies use to analyze their current condition and position themselves for the future (bdc, n.d.). Everitt (2022) explained that a SWOT analysis is a strategic planning technique that project managers can use to help them analyze their projects' strengths and weaknesses, as well as any opportunities and threats they may face.

Equipped with knowledge in considering different factors such as "an LMS that can be modified to fit with the needs of the university", "free or low-price", and "can be owned or managed by the university" in choosing the best suited LMS for the University such as Nueva Ecija University of Science and Technology, this SWOT Analysis was conducted.

II. METHODOLOGY

This study uses qualitative research methodology. Using SWOT analysis, the researchers were able to identify the strengths, weaknesses, and opportunities of the different LMS utilized by the different higher educational institutions in the region. Through this, the researchers were able to get some important information about LMS scenarios that can be used as bases in identifying the aspects of the LMS that needs to be present and those that need to be added in the future. This analysis was made prior to the development of the LMS for the use of the Nueva Ecija University of Science and Technology (NEUST). This study was conducted in March 2020.

III. RESULTS AND DISCUSSION

The table below shows the strengths, weaknesses, opportunities, and threats (SWOT) analysis of the various LMS platforms used by the different Universities in the Philippines.

Table 1. SWOT Analysis of LMS Used by Different Universities in the Philippines

Name of LMS	Category	Strengths	Weakness	Opportunities	Threats
Canvas	Features and Services Offered	• Outcomes • Canvas Data • Canvas Commons • Integrated Media Recorder • Web conferencing • Mastery Gradebook • Canvas on mobile • Canvas Parent • Canvas Polls	Getting support is not that easy if you encounter problems with the site.	Teaching and learning will be enhanced through all-in-one software	Conflict on schedule on the deadline due to notifications
	Ease of Use	It organizes students' grades in a timely manner. It gives students notifications about upcoming assignments.	The notification feature could be improved upon as the professor has to put the due date as "midnight" otherwise the	New teaching strategies will be established Innovate and Active Learning will be promoted	Gadgets compatibility issues

Name of LMS	Category	Strengths	Weakness	Opportunities	Threats
		Communication with professors. Hosting online Materials	assignment will be automatically erased from the platform.	Communication between teachers and students will be easier	
	Product and Service Cost	Canvas offers a free account for teachers, as well as a two-week, free trial with full-feature functionality	The university must pay for the training and admin access	Subscription-based	Subscription-based
	Software Requirements	**Operating Systems** Windows 7 and newer (users on Windows 10 need to download the Windows 10 Anniversary Update to submit Canvas assignments) Mac OSX 10.6 and newer Linux - ChromeOS Mobile Operating System Native App Support iOS 7 and newer (versions vary by device) Android 4.2 and newer **Screen Readers** Macintosh: VoiceOver (latest version for Safari) PC: JAWS (latest version for Internet Explorer) PC: NVDA (latest version for Firefox) There is no screen reader support for Canvas in Chrome **Supported Browsers** Canvas supports the current and first previous major releases of the following browsers: **Internet Explorer 11 and Edge** (Windows only— please make sure your	The audio recording feature has minor technical issues. Work on third-party application integration especially browsers compatibility.	Upgrade computer units to meet the demands of the system requirements of the LMS	Modifications and troubleshooting of issues will take time

Name of LMS	Category	Strengths	Weakness	Opportunities	Threats
		operating system is also current as noted in the computer specifications lesson; you may need to download the Windows 10 Anniversary Update to submit Canvas assignments) **Safari 9 and 10** (Macintosh only) **Chrome 52 and 53** **Firefox 48 and 49** (Extended Releases are not supported) **Flash 22 and 23** (used for recording or viewing audio/video and uploading files)			
	Hardware Requirements	**Computer Speed and Processor** Use a computer 5 years old or newer when possible 1GB of RAM 2GHz processor	It is best viewed at a minimum of 800x600, which is the average size of a notebook computer. If you want to view Canvas on a device with a smaller screen, we recommend using the Canvas mobile app.	Can be customized based on the needs of the university	Low productivity when hardware devices are not upgraded.
	Server Requirements	Subscription-based	Not disclosed by the provider because the LMS is a software as a service (SaaS)	Not disclosed by the provider because the LMS is a SaaS.	Modifications and troubleshooting of issues will take time
	Ease of Maintenance	Maintenance seems worry-free since the provider will do the maintenance	Make more cost affordable for schools and universities, especially for those interested to switch from higher-cost LMS	Can be customized based on the needs of the university	Maintenance might be costly for the universities
Blackboard	Features and Services Offered	• Collaborate Integration • Group Management	The notification feature could be improved upon as	The Universities' budget for portal	Conflict of schedule on the deadline due to

Name of LMS	Category	Strengths	Weakness	Opportunities	Threats
		• Grading Enhancements • Student Preview • SafeAssign • Enhanced Cloud Profile • Portfolio • Social Learning • Data Management • Blackboard Drive • Course Enrollments • Active Collaboration • Calendar • Content Editor • Retention Center • Dynamic Content	the professor has to put the due date as "midnight" otherwise the assignment will be automatically erased from the platform. The audio recording feature has minor technical issues. Work on third-party application integration, especially browser compatibility. Make cost more affordable for schools and universities, especially for those interested to switch from higher-cost LMS	viewing system and learning management will be reduced since the software offers both features New teaching strategies will be established Innovative and active learning will be promoted	notifications 4 Gadgets' compatibility issues Modifications and troubleshooting of issues may take time
	Ease of Use	Hosting of courses associated with a particular semester Integration with zoom and Panopto Grading of the respective courses and also hosts the submission of student work related to the particular homework assignments, quizzes, etc.,	The notification feature could be improved upon as the professor has to put the due date as "midnight" otherwise the assignment will be automatically erased from the platform.	New teaching strategies will be established Innovate and Active Learning will be promoted Communication between teachers and students will be easier	Gadgets compatibility issues
	Product and Service Cost	Full Blackboard package is $160,000 per year	Subscription-based	Subscription-based	Subscription-based
	Software Requirements	**Operating System:** Windows 7 or newer; Mac OS 10.6 or newer **Recommended Browsers and Software** Mozilla Firefox, Google	Microsoft Office is required to open most assignments on this platform. It does not support Google Docs or OpenOffice--save	Upgrade computer units to meet the demands of the system requirements of the LMS	Low productivity due to some obsolete parts

Name of LMS	Category	Strengths	Weakness	Opportunities	Threats
		Chrome Browsers	as a pdf and then upload to Bb.		
	Hardware Requirements	**Minimum Requirements** • Processor: 2 GHz or faster • RAM: 3 GB of RAM • Screen resolution: 1024 x 768 or higher Internet connection: Broadband internet connection	If you are using a satellite internet provider, you may experience timeouts, IP address issues, session problems, or course mail issues caused by latency.	Upgrade computer units to meet the demands of the system requirements of the LMS	Low productivity due to some obsolete parts
	Server Requirements	Subscription-based	Not disclosed by the provider because the LMS is a software as a service (SaaS)	Not disclosed by the provider because the LMS is SaaS.	Poor risk management Unmet expectations of some network administrators
	Ease of Maintenance	Maintenance seems worry-free since the provider will do the maintenance	Make cost more affordable for schools and universities, especially for those interested to switch from higher-cost LMS	Features of the LMS will be customized based on the need of the universities	Maintenance might be too costly for the universities
Moodle	Features and Services Offered	• All-in-one calendar • Bulk course creation and easy backup • Collaborative tools and activities • Convenient file management • Customizable site design and layout • Detailed reporting and logs • Embed external resources • Manage user roles and permissions • Multilingual capability	Not fully developed to cope with big projects Can be troublesome for some students when they are trying to take quizzes or tests, or just simply trying to access the course content. Needs complete development	Features of the LMS will be customized based on the need of the universities Teaching and learning will be enhanced through all-in-one software New teaching strategies will be established Innovate and Active Learning will be promoted	Data due to consistent modification of the system might cause confusion on the part of the developers and users Since modification can be done easily, it can be copied by other developers if not restricted properly

Name of LMS	Category	Strengths	Weakness	Opportunities	Threats
		• Multimedia integration • Multiple progress tracking options • Notifications and automatic alerts • Outcomes and rubrics • Peer and self-assessment • Personalized dashboard • Regular security updates • Secure authentication and mass enrolment • Simple add-ons and plugin management • Simple and intuitive text editor • Supports open standards		Communication between teachers and students will be easier	
	Ease of Use	• It's open source • Great community • Customizable • Widely available • It's familiar • It has loads of content available	*No identified weaknesses under this category.	Can be customized based on the needs of the university	Data due to consistent modification of the system might cause confusion on the part of the developers and users
	Product and Service Cost	Open Source (free)	N/A	Can be customized based on the needs of the university	Human Error Interoperability due to customization will not always work on all devices -
	Software Requirements	Moodle is compatible with any standards-compliant web browser. We regularly test Moodle with the following browsers: Desktop: • Chrome	Universities need to update their computer units to meet the demands of the system requirements of the LMS	Upgrade computer units to meet the demands of the system requirements of the LMS	Low productivity due to some obsolete parts

Name of LMS	Category	Strengths	Weakness	Opportunities	Threats
		• Firefox • Safari • Edge *Note: Moodle 4.0 does NOT support Internet Explorer 11.* Safari 7 and below have known compatibility issues with Moodle 4.0.			
	Hardware Requirements	**Minimum Requirements:** Disk space: 200MB for the Moodle code, plus as much as you need to store content. 5GB is probably a realistic minimum. Processor: 1 GHz (min), 2 GHz dual-core or more recommended. Memory: 512MB (min), 1GB or more is recommended. 8GB plus is likely on a large production server	Universities need update their computer units to meet the demands of the system requirements of the LMS	Upgrade computer units to meet the demands of the system requirements of the LMS	Low productivity due to some obsolete parts
	Server Requirements	These are just the minimum supported versions. We recommend keeping all of your software and operating systems up-to-date. Moodle upgrade: Moodle 3.6 or later PHP version: minimum PHP 7.3.0 *Note: minimum PHP version has increased since Moodle 3.10.* PHP 7.4.x and 8.0.x are supported too. PHP extension **sodium** is recommended. It will be required in Moodle 4.2. PHP extension **exif** is recommended. PHP setting **max_input_vars** is	Not fully developed to cope with big projects	Features of the LMS will be customized based on the need of the universities Create mechanisms to prevent possible data breaching	Poor risk management Unmet expectations of the administrators

Name of LMS	Category	Strengths	Weakness	Opportunities	Threats
		recommended to be >= 5000 for PHP 7. x installations. It's a requirement for PHP 8. x installations. Database requirements Moodle supports the following database servers. Again, version numbers are just the minimum supported version. We recommend running the latest stable version of any software			
	Ease of Maintenance	MIS Personnel can be easily tapped by the university for maintenance and update	Required skillful personnel for the maintenance	Good avenue for the university to train the students in on-hand maintenance	Human Error Interoperability due to customization will not always work on all devices

The table above shows that data collected after benchmarking on different LMS used by different private and public universities and colleges in the Philippines such as De La Salle University (DLSU)-Lipa, DLSU-Manila, University of the Philippines – Diliman, UP-Los Baños, Our Lady of Fatima University (OLFU), University of Asia and Pacific (UA&P), CPU, Ateneo De Manila University , University of the East (UE), Centro Escolar University (CEU), Jose Rizal University (JRU), Far Eastern University (FEU), DLSU-Dasmariñas, San Beda University, University of Batangas, Ateneo De Manila, Asia Pacific College, Miriam College, Mapua University, Visayas State University, UP-Cebu, Arellano University, University of Southern Mindanao, University of Mindanao, Lyceum of the Philippine University, Siliman University, Mapua Institute of Technology, St. Paul's University Quezon City, Philippine Women's University (PWU) , University of Santo Tomas (UST), Adamson University, Tarlac State University (TSU), Pangasinan State University, Misamis University, Central Luzon State University (CLSU), and Bulacan State University (BSU).

As shown in Table 1 above, the features and services offered by the LMS were the reasons why the universities selected their respective learning platforms. However, LMS 1 and LMS 2 have similar weaknesses, such as 1) problems in notifications, 2) audio recording technical issues; 3) the price of the LMS is too costly for the universities. Furthermore, a possible problem that universities might encounter would be contacting the developers to troubleshoot the problems encountered while using the LMS. Since the universities' MIS might not have full control of the system developed by their own faculty and staff.

Since the price was one of the main considerations of these universities, most of them settled for the most economical and suitable LMS to be used. The features of being customizable, easy to be familiar with, and having loads of content that can be used were additional strengths of the identified platform. However, its weakness of not being fully developed can be converted into an opportunity for developers through consistent and continuous development. While the confusion on the features and services offered by this for both students and teachers can be solved by the thorough orientation of the system. The threats that may possibly be faced by the end-users of the LMS can be resolved if there will be a group of developers, composed of the University's faculty and

staff, who can be hired by the university to focus solely on the development of the LMS.

The table below shows the data on the LMS used by selected state universities in Region III, Philippines.

Table 2. LMS Used by SUC in Region 3 Strengths and Weaknesses (S-W) Results

Attributes	Univ A Google Classrooms	Univ B Microsoft Themes	Univ C Moodle
Products or services offered	• Set classroom themes with school colors or logo • Reuse assignments, tests, or other course content in future classes • Add content to assignments, such as video, PDFs, Google Docs, or Google Forms survey • Share videos, links, or images from other websites with students • View assignments, announcements, and other resources on a class resource page • Draft assignments or announcements and schedule them to post at a later date • Use Google Calendar to track assignment due dates • Export grades to Google Sheets or a CSV file • Set permissions on whether students can make posts or comments (or mute individual students) • Set permissions on which teachers can create and manage classrooms, or which schools within a district can use Google Classroom • Hosting virtual classes with Google Meet • Originality reports, which let students scan their work for potential plagiarism	• Teams and channels • Conversations within channels and teams • Chat function • Document storage in SharePoint • Online video calling and screen sharing • Online meetings • Audio conferencing • Full telephony	• All-in-one calendar • Bulk course creation and easy backup • Collaborative tools and activities • Convenient file management • Customizable site design and layout • Detailed reporting and logs • Embed external resources • Manage user roles and permissions • Multilingual capability • Multimedia integration • Multiple progress tracking options • Notifications and automatic alerts • Outcomes and rubrics • Peer and self-assessment • Personalized dashboard • Regular security updates • Secure authentication and mass enrolment • Simple add-ons and plugin management • Simple and intuitive text editor • Supports open standards

Attributes	Univ A Google Classrooms	Univ B Microsoft Themes	Univ C Moodle
Price Range	Google Classroom is free for all schools and is included with subscriptions to G Suite for Education.	Starting from: $5.00/month	Free
Location	United States, 2014	United States, 2019	Australia, 2002
Strengths (Advantages)	1. Easy to use and accessible from all devices. 2. Effective communication and sharing. 3. Speeds up the assignment process. 4. Effective feedback. 5. No need for paper. 6. Clean and user-friendly interface. 7. Great commenting system. 8. Is for everyone.	1. Productivity gains and enriched communication 2. Better focus on your work 3. Increased transparency	1. It's open source 2. Great community 3. Customizable 4. Widely available 5. Sell content online 6. It's familiar 7. It has loads of content available
Weaknesses (Areas Needing Improvement)	1. Difficult account management 2. Limited integration options. 3. Too "googlish" 4. No automated updates. 5. Difficult learner sharing. 6. Editing problems. 7. No automated quizzes and tests. 8. Impersonal.	1. Difficult transition from outlook 2. Structure of files sometimes confuses users 3. Non-optimal online meeting experience hinders adoption 4. Challenges regarding permission settings 5. Limited flexibility can lead to manual replications	1. Not fully developed to cope with big projects 2. Can be troublesome for students when they are trying to take quizzes or tests, or just simply trying to access the course content. 3. Lack of complete development

Data in Table 2 above presents the competitive analysis matrix highlighting the strengths and weaknesses of the LMS used by the colleges and universities situated in Central Luzon, Region III. The institutions involved in this study were selected due to their proximity to the researchers as well as their similarities in terms of standards and policies. Moodle's customizable features and open-source capability stands out. Similarly, its features and services must be tailored-fit to the needs of the university. On the other hand, the weaknesses of Moodle can be converted into opportunities by assigning a group of developers, who will focus on modifications and continuous development that will be suitable for the needs and wants of universities' administrators, teachers, and students.

Table 3 presents the combination of the data presented in tables 1 and 2. The SWOT Analysis below was used as one of the bases for selecting and constructing a useful online learning platform for one of the state universities in the Province of Nueva Ecija, the NEUST.

Table 3. SWOT Analysis of the Chosen LMS Platform

	Strengths	**Weaknesses**	**Opportunities**	**Threats**
Ease of Use	It has a great community for both users and developers It is customizable It is widely available It has loads of content available	It can be troublesome for students when they are trying to take quizzes or tests, or just simply trying to access the course content.	Teaching and learning will be enhanced through all-in-one software New teaching strategies will be established Innovate and Active Learning will be promoted Communication between teachers and students will be easier	Data due to consistent modification of the system might cause confusion between developers and users
Product and Service Cost	Free, since it is open source	n/a	Can be customized based on the needs of the university	Poor risk management Unmet expectations of the administrators
Technical Requirements	Availability for university needs Data Quality can be monitored by the administration Authentication and authorization of the user are integrated.	Not fully developed to cope with big projects lack of complete development	Teaching and learning will be enhanced through all-in-one software Features of the LMS will be customized based on the need of the universities Create mechanisms to prevent possible data breaching Upgrade computer units to meet the demands of the system requirements of the LMS	Human Error Interoperability due to customization will not always work on all devices Low productivity due to some obsolete parts Poor risk management Unmet expectations of some administrators
Ease of Maintenance	Easy to customize and maintain	Required skillful personnel for the maintenance	Features of the LMS will be customized based on the need of the universities	Since modification can be easily copied by other developers if not restricted properly

Further, data show that the platform must be extensive and customizable. This is supported by the studies conducted by Alegado, et al (2022), Bantug, et al. (2021), Luciano (2020), Herrera & Luciano (2020), and Luciano, et. al (2020) which state that schools have started to utilize online platforms to make their services available for their stakeholders. As there are many options to use in developing software or system as well as in developing LMS for schools.

For State Universities and Colleges, a customizable feature will allow teachers to be creative and innovative in teaching their classes. It will also help students to be more interactive since the interface of the website is familiar to them. The school must assign a group of developers, who will be responsible for the consistent upgrade of the system based on the needs of the teachers, students, and administrators. However, each developer and owner of the system should be cautious since the consistent modification of data due to system

upgrading might lead to confusion for both users and developers.

IV.   CONCLUSION AND RECOMMENDATIONS

Based on the results of the analysis, the following conclusions were drawn:

1.   An LMS should be economical and efficient. It must also fit with the needs of the students, teachers, and school administrators of a university; and

2.   The most suitable LMS platform for universities should be customizable and economical.

3.   An open source and customizable features will help strengthen the LMS of a University because of these reasons: (1) will tailor fit the needs of the users; and (2) ease of maintenance for the developers.

The researchers also arrived at the following recommendations:

1. The University Learning Management System must be designed using an easy-to-customize and free platform. So, it will not be difficult for the university to adopt and implement the LMS.

2. For schools with no or inadequate human resources capable of developing the LMS, subscription-based LMS is recommended.

3. There should be a group of developers who will focus on consistent updates and modifications needed for a school's LMS.

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