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Influence of Students' Attitude and Satisfaction on the Adoption and Effective Use of Learning Management Systems in Higher Learning Institutions

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Abstract

The use of learning management systems (LMSs) in higher learning institutions (HLIs) enhances teaching and learning processes through online delivery and collaboration. There are several challenges that hinder the adoption of using the system, with limited research on the influence of students' attitudes and satisfaction on effective use of LMS. A quantitative survey was conducted from 246 undergraduate and diploma computer science students with data analysed using descriptive, correlation, and regression analyses to assess system usability, flexibility, simplicity, learning approach, satisfaction, and barriers to LMS adoption. The findings indicate that undergraduate students have significantly higher usability scores (Median = 4.12, Standard Deviation = 0.68) compared with diploma students (Median = 3.74, Standard Deviation = 0.72), $t(244) = 3.85$, $p < 0.001$. Undergraduate students reported higher satisfaction (Median = 4.08, Standard Deviation = 0.64) than diploma students (Median = 3.79, Standard Deviation = 0.70), $t(244) = 2.92$, $p = 0.004$. No significant differences were found in perceived simplicity between the two groups ($p > 0.05$). The study recommends strengthening of e-learning policies to enhance students' ICT skills and competencies. It also guides systems developers, decision-makers, academicians, policymakers, and education practitioners in supporting successful LMS use.

Contribution to Sustainable Development Goals (SDGs)

SDG 4 -Quality Education.

This study contributes to SDG 4 by examining how students' attitudes and satisfaction influence the adoption and effective use of Learning Management Systems (LMS) in higher learning institutions.

1. Introduction

The widespread use of technology has significantly improved the delivery of education, resulting in higher-quality teaching and learning [1]. Learning management systems (LMSs) are used across higher education institutions in both developing and developed countries to streamline teaching and learning processes [2, 3]. Many higher education institutions have embraced LMSs to facilitate online teaching and learning, enabling instructors to disseminate teaching materials and announcements, upload and download materials, and conduct discussions and quizzes [4]. Moodle, KEWL, Sakai, and Blackboard are the most commonly used LMSs in many educational institutions, especially in developing countries [5]. These systems allow students to access programme information, instructor support, course materials, forums or discussion boards, and other course resources without time or place limitations [6, 7]. These features enable students and instructors to engage in conversation throughout the session.

One factor in increasing students' information and communication technology (ICT) skills is the use of LMSs for educational activities [1]. Many young people use computers early on, improving their ICT skills. This new pedagogical era promotes the use of sophisticated technology in teaching and learning, particularly in science disciplines, to improve various elements. Four ICT pedagogy approaches in which the learning process is delivered online via LMSs and in person, resulting in a blended model is well addressed (Figure 1). Furthermore, the system's design enables students to collaborate in activities, which may lead to the development of new ideas or businesses, as well as learning. Finally, the system ensures student competency when using group assessment techniques. All of these models can be completed while the course is being taught.

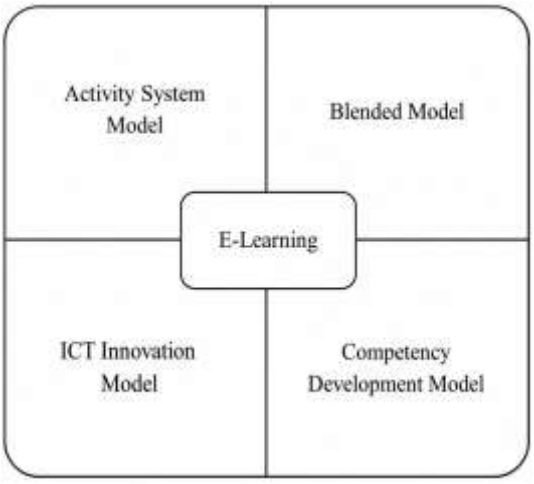


Figure 1. Models for ICT pedagogy on e-Learning.

Despite the potential benefits of LMSs in improving educational provision, many developing countries are still in the early stages of adoption. The use of such systems remains challenging for many higher-learning institutions. Most of these LMSs are underutilised, fail to meet expectations, and are eventually ignored by their users, especially students [8]. For instance, actual usage of LMSs in Sub-Saharan Africa is low despite the widespread adoption of such systems at various universities, including University of Nairobi (Kenya) University of Dar es Salaam (Tanzania), and Makerere University (Uganda) [9]. The effective use of any information system, including LMSs, relies on end users' acceptance, sustained use, satisfaction, and attitudes [10, 11]. There have been substantial contributions to the subject matter. Still, little empirical evidence has demonstrated a link between users' attitudes and satisfaction and LMS acceptance and sustained use. Thus, improving LMSs lies in meeting students' needs and expectations; hence, it is essential to understand students' attitudes and satisfaction to fully realise the potential of such systems.

This study aims to investigate how students' attitudes and satisfaction influence the adoption and

continued use of LMSs in higher education institutions. Specifically, it seeks to uncover the following:

i. Students' attitudes towards LMS use, focusing on system usability, flexibility, and simplicity.
ii. Students' satisfaction with LMSs in relation to learning processes, approaches, and outcomes.
iii. Challenges and barriers to effective LMS adoption and use.

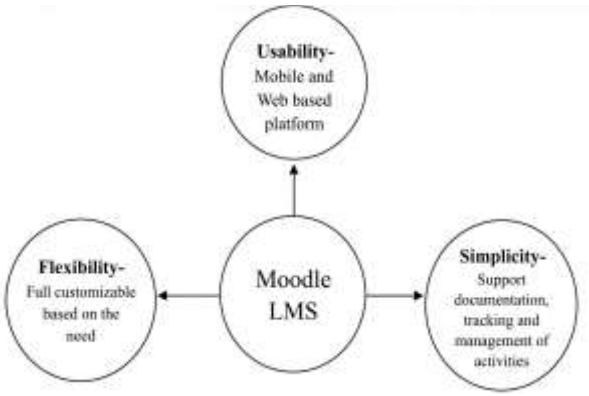
The study, in addition, provides recommendations to improve LMS implementation and enhance student engagement, digital competency, and teaching quality in HLIs. The findings of this research would broaden the knowledge of LMS developers, decision-makers, academics, policymakers, and other education practitioners, thereby helping to improve students' attitudes and satisfaction. Hence, producing more effective LMSs would encourage more students to adopt and continue using the system.

2. Literature Review

2.1 Moodle -LMS Practices

Moodle[1] is a popular open-source learning management system used by many universities, including the University of California, University of Georgia, University of Glasgow, and Australian National University, for educational purposes. It offers a range of features and advantages, including (i) weekly content organisation, (ii) online teaching and learning activities, (iii) assessments (assignments and quizzes), (iv) student-teacher conversations, communication, and collaboration, and (v) survey-based evaluations. From enrolment to course completion, the system enables the effective management and administration of all educational tasks. Additionally, tracking and records are the most commonly used features for promoting attendance and evaluating student performance [12]. The summary of the advantages in the adopting of the LMS at educational institutions, highlighting the key parameters that support its use (Figure 2).

Apart from Moodle, other LMSs, such as Blackboard, WebCT, Desire2Learn, Canvas, Edmodo, KEWL, Sakai, Segue, Interact, CourseWork, and Atutor, also focus on distributing and managing educational content. The advantages of each tool, including how it works, its features, and accessibility have been summarised in the literature [2, 13, 14]. However, open-source platforms have received significant attention, especially in developing countries, because they require no license fees. For instance, Makerere University customized Moodle and named it MUELE (Makerere University E-Learning Environment). The University of Zambia combined Moodle and CMAP, and the University of Cape Town deployed Moodle and Moodle WebCT for learning management activities, including teaching programming courses [15].



Figures 2. Benefits of using LMS for HLIs.

[1] https://moodle.org/

2.2 Attitudes and Satisfaction in Learning Management Systems

Users' attitudes and satisfaction are significant factors in the adoption and use of LMSs in higher learning institutions. Many studies have examined users' attitudes and satisfaction to identify factors that contribute to the importance and relevance of using LMSs. The quantitative research conducted by Nguyen [16] examined satisfaction with LMSs, particularly Blackboard and Edusoft, among 214 students at the Vietnam National University. The study focused on how the announcement system, instruction information, interaction, and technology quality on LMSs are useful for learning. It was found that learners' satisfaction is important and has both direct and indirect effects. Similarly, Yuen et al. [17] used a quantitative methodology with 1,179 students from 25 Hong Kong schools to investigate changes in LMS use, beliefs, and satisfaction, and to understand whether students would accept and continue using it. The results showed that LMS use provides positive growth over time. Furthermore, Alzahrani and Seth [18] surveyed 181 students from the United Kingdom who engaged with LMSs to analyse critical factors influencing their satisfaction toward use of LMSs. The authors found that service quality does not affect students' satisfaction, whereas information quality does.

Al Aufi and Naidu [19] investigated students' perceptions of the use and effectiveness of the LMS to facilitate a flipped learning experience at a Private Higher Education Institution in Oman. The authors used a mixed-methods survey with 70 students. The findings showed that LMS promotes a student-centred environment that is ideal for a broader active-learning approach in the context of higher education. Also, Mundir and Umiarso [20] applied quantitative approach to investigate the factors associated with students' satisfaction in using LMSs, namely perceived ease of use (PEOU), facilitating conditions, and interaction, at the UNITAR International University, Kelana Jaya, using. Seventy students from the Faculty of Education and Humanities participated in a survey with 17 closed-ended questions and one open-ended question. The research outcomes revealed that students enjoyed forum discussions and interaction with friends, and that they easily accessed the materials. Hence, emphasis on its use is paramount.

Mundir and Umiarso [20] explored students' attitudes and the factors influencing their learning of Islamic education using LMS. The study used a qualitative approach grounded in social cognitive theory and involved 18 students and 3 teachers. The findings showed that students' attitudes towards implementing an LMS during learning were positive, as it made it easy to access learning materials and other resources. In addition, students' attitudes were influenced by individual factors (e-learning self-efficacy), social factors (subjective norm), and organisational factors (accessibility system). The authors also examined students' attitudes towards using an LMS among 120 undergraduates at the Rajarata University of Sri Lanka. The results showed that perceived usefulness and perceived ease of use significantly affected attitudes towards using LMS. Likewise, Alghamdi and Bayaga [21] examined the same attribute using 222 faculty members across six universities. However, their findings revealed that the older generation (over 40 years old) tended to use LMS for teaching activities more than the younger generation. Also, it was not actively used for most teaching purposes.

Mousa et al. [22] assessed the attitudes and satisfaction of undergraduate nursing students at Cairo University towards using the Blackboard LMS through an exploratory cross-sectional study. Several findings were obtained, including (i) a positive attitude and neutral satisfaction with use, (ii) significant impact of attitude and satisfaction on the outcomes of learning and teaching, and (iii)

need for more training to improve the system's usability.

2.3 Mapping Attitudes and Satisfaction to UTAUT

When examining the factors influencing students' adoption of LMSs, several constructs from the Unified Theory of Acceptance and Use of Technology (UTAUT) are particularly relevant. Performance Expectancy (PE) reflects the belief that using an LMS will enhance learning outcomes, as students tend to value features that save time, promote collaborative learning, and improve ICT skills [23]. Research by Mousa et al. [22] emphasises Effort Expectancy (EE), which concerns PEOU and plays a vital role in student satisfaction, with system simplicity and user-friendly design being significant determinants. Social Influence (SI) also affects LMS adoption, as students are more likely to use the system when encouraged by lecturers and peers.

Prior study by Porter [24] reveals that the active integration of LMS by instructors positively drives student participation. Additionally, Facilitating Conditions (FC), such as reliable internet access, ICT infrastructure, and technical support, are critical for successful implementation and for students' attitudes and satisfaction. Generally, in African higher learning institutions, inadequate resources and infrastructural challenges remain major barriers to LMS adoption [25].

Overall system usability, flexibility, and simplicity are critical determinants of students' acceptance of LMSs, as they facilitate easy interactions. The learning approach supported by the LMS, such as collaboration, sharing of materials, and self-learning, has a significant effect on students' attitudes and satisfaction. All systems that offer user-friendly, adaptable environments that support learners' needs tend to foster innovation and digital skills in students.

3. Method

3.1 Research Design

This research design employs a quantitative approach, utilising an instrument comprising five open-ended questions, one with a 5-point Likert scale, and four closed-ended questions. A quantitative survey design was chosen for this study because it allows for the systematic collection and analysis of data from a relatively large sample, enabling generalisable insights into students' attitudes and satisfaction with the LMS.

The use of structured questionnaires with Likert-scale items is particularly suited to measuring perceptions, such as usability, flexibility, simplicity, and satisfaction, which are best captured numerically and analysed statistically. The open-ended questions focus on usability, flexibility, simplicity, and the challenges of using LMS. The closed-ended questions focus on the preferred approach and the learning process. A 5-point Likert scale was used to measure LMS satisfaction, with ratings ranging from 1 (strongly disagree) to 5 (strongly agree). To ensure the reliability of the questionnaire items, a pilot test was conducted with a small group of students before the main survey. Cronbach's alpha was calculated for the Likert-scale items measuring attitudes and satisfaction. The study employed a convenience sampling technique, targeting first-year undergraduate and diploma Computer Science students who had direct exposure to the Moodle LMS in their courses. This approach was chosen due to the accessibility of participants and the feasibility of data collection within the semester timeframe.

3.2 Sample and Survey

The target survey participants were students in Computer Science and Engineering programmes. Computer Science students were selected as the study sample because they have greater exposure to digital tools and technology-based learning than

students in other disciplines. Their familiarity with ICT makes them suitable respondents for

evaluating the usability, flexibility, and effectiveness of a Learning Management System (LMS). The sample focused on first-year undergraduate and diploma students in the 2023/2024 academic year. We sent the questionnaire to students who used LMS in the *CS 151: Computer Architecture and Organization I* undergraduate course and *IS 063: Introduction to Professional Issues in Computer Science* diploma course. Out of the 260 surveyed students, 246 students participated, representing approximately 94.6% of the response rate.

3.3 Data Collection and Analysis

The learning process was conducted in a blended mode (in-person and online). The physical method focused on the teaching process, while the online practice concentrated on other activities, such as providing lecture notes and reading materials, and uploading assignments, discussions, quizzes, and tests. The teaching process ran throughout the 15-week syllabus as per the semester timetable. The platform was introduced to students and assistance was provided to those with difficulty accessing and using LMS. At the end of the semester, questionnaires were distributed via Google Forms and personal information was not included to ensure confidentiality. The survey data were first organized in Microsoft Excel and subsequently imported into IBM SPSS Statistics version 25 for advanced statistical analysis. To assess students' attitudes, a cross-tabulation was performed, and the results were visualized as bar graphs for clarity. To evaluate satisfaction, both correlation and regression analyses were conducted to examine the strength and direction of relationships between variables. Specifically, Pearson's correlation coefficient was employed to determine associations among key constructs. A significance level of 0.05 was adopted as the threshold for statistical decision-making, ensuring that the findings were interpreted with a standard level of confidence.

3.4 Ethical Considerations

This study adhered to standard ethical research practices to protect participants' rights and to ensure the integrity of the collected data. Participation was voluntary, and students were informed of the research purpose, the procedures involved, and their right to withdraw at any time without penalty. To maintain confidentiality, no personal identifiers were collected, and responses were anonymised before analysis.

4. Results

The analysis focused on two main dimensions: students' attitudes (usability, flexibility, and simplicity), which reflect how easily learners can interact with the platform, and students' satisfaction (learning approach, process, and outcomes), which focuses on student-centred support, how effectively the system facilitates content delivery, and the extent to which LMS contributes to knowledge acquisition and skills development.

4.1 LMS Usability Among Students

The LMS's usability was assessed using various parameters, including knowledge of the system and its applicability in the studies. Figure 3 illustrates students' perceptions of LMS usability across different exposure levels. The chart shows that the highest reported usability is at the university level, particularly among undergraduate students (68%), indicating that most students become familiar with LMS primarily during higher education. A considerable proportion also learned through instructors (43% of undergraduates and 28% of non-degree students), highlighting the important role of lecturers in facilitating LMS adoption. In contrast, few students (9% of undergraduates and 5% of non-degree students)

were introduced to LMS at the ordinary/secondary level or through peers, suggesting limited early exposure. Activities include taking online courses and searching for scholarships, which require them to take online tests. Overall, Figure 3 demonstrates that usability is strongly influenced by institutional engagement and formal academic environments.

4.2 Simplicity and Ease of LMS Use

Many respondents reported favourable experiences. Figure 4 presents students' perceptions of LMS simplicity in terms of accessibility, ease of learning, and convenience. The majority of undergraduate students (52.7%) and non-degree students (47.3%) agree that LMS provides easy access to lecture notes and well-organised materials. However, a notable proportion of undergraduates (66.7%) perceive challenges regarding simplicity (NO responses), indicating that not all users find the system straightforward. Interestingly, all respondents (100%) disagreed that the LMS is more convenient for writing than paper, reflecting a strong preference for traditional methods in this regard. Figure 4 further suggests that while the LMS is valued for content access, usability issues persist in terms of ease of interaction and practical use.

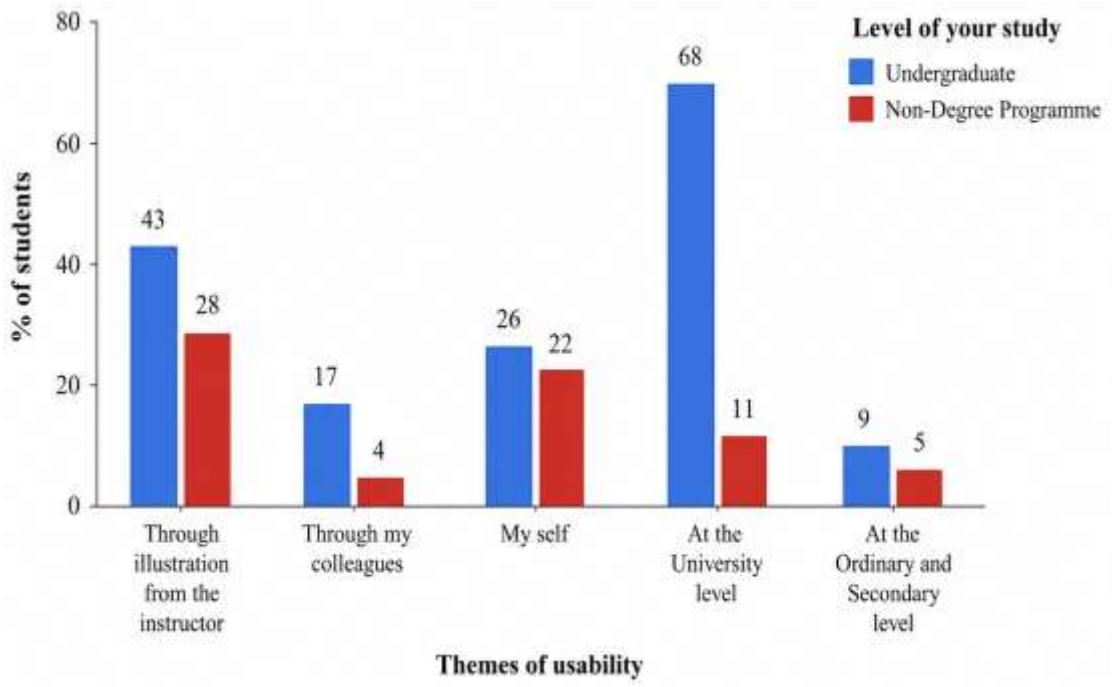


Figure 3. Distribution of students according to their total usability towards LMS.

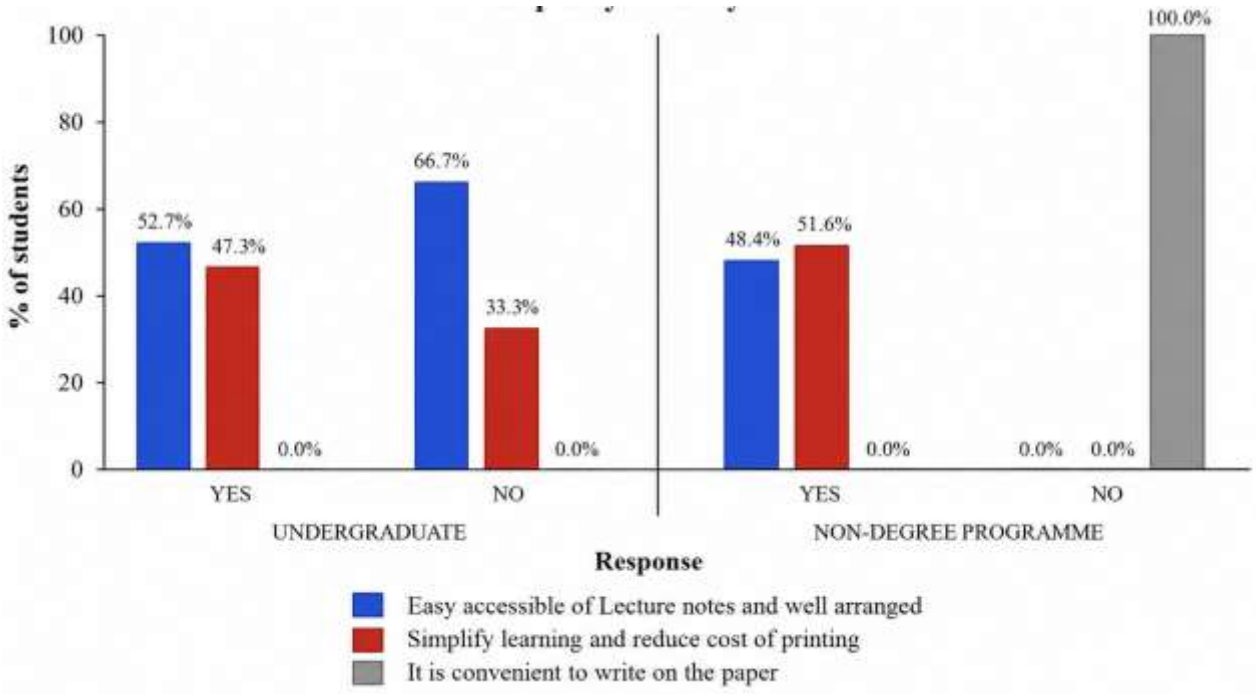


Figure 4. Distribution of students according to their simplicity towards LMS.

4.3 Flexibility of LMS in Supporting Learning Activities

Figure 5 compares the perceived flexibility of LMS-based learning with that of traditional paper-based methods. The results clearly show that LMS is highly valued for saving time (69.7% of undergraduates), improving ICT skills (60%), enabling fast assessment (73.9%), and providing a wide range of knowledge (66.7%). In contrast, traditional methods are associated with lower percentages in these areas but are strongly linked to increased cost (up to 100%). Additionally, LMS usage is not associated with increased cost (0%), reinforcing its economic advantage.

Overall, the Figure highlights that LMS offers greater flexibility and efficiency in learning processes compared with conventional approaches. In addition, implementing LMS enables students to acquire ICT skills more quickly. Students believed that the system helped them become more knowledgeable, test their skills, and gain confidence in the field of computer architecture in the digital world.

4.4 Challenges in LMS Adoption and Use

Students highlighted several concerns about using the LMS (Figure 6). Figure 6 outlines the key challenges students face when using LMS. The most significant issue reported is poor internet connectivity, affecting a large proportion of students (74% undergraduates and 36% non-degree students), indicating infrastructural limitations as a major barrier. Other challenges include limited time during online sessions and difficulties in practical sessions, though these challenges affected fewer students. Notably, a substantial number of

undergraduates (61%) reported no challenges, suggesting that despite existing barriers, many students can effectively use the system. Figure 6 emphasises that while LMS adoption is generally successful, external factors such as network reliability remain critical obstacles.

Network congestion was particularly severe during assessments that required many students to participate simultaneously. This was largely due to the high number of students accessing the system at the same time, which placed considerable demand on the available network resources. In addition, the system has a time limit. Many students complained about the timeout session during the exam, which caused them to lose focus. Students in practical courses emphasized the difficulty of assessing a student's capability in the absence of an instructor. However, some students did not encounter any challenges when using LMS.

4.5 Students' Satisfaction and Behavioral Intention to Use LMS

Of the 246 respondents, 65% were undergraduate students and 35% were diploma students. Overall, 72% of participants reported that the LMS was highly usable, and 68% agreed it was easy to navigate. Satisfaction levels were also high, with 70% rating their experience as satisfactory or very satisfactory. Figure 7 shows students' perceptions of the learning process by level of study and Figure 8 comparison of preferred learning approaches by study level.

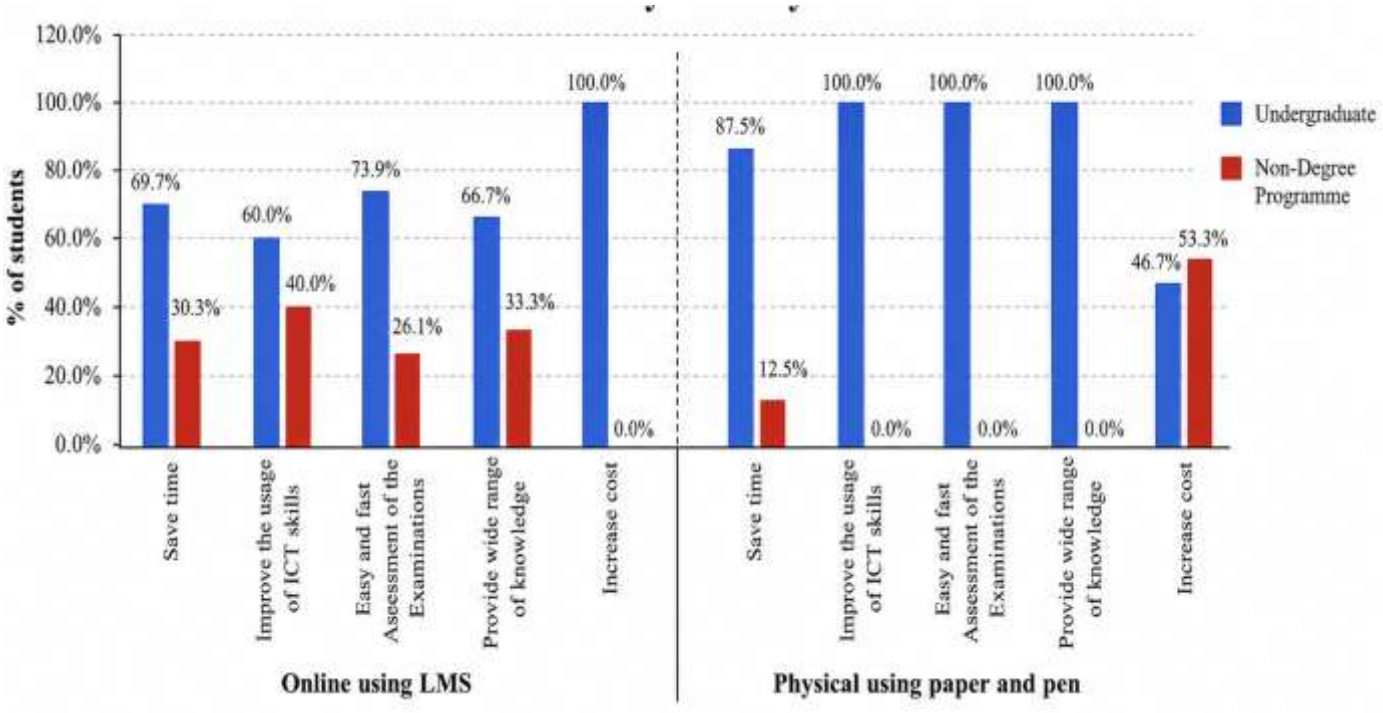


Figure 5. Distribution of students according to their total usability towards LMS.

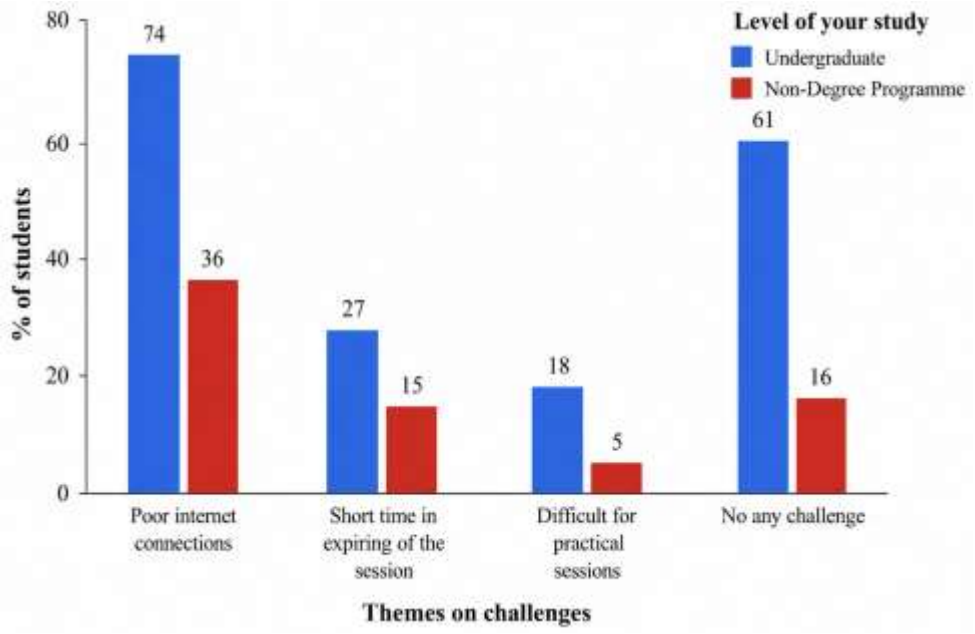


Figure 6. Distribution of challenges addressed by students upon using the LMS.

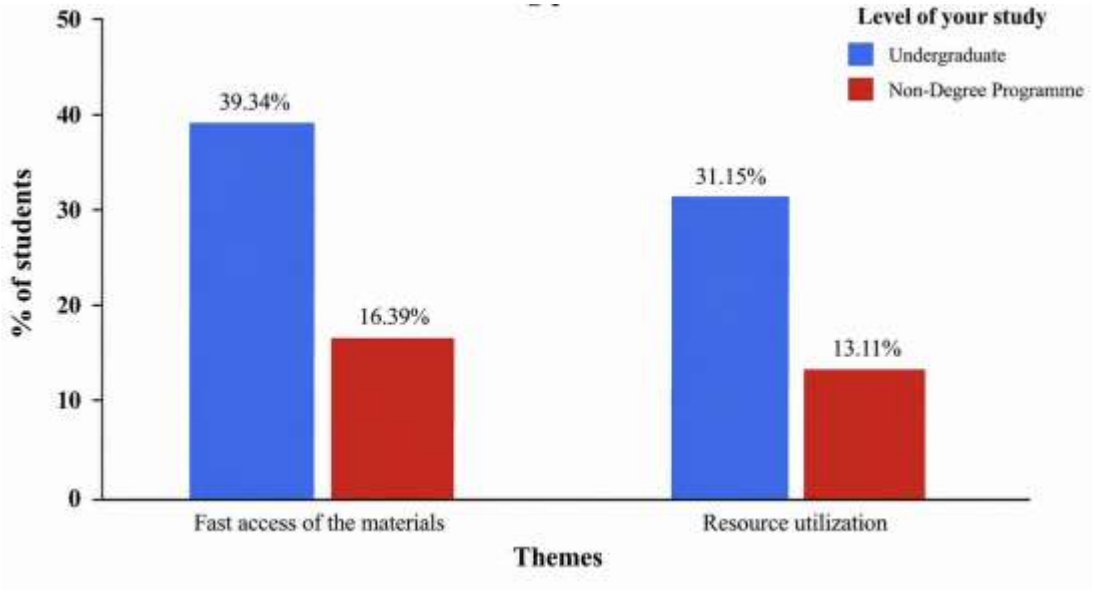


Figure 7. Students' perceptions of the learning process by level of study.

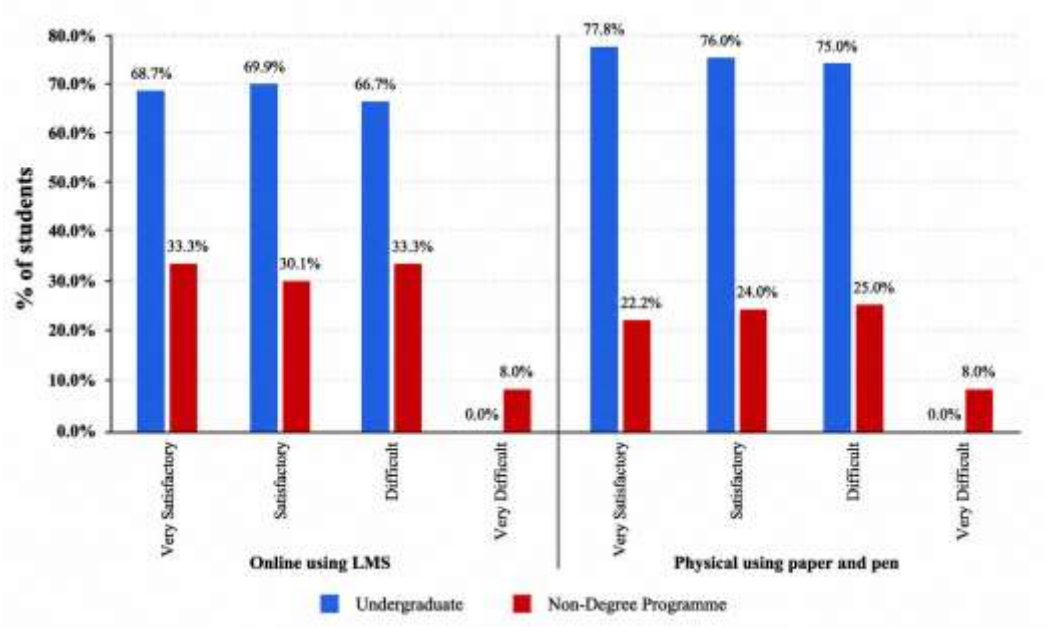


Figure 8. Comparison of preferred learning approaches by study level.

4.6 Correlation Analysis

Pearson's correlation coefficients were computed to examine the relationships among key constructs (Table 1). Results show that usability had a strong positive correlation with satisfaction ($r = 0.61$, $p < 0.001$), while flexibility was moderately correlated with satisfaction ($r = 0.49$, $p < 0.01$). Simplicity also correlated positively with satisfaction ($r = 0.54$, $p < 0.001$). These findings indicate that improvements in usability, simplicity, and flexibility are likely to enhance student satisfaction with the LMS.

4.7 Regression Analysis

A multiple regression analysis was conducted to assess the predictors of satisfaction (Table 2). The model was statistically significant ($F(3, 242) = 28.56$, $p < 0.001$), explaining 34% of the variance in satisfaction ($R^2 = 0.34$). Among the predictors, usability was the strongest ($\beta = 0.42$, $p < 0.001$), followed by simplicity ($\beta = 0.29$, $p < 0.01$), while flexibility had a smaller but still significant effect ($\beta = 0.18$, $p < 0.05$)

4.8 Independent Sample t-test Analysis

Independent-samples t-tests were conducted to examine group differences (Table 3). Undergraduate students reported significantly higher usability scores (Median = 4.12, Standard Deviation= 0.68) than diploma students (Median = 3.74, Standard Deviation = 0.72), $t(244) = 3.85$, $p < 0.001$.

Similarly, undergraduates reported higher satisfaction (Median = 4.08, Standard Deviation = 0.64) than diploma students (Median = 3.79, Standard Deviation = 0.70), $t(244) = 2.92$, $p = 0.004$. No significant difference was found in perceived simplicity between the two groups ($p > 0.05$).

Table 1. Pearson's Correlations among Constructs (N = 246).

Variable	Satisfaction	Usability	Simplicity	Flexibility
Satisfaction	1	0.61***	0.54***	0.49**
Usability		1	0.58***	0.47**
Simplicity			1	0.52***
Flexibility				1

Table 2. Multiple Regression Predicting Student Satisfaction.

Predictor	β	SE	t	*p*-value	95% CI
Usability	0.42	0.07	5.98	<0.001	[0.28, 0.56]
Simplicity	0.29	0.09	3.22	0.002	[0.11, 0.47]
Flexibility	0.18	0.18	2.14	0.034	[0.01, 0.35]

Table 3. Independent Samples t-test Results.

Variable	Undergraduate (n=160)	Diploma (n=86)	t(df)	p-value
Usability	4.12 (0.68)	3.74 (0.72)	3.85(244)	<0.001
Satisfaction	4.08 (0.64)	3.79 (0.70)	2.92(244)	0.004
Simplicity	3.95 (0.70)	3.88 (0.68)	0.74(244)	0.460

5. Discussions

The findings of this study are interpreted through UTAUT to explain how key system and contextual factors influence students' adoption and effective use of LMSs in higher education institutions. In particular, the study discusses the different aspects that support learning activities and shape the students' perceptions of academic usefulness. It includes effort expectancy, which reflects how easy it is to use the system, and facilitation conditions. Moreover, our study demonstrates that satisfaction is a key factor in sustainability when integrating teaching and learning across different technologies.

5.1 Performance Expectancy and the Role of LMS Flexibility in Enhancing Learning Outcomes

Performance expectancy is the extent to which an individual believes that using the learning management system will improve learning performance. This study emphasizes the use of an LMS to easily accommodate large classes and automate all activities. For example, managing more than 100 students can pose logistical and pedagogical challenges, including how to administer assignments and tests, address integrity issues, and provide quick feedback. Previous studies report that students use the platform when they receive tangible benefits and manage their time efficiently [23, 26].

The issue of academic dishonesty, such as copying from one another, is a major concern for instructors. Using the LMS has significantly reduced that worry. Research by Cavus and Ahih [12] highlights the advantages of using LMS that it helps with marking by speeding up the process. Also, some authors argued that, in large class settings, there is a big chance of making human errors during manual

marking [27]. It is highly recommended to adopt LMS platform to improve accuracy, manage consistency, and enhance the quality of the evaluation process. Previous studies highlight that LMS reduces the time a user spends to achieve the same output as when doing so manually, while also being more efficient [28, 29].

Generally, students should understand that the assessment process in the LMS is conducted on an individual basis, thereby requiring them to focus on their work [30]. Meanwhile, paper-based methods remain efficient, though they may be costly and can reduce students' digital skills. The research by Allen and Seaman [31] highlights the cost-effective use of LMS by minimising printing, processing time, and human resources.

5.2 Effort Expectancy: The Influence of Usability and Simplicity on LMS Adoption

Effort Expectancy (EE) is the UTAUT term that emphasises perceived ease of use as a determinant of technology adoption. According to Venkatesh et al. [32], users are more likely to adopt and use a system when it is simple to learn and to operate smoothly. This perspective aligns with the Technology Acceptance Model [33], which highlights perceived ease of use as a fundamental determinant of users' attitudes and intentions towards technology.

The LMS platform allows students to navigate the system, search for materials easily, submit assignments, and track their progress without technical difficulties. Empirical studies [26] demonstrate that systems with high usability enhance user satisfaction and promote continued use, particularly in higher education environments. It builds users' confidence and reduces resistance to adoption through teaching and learning processes. Instructors can upload content, create assessments, and communicate with students more efficiently. As a result, both groups are more likely to develop positive attitudes towards the system. This positive perception directly influences satisfaction and strengthens the intention to continue using the LMS, thereby reinforcing prior studies that link effort expectancy to sustained technology use.

The findings suggest that usability and simplicity are essential drivers of LMS adoption as they can foster positive user experiences, increase acceptance, and ultimately improve learning outcomes.

5.3 Facility Conditions: The Impact of Technical and Institutional Constraints on LMS Use

Facilitating Conditions (FC), such as access to flexible and supportive infrastructure, may play a secondary role relative to usability and simplicity, especially in contexts where access to technology is already adequate [34].

However, in many Sub-Saharan African contexts, including this study setting, facilitating conditions remain a critical barrier to effective LMS utilization. Several challenges, such as unreliable electricity supply, unstable internet connectivity, and limited access to adequate devices, continue to hinder both teaching and learning. For instance, many students rely on the personal bundle to access the LMS, which can be costly. Also, frequent power outages affect students' ability to participate in online assignments. These findings align with Alfadly [25], who emphasises that reliable ICT infrastructure and stable electricity are fundamental requirements for effective LMS implementation.

Beyond infrastructure, institutional support mechanisms also play a role in strengthening facilitating conditions. Using CCTV cameras during examination can enhance integrity and support supervisory efforts. As argued by Pandey and Pandey [35], reliance on external factors as excuses for non-performance should be minimised, and students

should be encouraged to take greater accountability for their learning activities.

Therefore, the need for institutions and the community to invest in ICT infrastructure is a major factor in the adoption and use of LMS in teaching and learning.

5.4 Student Satisfaction as an Extension of UTAUT

Student satisfaction is increasingly recognised as an important extension of the UTAUT, particularly in educational technology contexts where continuous use and learning outcomes are key indicators of success. While UTAUT primarily focuses on behavioural intention and actual use, satisfaction reflects post-adoption evaluation of system performance, capturing how well the LMS meets users' academic and interactional needs.

The use of LMS enhances interaction between students and instructors through discussion forums, assignment submissions, and feedback mechanisms. It further promotes active learning and encourages students to engage more deeply with course content and hence improve soft skills. Through activities such as online discussions and collaborative assignments, students develop critical thinking, communication, and teamwork skills that are essential for academic and professional development. Both diploma and undergraduate students frequently use discussion forums to exchange ideas and engage in academic debates, thereby deepening their understanding of course materials. Research by Porter [24] emphasises that LMS platforms are effective tools for promoting interaction between students and instructors, ultimately contributing to improved academic performance and learning experiences. Also, as noted by Ingram and Hathorn [36], within a group, members share common goals and demonstrate equal commitment to task completion. Without such alignment, the benefits of LMS collaboration may be limited.

Generally, the use of LMSs significantly contributes to student satisfaction by enhancing interaction, collaboration, and engagement in the learning process. Students' satisfaction serves as a crucial extension of UTAUT, linking system use and providing supportive academic needs as well as achieving social learning experiences.

5.5 Integrating UTAUT Constructs in LMS Adoption

The adoption of Learning Management Systems (LMS) in higher education can be explained by integrating constructs from UTAUT, which provides a robust framework for understanding technology acceptance and continued use. The key constructs performance expectancy, effort expectancy, facilitating conditions, and social influence collectively explain how students and instructors form intentions to adopt and sustain the use of LMS platforms [32]. Subsequent studies have further validated UTAUT in educational contexts, confirming its relevance in explaining e-learning adoption and digital learning behavior [37, 38].

Performance and Effort Expectancy remain as the strongest determinants of LMS use and adoption. When learners perceive that LMS use directly contributes to better academic outcomes, their willingness to adopt and consistently use the system increases significantly [39, 40]. When the platform is user-friendly, it reduces training needs and increases sustainable engagement. According to Al-Ammary et al. [41], perceived ease of use significantly influences users' attitudes and intentions to use technology, a relationship further supported by studies in higher education contexts.

Facilitating conditions play a crucial role in shaping actual usage behaviour upon using the LMS platform. Tarhini et al. [34] emphasise that

inadequate infrastructure can significantly limit the effectiveness of the LMS, even when users have positive perceptions of the system. Similarly, Parsazadeh et al. [42] highlight that technical support and institutional readiness are essential for successful e-learning implementation. Meanwhile, social influence also plays a significant role in LMS adoption, as peers and instructors often sway members. Research] shows that social pressure and peer behaviour significantly affect technology acceptance, particularly in educational settings that emphasise collaborative learning [32, 39].

Therefore, integrating UTAUT constructs provides a comprehensive explanation of LMS adoption by capturing technological, organizational, and social dimensions of user behavior. The theory provides diverse learning environments to students and instructors, particularly in higher educational contexts.

6. Conclusion

LMS has significant potential to enhance both blended and online teaching, serving multiple pedagogical and administrative purposes within HLIs. As discussed throughout this study, the benefits of LMS use span dimensions of user satisfaction, institutional efficiency, and educational outcomes. To maximise these benefits, institutions must take deliberate steps to promote effective LMS adoption. In particular, universities should strongly encourage instructors to integrate platforms, such as Moodle, into their courses, thereby fostering student engagement, building competence with ICT tools, and strengthening essential digital skills.

From a technical standpoint, several practical enhancements are necessary. The LMS should be customised to allow content to be viewed rather than automatically downloaded, reducing users' internet data consumption and saving storage space. Furthermore, enabling offline functionality is critical, especially in developing countries where unreliable internet remains a persistent challenge. This would allow students to complete assessments—such as exams—offline and upload their responses once connectivity is restored. To complement these features, universities must also invest in server capacity to ensure system stability, fast response times, and reliable access during high-stakes periods such as examinations. Alongside this, providing affordable and accessible internet for students is essential.

To further enhance security and teaching quality, institutions should provide supportive hardware, such as PCs and portable devices, along with licensed software for examinations. This reduces the risk of cheating and plagiarism, which are often associated with personal devices. Ultimately, LMS platforms serve as effective ecosystems for managing e-learning resources and fostering collaboration among students, instructors, and administrators within a unified digital environment. This study underscores that successful LMS integration requires addressing both strengths, such as improved accessibility, communication, and learner engagement, and limitations, such as inadequate infrastructure, limited digital literacy, and inconsistent connectivity. Therefore, universities must adopt comprehensive policies that drive digital transformation through sustained investment in ICT infrastructure, ongoing staff training, and robust user support services. Establishing clear institutional strategies for monitoring and evaluating LMS usage will ensure that technological adoption aligns with pedagogical goals, ultimately improving the overall quality of teaching and learning.

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CONTRIBUTIONS OF THE AUTHOR

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