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Bridging the digital divide: exploring undergraduate students' experiences with learning management systems in a rural South African University

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Introduction: This study drew on the Unified Theory of Acceptance and Use of Technology (UTAUT) to explore the perceptions, challenges, and opportunities associated with the use of learning management systems (LMSs) by undergraduate students of a rural South African university. The research aimed to understand how infrastructural, cultural, and pedagogical factors fostered engagement with LMSs among students, considering the digital divides and socio-economic disparities within the environment.
Methods: The study employed an interpretive qualitative approach as part of a broader mixed-methods study that is currently awaiting approval. Data were collected through semi-structured interviews with 40 purposively sampled undergraduate students from four faculties. Thematic analysis, guided by the UTAUT framework, was conducted to identify patterns in students' experiences.
Results: The findings revealed that while students identified the opportunity for learning flexibility and access through the LMS, their experience was primarily shaped by infrastructural limitations, gaps in digital literacy, and variation in the level of engagement by faculty. Effort expectancy and facilitating conditions emerged as determinants of LMS uptake. Cultural perceptions and social influence also contributed to shaping students' attitudes toward LMS use.
Discussion: Beyond the study's findings lies the assertion for institutional interventions targeting the rural digital divide in tertiary education. These interventions include improvements to digital infrastructure, training both students and faculty, and integrating LMS with culturally responsive pedagogies for equitable and meaningful use of technology. These findings will enter the arena of discourse on inclusive digital education and aid in policymaking and practice within under-resourced educational settings.

KEYWORDS

learning management systems (LMS), digital divide, rural higher education, technology adoption, unified theory of acceptance and use of technology (UTAUT)

Background to the study

The incorporation of LMSs into universities is a hallmark of present-day pedagogy, especially where face-to-face instruction is limited by geographical and infrastructural constraints (Ajani et al., 2025). At rural South African universities, LMSs such as Moodle and Blackboard are seen as tools for bridging educational gaps by providing sustained access to

learning materials and facilitating communication between students and educators (Maphalala and Adigun, 2021). However, the promise of tailoring LMS applications to local needs often encounters systemic challenges that weigh heavily on rural institutions.

South Africa's remote universities face a confluence of structural and socio-economic factors that impede the effective implementation of digital learning technologies. These consist of low Internet connectivity capacity, poor digital infrastructure, and limited or inadequate technical support (Bervell et al., 2021). Such constraints hinder not only the smooth functioning of any LMS platforms but also tend to widen the disparity in education, particularly among students coming from a disadvantaged background (Selwyn, 2016). Therefore, the digital divide remains a significant concern when discussing educational equity and access.

The COVID-19 pandemic had even more effects on the existing state of digital learning ecosystems in rural areas. Educational institutions experienced a rapid transition during the pandemic, with students in under-resourced areas being unable to cope due to a lack of devices, poor access to the Internet, and poor digital literacy capabilities (Adigun et al., 2022). Ajani et al. (2025) asserts that this situation presented unique challenges, underscoring the need for urgent intervention, namely interventions that go hand in hand with a particular setting in addressing rural realities while ensuring that technological interventions do not become a form of exclusion.

The perspective that students hold regarding LMSs rests at the center of understanding their effectiveness for enhanced learning. Research points to the conclusion that having favorable attitudes towards LMSs may result in more engagement, better grades, and increased satisfaction with the learning experience (Almaiah et al., 2020). Perceptions, of course, depend on a series of variables, such as usability and accessibility of the systems or how much LMSs match students' learning preferences or cultures (Nguyen, 2019).

A strong theoretical framework to study behavioural intents and usage patterns of students on LMS is the UTAUT model. Developed by Venkatesh et al. (2003), the model builds upon the performance expectancy, effort expectancy, social influence, and facilitating conditions as constructs influencing the adoption of technology within a particular setting. These theoretical determinants become even more significant for rural studies, where these external and internal factors influence students in how they avail themselves of digital platforms (Xue et al., 2024).

Implementation in rural universities, due to pedagogical and administrative issues, carries a myriad of challenges. Faculty members often lack sufficient training and follow-up support to integrate LMS smoothly into their teaching environments, leading to sporadic usage and decreased student interest (Ajani et al., 2025; Maphalala and Adigun, 2021). Furthermore, the lack of institutional policies that encourage digital inclusion further diminishes the new wave of change LMS can usher into township rurality. Hence, cultural aspects remain instrumental in shaping students' interaction with an LMS.

In many rural settings, more traditional channels of learning have been firmly embedded, thereby engendering resistance or skepticism when digital platforms are suggested (Chukwuemeka and Samaila, 2020). Understanding these cultural dynamics is necessary for shaping LMS interventions that technically and socially fit the cultural setting. The core issue of digital literacy is yet another critical aspect of the LMS adoption landscape. Students who are not socially adept at using digital platforms tend to avoid meaningful engagement with an LMS, which consequently limits their learning opportunity (Ajani and Matiyenga, 2025; Kent and Giles, 2017). Intending to tackle this issue, training programs should be implemented to equip students with the confidence and skills to use digital tools effectively for learning.

Furthermore, the ethical considerations regarding LMS usage, particularly concerning data privacy and surveillance, cannot be overlooked; indeed, students in rural universities may be especially vulnerable to having their private information compromised due to their limited awareness of digital rights and safeguards (Alghamdi, 2022). Thus, ensuring the LMS platforms uphold ethical standards is of utmost importance in engendering trust and motivating continual engagement. The following research objectives guide this study:

1 To explore undergraduate students' perceptions and lived experiences of using learning management systems (LMSs) in a rural South African university context.
2 To identify the infrastructural, socio-cultural, and pedagogical challenges that influence the adoption and effective utilization of LMSs in under-resourced higher education settings.
3 To apply the Unified Theory of Acceptance and Use of Technology (UTAUT) to examine the behavioural, social, and institutional factors that shape students' engagement with LMSs.

Given the foregoing, this study aimed to investigate South African rural university undergraduate students' lived experience of using LMSs. The UTAUT framework highlights the perceptions, challenges, and opportunities related to LMS, providing further discussion areas on digital equity and inclusion in education, particularly in resourced areas.

Theoretical underpinning

The present undertaking finds its theoretical support in the paradigm universally acknowledged as the Unified Theory of Acceptance and Use of Technology (UTAUT), postulated by Venkatesh et al. (2003). This dispute incorporates eight primary technology acceptance theories, including the Technology Acceptance Model (TAM), the Theory of Reasoned Action (TRA), and the Theory of Planned Behavior (TPB), among others. The UTAUT, in brief, presents an all-encompassing theory concerning actual behavioural intention and use of technology, particularly in an educational environment where acceptance is key to implementation. The UTAUT has four critical constructs that underpin the theory's adoption to any study (Figure 1), as shown below.

According to the above figure, Venkatesh et al. (2003) highlight what seem to be core to the UTAUT, as four constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions. Performance expectancy is the degree to which an individual believes that using a particular system will help them attain gains in job or academic performance. As relevant in this research, it concerns students' perception of how LMSs enhance learning outcomes (Venkatesh et al., 2003; Abbad, 2021).

Effort expectancy stands for the ease with which the technology is associated. In education settings in rural areas, this becomes a significant milestone since students have limited prior exposure to digital platforms. Some research has proven that technologies

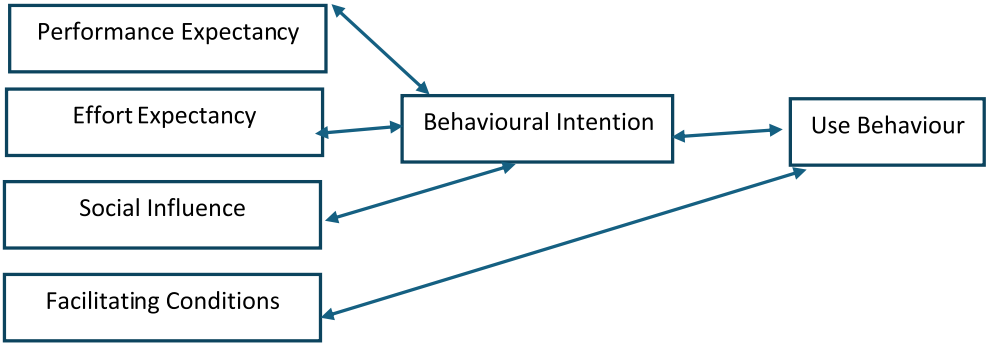

FIGURE 1
Underpinning constructs in UTAUT (Adapted from Venkatesh et al., 2003).

perceived as easy to use will be adopted by the users and consistently used (Tarhini et al., 2017; Alotumi, 2022). This study will consider effort expectancy concerning students' digital literacy and their ability to navigate LMS interfaces.

Such social influence tries to capture the extent to which individuals perceive that important others, such as friends, lecturers, or heads of institutions, think that they should be using the particular technology. In collectivist or community-oriented cultures, such as are prevalent in many rural South African contexts, social influence may significantly mold behavioral intentions (Attuquayefo and Addo, 2014; Bayaga and du Plessis, 2024). Such a construct becomes especially useful in understanding LMS adoption from the point of view of peer and faculty engagement.

Facilitating conditions refer to the degree to which an individual believes that organizational and technical infrastructure exists to support the use of the system. This includes, for example, access to devices, Internet connectivity, and ways in which the school is supporting such use. In under-resourced rural tertiary institutions, such facilitating conditions are often lacking and impede the effective use of LMSs (Bervell et al., 2021; Maphalala and Adigun, 2021). A nuanced theoretical lens is required to understand technology adoption in marginalized educational contexts. For this study, the primary emphasis is on the Unity Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh et al. (2003), but with due limitations and complemented by other paradigms of systemic inequalities, cultural dynamics, and digital exclusion.

However, although UTAUT concerns itself with individual technology use, there are critiques relating to its minimal engagement with systemic and structural influences affecting technology adoption in marginalized settings (Xue et al., 2024). Students' engagement with LMSs in rural South African universities is influenced not only by perceived usefulness or ease of use but also by infrastructural deficits, digital literacy gaps, cultural resistance, and institutional neglect—an issue UTAUT does not sufficiently address.

This study attempts to fill that gap by combining the UTAUT with digital divide insights (Selwyn, 2016), emphasizing disparities in access, know-how, and meaningful use of technology. A few infrastructural limitations, such as unstable Internet, the absence of devices, and deficient technical support, are not merely facilitating factors but evidence of a systemic inequality manifesting itself. These infrastructural issues predominantly affect students belonging to rural or under-resourced institutions, thereby limiting their access to LMSs, irrespective of their behavioural intentions.

The study considered that other cultural and pedagogical reasons may influence technology adoption. In many rural communities, deep-rooted in traditional ways of learning, digital platforms could be seen as somehow impersonal or isolating (Chukwuemeka and Samaila, 2020). Furthermore, because of the very collectivistic nature of these communities, social influence in the UTAUT framework needs to be interpreted through the perspectives of communal learning, peer support, and faculty engagement (Attuquayefo and Addo, 2014; Bayaga and du Plessis, 2024).

To give rise to these nuances, the study adopted a socio-technical approach in recognition of technology use as enmeshed within wider social, cultural, and institutional environments. This creates the possibility for a critical and inclusive use of UTAUT, taking into consideration the lived realities of students in marginalized settings. Conversely, the UTAUT provides a valuable point of departure from which to analyze LMS adoption. However, its theoretical use in this study has been contextualized and extended to include structural inequalities, cultural dynamics, and ethical considerations. Such theoretical pluralism generates a fuller understanding of how students see affordances and constraints of digital learning in rural South African universities (Ajani et al., 2025).

Literature review

Having been deemed the forefront of contemporary pedagogy, LMSs take their place in the profile of integration into higher education institutions, primarily where the teaching in mother institutions is limited. It creates environments in which learning content is structured, and dissemination of communication and assessment takes place, with Moodle, Blackboard, and Canvas acting commercially (Maphalala and Adigun, 2021). Their acceptance is given a swift boost in the recent global shift towards digital learning, especially during the period of the COVID-19 pandemic (Adigun et al., 2022).

Nevertheless, this potential remains unexploited as the LMSs confront a formidable implementation barrier in rural universities. These universities may struggle with infrastructural deficits, including inconsistent Internet connectivity, limited

digital device availability, and inadequate technical support (Bervell et al., 2021). Furthermore, such issues impede the smooth functioning of LMS platforms and add even more to the educational inequalities faced by students from underprivileged backgrounds (Selwyn, 2016). Student perception of LMS holds paramount importance for their acceptance and effective implementation. Studies show that a positive student perspective towards LMS correlates to better learner engagement, learner performance, and satisfaction with the educational experience (Almaiah et al., 2020). Such perceptions, however, are influenced by the usability of the system, ease of access, and alignment with students' best learning styles and cultural contexts (Nguyen, 2019).

The UTAUT principally analyses technology acceptance in an educational setting. The model was formulated by Venkatesh et al. (2003), identifying four factors that influence behavioural intention and usage: performance expectancy, effort expectancy, social influence, and facilitating conditions. This framework has been employed in numerous studies to investigate LMS adoption within different educational environments (Xue et al., 2024; Abbad, 2021). Performance expectancy, interpreted as the extent to which an individual believes that using a technology will aid him/her in achieving gains in job performance, has always been intended to have a positive influence on students' intention to use LMSs (Tarhini et al., 2017). Due to the scarcity of educational materials in villages, LMSs provide learning by affording access to content flexibly and consistently (Adigun et al., 2024).

Especially in contexts where digital literacy is low, effort expectancy—defined as the perceived ease of use of technology—assumes utmost relevance. If students perceive LMSs to be intuitive and user-friendly, they are more likely to continue engaging with them (Alotumi, 2022). On the other hand, when an interface is too complex or technical issues arise, it discourages use and gives LMSs what is commonly referred to as a bad reputation (Kent and Giles, 2017). Social influence, which steers students' attitudes toward the usage of LMSs, cannot be ignored. In collectivist cultures, the adoption of a digital platform can be significantly influenced by endorsement from the faculty and peers (Attuquayefo and Addo, 2014). Faculty involvement is considered a key factor in fostering the utilization of LMSs by students (Maphalala and Adigun, 2021).

Facilitating conditions include the organizational and technical infrastructure that supports technology realization. With regard to rural universities, lack of infrastructure in the form of unreliable Internet, lack of technical support, and institutional policies not favoring any digital inclusion may deter the use and acceptance of LMS (Bervell et al., 2021). Thus, removal of such barriers is critical in ensuring equitable access to digital learning environments. Cultural factors also impinge on LMS adoption. In most rural communities, traditional forms of learning have been established for a long time, and thus, shifts towards digital platforms may be resisted or subjected to doubt (Ajani and Rathilal, 2025; Chukwuemeka and Samaila, 2020). Learning these cultural impediments would hence make an LMS intervention more socially and pedagogically related.

Portraying the amalgamation of ethical considerations for data privacy and surveillance holds growing significance in the terrain of digital education. Privacy breaches might wreak havoc in rural universities with low awareness of digital rights (Alghamdi, 2022). It is pertinent that the LMS platforms conform to ethical standards as a trust-building mechanism and engender continued participation. In brief, the literature reveals the multipronged nature of LMS adoption in rural higher education. Despite the marginally greater pedagogic merits of LMSs, their utility is put to the test when infrastructural, cultural, and ethical issues go unaddressed. The UTAUT framework thus serves as a worthy vehicle to perceive this scenario and prompt cottage strategies towards inclusive digital education.

Methodology

Design and participants

This study employed an interpretative qualitative design, embedded in a broader framework of mixed methods. The qualitative aspect was expressly developed to identify the lived experiences of undergraduate students using LMSs at a rural South African university. This approach was very suitable for capturing the multifaceted and context-specific realities facing students in an under-resourced learning environment (Creswell and Poth, 2018; Adigun et al., 2022). This strategy ensured that the sample consisting of 40 undergraduate students cut across four faculty streams, namely, Education, Humanities, Science, and Commerce. This ensured balance in the academic disciplines and gender of study years, conforming to the qualitative research principles which value depth rather than broadness (Patton, 2015). Below is a demographic profile of the participants.

Demographic profile of participants

As indicated earlier, this study got ethics approval from the selected university, and participants were contacted, briefed, and informed of their voluntary participation in the study. The participants were evenly selected from the four faculties of the university. Table 1 below shows the biographical information of the 40 participants, purposively selected for the study.

TABLE 1 Biographical information for the participants.

Faculty	Number of participants	Gender distribution	Year of study
Education	10	5 Male, 5 Female	2nd – 4th Year
Humanities	10	6 Male, 4 Female	2nd – 4th Year
Science	10	4 Male, 6 Female	2nd – 4th Year
Commerce	10	5 Male, 5 Female	2nd – 4th Year

Measures

Data collection was conducted through semi-structured interviews, allowing for richer responses that went beyond surface-level perceptions of students, their challenges, and their engagement with LMSs. The guide included open-ended questions followed by prompts that gave participants the liberty to reflect on their experiences and that simultaneously guided the researcher to probe emerging themes (Braun and Clarke, 2006). It was administered to smaller groups of students first to test the clarity and relevance of the questions asked.

UTAUT semi-structured question-based

The UTAUT conceptual framework informs the formulation of interview questions. Developed by Venkatesh et al. (2003), the model identifies four core determinants of technology adoption—performance expectancy, effort expectancy, social influence, and facilitating conditions. The UTAUT framework has found application in educational settings, including in developing country contexts (Abbad, 2021; Bayaga and du Plessis, 2024). Questions were created in such a way as to address each construct. In this manner, students were asked how LMSs influenced their academic performances, under the category of performance expectancy; how easy they could use the platform, under effort expectancy; whether peers or lecturers influenced them to use the LMSs, under social influence; and whether they had infrastructure and support under facilitating conditions (Xue et al., 2024). This alignment ensured theoretical rigor and facilitated the interpretation of findings within a robust conceptual framework.

Process and procedure of data collection

Semi-structured, face-to-face interviews were conducted in calm and familiar locations on campus. Each interview lasted approximately 30–45 min and was audiotaped with the consent of the participants. The interviews were conducted in English, the language of instruction at the university, and were transcribed verbatim. Field notes were also taken to capture non-verbal cues and contextual observations, further enriching the data (Lincoln and Guba, 1985).

Ethical consideration

The committee on research ethics of the university granted ethics approval for the study. Participants were fully informed about the research and asked to sign a consent form before their participation. Their confidentiality was maintained via pseudonyms; participants could also withdraw from the study at any point with no penalty. The data collected were anonymized, securely stored, and used for academic purposes only. Participation was thus informed, with participants being informed of their rights regarding data privacy and consent, in compliance with South Africa's Protection of Personal Information Act (POPIA). Data storage, following all institutional and national research ethical guidelines (Resnik, 2018), was on password-protected files.

Analysis process and technique

Thematic analysis was undertaken to analyze the qualitative data according to Braun and Clarke's six-phase process (Braun and Clarke, 2006), which involves familiarization, coding, theme development, theme review, theme definition, and reporting. Coding was both inductive and deductive, guided by the UTAUT framework but allowing for emerging themes. NVivo software was used to track and organize the data. Several strategies were implemented to ensure the trustworthiness of the findings. Triangulation was achieved by juxtaposing answers across faculties and demographic groups. Member checks were performed, wherein preliminary findings were shared with the participants for validation. An audit trail was kept to record the analytical decisions for the sake of transparency (Shenton, 2004).

Thematic saturation was reached when no new codes or insights came up from successive interviews, thereby ensuring complete coverage of the data. In addition, a reflexive journal was maintained by the researcher throughout the study to critically reflect on personal biases, positionality, and their potential influence on data interpretation. Although the sample size was evenly distributed across faculties to ensure representational balance, participants were purposively selected based on their active engagement with LMSs; inclusion criteria required current undergraduate enrolment and LMS usage, while trustworthiness of the findings was reinforced through Lincoln and Guba's (1985) principles of credibility, dependability, confirmability, and transferability.

Results

This section presents the key findings due to the thematic analysis of semi-structured interviews with undergraduate students. These findings revolve around five emerging themes that reflect their lived experiences in the use of LMSs in the case of a rural South African university.

Theme 1: Perceived usefulness and academic enhancement (performance expectancy)

Students consistently stressed the application of the LMS for enhancement in students' academic performance. Many participants depicted the LMS as a tool to access course materials, submit assignments, and provide feedback on assignments. One participant noted, "*The LMS helps me keep track of my assignments and deadlines. Without it, I would be lost*." This concurs with Venkatesh et al.'s (2003) view, which asserts that performance expectancy is the single most important factor determining the acceptance of a technology. While another student stated, "*It is easier for me to study because everything is together—notes, slides, and even quizzes*." This correlates with the finding of Almaiah et al. (2020), which suggests that students' perceptions of the academic benefits of LMSs lead to higher engagement. A third participant added, "*It is like having a virtual classroom that's always open*." This perception is evidence of how flexible and accessible LMSs are, especially in rural areas where

physical resources might be slim (Ajani et al., 2025; Maphalala and Adigun, 2021).

The downside was that some students lamented not getting consistent content updates. "*Sometimes the lecturers do not upload anything, and we have to rely on WhatsApp groups*," one student lamented, pointing to faculty engagement as an important factor for exploiting the full potential of LMSs (Nguyen, 2019). While the other participant said, "*When used properly, LMS makes learning easier, but not all lecturers use it well*." This illustrates the variability in how LMS is implemented in reality and its impact on student experience.

Theme 2: ease of use and digital literacy (effort expectancy)

Effort expectancy emerged as a dominant theme, with students commenting on the ease and difficulty of navigating the LMS platforms. Most found the system intuitive. "*It is easy to use once you get the hang of it*," one student pondered. This supports the premise by Alotumi (2022) that perceived ease of use is an enhancer of technology adoption. Conversely, others encountered fundamental functions. "*I did not know how to submit assignments at first. I had to ask a friend*," explained a participant. This implied the digital literacy gaps in rural institutions (Kent and Giles, 2017). Another student shared, "*The interface is confusing sometimes, especially when there are updates.*" Such feedback implies a strong correlation between the quality of user experience design and LMS effectiveness.

Training and technical support were also further identified as important. "We need proper training. Not everyone is tech-savvy," one student emphasized. This corresponds to the view of Bervell et al. (2021), who state that an institution must provide support to close digital divides. A participant added, "*If there were a tutorial or guide, it would help a lot*." This indicates the need for more onboarding documentation for easy adoption of the LMS. Students showed willingness to learn. One student commented, "*I did not grow up with computers, but I am learning because it is important*." This shows that there is an opportunity for growth in digital competence when purposeful use of LMSs is incorporated in the learning environment.

Theme 3: social influence and peer engagement

Social influence has been found to affect students' behavior towards LMS usage significantly. Many students noted that their peers encouraged them to use the platform. "*My friends showed me how to use it. Now I use it every day*," one student remarked. This corroborates the UTAUT model, placing social influence as a determinant of behavioural intention (Venkatesh et al., 2003). Adding to that, faculty influence was paramount. "*Lecturers use LMS actively, and so do we*," one person said. Attuquayefo and Addo (2014) interviewed educators and agreed with the significance they place on the role of educators in facilitating technology adoption. Another student stated, "*If the lecturer does not use LMS, we do not bother checking it.*" This further points to the importance of faculty engagement. Group projects and discussions promote peer learning. "*We use forums on the LMS to discuss topics. It is helpful*," explained one student. Maphalala and Adigun (2021) note that such collaborative features enhance the social dimension of learning and build community. Another student stated, "*I feel more connected to my classmates through the LMS*." This is an indication of the platform's potential to alleviate feelings of isolation in rural areas.

However, some students felt excluded by this setup. "*Not everyone is on LMS. Some still prefer WhatsApp or face-to-face*," one student remarked. This suggests that LMSs can foster inclusion when used in conjunction with other communication tools tailored to the user's needs and preferences.

Theme 4: infrastructure and institutional support (facilitating conditions)

Infrastructure limitations are a perennial concern. Students cited poor Internet connectivity and the unavailability of devices as significant barriers. "*Sometimes I cannot log in because the network is bad, especially off-campus, where we need to rely on our different service providers or networks in our rural locations*," said one student. There are infrastructural challenges mentioned by Bervell et al. (2021) and Selwyn (2016). Device access, in contrast, was not equal. "*I use my phone, but it is hard to type out assignments, since not every student has a personal laptop, and once you are not on campus, you cannot use the computer labs*," a participant remarked. Another added, "*Since I do not have my laptop, I have to borrow from a friend*." Such experiences point to the need for investment at an institutional level into digital resources. "*The university, of course, should provide devices or better Wi-Fi at every location on campus. Some locations are without WI-FI*," said one student, paraphrasing the call for equity (Adigun et al., 2022).

Technical support was not available either. "*When there are problems, we do not know who to ask, as the computer labs sometimes have many students in line*," an informant shared, reinforcing the importance of having help desks or support teams to assist users. Another participant added, "*There should be someone guiding us, especially during assessments, such as quizzes*." Ajani et al. (2025) also recommend structured support systems for precisely this reason. Despite these setbacks, the students remained hopeful. "If the infrastructure improves, LMS will be beneficial," a student said. This optimism suggests that, given support, LMSs could make a difference in learning in rural universities.

Theme 5: cultural attitudes and resistance to change

Cultural perceptions affected the adoption of LMS. Some students viewed digital learning as impersonal. "*I prefer face-to-face. LMS feels distant, as this was the case in our high schools*," said a student. This shows the deep-seated preference for traditional teaching methods in the rural setting (Chukwuemeka and Samaila, 2020). Other students were skeptical of technology. "*I do not trust online systems. What if my work disappears, especially for the assessments*?" questioned a participant. These concerns again indicate that trust needs to be built into digital platforms through transparency and reliability. "*I feel more confident when I see my lecturer in person*," another student declared, emphasizing human interaction.

While resistance was also related to unfamiliarity, one student commented, "*I did not grow up with computers, so LMS is new to me*," which suggests that cultural and generational factors govern the

acceptance of technology. "*My parents do not understand why I use LMS*," another participant said, hinting at societal attitudes on a broader scope. Some, however, were willing to embrace change. "*We need to adapt. The world is digital now*," a student said. This expresses a growing awareness of the significance of digital literacy and the transforming potential that LMS offer to educational processes. Agreeing with Adigun et al. (2024), cultural changes have to complement the technological changes for fostering self-directed learning in such digital environments.

Discussion

The findings of this research shed light on the multifaceted nature of LMS adoption in rural higher education, outlining both the transformative potentialities and operational challenges of digital learning platforms. Drawing on the UATUT framework, the discussion integrates empirical data with theoretical constructs to highlight the behavioural, infrastructural, and cultural drives influencing LMS engagement.

To begin with, the performance expectancy is established as the primary determinant for LMS usage. Students perceived LMSs as convenient tools to administer academic tasks and access materials, thereby creating scope for better learning outcomes (Ajani et al., 2025). This perspective is in agreement with the views of Venkatesh et al. (2003) and Abbad (2021), according to which the perceived usefulness of a technology is an important consideration in choosing a technology for adoption. The positive impact of LMSs on academic performance is also borne out by the research of Almaiah et al. (2020), creating further credence for the theory that digital platforms support self-directed learning and enhance educational efficiency in under-resourced situations (Adigun et al., 2024).

Although LMSs provide a potent platform, they must be consistently utilized by faculty members. Students shared their experiences of how their lecturers used the platform, noting that it sometimes boosted their motivation but also hindered their access to learning materials at other times. This finding repeats what Maphalala and Adigun (2021) pointed out as an essential aspect of the teaching and learning process about LMS integration. Without the active participation of educators, those who may use LMSs have little benefit, especially in rural establishments where other resources are minimal. Effort expectancy was another central theme, with participants expressing a disparity of views on the ease of use of LMSs. Some found such platforms to be intuitive, while others struggled due to a lack of digital literacy. This is in line with the findings of Alotumi (2022) and Kent and Giles (2017), who stress that ease of use and digital competence remain essential for sustaining engagement over time. Although institutions may never be able to provide all the necessary technical support for every staff member or teacher, the study implies that technical and pedagogical support should be woven into any targeted intervention related to LMS adoption.

The social influence significantly attested to student attitudes towards LMSs; peer support and faculty endorsement promoted usage, which is other research evidence (Ajani et al., 2025; Attuquayefo and Addo, 2014; Bayaga and du Plessis, 2024). In collectivist cultures, such as the rural South African milieus, communal processes of learning and experience bear heavily on technology acceptance. The CASA shows that when LMSs are embedded within cooperative learning practices, students feel more engaged and perceive the platforms as more credible. Facilitating conditions, especially infrastructural support, were crucial to the effective use of LMS. Students identified poor Internet connectivity, unavailability of devices, and inadequate technical support as significant barriers. The present findings support arguments by Bervell et al. (2021) and Selwyn (2016) that digital divides continue to exist because of systemic inequalities regarding access to technology. Therefore, from an institutional perspective, it is necessary to invest in infrastructure and support services to ensure equitable participation in digital learning.

Cultural attitudes towards technology were also barriers to LMS adoption. Some students were skeptical or uncomfortable with digital platforms and preferred traditional, face-to-face interactions (Ajani, 2025). Such resistance mirrors the entrenched pedagogical norms in rural communities and also suggests the need for culturally responsive approaches in digital teaching (Chukwuemeka and Samaila, 2020). The issue of cultural adaptation is mentioned as being just as important as technological readiness by Adigun et al. (2022) to ensure complete LMS integration. The study brought forth ethical concerns regarding data privacy and surveillance. Students, often unaware of their digital rights, expressed concerns about the safety of their personal information. This finding is in line with Alghamdi's (2022) argument regarding the need for ethical safeguards within digital education. To build trust for LMS platforms, they should have transparent policies that educate users on data protection.

Notably, the study indicated that students were willing to adapt and engage with LMSs, provided they were given care and support in so doing. This quality of resilience and eagerness to learn could mean that rural students stand to do well in digital environments if systemic barriers affecting access are removed. As noted by Adigun et al. (2024), in the building of self-directed learning in blended environments, structure, pedagogy, and cultural values have to be treated as interdependent factors. Thus, the UTAUT framework, which is very apt in tracing the interrelationship between factors that influence LMS adoption, enabled the evaluation of performance expectancy, effort expectancy, social influence, and facilitating conditions and thereby gave a very nuanced picture of the students' behavioural intentions and actual usage. Thus, the findings endorse the applicability of UTAUT in rural educational settings and further add to the discourse concerning inclusive digital education (Xue et al., 2024).

An important observation from the study is the imperative to develop institutional strategies that will tackle infrastructural deficits, foster digital literacy, and promote culturally responsive pedagogies. LMSs have the potential to impact teaching and learning in rural universities significantly, but for them to succeed, a holistic approach centered on students' lived realities must be followed. Future research needs to look at the longitudinal impacts of LMS integration and examine the role of policy in digital equity in higher education.

Conclusion and recommendations

This study illuminates the complex interaction between infrastructural, pedagogical, and socio-cultural factors that direct undergraduate student engagement with learning management systems (LMSs) in a rural South African university. Using the Unified Theory of Acceptance and Use of Technology (UTAUT) acceptance model, students were found to have an element of consciousness concerning

the potential the LMS holds for learning. However, their experiences were primarily shaped by the infrastructure that inhibited its ever-present use, inconsistent faculty engagement, and digital literacy levels. Thus, digital learning needs to have holistic lenses and be local in its approach to under-resourced higher education settings. It has been shown that performance expectancy and effort expectancy are critical factors in the students' behavioural intentions for LMS utilization (Brown and Sitzmann, 2011). Students appreciated the flexibility and accessibility of LMSs, but they also encountered some inconveniences related to their use, and many lacked the necessary computer proficiency. The social influence of friends and lecturers was important in determining attitudes towards LMS adoption, whereas facilitating conditions such as Internet access, device availability, and technical support acted as either enablers or barriers. This supports the applicability of the UTAUT in investigating technology acceptance in a rural educational environment (Venkatesh et al., 2003; Xue et al., 2024).

Based on the foregoing, there are some recommendations. The university must prepare the digital infrastructure. For instance, they may provide campus-wide Internet access or device loaning schemes to ensure that access to LMS platforms is free and equal (Bervell et al., 2021; Alotumi, 2022). Furthermore, structured training programs should be set up for the students and lecturers to foster their digital know-how and pedagogical aptitude in the use of LMSs. These programs would function ad infinitum and adapt to the feedback of the users to ensure their continued applicability and effectiveness (Bervell et al., 2021; Alotumi, 2022). In addition, institutional policies should ensure and support the consistent use of LMS across all faculties. Curriculum design and performance evaluation for academic staff should take into consideration the use of an LMS. Moreover, responsive measures should be taken to resist digital learning interventions where communities have a culture deeply steeped in more traditional forms of pedagogy. Students and faculty can participate in co-designing LMS content and delivery mechanisms to engender greater ownership and acceptance (Chukwuemeka and Samaila, 2020; Adigun et al., 2022).

Conversely, future research should also consider the long-term effects of LMS integration on academic performance and student retention, particularly in rural and marginalized areas. Comparative studies can help widen the array of best practices to include all instances of digital education. While tackling structural, pedagogical, and cultural issues of adopting an LMS, universities can start bridging the digital divide to build an equitable and better learning environment for all students.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by University of Zululand Research Ethics Committee (Reg No: UZ-REC 0691–008) Ethics certificate – UZ-REC 0691–008 Dept 2024/11. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

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References

Abbad, M. M. M. (2021). Using the UTAUT model to understand students' usage of e-learning systems in developing countries. *Educ. Inf. Technol.* 26, 7205–7224. doi: 10.1007/s10639-021-10573-5

Adigun, O. T., Mpofu, N., and Maphalala, M. C. (2024). Fostering self-directed learning in blended learning environments: a constructivist perspective in higher education. *High. Educ. Q.* 79:e12572. doi: 10.1111/hequ.12572

Adigun, O. T., Nzima, D. R., Maphalala, M. C., and Ndwandwe, N. D. (2022). COVID-19 and learners with disabilities: towards divergent praxis in teacher preparation for equity and epistemic justice. *S. Afr. J. High. Educ.* 36, 225–242. doi: 10.20853/36-4-5178

Ajani, O. A. (2025). Enhancing knowledge production through the management of technology and innovation in higher education: challenges and opportunities. *Indonesian J. Innov. Appl. Sci.* 5, 129–144. doi: 10.47540/ijias.v5i2.1644

Ajani, O. A., Gamede, B. T., and Govender, S. (2025). Cultural and ethical dimensions of learning management system adoption in rural universities: Exploring data privacy, algorithmic bias, and contextual realities. *Multidisciplin. Sci. J.* 8:2026142. doi: 10.31893/multiscience.2026142

Ajani, O. A., and Matiyenga, T. C. (2025). Enhancing critical analysis and argumentation skills in university students through multimodal approaches: a comprehensive study. *Int. J. Educ. Reform*. 1–21. doi: 10.1177/10567879251326556

Ajani, O. A., and Rathilal, S. (2025). Exploring design thinking for innovation in higher education: a comprehensive review of varied influential factors. *Soc. Sci. Educ. Res. Rev.* 12, 21–32. https://zenodo.org/records/15804504

Alghamdi, A. A. (2022). Digital transformation within Saudi education system: 2020 and beyond. *Educ. Rev.* 6, 419–425.

Almaiah, M. A., Alamri, M. M., and Al-Rahmi, W. M. (2020). Applying the DeLone and McLean information system success model to understand the factors affecting the student's satisfaction with a learning management system in Saudi Arabia. *IEEE Access* 8, 122295–122307. doi: 10.1109/ACCESS.2020.3000000

Alotumi, M. (2022). Factors influencing graduate students' behavioural intention to use Google classroom: case study-mixed methods research. *Educ. Inf. Technol.* 27, 10035–10063. doi: 10.1007/s10639-022-11051-2

Attuquayefo, S. N., and Addo, H. (2014). Using the UTAUT model to analyse students' ICT adoption. *Int. J. Educ. Dev. ICT* 10, 75–86.

Bayaga, A., and du Plessis, A. (2024). Ramifications of the unified theory of acceptance and use of technology (UTAUT) among developing countries' higher education staffs. *Educ. Inf. Technol.* 29, 9689–9714. doi: 10.1007/s10639-023-12194-6

Bervell, B., Kumar, J. A., Arkorful, V., Agyapong, E. M., and Osman, S. (2021). Remodelling the role of facilitating conditions for Google classroom acceptance: a revision of UTAUT2. *Australas. J. Educ. Technol.* 38, 115–135. doi: 10.14742/ajet.7178

Braun, V., and Clarke, V. (2006). Using thematic analysis in psychology. *Qual. Res. Psychol.* 3, 77–101.

Brown, K. G., and Sitzmann, T. (2011). Training and employee development for improved performance. In S. Zedeck (Ed.), APA handbook of industrial and organizational psychology, Vol. 2. Selecting and developing members for the organization (pp. 469–503). American Psychological Association. doi: 10.1037/12170-016

Chukwuemeka, E. J., and Samaila, D. (2020). Teachers' perception and factors limiting the use of high-tech assistive technology in special education schools in north-West Nigeria. *Contemp. Educ. Technol.* 11, 99–109. doi: 10.30935/cet.646841

Creswell, J. W., and Poth, C. N. (2018). Qualitative inquiry and research design: Choosing among five approaches. *4th* Edn. London, England: Sage.

Kent, A. M., and Giles, R. M. (2017). Pre-service teachers' technology self-efficacy. *SRATE J.* 26, 9–20.

Lincoln, Y. S., and Guba, E. G. (1985). Ethics: The failure of positivist science. *Rev. Higher Educ.* 12, 221–240.

Maphalala, M. C., and Adigun, O. T. (2021). Academics' experience of implementing e-learning in a south African higher education institution. *Int. J. High. Educ.* 10, 1–13. doi: 10.5430/ijhe.v10n1p1

Nguyen, Q. H. (2019). Student perceptions of learning management systems: A case study of a university in Vietnam. *J. Educ. Technol. Soc.* 22, 13–25.

Patton, M. Q. (2015). Qualitative research & evaluation methods: Integrating theory and practice. *(4th ed.).* Edn. California: Sage Publications.

Resnik, D. B. (2018). The ethics of research with human subjects: Protecting people, advancing science, promoting trust, vol. *74*. Netherlands: Springer.

Selwyn, N. (2016). Is digital education the future? Critical perspectives on the use of technology in education. Cambridge: Polity Press, Routledge.

Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Educ. Inform.* 22, 63–75.

Tarhini, A., Masa'deh, R., Al-Busaidi, K. A., Mohammed, A. B., and Maqableh, M. (2017). Factors influencing students' adoption of e-learning: a structural equation modelling approach. *J. Int. Educ. Bus.* 10, 164–182. doi: 10.1108/JIEB-09-2016-0032

Venkatesh, V., Morris, M. G., Davis, G. B., and Davis, F. D. (2003). User acceptance of information technology: toward a unified view. *MIS Q.* 27, 425–478. doi: 10.2307/30036540

Xue, L., Rashid, A. M., and Ouyang, S. (2024). The unified theory of acceptance and use of technology (UTAUT) in higher education: a systematic review. *SAGE Open* 14, 1–22. doi: 10.1177/21582440241229570