Faculty Acceptance and Adoption of Learning Management Systems (LMS) using the Extended Technology Acceptance Model (ETAM)

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Abstract: This paper examines various factors that influenced the acceptance and adoption of LMS among the faculty of the selected State Universities and Colleges (SUCs) in Leyte and Biliran Provinces in the Philippines using the Extended Technology Acceptance Model (ETAM). Additionally, a cross-sectional survey, purposive sampling, and stratified sampling were all used in the study as part of a quantitative, non-experimental research design. A sample of 306 faculty members completed a Google Form survey. The mean, standard deviation, Pearson product-moment correlation coefficient, and one-way ANOVA were used in data analysis. Further, the study found significant relationships between faculty factors and their perceived ease of LMS use and LMS usefulness. In addition, the faculty members perceived that the ease of LMS use significantly affected their attitude toward using LMS. Likewise, the faculty members also perceived that the usefulness of LMS significantly affected their attitude and acceptance of the use of LMS. Similarly, their attitude toward using the LMS significantly affected their acceptance of the use of the LMS. Moreover, the study's findings supported the validity of ETAM in measuring LMS acceptance and adoption.

1. Introduction

The rapid advancement and application of Information Communication Technology (ICT) in education have resulted in an explosion of new hardware and software technologies. These digital technologies have had a significant impact on the education system, leading to a paradigm shift [1]. One of the technologies created with educators and students in mind is the Learning Management System (LMS) [2]. LMS is a web-based educational program that manages, delivers, tracks, and evaluates training and educational materials. It has revolutionized teaching and learning modalities from traditional to flexible or pure online instruction [3].

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Recently, there has been a noticeable increase in the adoption of LMS in educational institutions worldwide due to the unprecedented disruptions brought by the COVID-19 pandemic, which has altered the teaching and learning process [4][5]. Since instructors are the ultimate users and significant stakeholders, their acceptance and adoption of LMS are essential to system's effective implementation. Thus, this research examines the factors that influence faculty acceptance and adoption of LMS using the Extended Technology Acceptance Model (ETAM) [6].

Based on the literature review conducted, several studies utilized TAM (whether original or extended TAM) in examining the factors that influence the faculty acceptance and adoption of LMS across countries. However, most researchers have studied the academic adoption of LMS in the Western context, with only a few investigations undertaken in other areas [7]. In the Philippine context, Fearnley and Amora [8] used extended TAM in their study on LMS adoption in higher education, in which they incorporated three external variables such as system quality, perceived self-efficacy, and facilitating conditions. However, the external influences of faculty factors such as technology access, technology skills, and computer self-efficacy have not yet been examined.

The main objective of this study was to examine the factors that influenced the acceptance and adoption of LMS among the faculty of the selected State Universities and Colleges (SUCs) in Leyte and Biliran Provinces in the Philippines using ETAM. Specifically, it aims to determine the following: (1) level of perceptions of the faculty on faculty factors, ease of LMS use, usefulness of LMS as a learning tool, attitude of the faculty towards the use of LMS, and acceptance of the faculty on the use of LMS; (2) relationships between faculty factors, perceived ease of LMS use, and perceived usefulness of LMS; (3) influence of perceived ease of use of LMS on attitude towards using LMS; (4) influence of perceived usefulness on attitude and acceptance on the use of LMS; and (5) influence of attitude toward using LMS on acceptance on the use of LMS.

2. Framework

2.1 The Extended Technology Acceptance Model (ETAM)

The study is anchored on the Extended Technology Acceptance Model (ETAM) [6], as shown in Figure 1.
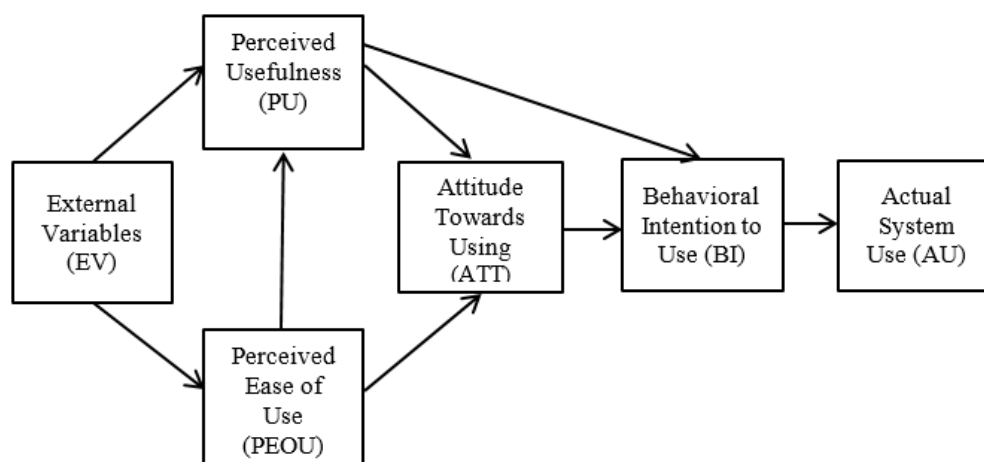

Figure 1. The Extended Technology Acceptance Model (ETAM)

ETAM is a groundbreaking theoretical framework designed to explain the factors influencing users' acceptance and adoption of technology. ETAM suggests that the external variables (EV) directly influence the users' perceived usefulness (PU) and the users' perceived ease of use (PEOU). In addition, the individuals' perceived ease of use (PEOU) significantly affects the users' perceived usefulness (PU). Likewise, the users' perceived ease of use (PEOU) and perceived usefulness (PU) of technology significantly affect their attitude (ATT) and behavioral intentions (BI) to use that technology, which significantly affects their actual use (AU) of technology. Thus, it has been widely applied and extended in diverse settings to explore the users' attitudes, motivations, and behaviors related to technology adoption, making it a fundamental model in the field of information systems and technology research.

The ETAM was chosen to be used in this study for various reasons. First, the study utilized the five constructs of the model, such as EV, PEOU, PU, ATT, and AU, in examining the faculty acceptance and adoption of LMS. Second, the reliability of the ETAM in determining the user's usage of LMS in a different context with a different application has been proposed and confirmed by various scholars [7][9]. Moreover, ETAM has been a standout among the most well-known models for understanding the faculty acceptance of technologies worldwide [10].

The conceptual framework grounding this study links together the theoretical ETAM [6], as shown in Figure 1. Furthermore, there are five constructs formed in this study, as shown in Figure 2, stated as follows: (1) Faculty factors such as technology skills, access, and computer self-efficacy as external variables (EV); (2) Perceived LMS Usefulness (PU); (3) Perceived ease of LMS use (PEOU); (4) Attitude towards the use of LMS (ATT); and (5) Acceptance of the use of LMS (AU). To provide a better understanding of LMS acceptance and adoption among faculty members of the participating SUCs in Region 8, the above-mentioned factors in the study were examined to determine their influences and relationships among variables.
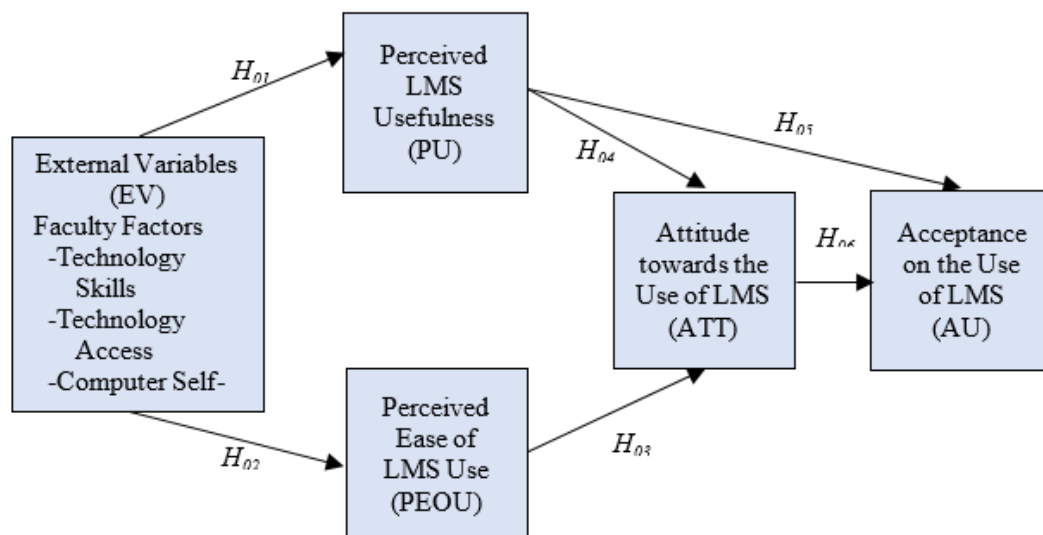
Figure 2. Research Framework and Hypotheses

According to ETAM presented by Davis (1989), the external variables influence the PEU and PU directly. Thus, it was hypothesized in this research that faculty factors such as ICT technology skills, technology access, and computer self-efficacy would significantly affect the perceived usefulness of LMS and ease of LMS use among faculty. This means that if the faculty perceive the LMS as easy and

useful, then it might affect their perceived technological skills, access to technology, and computer self-efficacy in using the LMS. Thus, the study posits that:

H01: There are significant relationships between faculty factors and the perceived usefulness of LMS.

H02: There are significant relationships between faculty factors and perceived ease of LMS use.

Further, ETAM assumes that both PEU and PU influence individuals' attitudes toward the use of technology. Thus, it was hypothesized in this study that both the perceived usefulness of LMS and the perceived ease of LMS use would positively affect the attitude towards the use of LMS. This implies that if the faculty perceives the LMS as easy to use and useful, then they will formulate a positive attitude towards using it. Thus, the study posits that:

H03: Perceived ease of LMS use significantly affects attitude towards the use of LMS.

H04: Perceived usefulness of LMS significantly affects attitude toward the use of LMS.

Furthermore, [6] noticed that PU and ATT directly influence the actual use of technology. Thus, it was hypothesized in this study that the perceived usefulness and attitude towards the use of LMS would positively affect the acceptance of using LMS. This implies that if the faculty would find LMS useful and would have a positive attitude towards the use of LMS, then they would accept and use it. Thus, the study posits that

H05: Perceived usefulness of LMS significantly affects acceptance of the use of LMS as a learning tool.

H06: Attitude towards the use of LMS significantly affects acceptance of the use of LMS as a learning tool.

3. Methodology

The research methodology used in this study covers various aspects, including research design, research environment, sampling technique, research respondents, research instrument, data gathering procedure, ethical considerations, and statistical treatment of data. It aims to examine the utilization of learning management systems among the selected State Universities and Colleges (SUCs) in Region 8.

3.1 Research Design

In this study, a quantitative, non-experimental research design using a cross-sectional survey was selected to examine the use of LMS among SUCs in Region 8, using the extended TAM (Technology Acceptance Model). This research design enables the researcher to choose participants based on the set inclusion and exclusion criteria for the study.

3.2 Research Environment

The study was conducted at selected SUCs in Region 8, which encompasses the eastern part of the Visayas and includes the major islands of Leyte and Biliran.

3.3 Sampling Technique

Two sampling techniques were applied: purposive sampling was used to determine the SUCs that would take part in this study, and stratified random sampling was used to determine the participants from these chosen SUCs.

3.4 Research Respondents

The study participants were faculty members from the identified SUCs in Leyte and Biliran provinces. These faculty members utilized various LMS platforms in their classes during the 2020-2021 school year.

3.5 Research Instrument

In order to ensure content validity, the questionnaire used in this study was adapted from the original study by Davis (1989), which measured the constructs of the TAM model. The questionnaire aimed to measure all five constructs of the TAM model: faculty factors, perceived LMS usefulness, perceived ease of LMS use, attitude toward the use of LMS, and acceptance of the use of LMS. The questionnaire consisted of forty-five (45) items that encompassed all five (5) constructs of TAM. It was divided into five (5) parts: the first part included twenty-five (25) items that measured the level of skills related to faculty factors. The second part contained five (5) items that assessed the ease of LMS use. The third part also contained five (5) items that measured the perceived usefulness of LMS. Similarly, the fourth part contained five (5) items that measured the respondents' attitude toward the use of LMS, and finally, another five (5) items that evaluated the respondents' acceptance of using LMS.

3.6 Data Gathering Procedure

The study was conducted during the 2020-2021 school year. The approved questionnaire was distributed to the faculty members of the participating SUCs in Region 8 via a Google Form link. Faculty participation was voluntary and based on availability. To ensure full awareness and improve the response rate, the questionnaire included a confidentiality statement. This statement clearly indicated that responses would be treated with the utmost confidentiality and would only be used to support the analysis outlined in the study's objective.

3.7 Ethical Consideration

The information provided by the participants and the schools involved in this study was treated with the utmost confidentiality to protect their privacy and identity. The participants voluntarily consented to answer the questionnaires, and no financial compensation or incentives were provided. Additionally, there was no cost incurred by the participants or the schools. They also had the right to refuse or reject involvement in the research.

3.8 Statistical Treatment of Data

The quantitative data obtained from the questionnaire underwent statistical analysis using different mathematical tools to address the problems and hypotheses considered in this study. The following statistical tools were employed to aid in a better understanding of the data as well as its relationship between and among variables: (a) the sample size was determined by Krejcie's and Morgan's formula and stratified random sampling was used; (b) to determine the respondents' level of perceptions of faculty factors, ease of use and usefulness of LMS, attitude towards the use of LMS, and acceptance of LMS as a learning tool, the mean and standard deviation were used; (c) the Pearson Product Moment Correlation Coefficient was used to determine whether significant relationships existed among identified factors, and (d) a One-Way Analysis of Variance was used to test whether identified factors significantly affected attitude and acceptance of LMS use.

4. Results and Discussions

This section deals with the presentation of findings and the analysis and interpretation of data generated from survey responses to examine the factors that influenced the acceptance and adoption of the LMS among the faculty of the selected SUCs in Leyte and Biliran Provinces in the Philippines. Specifically, this study presents the level of perception of faculty factors, ease of use and usefulness of LMS, attitude, and acceptance of the faculty on the use of LMS, the relationship between faculty factors and each of the perceived ease of LMS use and usefulness of LMS, the effect of perceived LMS use and usefulness on attitude towards using the LMS, and the effects of attitude on the acceptance of LMS.

4.1 Perception of Faculty Factors

Table 1 presents the perceptions of the faculty on faculty factors such as technology access, technology skills, and computer self-efficacy.

Table 1. Perception of Faculty on Faculty Factors

Faculty Factors	WM	SD	Interpretation
Technology Access	3.78	2.23	Good
Technology Skills	3.82	0.33	Proficient
Computer Self-Efficacy	3.66	0.11	High

The above results imply that if the faculty perceive that if they have good access to technology, they are proficient in computers and high in computer self-efficacy, then it will directly influence them to easily use LMS. The results were confirmed by the studies of Abdullah and Suhaim [11] and Buabeng-Andoh and Baah [12], which pointed out that the uptake and use of technology are associated with teachers themselves rather than the existence of tools in the classroom.

4.2 Perception of the Ease of LMS Use and Usefulness of LMS as a Learning Tool

Table 2 presents the perceived ease of LMS use and usefulness of LMS by the faculty. In general, the weighted mean for perceived ease of LMS use was (M = 3.66), which means that most faculty agreed that using LMS was easy. The results imply that if the faculty were proficient or experts in ICT, they would find it very easy to use LMS for teaching. The perceived ease of LMS use by the faculty would be directly influenced by their skills in technology and computer self-efficacy. The results were confirmed in previous studies by Ambag *et el.* [13] and Yalcin and Kutlu [14], stated that the perceived ease of use is affected by technology skills and computer self-efficacy.

Table 2. Perception of Faculty on Ease of Use and Usefulness of LMS

Faculty Perceptions	WM	SD	Interpretation
1. Perceived Ease of LMS use	3.66	0.20	Easy
2. Perceived Usefulness of LMS	3.77	0.20	Useful

Similarly, the overall mean for the usefulness of LMS as a learning tool was M = 3.77, which means that most faculty considered LMS a useful learning tool for the teaching and learning process. The results imply that the perceived usefulness of LMS by the faculty was greatly affected by how they perceived the ease of LMS use and faculty factors. The results were confirmed by Davis [6], who stated that perceived ease of use may be a causal antecedent to perceived usefulness. Likewise, Wichadee [15] also confirmed that the more the instructors perceived ease of LMS use, the more intensively their beliefs about its use increased. Moreover, Matarirano *et al.* [16] suggested that if an LMS is adopted and used, it is considered useful; otherwise, users will be reluctant to use it.

4.3 Attitude of the Faculty toward the Use of LMS

Table 3 reflects the attitude of the faculty toward the use of LMS. The results imply that most faculty had different attitudes toward the use of LMS. Some of them considered using LMS for delivery instruction easy and useful and perceived that it was not a waste of time. In contrast, some of them also considered LMS easy and useful but felt that it was indeed a waste of time.

Table 3. Attitude of Faculty towards the Use of LMS

Attitude towards the Use of LMS	WM	SD	Interpretation
1. I found that using LMS in teaching and learning arouses my interest and that of the students.	3.58	0.29	Favorable
2. I feel that using LMS in instructional delivery increases the ICT skills of the students.	3.87	0.13	Favorable
3. I like using LMS to upload lessons, quizzes, assignments, and projects to my students.	3.84	0.13	Favorable
4. I experience fulfillment in posting lecture materials on LMS for students.	3.74	0.14	Favorable
5. I feel that using LMS in instructional delivery is not a waste of time.	3.04	0.2	Undecided
Overall	*3.61*	*0.18*	*Favorable*

However, regardless of whether using LMS was a waste of time or not, the result did not affect the overall weighted mean of M = 3.60, which means that most faculty had a favorable attitude toward the use of LMS. The results were confirmed by the studies of Wichadee [15] and Tena *et al.* [17], who studied the faculty members' attitudes and adoption of LMS. Their studies found that most faculty had a high overall attitude towards the use of LMS.

4.4 Acceptance of Faculty on the Use of LMS

Table 4 shows the acceptance of faculty on the use of LMS. This implies that most faculty in Region 8 accept the use of LMS for teaching.

Table 4. Acceptance of Faculty on the Use of LMS

Acceptance of Using the LMS	WM	SD	Interpretation
1. I use LMS for uploading lessons, quizzes, assignments, and projects to my students.	3.84	0.20	Acceptable
2. I use LMS for checking the quizzes, assignments, and feedback from my students.	3.75	0.15	Acceptable
3. I use LMS frequently.	3.71	0.12	Acceptable
4. I use LMS for virtual discussions.	3.52	0.27	Acceptable
5. I use LMS to expand my teaching technique.	3.64	0.21	Acceptable
Overall	*3.69*	*0.19*	*Acceptable*

In general, the overall weighted mean for the acceptance of the use of LMS was M = 3.69, which means that it is acceptable for the faculty to use LMS as a learning tool for teaching. The results were confirmed by the study of Buabeng-Andoh and Baah [12] related to internal and external factors of teachers' ICT usage, wherein they found out that internal and external factors would directly influence the faculty's usage of technology.

4.5 Relationships between Faculty Factors and Each of the Perceived Ease of LMS Use and Usefulness of LMS

4.5.1. Correlation between Faculty Factors and Perceived Ease of LMS Use

The first hypothesis that this study wanted to investigate was whether there were significant relationships between faculty factors and the perceived ease of LMS use and the usefulness of LMS in instruction.

Table 5. Correlation between Faculty Factors and Perceived Ease of LMS Use

Faculty Factors	Tech Acc	Tech Skills	Computer SE	Ease of Use
Tech Acc	1	.420**	.397**	.394**
Tech Skills		1	.630**	.567**
Computer SE			1	.686**
Ease of Use				1

**Correlation is significant at .01 level (2-tailed)

Table 5 shows the correlation between each faculty factor and the perceived ease of use of LMS. Generally, the results of the Pearson correlation analysis revealed that there were significant positive relationships between each component of the faculty factors and perceived ease of LMS, based on the

number of faculty r(303) with correlation values ranging from (r = .39) to (r = .69). These factors were highly significantly correlated since the values were all significant even at p < .01 level of significance. Thus, the first null hypothesis is rejected in favor of the first research hypothesis, which stated that there were significant relationships between the faculty factors and the perceived ease of LMS used by the faculty.

4.5.2 Correlation between Faculty Factors and Perceived Usefulness of LMS

The Pearson correlation among faculty factors was found to be strongly, moderately, and weakly positively correlated with the perceived usefulness of LMS, with correlation values ranging from r = .39 to r = .52 as shown in Table 6. This means that the second research hypothesis is also accepted in terms of the perceived usefulness of LMS. In other words, there were significant positive relationships between the faculty factors and the perceived usefulness of LMS. The correlation results indicated that all faculty factors were considered determinants of the perceived usefulness of LMS. The results were confirmed by the studies of Alshammari [7] and Buabeng-Andoh and Baah [12], who stated that internal and external factors were found to influence teachers' ICT usage.

Table 6. Correlation between Faculty Factors and Perceived Usefulness of LMS

Faculty Factors	Tech Access	Tech Skills	Comp SE	Usefulness
Tech Acc	1	.420**	.397**	.394**
Tech Skills		1	.630**	.418**
Comp SE			1	.518**
Usefulness				1

**Correlation is significant at .01 level (2-tailed)

4.6 Effect of Perceived Ease of Use of LMS on Attitude

The third hypothesis that this study intended to answer was if whether there was a significant effect of the faculty's level of perceived ease of use on their attitude towards using LMS for teaching. Table 7 shows the summary ANOVA on the effects of perceived ease of use of LMS on attitude.

Table 7. Summary ANOVA on the Effect of Perceived Ease of LMS Use on Attitude

Attitude	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	89.054	4	22.264	122.860**	.000
Within Groups	54.363	300	.181		
Total	143.418	304			

**ANOVA is significant at .05 level

A one-way ANOVA was conducted to compare the effects of faculty's perceived ease of LMS use on their attitude towards using LMS in five conditions: those who evaluated it as very easy, easy, undecided, difficult, and very difficult. A one-way ANOVA analysis revealed that there was a

statistically significant effect of the faculty's perceived ease of LMS use on their attitude towards using LMS at the $p < .05$ significance level for the five conditions ($F_{(4,300)} = 122.860$, $p = .001$). This accepts the third research hypothesis, which states that the ease of LMS use significantly affects attitudes towards using LMS. Thus, it concluded that levels of perceived ease of use of LMS significantly affected the attitude towards using LMS. The results were confirmed by Wichadee [15], who examined the factors related to faculty members' attitudes and adoption of LMS. It revealed that the perceived ease of use of LMS had a significant effect on attitudes towards the adoption of LMS.

4.7 Effect of Perceived Usefulness on Attitude towards Using the LMS and Acceptance of the Use of the LMS

This study also investigated whether the perceived usefulness of LMS significantly affected attitudes towards using the LMS and acceptance of the use of LMS. These were the fourth and fifth hypotheses of this study.

Table 8. Summary ANOVA on the Effect of Perceived Usefulness of LMS on Attitude and Acceptance

Attitude and Acceptance		Sum of Squares	df	Mean Square	F	Sig.
Attitude	Between Groups	74.881	4	18.720	77.019**	.000
	Within Groups	72.918	300	.243		
	Total	147.799	304			
Acceptance	Between Groups	75.658	4	18.915	43.624**	.000
	Within Groups	130.074	300	.434		
	Total	205.732	304			

**ANOVA is significant at .05 level

As shown in Table 8, there was a statistically significant difference in the attitude between groups of perceived usefulness of LMS as determined by One-Way ANOVA ($F_{(4,300)} = 77.02$, $p = .001$). The null hypothesis was rejected because the p-value is less than .05. Thus, there was statistically significant evidence at the $p<.05$ level to show that the perceived usefulness of LMS significantly affects the respondents' attitude toward using LMS. Taken together, these results suggest that perceived usefulness does influence the attitude toward the use of LMS in instruction. Specifically, the results suggest that if the faculty agreed or strongly agreed with the perceived usefulness of LMS, they would develop a positive attitude toward using LMS for instructions.

Another aspect of this hypothesis is the effect of the perceived usefulness of LMS on the acceptance of its use. A One-Way ANOVA revealed that there was a statistically significant effect between groups of perceived usefulness on the acceptance of using LMS ($F_{(4,300)} = 43.62$ ($p = .001$). Thus, it was concluded that the levels of perceived usefulness of LMS significantly affected the acceptance of LMS use by faculty. The results were confirmed by Alshammari [7], Wichadee [15], and Azman *et al.* [18], who studied the lecturers' perceived usefulness and acceptance and found a significant positive and

moderate relationship between the perceived usefulness of LMS and the lecturers' attitude and acceptance of the use of LMS.

4.8 Effect of Attitude on the Acceptance of the Use of LMS

The sixth hypothesis that this study intended to answer was that the attitude towards the use of LMS significantly affected the acceptance of the use of LMS as a learning tool. This can be found in Table 9.

Table 9. Summary ANOVA on the Effect of Attitude on Acceptance of LMS Use

Attitude	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	77.641	4	19.410	45.460	.000
Within Groups	128.091	300	.427		
Total	205.732	304			

**ANOVA is significant at .05 level

A one-way ANOVA revealed that there was a statistically significant effect on the mean level of acceptance between groups ($F_{(4,300)} = 45.46$, $p = .001$). In other words, the null hypothesis was rejected. This means that there was enough evidence to conclude that the attitude towards the use of LMS significantly affected the acceptance of the use of LMS as a learning tool. Thus, it can be concluded that there was a statistically significant difference in the acceptance of the use of LMS between the levels of attitude of the respondents. In other words, the respondents who had a strong positive attitude towards the use of LMS were also those who strongly accepted the use of LMS. If the faculty had a positive attitude towards the use of LMS, it would be easy for them to use and adopt LMS for teaching and learning.

5. Conclusion and Recommendations

In this study, the influence of faculty factors in utilizing the Learning Management System (LMS) among the selected SUCs in the region was examined using the Extended Technology Acceptance Model (ETAM). The researcher considered these factors to be the main barriers to the acceptance and adoption of LMS among faculty members. Thus, the ETAM was used as a theoretical model to examine how the faculty perceived it in terms of ease of use and usefulness, which led to the development of an attitude that might lead to the acceptance and adoption of the technology or not.

In addition, the study also examined the relationships between faculty factors and the faculty's perceived ease of use and usefulness of LMS, whether it affected or not the attitude towards using LMS, and whether attitude affected the acceptance of the use of LMS. Generally, the researcher concludes that most of the faculty were proficient in terms of their skills in using the technology; however, they found it hard to install, modify configuration settings, and resolve simple hardware or software problems. Likewise, they were proficient in surfing the Internet and sending email attachments. However, most of them still did not know how to use security codes to restrict third parties' access to the LMS platform.

Further, it has been concluded that most of the faculty perceived LMS as easy and useful as a learning tool. Consequently, they developed a favorable attitude towards using LMS and then eagerly accepted it. In addition, faculty factors were significantly correlated with perceived ease of use and usefulness. Moreover, the perceived ease of use significantly affected attitude towards LMS use; also, the perceived

usefulness of LMS significantly affected attitude towards using LMS; and attitude towards the use of LMS significantly affected the acceptance of the use of LMS.

Moreover, the findings of the study confirm the reliability of the Extended Technology Acceptance Model (ETAM) in examining LMS acceptance and adoption among faculty of the selected SUCs in Region 8.

Based on the findings and conclusions presented, the following recommendations are suggested: The human resource management department should develop more computer training programs to assist the faculty in using LMS, database software, installing, changing configuration settings, and resolving simple hardware or software problems, and learning how to use security codes to restrict third parties' access to the LMS platform.

Finally, the institutional leaders should continuously adapt themselves to changing technological environments, inculcate a positive attitude towards the adoption and implementation of LMS within their institution, and may consider developing LMSs that have the potential to assist the instructors with an innovative and effective LMS design.

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