

# EXPLORING THE DIFFUSION OF TECHNOLOGY OF THE LEARNING MANAGEMENT SYSTEM IMPLEMENTATION: A NARRATIVE FROM A MULTI-CAMPUS HIGHER EDUCATION INSTITUTION

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**ABSTRACT:** *The novel coronavirus disease (COVID-19) that appeared in 2019 caused considerable disruption in 2020. Many developed countries have implemented lockdowns to limit the disease's spread and impact. Due to the unprecedented worldwide health crisis and accompanying restrictions, many institutions had to immediately adopt to online course delivery to continue the teaching and learning process. Although the Technology Acceptance Model (TAM) suggests that the perceived usefulness and perceived ease of use of technological tools are the primary drivers of information system utilization, the pandemic itself compelled faculty to adopt the determined technology at hand, thereby, circumventing the user's perception about its usefulness and apparent utilization. This study explores relevant studies to identify a range of factors to streamline the process of the diffusion of technology of the Learning Management System (LMS) into a multi-campus Higher Educational Institution in the Southern Part of the Philippines. The data from the implementation procedures helps narrate how the diffusion of technology is apparent in the University while in the pandemic for two years. It provided insights into important milestones in the diffusion of technology during a pandemic. However, the users' perspectives must be included in the data that must be collected and analyzed. The LMS statistics may not provide a complete picture of the implementation. It is hoped that future studies will dig deeper into both the implementers' and end-users perspectives to acquire a better understanding of the important success factors for the diffusion of technology in learning management implementation.*

**Keywords:** Learning Management System, Diffusion of Technology, Implementation, e-Learning, Technology adoption

## INTRODUCTION

Even in the midst of the COVID-19 pandemic, higher education institutions (HEIs) strive to provide appropriate educational environments within the framework of each country's education policies in order to achieve high-quality educational outcomes, improve research efficacy, foster innovation, and creativity, and develop students' skills and capabilities [1]. As a result, higher education institutions (HEIs) develop information systems to handle all learning functions, which are referred to collectively as Learning Management Systems (LMS) [2].

The learning management system (LMS) serves as the foundation for online learning, handling learning processes, classrooms, assessments, and assignments [3]. One study investigated the role of LMS in educational settings. Their study concluded that its use facilitates learning activities and allows students to learn from their peers. LMSs make use of data and communication technology to create innovative methods of learning [4]. Furthermore, such systems support a wide range of instructional procedures, serving as a full-fledged learning platform [5]. Although LMS offers numerous benefits to users, a computer system cannot enhance a user's performance if the user does not intend to utilize it. The Technology Acceptance Model (TAM), derived from the Theory of Reasoned Action (TRA), suggests that the perceived usefulness and perceived ease of use of technological tools are the primary drivers of their utilization. The TAM helps explain and predict user behavior while engaging with any information systems. Many academics use TAM to predict users' acceptance of new technologies and how individuals adapt to e-learning [6] and in this case to a Learning Management System. However, it should be noted that the pandemic became a driving force for technology acceptance. Faculty and students are compelled to adopt to the technology that would allow them to continue learning amidst

the pandemic. Nonetheless, TAM gave useful insights that were used in the implementation of the LMS.

The role of LMS implementors is to help the faculty to easily adapt to the available technology and help them prepare their course pages for the upcoming opening of classes. Although the LMS has been institutionalized, the University values the academic freedom of the faculty. Thus, another goal of the implementation planners is to help the faculty make the conscious decision to utilize it and sustain it even in the new normal.

The diffusion of technology refers to the process by which new technologies are adopted and integrated into a society or organization. In the field of education, the use of learning management systems has become increasingly widespread in recent years, leading to the need for research on the diffusion of technology in these contexts [7]

Recent studies have identified a range of factors that influence the adoption and integration of LMS, including perceived usefulness, compatibility with existing practices, and the availability of training and support. For example, in a study of Rashid et al. [6] the most important factors influencing the diffusion of LMS in higher education were the teachers' readiness, teachers' perception of usefulness, and ease of use. Finally, the availability of training and support is another crucial factor in the diffusion of LMS. Educators may be intimidated by the prospect of using new technologies in their teaching and learning practices and may require support and guidance to effectively use LMS. By providing training and support, schools and universities can help ensure that educators feel confident and capable when using these technologies [8].

## REVIEW OF RELATED LITERATURE

### *Implementation Framework*

To develop a meaningful learning environment, it is necessary to address a number of interrelated and interdependent factors

[9,10]. An overall framework for directing the installation of e-learning systems such as Learning Management Systems (LMS) and improving the student learning experience in HEIs is still needed [11]. In addition, it is vital to compare existing e-learning frameworks to determine their applicability for the learning design [12]. This section analyses the existing e-learning framework applicable to an LMS implementation in a multi-campus University.

Existing frameworks focus on a limited number of elements while taking into account the unique perspectives of each element because models are typically described as a process and something that exists, whereas frameworks specify what to do and what to consider [13]. Others perceive the important parts in an overly general approach and lack implementation details (Collis and Moonen, 2002). In addition, some consider LMS implementation phases a subset [12]. The paper highlights the significance of LMS deployment frameworks in academic institutions for streamlining the online learning process [14]. For this paper, four notable models and frameworks were explored that are close to the nature of the multi-campus HEI like the University of Science and Technology of Southern Philippines (USTP).

Figure 1 shows Ssekakubo et al model [15] for implementing LMS in traditional universities. It comprises five steps: planning, design, development and evaluation, delivery and maintenance



Figure 1. Sequencing of the Stages of E-Learning Implementation

Saeedikiya et al. [16] (as shown in Table 1) highlight the stages of e-learning system implementation, some of the stakeholder engagement, and the function of various personnel in e-learning implementation while recognizing the educators' involvement in the success of the e-learning system. These are merely high-level steps, with few specifics and processes [17].

In the Extended Learning Environment Network project (ELEN), a three-year implementation plan for integrating ICT in a variety of Courses at eight British universities, project partners proposed a philosophical framework for institutionalizing online learning (Table 2). Since technology dependency is a major concern for online learning innovation, Diercks-O'Brien [8] identified Support Systems for the successful implementation of VLE. The framework gives a generic approach to learning and teaching through support systems and calls on all stakeholders to be flexible and adaptable.

Table1. Stages Highlighted by Saeedikiya et al.

Stage	Description
Diagnosis	This step analyzes the e-learning system's status. Institutional managers, business managers, and e-learning professionals must participate.
Decision Making	In this stage, the university chooses an LMS. It determines the university's financial and technical resources.
Design	During this stage, e-learning specialists, technological experts, subject matter experts, and institutional designers identify students' needs and review course content.
Development	This stage comprises of a system pilot project to discover various functions and resolve implementation concerns.
Post Delivery	This step is followed by e-learning system development, which involves students and teachers.

Table 2. Support System Extracted from ELEN

User	Concern
Student	Off-campus access, online learning integration, learning support (relevance of the use of technology, task focus, learning outcomes, monitoring of progress, feedback)
Teacher	IT training and support, campus access, technical and educational project development and design, extended learning environment administrative assistance, and online learning integration.
HE Institution	Reliable network, information integration/ management, project management, learning/teaching strategy, IT strategy, and support.

Basak et al. [18] (Figure 2) suggested a framework of eight important success variables affecting the adoption of e-learning in higher education: technological, institutional, pedagogical, management, ethical, evaluation, resources, and social interaction factors. Each of the eight primary criteria determines perceived usefulness and ease of usage.

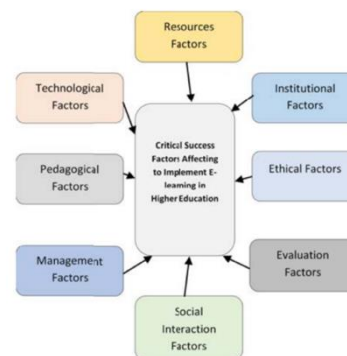


Figure 2. Critical Success Factors of e-learning Implementation

## METHODOLOGY

This paper aims to describe the steps taken in the implementation of the Learning Management System at the height of the COVID-19 pandemic. This can be taken as narrative research, which is described as a methodology of studying individual lived experiences as a source of knowledge in and of itself that warrants deeper understanding [19]. A turn to the narrative here is essentially a semiotic move. Rather than see data as indexical—that is, as existing by dint of an actual relation to events or objects—we start to see them here as symbolic, and so as taking on meaning through processes of interpretation, “translation” [20] and “framing” [21]. The process of narration is one by which data is found to be meaningful, and indeed, as Genevieve Bell notes, data has responsibilities: “a story it was compelled to say” [22]. It is the chronology sequence that sets narrative research apart from the other approaches in qualitative research [23].

Data narration reintroduces the concept of sequence and, with it, the concepts of the path, movement, and trajectory. Trajectory mirrors the logic of equivalence, as mentioned above, in the sense that diverse pieces, data items, or moments are regarded as components of a single whole; yet, it also incorporates a teleological component, a directedness in which past acts predict future results [24].

## RESULTS AND DISCUSSIONS

The University of Science and Technology of Southern Philippines (USTP) was able to frame its own strategies for LMS adoption after examining some of the various frameworks and models used in developing and implementing an LMS in HEIs throughout the developed world and noting the commonalities in their rudiments, as well as taking into context the implementation framework of other HEIs that implemented the LMS long before the pandemic began.

### *Background*

The University of Science and Technology of Southern Philippines (USTP) is faced with the task of confronting the issue head-on while operating eight (8) campuses throughout the two major provinces of Misamis Oriental and Occidental. Each campus has different challenges when it comes to access to technology, ICT infrastructure, and human readiness and capabilities. At the onset of the pandemic, USTP allowed the faculty to choose their preferred remote learning system to communicate with the students and finish the semester off. Google Classroom, Edmodo, Moodle, and social media were utilized. As the new school year began in the year 2020, the Administration had to decide how to institutionalize its pandemic response. Institutionalizing teaching and learning benefits the organization better in managing the teaching and learning process.

### *Steps Taken*

The establishment of the Flexible Learning Committee was the initial step in the implementation of the Learning Management System. It was led by the Vice President of Academic Affairs and included the Vice Chancellors for Academic and Student Affairs of the major campuses, Campus Directors of the Satellite Campuses, the Center for

Innovative Teaching and Learning, and the Digital Transformation Office.

This committee determined that the most logical LMS to utilize is Moodle since the university currently has one and it has considerably more robust features than Google Classroom with regard to Instructional and Administrative Requirements. Not to mention the System's cost-effectiveness, as it is open-source software. The Digital Transformation Office (DTO) was responsible for branding Moodle, structuring it to support many campuses, customizing the user interface, and enhancing the user experience. In addition, the LMS was hosted in the cloud so that students and faculty could access it at any time and from any location.

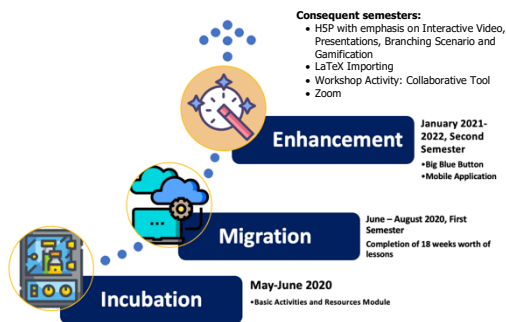
Conducting capability trainings to enable the faculty's smooth transition from face-to-face to totally online classes was another significant step. It was also done to aid faculty in the efficient migration of their resources, activities, and assessments. The entire implementation is guided by the "Bayanihan" principle. It is a Filipino term for the collaborative spirit. The technological preparedness of the users is an essential aspect for the success of the deployment. This strategy allows for a balance between users with and without technological expertise. During the first semester of SY 2020-2021, the Helpdesk and online ticketing system were also created as part of the support to the LMS implementation.

### *Implementation Timeline*

The incubation stage aimed to orient the faculty to the Learning Management System of the University by giving them capability training on the analogous teaching processes of face-to-face to online and remote learning. During this stage, the faculty were taught the basic and essential tools to add activities and resources to the LMS.

The migration stage aimed to successfully populate the course pages with 18-week's worth of lessons or 54 hours for a lecture class. With the guidelines on the minimum learning content from the Office of the Vice President for Academic Affairs, faculty members are encouraged to add necessary lessons for their individual classes when they see it fit. Through the Bayanihan principle, migrating the 18 weeks' worth of lessons or 54 hours of the lecture has been made easier. That is, courses that are offered by more than one program were tasked to unify their course syllabi and work together to build their course pages. The faculty would then share that course page.

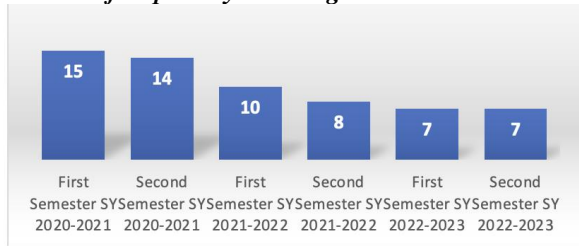
The enhancement stage is where more features are introduced to make online and remote learning more interactive and engaging.



**Figure 3. Implementation Timeline and Stages**

All attendees of the capability training and workshops were also given recorded videos and training materials to watch after the training. For the first year of implementation, the helpdesk and online ticketing system were operational six days a week. The coursepage creation and students' enrollment are managed by the DTO. The coursepages were also preloaded with sections for Course description, Welcome Message, Faculty introduction, Syllabus, links to the Vision and Mission of the University, Students' handbook and Graduate Attributes files.

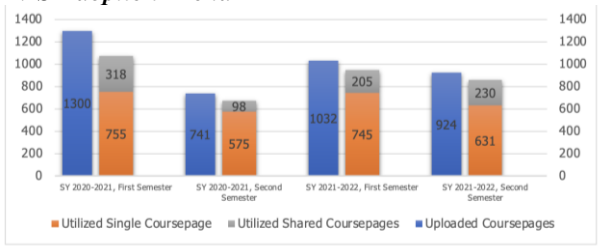
**Number of Capability Training Conducted**



**Figure 4. Capability Training Graph**

The chart above (Figure 4) shows that during the first semester of the SY 2020-2021, a total of 15 trainings were conducted, while 14 training were conducted in the second semester of the same school year. The number of training decreases as each semester progresses. This shows that the frequency of training conducted during the first year of the LMS implementation is vital for success. As the request for training decreases every semester, the utilization rate increases as seen in the LMS adoption trend below.

**LMS Adoption Trend**



**Figure 5. LMS Adoption Trend**

The chart showed that out of the total uploaded coursepages in the SY 2020-2021, first semester, there is an 82.54%

utilization of the coursepages, which is composed of 755 single coursepages and 318 shared coursepages. The SY 2020-2021, second semester showed that there is an increased to 90.82% utilization of the coursepages from 575 single coursepages and 40 shared coursepages. The SY 2021-2022, First Semester, had a 92.05% utilization rate from its 745 single coursepages and 205 shared coursepages over its total uploaded coursepages of 1032. The SY 2021-2022, Second Semester, showed a 93.18% utilization from a total of 631 single coursepages and 230 shared coursepages. This is against the 924 total coursepages uploaded during that term. The SY 2022-2023, first semester had a total of uploaded coursepages of 762 and the only utilized coursepages are 67.06%, which is composed of 287 individual coursepages and 222 shared coursepages. The decrease of 26.12% in the utilization rate is due to the changes of learning mode from fully online classes to a blended learning. The University holds face-to-face classes for courses with laboratory.

**Implication to Diffusion of Technology**

The perceived usefulness of LMS is a particularly important factor in determining whether they will be adopted and integrated into educational settings. LMS can provide numerous benefits to educators and learners, including the ability to organize and share course materials, facilitate communication and collaboration, and track student progress. By highlighting these benefits, schools and universities can help convince educators of the value of using LMS in their teaching and learning practices.

The creation of the Flexible Learning Committee (FLP) was critical to the implementation since it sets the stage for everything to happen accordingly. Ssekakubo et al [15] framework that includes planning, design, development, evaluation, delivery and maintenance were taken into consideration by the implementors. The stages of e-learning framework [16] includes the educators which are considered as the frontline in the academe. The use of Bayanihan teams allowed collaboration among faculty who are the main designers of learning. The incubation and migration manifested the stages described in this framework. The support system that was extracted from the study of ELEN was the pillar for the capability training, as well as the creation of a helpdesk and online ticketing system. The framework of Basak et al. [18] presents a more comprehensive implementation that becomes the future direction of the LMS implementation. The implementation timeline and the training design per semester demonstrate the long-term plan of the implementors to sustain the utilization of the LMS even in the gradual return to face-to-face learning.

In addition to perceived usefulness, the compatibility of LMS with existing practices is also an important factor in their diffusion. Educators may be hesitant to use LMS if they require significant changes to their existing teaching and learning practices. By ensuring that LMS are compatible with existing practices, schools and universities can help smooth the transition to using these technologies.

Finally, the availability of training and support is another crucial factor in the diffusion of LMS. Educators may be intimidated by the prospect of using new technologies in their teaching and learning practices, and may require support and

guidance to effectively use LMS. By providing training and support, schools and universities can help ensure that educators feel confident and capable when using these technologies.

The data shows that while the number of capability trainings decreases each semesters that pass by, the utilization rate increases (Figure 4-5). The gap between the uploaded coursepages and the utilized coursepages, both single and shared coursepages, decreases for the subsequent semesters during the two year implementation period.

Overall, the diffusion of technology in learning management systems is a complex process that is influenced by a range of factors. By considering the perceived usefulness of LMS, their compatibility with existing practices, and the availability of training and support, schools and universities can help ensure that these technologies are successfully adopted and integrated into their educational settings. This can lead to improved teaching and learning outcomes, and help educators and learners take full advantage of the benefits of LMS.

## CONCLUSION

The two years spent implementing a Learning Management System in a multi-campus Higher Educational Institution provided insights into important milestones in the diffusion of technology during a pandemic. The FLP committee was guided in the successful implementation of the learning management system at the University of Science and Technology of Southern Philippines (USTP) by examining relevant frameworks and models in the LMS implementation. The utilization data with the training capabilities conducted during the incubation, migration and enhancement stages are significant indicators that technology diffusion is evident in the University. However, the users' perspectives must be included in the data that must be collected and analyzed. The LMS statistics may not provide a complete picture of the implementation. It is hoped that future study will dig deeper into both the implementers' and end-users' perspectives to acquire a better understanding of the important success factors for the diffusion of technology in learning management implementation.

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