



Implementing AI-Enabled Learning Management System for Colleges of Education in Kwara State: Insights from a Systematic Review

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Abstract

The integration of Artificial Intelligence (AI) into Learning Management Systems (LMS) presents significant opportunities for enhancing teaching and learning in higher education. However, the extent to which these technologies are understood, adopted, and effectively implemented in Colleges of Education in Nigeria remains uncertain. The study adopts a systematic review methodology, drawing on recent literature (2019–2025) from major academic databases. Findings reveal that awareness of AI technologies among lecturers and students is increasing; however, such awareness is largely general and not specifically linked to AI-enabled LMS functionalities. The extent of adoption is found to be low to moderate, with most institutions utilising LMS platforms primarily for basic instructional purposes, while advanced AI features such as adaptive learning, predictive analytics, and automated assessment remain underutilised. The study further identifies key challenges hindering effective implementation, including inadequate technological infrastructure, limited digital and AI competencies, insufficient funding, resistance to change, and the absence of clear institutional policies. In response, the study develops a conceptual framework that highlights the interaction between enabling factors, system features, implementation processes, and expected outcomes. The study concludes that while AI-enabled LMS has the potential to significantly improve teaching effectiveness and learning outcomes, its successful integration requires strategic investment in infrastructure, capacity building, and policy development.

Keywords: Artificial Intelligence, AI-enabled LMS, Colleges of Education, Learning Management System, Nigeria, Teaching and Learning.

Introduction

The integration of technology into education has transformed teaching and learning globally. Artificial Intelligence (AI) offers the potential to revolutionise Learning Management Systems (LMS) platforms by enabling adaptive content delivery, intelligent tutoring, and predictive learning analytics that respond to individual learner needs. Akinola and Adebayo (2023) observed that LMS tools are increasingly being adopted in educational institutions worldwide to improve instructional delivery, enhance learner engagement, and facilitate continuous assessment. Understandably, in Nigeria, this shift is particularly observable in higher institutions of learning that possess the requisite resources for technological innovation.

A learning management system is a digital platform designed to facilitate the delivery, tracking, and management of educational content. Exemplifying this, Al-Fraihat, *et al.* (2020) indicated that LMS platforms, such as: Moodle, Google Classroom, Canvas, and Blackboard, have become integral to contemporary pedagogy, allowing for streamlined content distribution, communication, assessment, and learner tracking. The platforms are perceived to offer support for synchronous and asynchronous learning environments, with obvious flexibility and personalised learning pathways. The platforms are believed to be particularly useful in implementing flipped classroom models, blended learning, and distance education.

According to Alotaibi (2024) the convergence of AI and LMS has the potential to transform the landscape of education because the integration offers a more personalised and adaptive approach to teaching and learning. By combining AI and LMS, educators can create adaptive personalisation of educational content and a more dynamic interaction between students and learning platforms (Saad and Isa, 2025). Furthermore, by leveraging advanced AI algorithms, LMS can analyse the progress and individual preferences of students, thus optimising their learning experience. AI-enabled LMS can provide real-time feedback to students, support teachers in monitoring learning progress, and recommend tailored instructional interventions. In the context of Colleges of Education in Kwara State, where teaching resources are limited, an AI-enhanced LMS could significantly improve teaching efficiency and learning outcomes. This research therefore seeks to bridge the gap between traditional teaching methods and emerging digital innovations, promoting effective pedagogy and learner success.

Problem Statement/Justification

The integration of Learning Management Systems (LMS) in education has gained traction globally, with many schools adopting these platforms to improve instructional delivery and enhance student learning outcomes. In Nigeria, the adoption of LMS is increasingly evident in higher institutions, particularly in urban areas like Abuja, where schools have the infrastructure, digital tools, and funding to support such systems. Despite significant advances in educational technology, Colleges of Education in Kwara State continue to experience poor adoption of interactive digital learning tools. Teachers often lack the capacity or motivation to utilise existing LMS platforms effectively, while students receive minimal personalised support in their learning process. Current LMS implementations are typically static offering limited automation, poor feedback mechanisms, and no intelligent recommendation systems (Friday *et al.*, 2025). Consequently, teaching and learning outcomes remain suboptimal, with low student engagement and inconsistent academic performance. The absence of AI-driven systems that can adapt content, monitor progress, and assist both learners and instructors has become a critical gap in achieving 21st-century education standards. This study therefore, justifies the need for design, implementation, and evaluation of an AI-enabled LMS as a sustainable, scalable solution for improving education quality and outcomes in Kwara State Colleges of Education. Addressing this problem is essential to improving the quality of education delivery, and to improve Teaching and Learning Outcomes in State Colleges of Education in Kwara State. The implementation of this program promises to create a sustainable model for AI-Enabled Learning Management Systems, ultimately benefiting both educators and students in Kwara State.

Literature Review

Learning Management Systems (LMS) have become essential for supporting teaching and learning in higher education. They facilitate content delivery, assessments, and interaction among learners and instructors. A learning management system is a software application used to plan, implement, and assess learning processes, including educational courses, training programmes, and materials. Deku *et al.* (2024) see learning management system as an online software which is used to plan, execute, and assess a specific learning process. It is software used in e-Learning programmes and which helps in administration, documentation, tracking, and recording. Learning Management Systems are used to maintain online collaboration over the internet. It is executed through different

platforms which include but are not limited to open-source learning management, commercial learning management, and cloud-based learning management system platforms. However, traditional LMS platforms often lack adaptability and personalisation, which limits their impact on learning effectiveness.

According to Simon *et al.* (2025), the learning management system has helped both lecturers and students to access learning content at any time, anywhere, and to share courseware with friends and colleagues. It also helps in creating a centralised source of learning; supports tracking and reporting of students' engagement and progress made; increases students' seriousness particularly in turning-in their assignments; it also increases communication and interaction between lecturers and students, and students-to-students; and enhances learning analytics. The positive role of the learning management system in the implementation of curriculum in institutions of higher learning has been proved by numerous studies conducted by scholars worldwide. According to Peria *et al.* (2021), the use of learning management systems is currently dominating the academic scene in higher educational institutions. Oguguo *et al.* (2021), maintained that the learning management system is an instructional strategy that makes learning easier and faster when compared with traditional classroom learning, promotes interactive and collaborative learning experiences, encourages one to learn at his/her own pace, enhances flexible learning system and gives opportunities to learners to access the latest materials.

Artificial Intelligence enables machines to perform cognitive tasks such as learning, reasoning, and decision-making. Within education, AI technologies such as machine learning, chatbots, and predictive analytics have been used to personalise learning paths and improve instructional decision-making. AI-enhanced LMS platforms can analyse student performance, predict learning difficulties, and recommend tailored learning materials. Recent studies demonstrate that AI tools can enhance student engagement, retention, and academic success (Wang *et al.*, 2024). The incorporation of AI into LMS signifies a transformative shift in the landscape of education, enabling unprecedented personalisation and adaptation of content. The recent literature on the subject indicates that deep learning and AI-based techniques have the potential to transform e-learning, offering more personalised and effective learning experiences. The deployment of sophisticated algorithms enables the precise adaptation of content to the individual requirements

of each student, thereby optimising the interaction between them and the learning system. Nevertheless, despite these advances, significant shortcomings have been identified in the effectiveness and acceptance of AI-based techniques in adaptive LMS. Given their role in preparing future teachers, integrating AI into LMS platforms in Kwara State Colleges of Education will not only enhance pedagogical practices but also expose pre-service teachers to innovative digital approaches, creating a multiplier effect across the education sector.

Methodology

This study adopts a systematic review methodology guided by the PRISMA framework to identify, evaluate, and synthesise existing research on the use of AI-enabled Learning Management Systems (LMS) in enhancing teaching and learning outcomes. Relevant literature published between 2019 and 2025 were searched across major academic databases using clearly defined keywords. Studies will be screened through the PRISMA stages of identification, screening, eligibility, and inclusion, based on criteria that focus on AI-enabled LMS, teaching and learning outcomes, and higher education contexts. The review involved an extensive search of scholarly literature from reputable academic databases such as Google Scholar, ERIC, Scopus, Web of Science, ResearchGate, JSTOR, and relevant institutional repositories. Search terms included combinations of Artificial Intelligence, Learning Management Systems, AI-enabled LMS, digital pedagogy, adaptive learning, teaching outcomes, learning outcomes, and teacher education, using Boolean operators to expand or restrict results as necessary. Data were extracted from selected studies using a structured extraction guide and analysed through thematic synthesis. This process enabled the identification of recurring patterns, challenges, benefits, and implications of AI-enabled LMS for Colleges of Education. As the study relies exclusively on published literature, it poses no ethical risks, and all sources were duly acknowledged.

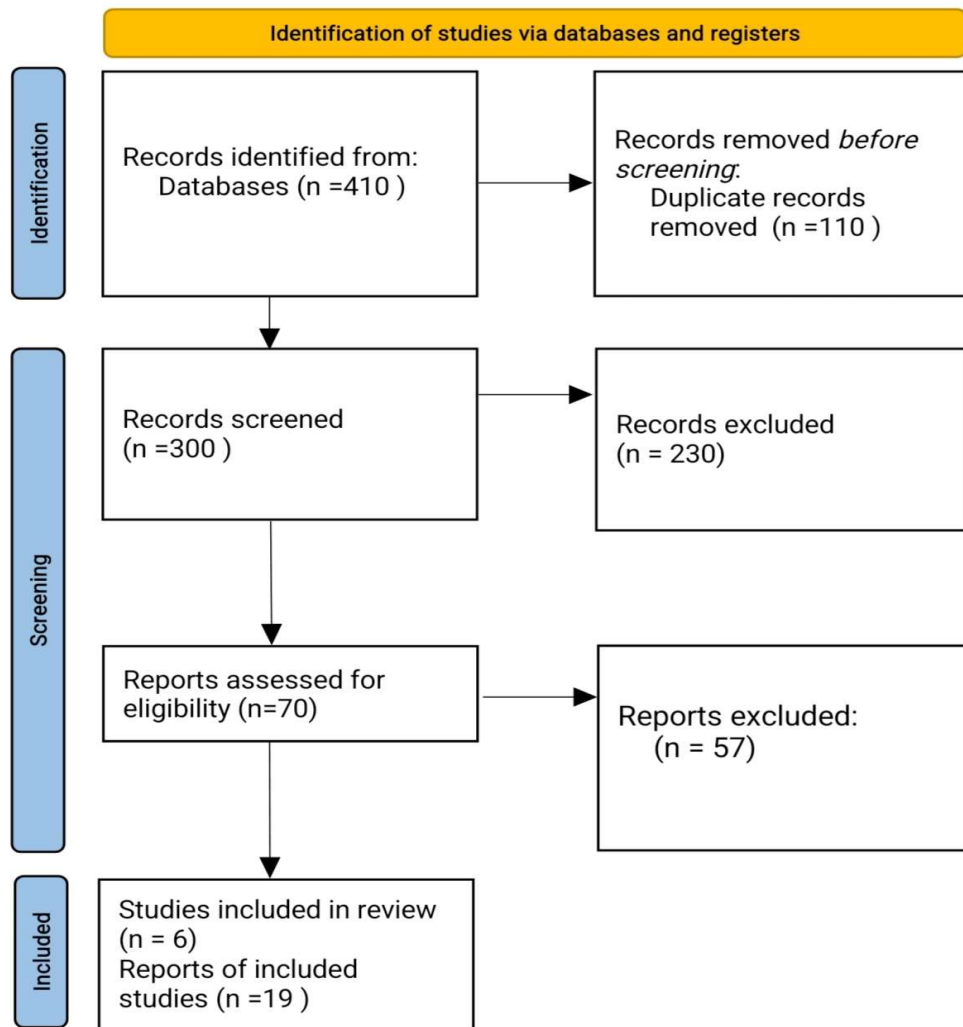


Figure 1: PRISMA Flow Diagram for the systematic review

Findings and Discussion

The Findings and discussions are Organised into themes aligned with research questions:

Theme 1: Awareness and Adoption of AI-Enabled LMS

The level of awareness of AI-enabled Learning Management Systems (LMS) among lecturers and students in higher education institutions, particularly within the Nigerian context, reflects a growing but uneven understanding of emerging educational technologies. Recent empirical studies Mahuta and Abubakar (2025) indicate that awareness of artificial intelligence in education is no

longer at an introductory stage; however, it remains largely conceptual rather than practical especially in institutions with limited technological infrastructure.

Evidence from recent Nigerian studies shows that lecturers generally demonstrate a moderate to high level of awareness of AI tools used in teaching and learning. A study on lecturers in a Nigerian university revealed that educators are aware of various AI tools such as ChatGPT, automated grading systems, and academic support applications, indicating increasing exposure to AI-driven educational technologies (Muhammed *et al.*, 2025). Similarly, another study found that lecturers possess a moderate level of awareness of AI for educational purposes, although this awareness does not necessarily translate into effective classroom integration (Thomas *et al.*, 2024). This suggests that while lecturers in Colleges of Education such as those in Kwara State may be familiar with AI concepts, their understanding is often limited to general awareness rather than specific knowledge of AI-enabled LMS functionalities like adaptive learning, predictive analytics, and intelligent tutoring systems.

Among students, awareness of AI in education is also increasing, largely driven by exposure to digital technologies and self-directed exploration of AI tools. Abubakar *et al.* (2024) examined student perspectives in tertiary institutions in North-Central Nigeria and found that students are increasingly aware of AI applications in learning environments, particularly in relation to personalised learning and academic support tools. Globally, this trend is even more pronounced, with recent evidence suggesting that a significant majority of students actively use AI tools to support learning tasks, although formal institutional training remains limited (Pedro *et al.* 2019). This indicates that student awareness is often informal and practice-driven, rather than structured through institutional LMS environments.

Despite this growing awareness, a critical gap exists between general AI awareness and awareness of AI-enabled LMS specifically. Many lecturers and students are familiar with standalone AI tools but lack adequate knowledge of how these tools can be integrated within LMS platforms to enhance teaching and learning. This aligns with findings from studies on AI literacy, which emphasise that awareness does not automatically translate into readiness or adoption, as users may lack the necessary technical understanding or institutional support to utilise AI effectively (Yu *et*

al., 2026). In addition, research on AI in education highlights that while educators are increasingly aware and positive about AI technologies, their confidence in applying these tools within structured learning systems remains limited (Ghimire *et al.*, 2024).

Furthermore, awareness levels are influenced by several contextual factors, including digital literacy, access to training, institutional support, and exposure to technology. Studies show that awareness is higher among individuals who have participated in workshops, seminars, or professional development programmes related to AI and digital education (Pedro *et al.*, 2019). Conversely, in environments where such opportunities are lacking such as many Colleges of Education awareness tends to be superficial and fragmented. This reinforces the argument that awareness must be supported by structured capacity-building initiatives to be meaningful. In the context of Kwara State Colleges of Education, it can therefore be inferred that the level of awareness of AI-enabled LMS among lecturers and students is moderate but insufficient for effective implementation. While both groups are increasingly exposed to AI technologies, their understanding is largely limited to general applications rather than integrated LMS systems. This gap highlights the need for targeted interventions, including training programmes, awareness campaigns, and institutional policies that specifically focus on AI-enabled LMS adoption and utilisation. Overall, the findings suggest that awareness exists as a foundational step; however, without deliberate efforts to deepen knowledge and promote practical engagement, it may not translate into meaningful improvements in teaching and learning outcomes.

Theme 2: Extent of adoption of AI-enabled LMS

The extent of adoption of AI-enabled Learning Management Systems (LMS) in teaching and instructional delivery within Nigerian higher education and by extension, Kwara State Colleges of Education can be described as emerging but still limited, fragmented, and largely at an experimental stage. While there is growing exposure to artificial intelligence tools in education, the integration of these tools into structured LMS platforms for instructional delivery remains relatively low. Recent studies show that although AI technologies are increasingly recognised for their potential to transform teaching and learning, their practical adoption within formal instructional systems is still developing. A 2025 study on AI adoption in Nigerian higher education found that AI tools such as intelligent tutoring systems, automated grading, and generative AI are

being introduced into academic environments, but their use is often informal and not fully embedded into institutional LMS frameworks (Friday *et al.*, 2025). This suggests that while lecturers and students may interact with AI tools independently, their integration into teaching workflows through LMS platforms is not yet widespread.

Similarly, a study on generative AI and learning analytics in Nigerian universities indicates that AI is beginning to support personalised learning and student engagement; however, adoption is still inconsistent across institutions and disciplines (Akintola, 2025). The study highlights that only a limited number of institutions have begun integrating AI-driven features such as adaptive content delivery and learning analytics into their digital learning environments. This reflects a transitional phase where institutions are moving from traditional LMS usage toward more intelligent, AI-supported systems, but have not yet achieved full implementation. At the instructional level, the adoption of AI-enabled LMS features among lecturers remains moderate but not fully operational. A study on AI utilisation in teaching shows that while educators acknowledge the benefits of AI for instructional delivery, including enhanced content delivery and automated assessment, actual usage in classroom practice is still limited (Alotaibi, 2024). Many lecturers continue to rely on conventional teaching methods or basic LMS functionalities (such as uploading materials and assignments), without utilising advanced AI capabilities like predictive analytics or personalised feedback systems.

Among students, the extent of adoption appears slightly higher in terms of independent use of AI tools, but not necessarily within LMS environments. Research on e-learning adoption in Nigeria indicates that students actively engage with digital learning tools; however, their use of AI is often outside institutional platforms, relying instead on standalone applications (Muraini *et al.* 2025). This creates a disconnect between institutional teaching systems and actual student learning practices, limiting the effectiveness of AI-enabled LMS in formal education settings. A critical observation from the literature is that the adoption of AI-enabled LMS is often partial and feature-specific rather than comprehensive. Institutions that have adopted LMS platforms tend to use them primarily for content distribution and communication, with minimal integration of AI-driven functionalities. Advanced features such as adaptive learning systems, intelligent tutoring, automated grading, and predictive analytics are either underutilised or completely absent in many Colleges of Education.

Furthermore, the extent of adoption is significantly influenced by factors such as infrastructure, digital competence, institutional support, and policy direction. Studies consistently highlight that inadequate ICT infrastructure, lack of training, and absence of strategic frameworks limit the full deployment of AI-enabled LMS in teaching and instructional delivery (Muraini *et al.* 2025; Ademola-Popoola et al., 2025)). As a result, even when LMS platforms are available, they are often used at a basic level without leveraging their intelligent capabilities. In the specific context of Kwara State Colleges of Education, it can therefore be inferred that the extent of adoption of AI-enabled LMS features is low to moderate. While there is evidence of initial exposure to AI technologies and LMS platforms, the integration of advanced AI functionalities into teaching and instructional delivery is still minimal. Adoption remains largely experimental, uncoordinated, and dependent on individual initiative rather than institutional policy.

Challenges Hindering the Implementation of AI-enabled LMS

The implementation of AI-enabled Learning Management Systems (LMS) in Kwara State Colleges of Education is shaped by several interconnected challenges that go beyond mere access to technology. While the promise of AI in education is widely recognised, the realities on ground suggest that institutions are still grappling with foundational issues that limit effective integration into teaching and learning practices. One of the most pressing challenges is inadequate technological infrastructure. For AI-enabled LMS to function effectively, there must be stable internet connectivity, reliable electricity, and access to modern digital devices. However, studies by Ademola-Popoola et al. (2025) and Chibuzor and Kolo (2024) show that many institutions in Nigeria still struggle with poor internet bandwidth and unstable power supply. In practical terms, this means that even when LMS platforms are available, their advanced AI features such as real-time analytics or adaptive learning cannot be fully utilised. Without strengthening this basic infrastructure, the idea of implementing AI-driven systems remains more theoretical than practical. Another major barrier is the limited digital and AI-related competence among lecturers. Although many educators are aware of AI tools, their ability to integrate these tools into teaching is often quite limited. Idika et al. (2025) point out that awareness does not necessarily translate into competence, as many lecturers lack hands-on training in using AI for instructional delivery. This gap creates a situation where LMS platforms are used only for basic functions like uploading lecture notes, while more advanced features remain underutilised. Over time, this limits the overall

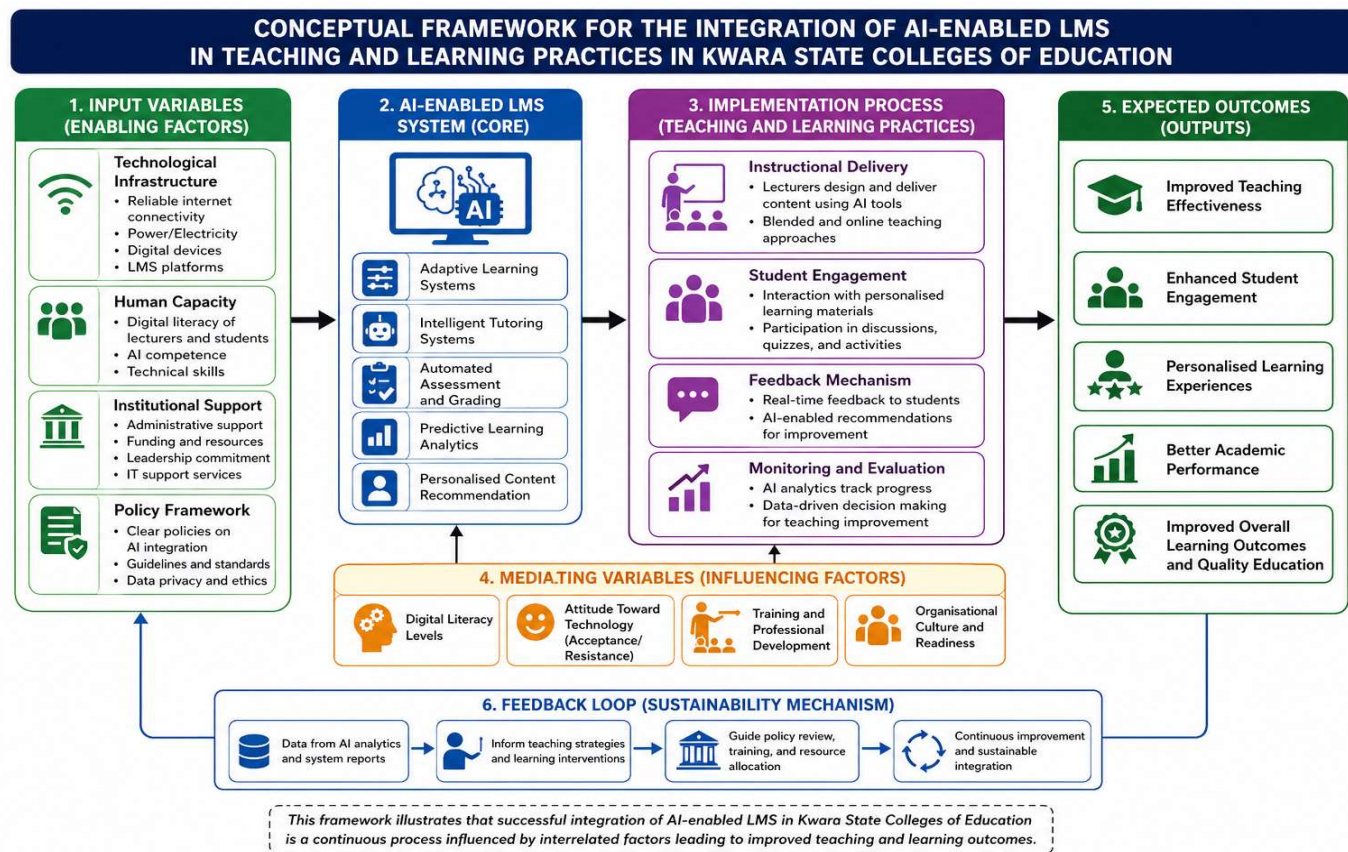
impact of the system on teaching quality. Closely related to this is resistance to change, which is often subtle but significant.

Some lecturers are hesitant to adopt AI-enabled systems because they are comfortable with traditional teaching methods or unsure about how these technologies will affect their roles. As Alekseeva et al. (2021) observed in broader discussions on AI adoption, fears about job displacement and loss of control can influence how professionals respond to new technologies. In the context of Colleges of Education, this resistance may not always be openly expressed, but it manifests in low engagement with digital tools and reluctance to experiment with new teaching approaches. Furthermore, funding constraints also play a critical role in limiting implementation. Developing and maintaining AI-enabled LMS requires substantial financial investment not just for acquiring the technology, but also for training staff, maintaining systems, and ensuring continuous upgrades. Amadi and Nwogu (2023) emphasise that many Nigerian educational institutions operate under tight budgets, where priorities such as infrastructure and staffing often take precedence over technological innovation. As a result, AI adoption becomes delayed or implemented in a fragmented manner. Another important challenge is the absence of clear institutional policies and strategic direction. Effective integration of AI into education requires more than individual effort; it needs coordinated planning at the institutional level. However, studies by Idika et al. (2025) and Mahuta and Abubakar (2025) highlight that many institutions lack specific policies or roadmaps guiding AI adoption. Without such frameworks, implementation efforts tend to be inconsistent, with different departments or individuals adopting technologies in isolation rather than as part of a unified strategy.

There are also growing concerns around data privacy and ethical issues, which cannot be ignored. AI-enabled LMS rely heavily on collecting and analysing student data to provide personalised learning experiences. While this offers clear benefits, it also raises questions about how data is stored, who has access to it, and how it is used. Roberts *et al.* (2024) note that many institutions, particularly in developing contexts, do not yet have robust data governance structures in place. This creates uncertainty and can make institutions cautious about fully embracing AI technologies. In addition, the compatibility of existing LMS platforms with AI technologies presents a technical barrier. Many Colleges of Education already use basic LMS platforms, but these systems are often not designed to support advanced AI functionalities. Integrating AI tools into such systems

requires technical expertise and system upgrades, which may not be readily available. As a result, institutions may find themselves stuck using outdated systems that cannot support modern, intelligent features.

Conceptual Framework



Author's construct, *Abduldayan et al. 2026.*

The conceptual framework illustrates the process of integrating AI-enabled Learning Management Systems (LMS) into teaching and learning practices in Kwara State Colleges of Education. The framework is presented as a structured flow model consisting of interconnected components.

Input Variables (Foundational Enablers)

The conceptual framework begins with the input variables, which represent the foundational conditions necessary for the successful integration of AI-enabled Learning Management Systems (LMS) in Kwara State Colleges of Education. These inputs include technological infrastructure, human capacity, institutional support, and policy framework. Technological infrastructure refers to the availability of stable internet connectivity, reliable electricity supply, functional LMS

platforms, and appropriate digital devices. Human capacity involves the digital literacy and AI-related competencies of lecturers and students, which determine their ability to effectively use the system. Institutional support encompasses leadership commitment, funding, and technical assistance, while policy framework refers to the existence of clear guidelines regulating the use of AI in education. Together, these elements determine the readiness of institutions to adopt AI-enabled LMS, as any deficiency in these areas can significantly hinder implementation.

AI-Enabled LMS System (Technological Core)

At the centre of the framework is the AI-enabled LMS, which serves as the technological core driving the transformation of teaching and learning processes. Unlike traditional LMS platforms, AI-enabled systems incorporate intelligent features such as adaptive learning, automated assessment, predictive analytics, intelligent tutoring, and personalised content delivery. These features enable the system to respond to individual learner needs, provide real-time feedback, and support data-driven instructional decisions. This component is critical because it translates the available inputs into practical teaching and learning experiences, making the system more interactive, responsive, and learner-centred.

Implementation Process (Teaching and Learning Practices)

The implementation process describes how the AI-enabled LMS is utilised in actual teaching and learning activities. This includes instructional delivery, student engagement, feedback mechanisms, and monitoring and evaluation. Lecturers use the platform to design and deliver course content, manage assessments, and track student progress, while students interact with the system through personalised learning pathways, assignments, and collaborative activities. The inclusion of real-time feedback enhances both teaching effectiveness and student learning experiences. This stage is crucial because the success of AI integration depends largely on how effectively the system is embedded into everyday teaching practices rather than merely being available.

Mediating Variables (Influencing Factors)

The framework recognises that several factors influence the effectiveness of AI-enabled LMS implementation. These mediating variables include digital literacy, user attitudes, training and professional development, and organisational culture. Digital literacy determines how well

lecturers and students can navigate and utilise the system, while attitudes toward technology influence their willingness to adopt and engage with AI tools. Training and professional development provide opportunities for skill enhancement, and organisational culture reflects the institution's openness to innovation and change. These factors act as moderators, either facilitating or constraining the successful integration of AI-enabled LMS.

Expected Outcomes (Outputs of the System)

The expected outcomes represent the benefits derived from the effective integration of AI-enabled LMS into teaching and learning practices. These outcomes include improved teaching effectiveness, enhanced student engagement, personalised learning experiences, improved academic performance, and overall better learning outcomes. The framework assumes that when the inputs are adequate, the system is effectively utilised, and mediating factors are favourable, these positive outcomes will be achieved. These outcomes justify the adoption of AI-enabled LMS and highlight its potential to transform education in Colleges of Education.

Feedback Loop (Continuous Improvement Mechanism)

The final component of the framework is the feedback loop, which ensures continuous improvement and sustainability of the system. Through AI-generated data such as learning analytics and performance reports, institutions and lecturers can evaluate the effectiveness of teaching strategies and system performance. This feedback is used to refine instructional approaches, improve system functionality, and update institutional policies. The feedback loop makes the framework dynamic rather than static, allowing it to adapt to changing educational needs and technological advancements. It ensures that the integration of AI-enabled LMS remains relevant, effective, and sustainable over time.

Conclusion

This study set out to develop a framework for implementing an AI-enabled Learning Management System (LMS) to improve teaching and learning outcomes in Kwara State Colleges of Education. Based on the thematic analysis of existing literature, the study reveals that while awareness of AI technologies among lecturers and students is gradually increasing, such awareness remains largely superficial and does not translate into effective utilisation within structured LMS environments.

Both lecturers and students demonstrate familiarity with general AI tools; however, knowledge of AI-enabled LMS functionalities is still limited. The findings further indicate that the extent of adoption of AI-enabled LMS features in teaching and instructional delivery is relatively low. Existing LMS platforms are mostly used for basic functions such as content sharing and communication, with minimal integration of intelligent features like adaptive learning, predictive analytics, and automated assessment. This suggests that AI-enabled LMS adoption in Colleges of Education is still at a developmental stage. In addition, the study identifies several critical challenges hindering effective implementation, including inadequate technological infrastructure, limited digital and AI-related competencies, insufficient funding, resistance to change, and the absence of clear institutional policies. These barriers are interconnected and collectively contribute to the slow pace of AI integration in teaching and learning practices.

To address these gaps, the study developed a conceptual framework that highlights the interaction between enabling factors, system components, implementation processes, mediating variables, and expected outcomes. The framework provides a structured pathway for integrating AI-enabled LMS in a sustainable and context-sensitive manner. Finally, the study concludes that although AI-enabled LMS holds significant potential for transforming teaching and learning in Kwara State Colleges of Education, its successful implementation depends on a coordinated effort that combines infrastructure development, capacity building, policy support, and continuous system evaluation.

Recommendation

The following recommendations were made based on the findings of the study:

1. **Enhancing Awareness and Capacity Building:** Colleges of Education should organise regular workshops, seminars, and training programmes to improve awareness and deepen understanding of AI-enabled LMS among lecturers and students. Emphasis should be placed on practical usage rather than theoretical knowledge.
2. **Promoting Functional Adoption of AI-Enabled LMS:** Institutions should move beyond basic LMS usage by integrating advanced AI features such as adaptive learning systems, automated assessment tools, and learning analytics into teaching and instructional delivery.

3. **Improving Technological Infrastructure:** Government and institutional management should invest in reliable internet connectivity, stable power supply, and modern digital tools to support the effective functioning of AI-enabled LMS.
4. **Strengthening Digital and AI Competencies:** Continuous professional development programmes should be implemented to equip lecturers with the necessary digital and AI skills required for effective instructional delivery using AI-enabled systems.
5. **Developing Institutional Policies and Strategic Frameworks:** Colleges of Education should establish clear policies and strategic plans that guide the adoption, implementation, and ethical use of AI-enabled LMS in teaching and learning.
6. **Addressing Resistance to Change:** Institutional leaders should promote a culture of innovation by encouraging positive attitudes toward technology adoption and providing support systems that ease the transition from traditional to digital teaching methods.
7. **Ensuring Sustainable Implementation:** A phased implementation approach should be adopted, starting with pilot projects before full-scale deployment. Continuous monitoring and evaluation should be carried out using feedback from AI analytics to improve system performance.
8. **Encouraging Collaboration and Partnerships:** Institutions should collaborate with technology providers, government agencies, and other educational institutions to facilitate knowledge sharing, funding opportunities, and technical support for AI integration.

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