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University Instructors' Perceptions of the Adoption and Use of Modular Object-Oriented Dynamic Learning Environment for Teaching and Assessment

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Abstract

The integration of technologies such as the Moodle Learning Management System (LMS) into teaching and learning has become a global priority. This study examines university instructors' perceptions of the adoption and use of Moodle LMS, considering perceived usefulness, perceived ease of use, behavioural intention, and overall attitude. The study also investigated differences in perceptions in three universities and the barriers to the actual use of Moodle LMS. Data were collected from 100 instructors across three universities, namely the University of Dar es Salaam (Dar es Salaam University College of Education - DUCE), Sokoine University of Agriculture (SUA), and Mbeya University of Science and Technology (MUST), using structured online questionnaires integrated with a subsection of qualitative information. The findings indicated that university instructors had positive perceptions of the adoption and use of Moodle LMS. MUST had the highest levels of positive perceptions, followed by DUCE and then SUA. Despite positive perceptions, instructors do not use Moodle LMS effectively due to barriers such as unreliable, unstable internet connectivity, limited knowledge among instructors and students, and poor infrastructure. Also, electricity issues, technical problems and failure to interact with students during the teaching and learning process emerged as other stumbling blocks.

Keywords: Higher education, Moodle LMS, Perceptions, Teaching, University instructor

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Introduction

Integration of technology into education has recently become a global priority, as highlighted by international and national policy frameworks. Technology in education has been included in the list of 21st-century literacy skills, providing instructors and students with the basic information needed to understand and effectively use technology in teaching and learning (Avdiu et al., 2025; Kafka & Papageoorgiou, 2025; Olantunji et al., 2021). Therefore, according to the United Nations Educational, Scientific and Cultural Organisation [UNESCO] (2024) and the United Nations Children's Fund [UNICEF] (2025), there is a need to harness digital technologies to transform teaching and learning processes at all levels of education. These international organisations, among others, insist on the responsible use of Learning Management Systems (LMS) to support blended and online learning models, build institutional resilience, and enhance pedagogical practices in educational settings. Accordingly, UNICEF (2025) education and technology strategy highlights the need to set and develop digital learning environments that are inclusive, accessible, and adaptable, especially in low-resource contexts. The literature indicates that Moodle Learning Management Systems (LMSs) have emerged as essential platforms for facilitating online and blended learning environments due to their customisable course modules, integrated assessment tools, and collaborative learning features (Hew et al., 2019; Khan, 2022). Thus, instructors need to adopt and use Moodle LMS to create a digital learning environment for teaching and assessment.

Conceptualising Moodle LMS

Moodle is a Learning Management System (LMS) that stands for Modular Object-Oriented Dynamic Learning Environment and supports instructors in creating curricula and course materials for teaching and learning (Bojiah, 2022; Devi et al., 2020; Gamage et al., 2022; Moodle, 2018). Krouska et al. (2018) define Moodle LMS as a single, robust, secure, and integrated system designed to provide educators, administrators, and students with a personalised learning environment. Devi et al. (2020) point out that Moodle LMS is an open-source platform for teaching and learning, which allows classrooms to extend into the web.

Moodle LMS was developed from socio-constructivist pedagogy to provide a set of tools that support an inquiry- and discovery-based approach to online teaching and learning (Gamage et al., 2022; González-Zamar et al., 2023; Makruf et al., 2022; Zabolotniaia et al., 2020). As it is based on social constructivism, it offers an online teaching and learning environment that allows both instructors and students to collaborate and interact, integrating with conventional classroom instruction (Bojiah, 2022; Devi et al., 2020). Moodle employs blended learning, distance education, flipped classroom, and other online learning strategies in universities, schools, workplaces, and other settings. Because of its usefulness, it has been adopted, deployed, and implemented in many educational institutions and schools for teaching and assessment (Almas et al., 2021; Khan, 2022; Sanusi et al., 2024).

Also, Moodle LMS serves as a tool for decolonising university curricula by making practitioners understand them before teaching and learning take place (Mpungose, 2019; Olantunji et al., 2021). Using Moodle makes it easier for lecturers to integrate and blend various learning features and activities, manage course content, and post learning resources (Al-Rahmi et al., 2023; González-Zamar et al., 2023; Makruf et al., 2022; Mpungose, 2019).

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Moodle LMS enable instructors to communicate with students easily, engage in discussions, and assess and provide them with feedback (Sanusi et al., 2024). Moodle LMS allows flexibility and the use of varied multimedia formats, including videos, audio files, and images, which enable instructors to create engaging and interactive courses suitable for different learning styles (Alomari, 2024; Evgenievich et al., 2021; González-Zamar et al., 2023; Nzuki, 2022; Mpungose, 2019). Moodle LMS enable educational institutions to streamline course delivery, enhance communication, and support diverse pedagogical strategies. A research review conducted by Gamage et al. (2022) indicates that Moodle improves student performance, satisfaction, and engagement, as well as collaborative learning and online assessments. Another study conducted by Maphosa (2024) revealed that Moodle LMS facilitates the acquisition of practical knowledge and skills, as well as project- and collaborative learning, predominantly in areas where experts are scarce. Despite Moodle LMS's usefulness in the teaching and learning process, various factors influence its adoption and use by instructors.

Factors that influence the adoption and use of Moodle LMS

The literature shows that the factors influencing the adoption and use of Moodle LMS include technological, social, human, and motivational factors (Ansong et al., 2017; Oliveira et al., 2016; Ziraba et al., 2020). According to these authors, the technological factors include poor infrastructure, poor internet connectivity, and high costs; social factors involve environmental factors, encouragement from others, and cultural acceptance. The personal or human factors include instructors' attitudes, perceived usefulness, perceived ease of use, self-efficacy, and organisational factors, as well as instructors' competences. The motivational and reinforcement factors include the nature of the courses taught and how they are organised to facilitate easy integration with Moodle LMS. This study focuses on instructors' perceptions, as they are strongly influenced by technological, social, and motivational factors (Ziraba et al., 2020).

The perceptions of instructors are human factors, which include perceived usefulness (PU), perceived ease of use (PEU), attitudes (A), and behavioural intentions (BI) (Davis et al., 1989; Kimmons & Veletsianos, 2022; Kakasevki et al., 2023; Ziraba et al., 2020). The instructors' features of PEU, PU, attitudes, and BI affect the use and adoption of technology in teaching and learning (Ziraba et al., 2020). Ziraba et al. (2020) note that these constructs are vital, as they directly influence how instructors use Moodle LMS. Regarding perceptions as a human factor, it has been reported that instructors are often reluctant to step outside their comfort zones, so they continue to use old teaching methods. The PU and PEU of using Moodle LMS influence instructors' BI to use the system (Davis et al., 1989). Again, the PU of Moodle LMS has a direct significant influence on the BI to use the system, while both PU and BI directly influence PEU to use the system (Ziraba et al., 2020).

Many studies on instructors' perceptions of the adoption and use of Moodle LMS indicate that instructors tend to have positive perceptions (Almas et al., 2021; Gamage et al., 2020; Largamente et al., 2022; Maphosa, 2024; Kurt & Tingöy, 2023).; Mpungose, 2019). Other studies indicate that instructors' perceptions vary according to age and gender (Barbara & Riding, 2018; Davis et al., 1989; Khan, 2022; Zhang, 2023). Other studies indicate that instructors' perceptions vary according to areas of specialisation (Adebayo & Enejo, 2020; Mashabe & Modise, 2024; Rendozai, 2023). These studies indicate that instructors who specialise in technology, science, and teaching might have more positive perceptions.

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Moreover, studies show that even when there are positive perceptions regarding the adoption and use of Moodle LMS, various challenges such as poor internet access, and a lack of computers interfere its implementation (Hamoud & Nzlano, 2024; Maphosa, 2024; Raphael & Mtebe, 2023), poor institutional planning (Alomari, 2024; Largamente et al., 2022; Shaukat et al., 2020), and poor infrastructural constraints and continuous professional development among instructors (Ansong et al., 2017; Kurt & Tingöy, 2023; Raphael & Mtebe, 2023; Ziraba et al., 2020). For instance, in developing countries, the adoption and use of Moodle LMS are reported to be limited due to inadequate technological infrastructure and poor internet connectivity (Bhalalusesa et al., 2023; Mtebe, 2015).

Other researchers report that colleagues' opinions and encouragement negatively influence the adoption and use of Moodle LMS in higher education institutions (Al-Rahmi et al., 2023; Ansong et al., 2017; Biccard & Makgatto, 2024; Nzuki, 2022). Poor communication with the students while teaching using Moodle, poor organisation of course content, a lack of incentives and enjoyment in using Moodle, and instructors' lack of motivation to use Moodle during the teaching and learning process add to the problem (Bhalalusesa et al., 2023; Kakasevki et al., 2023; Rahael & Mtebe, 2023; Zabolotniaia et al., 2020).

Considering these challenges, universities and other educational institutions must develop sound plans and create a conducive environment for the effective adoption and use of Moodle LMS. Largamente et al. (2022), Maphosa (2024), and Suparjan (2024) emphasise the need for comprehensive training for instructors in course design and for addressing infrastructural challenges. The authors also emphasise the need for effective strategic planning to transform the academic teaching and learning environment in universities and to develop innovative structures that will improve both instructors' teaching practices and student learning. University instructors, as human capital, are considered vital agents in transforming teaching and learning through technology (Biccard & Makgatto, 2024; Hamoud & Nzilano, 2024; Maphosa, 2024).

Adoption and use of Moodle LMS in Tanzanian universities

In Tanzania, the adoption of Moodle LMS in higher learning institutions began as part of broader efforts to enhance teaching, learning, and assessment through digital platforms (Tanzania Commission for Universities [TCU], 2020). As early as the 2010s, most public universities embraced Moodle to support e-learning and blended learning approaches in line with national and global trends in educational technology (Mtebe, 2015; Raphael & Mtebe, 2023). Over time, these institutions integrated Moodle LMS into their academic systems, with lecturers serving as key users and facilitators of the platform. To ensure effective use, universities in Tanzania have been implementing various capacity-building initiatives, such as workshops and training sessions.

TCU has set the guidelines and principles for the development, delivery and assessment of courses offered through online and/or blended modes in university institutions in Tanzania (TCU, 2022, p. xv). According to TCU (2022), each university institution is primarily responsible for enhancing the quality of its online courses by equipping instructors with the pedagogical and technical skills needed to teach effectively with technology and by developing learning resources that meet online course quality standards. Hence, different institutions adopt and use Moodle LMS in different ways. However, these institutions face

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challenges and barriers that deny them the opportunity to enjoy similar benefits both domestically and globally (TCU, 2022). TCU (2022) reports numerous contextual challenges, including low internet connectivity, a shortage of computers, and a lack of electricity. Moreover, there are studies which report critical challenges of infrastructural constraints and flaws in continuous professional development (Bhalalusesa et al., 2023; Hamoud & Nzilano, 2024; Mtebe, 2015; Raphael & Mtebe, 2023), and usability problems related to navigation, content, layout, interaction, feedback, help and support (Almas et al., 2021; Bhalalusesa et al., 2023). Since the adoption and implementation of Moodle LMS are context-bound (Suparjan, 2024; TCU, 2022), it is important to examine instructors' perceptions of its adoption and use in other university contexts. This will help us gain a broader understanding of the diverse challenges, barriers, and benefits associated with the use of Moodle LMS in universities.

Purpose and Research Questions

Given the transformative potential of Moodle LMS in higher education, this study examines university instructors' perceptions of its adoption and use, with a particular focus on how individual and institutional factors shape behavioural intentions and actual usage patterns. Specifically, the study examines university instructors' perceptions of the Moodle LMS, explores how these perceptions differ across universities, and identifies contextual barriers to its actual use in teaching and learning. The study aims to answer the following research questions:

i. What are the perceptions of academic staff toward the adoption and use of the Moodle LMS in teaching and assessment?

ii. How do the perceptions of the university instructors regarding the adoption and use of Moodle LMS vary by university?

iii. What are contextual barriers that influence the academic staff's actual use of Moodle LMS in teaching and assessment?

Theoretical Framework

The Technology Acceptance Model (TAM) developed by Davis et al. (1989) informed the study. TMA is an information systems theory that describes how instructors accept and use technology in teaching and learning. The theory postulates six external variables related to perceptions of technology use: Perceived usefulness, Perceived ease of use, Attitude towards use, Behavioural intention to use, and Actual system use, as shown in Figure 1:

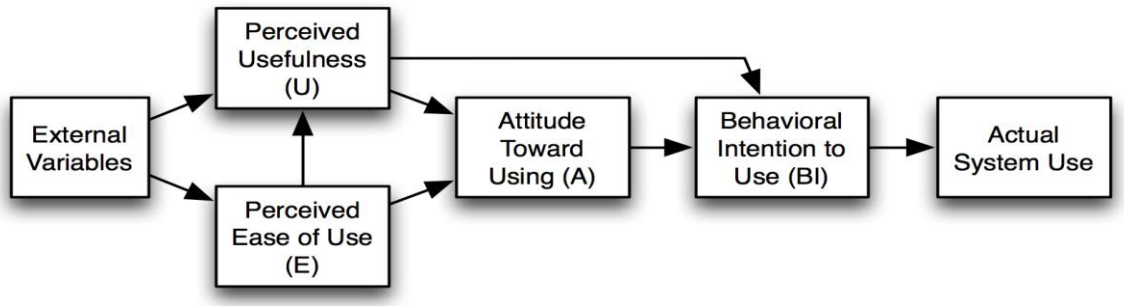


Figure 1: The Technology Acceptance Model
Source: Davis et al. (1989).

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As Figure 1 illustrates, the model suggests that when instructors are exposed to a new technology, various determinants influence their decision to use it. The determinants include the degree to which instructors believe that using Moodle LMS will improve their teaching performance (Perceived usefulness-PU) and the degree to which instructors believe that using Moodle LMS would be easy without complications (Perceived ease of use-PEU). However, external variables such as social influence, infrastructure, and motivation are important determinants of instructors' attitude (A) and behavioural intention (BI) to use Moodle LMS.

Methodology

Study approach

This study employed a mixed-methods approach, collecting quantitative and qualitative data to examine university instructors' perceptions of the adoption and use of the Moodle LMS for teaching, learning, and assessment. The approach suited the researchers' theoretical conceptions and research questions, which required both quantitative data (perceptions) and qualitative data (barriers). Quantitative methods were used to collect data on university instructors' perceptions. In contrast, qualitative methods were used to gather information on external barriers affecting the adoption and use of Moodle LMS. Also, quantitative methods were used to examine variations in university instructors' perceptions of Moodle adoption and use across the selected universities, which are reported to be contextual (Suparjan, 2024; TCU, 2022). The mixed-methods approach enabled researchers to gain a more comprehensive understanding of university instructors' perceptions of Moodle use, as suggested by Creswell and Creswell (2018).

Area of the study and sampling of participants

The study was conducted at three conveniently selected public universities: the University of Dar es Salaam (Dar es Salaam University College of Education, DUCE), Sokoine University (SUA), and Mbeya University of Science and Technology (MUST). The selection of three universities enabled the researchers to explore contextual differences among colleges and universities as explained by TCU (2022). Across the three universities, the study included professors, lecturers, and assistant lecturers who were on post, excluding those on leave. The categories of participants were included because they are responsible for teaching at universities, as per the TCU (2022) guidelines. The study engaged 100 participants who responded to an online questionnaire; 33 from DUCE (Faculty of Education), 39 from SUA (School of Education) and 28 from MUST (College of Science and Technical Education). The participants were randomly sampled using the Statistical Power Analysis sampling procedure at a 95% confidence level and a 5% margin of error, with a table of population and suggested sample size as indicated by Cohen et al. (2018). This sample size was considered appropriate for the study, as meaningful results from questionnaires require a sample of at least 100 participants (Fairclough & Thelwall, 2022; Fox, 2024). Table 1 presents the distribution of participants by university, population, sampling procedures and sample size.

Table 1: Study Participants by University

Universities	Population	Sampling Procedure	Sample Size
DUCE	54	Random	33
SUA	61	Random	39
MUST	45	Random	28
Total	**160**		**100**

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Data collection procedures

The study employed a questionnaire adapted from Davis et al. (1989). The modified questionnaire consisted of four subscales for measuring internal reliability in this study, which indicated PEU (α = .91), PU (α = .93), BI (α = .91), and Attitude (α = .88). A total of 100 questionnaires were completed online, where they were posted on university instructors' social media such as WhatsApp. Two subscales, namely PEU and PU, had six items each, while the other two subscales, BI and Attitude, had five items each. The tool was measured on a five-level Likert scale, where 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neutral*, 4 = *Agree*, and 5 = *Strongly Agree*. To obtain qualitative data on the barriers and challenges to adopting and using Moodle LMS, the questionnaire included open-ended questions.

Data analysis

The data from the questionnaires were analysed using the Statistical Package for the Social Sciences (SPSS) version 26, in which descriptive statistics, including the mean and standard deviation, were computed to determine the university's instructors' perceptions of Moodle LMS adoption and use. The 6 items related to PEU and PU and the 5 items related to BI and Attitude were merged into 4 items covering PEU, PU, BI, and Attitude. The findings are interpreted at a decisive mean level of 2.5 on the 4-level Likert scale. The researchers also analysed variations in the perceptions among universities by comparing the means. Interpretation of findings was based on a decisiveness factor of 3, whereby a mean of 3 indicated neutral perceptions, below 3 indicated disagreement (negative perceptions), and above 3 indicated agreement (positive perceptions) on the five-level Likert scale. In addition, data from open-ended questions were transcribed and imported into MAXQDA, where thematic analysis was employed to group similar barriers across universities. Also, university instructors' direct verbatim comments regarding barriers to the actual use of Moodle LMS were indicated in the findings.

Results

The study examined university instructors' perceptions about the adoption and use of Moodle (LMS). Specifically, it explored how these perceptions differ across universities and identified the universities' contextual barriers that influenced their integration into teaching and assessment practices. Results are presented in sub-titles as follows:

University instructors' perceptions concerning the adoption nd using Moodle LMS

Findings indicated that the university academic staff have positive perceptions towards the adoption and use of Moodle LMS, with means of 3.24 (PEU), 3.16 (PU), 3.55 (BI), and 3.42 (OA), as shown in Table 2.

Table 2: ***University Instructors' Perceptions towards Adopting and Using Moodle LMS***

Perceptions (α = .86)	N	Min.	Max.	Mean	Std. Dev.
Perceived ease of Use	100	1.00	5.00	3.24	.80
Perceived Usefulness	100	1.00	4.83	3.16	.83
Behavioural Intentions	100	1.00	5.00	3.55	.85
Overall Attitude	100	1.00	5.00	3.42	.79
Valid N (listwise)	100				

Findings on the PEU items further indicate that university instructors find it easier to upload content to Moodle (mean = 3.47). However, they disagreed that they do not need much assistance to use Moodle effectively (mean = 2.93), *as shown in Table 3*.

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Table 3: ***Perceived Ease of Use by Items***

Items (α = .91)	N	Min.	Max.	Mean	Std. Dev.
I find it easy to navigate Moodle for teaching purposes.	100	1	5	3.24	1.03
I believe it is easy to upload content on Moodle	100	1	5	3.47	.95
Moodle is user-friendly and intuitive	100	1	5	3.35	.96
I do not need much assistance to use Moodle effectively	100	1	5	2.93	1.05
The tools available in Moodle are easy to understand and use	100	1	5	3.16	.92
The Moodle interface is clear and well-organised	100	1	5	3.30	.91
Valid N (listwise)	100				

Regarding PU, the findings indicated that university instructors find Moodle more useful for conducting assessments and grading (mean = 3.23) but less useful for engaging students more effectively in the learning process (mean = 3.07), as shown in Table 4.

Table 4: ***Perceived Usefulness by Items***

Items (α = .93)	N	Min.	Max.	Mean	Std. Dev.
Moodle helps me manage my teaching materials more efficiently	100	1	5	3.22	.96
Moodle improves the effectiveness of my teaching and communication with students	100	1	5	3.15	1.04
I find Moodle to be a useful tool for conducting assessments and grading	100	1	5	3.23	.98
Moodle enables me to engage students more effectively in the learning process	100	1	5	3.07	.92
The use of Moodle enhances my ability to deliver course content to students	100	1	5	3.12	.91
Moodle provides me with valuable insights into student performance and participation	100	1	5	3.19	.94
Valid N (listwise)	100				

On the other hand, the findings indicated that the university instructors do intend to spend more time learning new Moodle features to improve their teaching, with a mean of *3.79*, but have less intention to regularly use Moodle in teaching in the future, with a mean of 3.34, as shown in Table 5.

Table 5: ***Behavioural Intentions by Items***

Items (α = .91)	N	Min.	Max.	Mean	Std. Dev.
I plan to use Moodle regularly for teaching in the future	100	1	5	3.34	1.00
I am likely to continue using Moodle for assessment purposes in my courses	100	1	5	3.46	.97
I intend to explore and use more features of Moodle in my future courses	100	1	5	3.58	.93
I would recommend Moodle to my colleagues for teaching and assessment purposes	100	1	5	3.58	.95
I am willing to spend time learning new Moodle features to improve my teaching	100	1	5	3.79	1.09
Valid N (listwise)	100				

Concerning the overall attitudes, the findings indicated that the academic staff have more positive attitudes towards the value of Moodle for both teaching and student assessment, with a mean of *3.69,* and less positive attitudes towards the comfort level of using Moodle for teaching and assessment, with a mean of *3.19,* as presented in Table 6.

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Table 6: ***Overall Attitudes by Items***

Items (α = .88)	N	Min.	Max.	Mean	Std. Dev.
I have a positive attitude toward using Moodle for my teaching and assessment needs	100	1	5	3.73	.93
I feel comfortable using Moodle for teaching and assessment	100	1	5	3.19	1.04
Overall, I am satisfied with using Moodle as an LMS in my teaching	100	1	5	3.21	.99
I believe Moodle is a valuable tool for both teaching and student assessment	100	1	5	3.69	.91
Using Moodle has been a rewarding experience for me as a faculty member	100	1	5	3.27	.96
Valid N (listwise)	100				

Variations in instructors' perceptions by university

Findings indicated that instructors at all three universities perceive Moodle LMS as easy to use, have a behavioural intention to use it, and hold positive attitudes towards it. Meanwhile, the instructors from two of the universities perceive it as useful in teaching and assessment, as Table 7 indicates.

Table 7: ***Variations of Academic Staff Perceptions by Universities***

University		PEU	PU	BI	OA
UDSM (DUCE)	Mean	3.27	3.17	3.46	3.34
	N	33	33	33	33
	Std. Deviation	.74	.78	.691	.728
SUA	Mean	3.08	2.96	3.42	3.26
	N	39	39	39	39
	Std. Deviation	.95	.94	.97	.86
MUST	Mean	3.42	3.43	3.82	3.72
	N	28	28	28	28
	Std. Deviation	.61	.650	.815	.71

As Table 7 illustrates, university instructors at MUST perceive Moodle LMS as easy to use, with a mean of *3.42*, followed by DUCE at 3.27 and SUA at *3.08*. Furthermore, the university instructors at MUST perceive Moodle LMS as useful in teaching, with a mean of 3.43, followed by DUCE with 3.18. In contrast, the university instructors at SUA do not perceive it as useful in teaching and assessment, with a mean of *2.96*. Moreover, the MUST academic staff had a higher behavioural intention to use Moodle LMS, with a mean of *3.82*, followed by DUCE at 3.46 and SUA at *3.42*. Regarding overall attitudes, more academic staff at MUST held positive attitudes, with a mean of 3.72, followed by DUCE at 3.34 and SUA at *3.26*.

Contextual barriers to actual use of Moodle LMS among university instructors

The instructors were asked to explain the contextual barriers to the actual use of Moodle LMS. Findings indicated that most of the university instructors (42 out of 100), 17 were from DUCE, 18 from SUA, and 07 from MUST, mentioned the unreliable and unstable intranet connectivity as the leading barrier. Regarding the, one of the university instructors from MUST said: “Internet is not reliable to both instructors and students whereby sometimes we are forced to pay for personal internet so that we conduct teaching and assessment effectively and avoid to postpone the lessons”. Another instructor from DUCE said: “We face the barrier of unstable internet connectivity which cause interruptions of the lesson and lose its connectivity”. Moreover, 25 mentioned inadequate knowledge among instructors and students; 09 from DUCE, 08 from SUA, and 08 from MUST, whereby 12 indicated inadequate and poor infrastructure; none from DUCE, 07 from SUA, and 05 from MUST.

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The other 04 instructors discussed electricity issues: 02 from DUCE, 01 from SUA, and 01 from MUST, while the other 06 reported technical problems with the LMS itself (02 from each university). Concerning inadequate knowledge among instructors, one instructor from SUA said: "University instructors are not aware of some updated innovations to use Moodle LMS effectively. Instructors find it difficult to navigate and use advanced features". Regarding inadequate knowledge among students, another instructor from MUST said:

> Most students still experience difficulties with orientation when using ICT devices, resulting in not joining lessons on time on the Moodle LMS. Sometimes, students miss lessons and assessment activities due to their inability to join and use the Moodle LMS.

Regarding poor infrastructure, one instructor from MUST said: "Most students do not have laptops and smartphones to access Moodle LMS for learning. Sometimes, even computer laboratories are not accessible for students to use computers for learning". Another instructor from SUA wrote that, "There are inadequate facilities to support actual use of Moodle LMS such as computers, laptops, and those available are outdated." The other 11 instructors mentioned difficulty using Moodle LMS for interaction with students (03 from DUCE, 03 from SUA, and 05 from MUST), as explained by one instructor from DUCE: "Moodle LMS system is not interactive enough to engage students during the teaching and learning process."

Discussion

Findings have shown that university instructors have positive perceptions towards the adoption and usage of Moodle LMS. Mostly, the university instructors' BI is high, followed by overall attitude, PEU, and PU. Their high BI might have been influenced by their positive PU and PEU regarding the adoption and use of Moodle LMS, as explained by Davis et al. (1989). This is because PU has a direct, significant impact on BI's adoption and use of Moodle LMS, while PEU is influenced by both PU and BI (Ziraba et al., 2020). Regarding PEU, the findings indicated that university instructors find it easier to upload content to Moodle LMS but have difficulty using Moodle without assistance. Further, they find Moodle LMS more useful for conducting assessments and grading but less useful for engaging students in the learning process. Also, the instructors have a high intention to spend more time learning new Moodle features to improve their teaching, but they have a lower intention to plan to use Moodle regularly for teaching in the future. On the other hand, they have more positive attitudes towards the value of Moodle for both teaching and student assessment, but less positive attitudes towards its comfort in use for teaching and assessment.

Similar findings have been reported in previous studies on instructors' positive perceptions of adopting and using Moodle LMS (Almas et al., 2021; Gamage et al., 2020; Largamente et al., 2022; Maphosa, 2024; Mpungose, 2019; Suparjan, 2024). Positive perceptions of instructors regarding Moodle LMS influence their adoption and use of the system in teaching and assessing students. When instructors adopt and use Moodle LMS, they provide a range of teaching and learning tools that support students' inquiry and discovery (Gamage et al., 2022; Makruf et al., 2022; Zabolotniaia et al., 2020). Adopting and using Moodle LMS makes it easier for instructors to integrate diverse learning activities, accommodate diverse learning styles, engage students in discussions, assess learning, manage course content, and disseminate learning resources (Makruf et al., 2022; Mpungose, 2019; Sanusi et al., 2024). Moodle LMS allows instructors to employ various pedagogical strategies and gives the

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flexibility to use diverse multimedia formats, such as videos, audio files, and images (Alomari, 2024; Evgenievich et al., 2021; Mpungose, 2019). Instructors' adoption and use of Moodle LMS equip students with practical knowledge and skills, project-based learning, and collaborative learning in areas where experts are limited, thereby improving their learning performance and satisfaction (Gamage et al., 2022; Maphosa, 2024). However, the adoption and use of Moodle LMS face context-specific challenges (Suparjan, 2024; TCU, 2022).

This study also examined differences in the perceptions among instructors from the three universities. Findings indicated that the MUST instructors had the highest PEU, BI, and overall attitudes, followed by those from DUCE and SUA. Further, MUST instructors had higher perceptions of Moodle LMS as useful, followed by those from DUCE, whereas SUA instructors did not perceive it as useful for teaching and assessment. The literature indicates that variations in the adoption and use of MOODLE can be influenced by various factors (Ansong et al., 2017; Oliveira et al., 2016; Ziraba et al., 2020). The factors include technological factors (infrastructure investment, availability of internet connectivity and management of costs), social factors (institutional teaching environment, encouragement from others and cultural acceptance), human factors (instructors' attitudes, perceived usefulness, perceived ease of use, self-efficacy, competences) and motivational factors (nature of the courses, organisation of the course). For instance, regarding the nature of the course, Adebayo and Enejo (2020), Mashabe and Modise (2024), and Rendozai (2023) report that differences in adoption and use of MOODLE LMS can be due to areas of specialisation. According to these authors, instructors who specialise in technology, science, and teaching, as those at MUST, have more positive perceptions than those in other specialisations.

The reported variations among the three universities depend on the extent to which each university invests in adopting and using the Moodle LMS, particularly in the following areas. Moreover, the contextual differences might be due to variations in specific university leadership and responsibility to promote the adoption and use of the Moodle LMS as stipulated in the *guidelines and principles for the development, delivery and assessment of courses offered through online and/or blended modes in university institutions in Tanzania* (TCU, 2022). According to TCU (2022), each university is responsible for equipping instructors with the required pedagogical and technical skills and for developing learning resources that meet quality standards for the practical use of the Moodle LMS system for teaching and assessment.

The results indicate that instructors face various barriers to the actual use of the Moodle LMS system despite their reported positive perceptions. The barriers include unreliable, unstable intranet connectivity, inadequate knowledge, poor infrastructure, electricity issues, technical problems, and failure to interact with students during the teaching and learning process. Similar findings have been reported in previous studies, showing that despite their positive perceptions, instructors fail to practice actual use of Moodle LMS during teaching and learning process due poor internet connectivity, inadequate technological facilities such as computers (Bhalalusesa et al., 2023; Maphosa, 2024; Mtebe, 2015; Raphael & Mtebe, 2023; Suparjan, 2024), poor institutional planning (Alomari, 2024; Largamente et al., 2022), poor infrastructures and flawed continuous professional learning among instructors (Ansong et al., 2017; Ziraba et al., 2020; Raphael & Mtebe, 2023). Sometimes, negative opinions from colleagues and staff discourage instructors from using Moodle LMS in higher education institutions (Ansong et al., 2017). Other studies report poor organisation of course content, a

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lack of incentives, and low enjoyment and motivation to use Moodle during the teaching and learning process (Bhalalusesa et al., 2023; Kakasevski et al., 2023; Raphael & Mtebe, 2023; Zabolotniaia et al., 2020). It is very challenging for instructors to adopt and use Moodle LMS in a context where technology is seen as a burden. Such a context undermines instructors' positive perceptions and motives to adopt and use Moodle LMS, overwhelms their workload, and causes them to experience work-related frustrations.

The reported barriers are linked to perceptions of university instructors, who find it less easy to use Moodle LMS without assistance, indicating a lack of knowledge and competence in using technology for teaching and assessment. Moreover, it was found that the instructors consider Moodle LMS less useful for engaging students in the learning process, which is reported as a barrier to the system's actual use. Their low intention to regularly use Moodle LMS for teaching in the future, and their discomfort with using it for teaching and assessment, may suggest that the adoption and use of Moodle LMS in universities are unsustainable. So, the university instructors need to understand the application of Moodle LMS and its rubrics, and how to prepare a conducive online teaching and learning environment before actual use (Gamage et al., 2022; Makruf et al., 2022; Mpungose, 2019; Sanusi et al., 2024; UNESCO, 2024; UNICEF, 2025). Again, as the system is based on social-constructivism, instructors need to be conversant with various pedagogies to be able to engage and interact with the students during online teaching and learning through collaboration, inquiry, discovery learning, flipped classrooms, and projects (Alomari, 2024; Bojiah, 2022; Devi et al., 2020; Evgenievich et al., 2021; Gamage et al., 2022; Makruf et al., 2022; Zabolotniaia et al., 2020). The instructors' use of Moodle LMS will be effective only in a conducive online teaching and learning environment, which may influence them to plan to use Moodle LMS regularly in the future. This might also help them become comfortable using the system.

University instructors are considered a significant component in transforming teaching and learning through the use of technology (Kimmons & Veletsianos, 2022; Maphosa, 2024); thus, effective adoption and use of Moodle LMS in universities is dependent on the competencies of instructors, sound planning and the presence of a conducive environment in the institutions. Various pieces of literature emphasise comprehensive instructor training, addressing infrastructural challenges, and developing innovative structures that benefit instructors and foster student learning (Hamoud & Nzilano, 2024; Largamente et al., 2022; Maphosa, 2024; Suparjan, 2024). With improved infrastructure and professional development, instructors are more likely to use Moodle LMS effectively in teaching and assessment.

Conclusions and Implications

This study draws three conclusions. First, university instructors have positive perceptions regarding the adoption and use of Moodle LMS in teaching and assessment, with higher BI, followed by overall attitude, PEU, and PU. Second, instructors' perceptions vary by university. Perceptions across all four aspects of BI, PEU, PU, and overall attitudes are higher at MUST, DUCE, and SUA, respectively. Third, despite positive perceptions of instructors, various barriers hinder the actual use of the Moodle LMS. These include unreliable and unstable internet connectivity, inadequate knowledge, poor infrastructure, electricity issues, technical problems and failure to interact with students during the teaching and learning process. These conclusions imply that instructors' perceptions of adopting and using Moodle

LMS are insufficient to account for its effective use. Transforming teaching and assessment in 21st-century universities, as emphasised by Avdiu et al. (2025), Kafka and Papageoorgiou (2025), UNESCO (2024) and UNICEF (2025), demands addressing the barriers and challenges that hinder instructors from effectively using Moodle LMS. This can be achieved through a well-planned policy that provides comprehensive professional development for instructors, including targeted training programmes, ICT infrastructure investments, blended learning strategies, and engaging university students in planning, since LMS adoption is inherently a two-way process. This investment will enhance the technological environment to support the adoption and effective use of the Moodle LMS. Each university should take responsibility for planning, providing instructors with the resources they need, and ensuring the quality of its online courses through contextual professional development, as stipulated by TCU (2022). Also recommended are further studies focusing on instructors' professional learning in pedagogical strategies to engage students in teaching and learning using the Moodle LMS across various levels of education.

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