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Impact of Adaptive Pedagogy and AI-Driven Support Systems on Educational Management Training among Universities in Nigerian: A Review

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Abstract
This narrative review examines the possibilities and implications of AI-based support systems for educational management training in Nigerian universities, with particular attention to adaptive pedagogy. Using a literature-based review approach, it draws on pertinent scholarly research and conceptual literature on artificial intelligence, adaptive learning systems, educational management, leadership development, learning analytics and institutional decision-support. The sources were synthesised thematically to identify applications, benefits, constraints and gaps in AI-supported management training. The review finds that AI-enabled support can strengthen individualised professional learning, analysis, administration, decision-making and adaptive institutional leadership. Implementation in Nigerian universities is constrained by weak digital infrastructure, connectivity and funding; low digital literacy; shortages of skilled staff; limited capacity-development structures; and unresolved issues of data privacy and ethical governance. A major empirical gap remains: little research examines AI support systems specifically within educational management training in Nigerian universities. The study contributes an integrated account of AI, adaptive pedagogy and educational management training in the Nigerian context, and identifies the institutional conditions required for sustainable use. It recommends continuous professional development in AI, investment in digital infrastructure, and context-specific governance models for responsible implementation.

Keywords: Artificial Intelligence, Adaptive Pedagogy, AI-Driven Support Systems, Educational Management Training, Nigerian Universities, Higher Education.

Introduction
AI is not just about automation; it is redefining higher education and transforming it into adaptive, personalized learning. AI/ML's incorporation into e-learning has been proven in reviews, where adaptive systems optimize learning progressions for individual learners, boost engagement, and aid in academic achievement (Gligorea et al., 2023). At the curricular level, AI-powered tools and applications have transformed management education by making it more experiential and immersive, more evidence- and data-driven, and more personalized, enhancing students' engagement and learning (Mutsuddi, 2025). In AI-driven teaching, intelligent tutoring systems, predictive analytics, and real-time feedback mechanisms are now regarded as integral tools that enhance engagement, retention, and critical thinking (Rajkumar et al., 2025). On the institutional side, AI has also started to play a crucial role in university management: AI's capability to analyze and consolidate data from various sources like admissions, learning platforms, academic records, and human resources into a unified whole is a significant challenge, as it enables to transform that data into actionable insights for strategic planning, quality assurance, and operational efficiency, suggesting positive impacts on enrollment management, resource allocation, and student success efforts (Nara et al., 2026). Decision support systems have also shown positive impacts on managing student enrollments, allocating resources, and supporting student success programs (Zhang & Goyal, 2024). However, faculty readiness and institutional capacity limit the potential of these systems. To equip teachers with the knowledge, skills, and mindsets to use these tools effectively, professional development, training programmes, and technical support are needed (Ng et al., 2023, p. 153). However, several universities have reported that faculty members still lack access to the required infrastructure, policy guidance, and professional development programmes to implement AI pedagogy

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effectively (Hazra, 2026). This global context exists against the backdrop of a long-standing quality challenge in Nigerian public universities, where the quality of graduates and the relevance of their skills and attributes to the socioeconomic development of the nation have been constantly questioned (Nnadozie et al., 2023; Ogar et al., 2022; Olutola & Olatoye, 2020). TETFund has made several investments in staff training to offset the capacity gap (Ezekwe & ANI, 2023), and the adoption of technology has been found to affect academic staff engagement when institutions provide support (Ruth et al., 2024). Despite the potential of AI in reshaping the landscape of education, its penetration into the Nigerian university system is still in its early stages, facing challenges such as limited internet access, a shortage of resources, a lack of skilled personnel, concerns about data privacy and security, and inadequate infrastructure (Luwoye et al., 2024). Despite the benefits that Nigerian students see in using technology-based learning platforms for improved comprehension and retention, Nigerian studies also highlight the positive aspects of generative AI (learner support, accessibility, scalability) as well as the negative aspects (subversion of academic honesty, increased lecturer work load, and overreliance) emphasizing the need for critical AI literacy, institutional AI policies, and robust data governance (Peters & Olojede, 2025). However, little empirical research exists on the impact of AI-based support systems on educational management training and on training academic and administrative staff in managing teaching, learning, and institutional processes. This gap, along with the current study's examination of how AI-based support systems influence educational management training in Nigerian universities through the lens of artificial intelligence and adaptive pedagogy, forms the basis for this study.

Review of Related Literature

Artificial Intelligence

Artificial intelligence (AI) is the family of computational technologies that can mimic human cognitive capabilities, including learning, reasoning, perception, and problem-solving, in computer systems. AI has been a reality since the early 1960s, when intelligent tutoring systems (I.T.S.) emerged as a substantive area of research in education (Bond et al., 2024, p. 1). AI has also come to the fore in higher education; the 2018 Horizon Report in higher education forecasted that the use of AI in teaching and learning would accelerate at a faster pace than other uses, predicting that it would increase by 43% between 2018 and 2022 (Zawacki-Richter et al., 2019, p. 1). The survey results indicate that adaptive systems and personalisation, and profiling and prediction, are the two most commonly researched areas of AI for HE, while the most prominent application areas are intelligent tutoring systems and learning analytics, and automated assessment (Bond et al., 2024, p. 1; Crompton & Burke, 2023, p. 20). In the context of developing countries like Nigeria, AI is seen as a potential game-changer in education due to its ability to personalise learning, optimise administrative processes, enrich content delivery, and make informed decisions based on data, despite a lack of infrastructure, internet connectivity, funding, and expertise to back its implementation (Luwoye et al., 2024).

Adaptive Pedagogy

Adaptive pedagogy is an orientation to instruction that continuously and systematically adapts instruction to the features of the individual learner. It stems from the pedagogy of personalising learning, which is explicitly learner-centred and inclusive, and requires educators to cater for all learners (Peng et al., 2019, p. 4). It is defined as: "The systematic adjustment of instructional parameters as a function of the specific characteristics of the learner that are relevant" (Tetzlaff et al., 2023, p. 2), such as a person's prior knowledge, cognitive capabilities, and affective and motivational states. Adaptivity exists on a continuum, from differentiated instruction, which is teacher-led planning of instruction based on learner differences (Peng et al., 2019, p. 3) to adaptive instruction, which is the customization of the content, feedback, and pacing of instruction based on learners' real-time data (Ginting et al., 2024, p. 2007). However, there is a danger in being too purely technological or, as critics warn, "lacking pedagogies" in the use of personalising tools (Pina et al., 2018, p. 2), as pedagogical assumptions that are implicit in the design of the adaptive environments must be made explicit if they are to be used for educational purposes. Adaptive pedagogy thus can be interpreted as a principled combination of learner-centred theory and data-driven educational practice.

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AI-Driven Support Systems

AI-powered support systems in universities are technological infrastructures that gather, combine and interpret institutional data for human decision-making. Higher education institutions produce vast, dispersed data sets in the areas of admissions, learning platforms, academic records, advising, finances, and human resources, which makes it possible to leverage AI and transform these data into actionable intelligence to inform strategic planning, quality assurance, student success initiatives, and operational efficiencies (Nara et al., 2026). Empirical research on decision support systems in higher education administration has consistently documented high rates of use and found they have had a positive impact on strategic planning, enrolment management, resource allocation and student success initiatives, as well as highlighted issues of data quality, data privacy, and change resistance (Zhang & Goyal, 2024). AI-based systems can be designed to be tailored, built using machine learning, predictive modelling, and adaptive algorithms to optimise student experiences, identify students at risk, and inform administrative and academic decisions – and to be fair, accountable, and transparent (M, 2022; Paul et al., 2024). These systems serve as the operational link between raw institutional data and improved management and pedagogical outcomes.

Educational Management

Educational management integrates organizational, administrative, strategic, and pedagogical processes to provide high-quality education and ensure the efficient functioning of educational institutions (Lysokon et al., 2024). As a science, it is pluralistic (multiple perspectives) and should be pluralistic in its content and perspectives and must never be detached from educational purpose; when educational purpose and management are separated, there is the risk of "managerialism": "a stress on processes at the expense of educational purpose and values" (Sauphayana, 2021, p. 166). In modern educational management, digitalisation, capacity building, ethics, and decision-making have been identified as central aspects of leadership that distinguish institutional vision from inclusive learning spaces and continuous innovation (Ashraf & Alam, 2025). In this context, university management needs a balanced approach that sets clear goals, assesses the quality of teaching and research, continually improves educational processes, and maintains open communication with stakeholders (Lysokon et al., 2024). Here, AI-powered support systems are relevant as tools to make management more evidence-based, responsive, and adaptable.

Educational Management Training

Educational management training is a structured process for developing the specialized skills and knowledge of personnel in charge of educational institutions, including training centers for educational management officials (Thom & Ngoc, 2024). University research shows that leadership skills can improve through formal management training, but informal approaches like self-awareness, social networks, and peer problem-solving are likely key methods in managerial development (Terrion, 2006). The best professional development program for university administrative staff aligns with the university's strategic goals, is flexible to its organizational structure and culture, and builds an "adaptive administrative environment" (Grinkevich & Шабанова, 2018). Based on empirical research on training middle-level administrative managers, factors fall into three categories: organisational, functional, and individual; human-related factors (support from leaders, staff capacity, and manager motivation) are most influential (Ngân, 2023). To be transformative, university management training needs supportive institutional climates.

Higher Education: Nigerian Universities

In Nigeria, public universities face constant resource limitations and growing demand, embodying this paradox in their approach to AI. AI's potential for personalised learning, administrative efficiency, and data-driven decisions is juxtaposed with challenges such as limited internet access, a scarcity of skilled personnel, data privacy and security concerns, inadequate infrastructure, and underfunding of the university system (Luwoye et al., 2024). Critical examinations confirm that infrastructural and resource gaps, along with low-quality and limited information availability, constrain adoption and require intentional investment in capacity building and fair, transparent system design (FCIMN, 2026). Institution-based findings from Nigeria further suggest infrastructural problems, lack of lecturer training, and low digital competence as key challenges, implying that unless deliberate capacity-building efforts are made, most lecturers will continue to use traditional

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teaching methods (Jesam et al., 2025, p. 136). Meanwhile, Nigerian research on generative AI highlights both the benefits – such as facilitating student learning, making learning more accessible and scalable – and the risks – including integrity in academic work and workload burden on lecturers (Peters & Olojede, 2025); the technology-based learning platforms also have been shown to boost learners' understanding and retention of knowledge (Yetunde, 2025). On the other hand, the Nigerian higher education landscape is poised for and against transformation through AI.

Personalized Learning

Personalized learning aims to promote individual learning; the learning process adopts suitable methods, techniques, content, starting points, and evaluation processes based on each learner's characteristics and learning potential (Peng et al., 2019, p. 4). The United States Department of Education defines it as instruction that maximizes learning for each learner by adjusting pace and instructional approach and using varied learning objectives, approaches, content, and sequencing based on learner needs (Shemshack & Spector, 2020, p. 5). More recent scholarship views personalisation as a "responsive and structured approach that responds to the individual learner's approach to learning", and AI technologies as providing an intuitive, data-tracked approach to teaching. (Hardaker & Glenn, 2025) After screening 17,899 records and consolidating the findings of 45 studies, a systematic review confirmed that AI in personalised learning in the higher education sector can be a powerful tool for optimising learning outcomes by adapting materials and feedback to meet the individual needs of learners, but that there remain many ethical, data protection, and teacher training challenges (Merino-Campos, 2025). In short, personalised learning provides the pedagogical justification for adaptive and AI learning systems to work.

Intelligent Tutoring Systems

Intelligent tutoring systems are computer programs that simulate the learner's psychological State to deliver personalized tutoring in a variety of disciplines, including algebra, medicine, law, and reading (Ma et al., 2014). This effectiveness is one of the most consistently demonstrated in educational technologies. A recent meta-analysis of 107 effect sizes (14321 participants) revealed that ITS had a positive effect on achievement compared to teacher-led large group instruction ($g = 0.42$), non-ITS computer based instruction ($g = 0.57$), and textbooks/workbooks ($g = 0.35$), with no significant difference when compared to individualised human tutoring ($g = -0.11$) (Ma et al., 2014). Moderate positive effects are reported in the literature when focusing on college students, with ITS outperforming all instruction methods other than human tutoring (Steenbergen-Hu & Cooper, 2013), and with a 50-evaluation meta-analysis reporting a median effect of 0.66 standard deviations (from the 50th percentile to 75th percentile) (Kulik & Fletcher, 2015). More recent syntheses extend this finding with overall gains ($g = 0.86$) but with variation in the design (Huang et al., 2025). In higher education, ITS serves in several ways, including delivering instructional content, assessing knowledge gaps, providing automated feedback, curating content, and creating opportunities for learner collaboration (Zawacki-Richter et al., 2019, p. 14).

Digital Learning

Digital learning refers to the use of digital technologies to facilitate and improve learning, and is a key part of the higher education student experience. By mapping 243 studies published from 2007 to 2016, Bond et al. (2020, p.1) found that educational technologies were associated with increases in student engagement across behavioural, affective, and cognitive measures, all of which are of primary concern to teachers. However, the engagement potential of technology is not equal: a large-scale review involving 61 research-based recommendations for eight types of educational technologies ends up with several conclusions, one of which is that some types of technology have demonstrated a wider engagement potential in relation to supporting higher-order activities, structure, communication and active learning (Godsk & Møller, 2024, p. 2941). Qualitative evidence from 52 lecturers in 12 Ugandan universities shows that digital tools positively affect engagement, theory–practice linkages, and achievement, while slow internet connectivity and limited digital literacy remain limiting factors in Africa (Uzorka & Odebiyi, 2025). Pedagogical integration, infrastructure and faculty capability are thus the three components of digital learning that can bring benefits together (Jha et al., 2022).

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Educational Technology

Educational technology (edtech) is the purposeful use of technology in education, learning, and administration. The TPACK framework (Content, Pedagogy and Technology knowledge) has been identified as the overarching lens for teacher preparation and practices in Higher Education (Akintayo et al., 2024, p. 58; Chugh et al., 2023, p. 16420). Structured frameworks such as SAMR (substitution, augmentation, modification, and redirection) and ADDIE (analyze, design, develop, implement, and evaluate) can be used to evaluate the transformative power of technology and to plan the design of learning experiences integrating technology (Akintayo et al., 2024, p. 58; Mekheimer, 2025, p. 25017). Content analysis of edtech frameworks by practitioners and researchers documents the growing number of frameworks and highlights the need to use them in a contextualised manner (Cherner & Mitchell, 2020). At the system level, protocols and scaffolding have been developed for quality technology integration for leaders, educators, and students, with a range of responsibilities (Crompton & Burke, 2024, p. 712), such as UNESCO's ICT in Education Policy Toolkit and ISTE standards. In this sense, therefore, educational technology is not just about hardware and software, but about a system of frameworks, standards, and professional development that defines how technology can enhance learning (Chugh et al., 2023, p. 16420).

AI in Education

AI in education refers to the use of AI methods in teaching and learning, assessment, and administration, and is predicted to significantly transform higher education. The field has grown in leaps and bounds: AI in education is expected to increase by 43% from 2018–2022, whereas the number of teaching- and learning-related applications is projected to grow even more rapidly (Zawacki-Richter et al., 2019, p. 1). Current AIEd practice in higher education largely focuses on adaptive systems and personalisation, followed by profiling and prediction, and calls for greater ethical, methodological, and contextual rigor in the future (Bond et al., 2024, p. 1). In practice, AI in higher education can take various forms, such as virtual agents or digital assistants, automated assessment, and the coordination of learning analytics, curriculum sequencing, and instructional design (Crompton & Burke, 2023, p. 20). In particular, in the field of management education, AI-powered tools have influenced the curriculum, making it more evidence-based, experiential and immersive, thus enhancing student engagement and personalization (Mutsuddi, 2025 & Shaibu et al, 2025), while AI-driven pedagogies are reported to have improved management education engagement, retention and critical thinking (Rajkumar et al., 2025). E-learning integrated with adaptive systems has also been proven to optimize individual learning paths and boost learning performance (Gligorea et al., 2023). AIEd's future thus looks like further embedding AIEd in university pedagogy and administration.

Learning Analytics

Learning Analytics is defined as the measurement, collection, analysis and reporting of data relating to learners and their context to understand and optimise learning and learning environments (Gašević et al., 2015, p. 70). The main motivations for adopting learning analytics in institutional contexts are to enhance students' learning and motivation to learn (and thus decrease the dropout rate) and to offer adaptive learning pathways that lead toward curriculum-defined goals (Ifenthaler & Yau, 2020, p. 1964). In theory, analytics gather and track learning activities in real-time: online tasks, group work, interactions with university systems, and so forth, and process this information as it occurs and use it to make decisions (Guzmán-Valenzuela et al., 2021, p. 25). Documented institutional outcomes include lower student attrition, such as when student attrition at the University of New England fell from 18% to 12% (see Wong, 2017, p. 24), and a 40% drop in dropout rates among students who received proactive communications at Rio Salado Community College. Learning analytics can also predict students at risk of dropping out, allocate resources, and provide interventions to support student learning success (Gašević et al., 2015, p. 70; Hernández-de-Menéndez et al., 2022, p. 1211). Yet, scholars warn of the danger of analytics producing "one size fits all" models as instructional conditions moderate the predictive power of analytics (Gašević et al., 2015, p. 70), and that institutions must be wary of collecting data without a clear implication of an improvement in learning (Guzmán-Valenzuela et al., 2021, p. 25).

m. Adaptive Learning Systems

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Adaptive learning systems are computerised learning systems that adapt learning content, presentation style, or learning paths based on an individual student's learning profile, learning status, or human factors (Shemshack & Spector, 2020, p. 5). They track each student's progress and adjust instruction as needed, dynamically changing the level and type of instruction based on the student's abilities and skill attainment, whether automatically or through teacher intervention (Peng et al., 2019, p. 4). In concept, adaptive learning is a product of Artificial Intelligence, supported by intelligent technology, and shares three common characteristics with all adaptive approaches: individual differences, individual performance, and adaptive adjustment (Peng et al., 2019, p. 3). Modern adaptive strategies use different approaches to the learning process tailored to students' needs, competences, and abilities, fostering active and self-regulated learning (Rincón-Flores et al., 2024, p. 5). They are based on pedagogical principles of mastery learning, formative assessment, and autonomy, and depend on ethical design, sufficient infrastructure, and pedagogical orientation (Borah, 2025). Adaptive systems, therefore, make the vision of personalised learning and adaptive pedagogy actionable in data-centered learning environments.

University Management Training

University management training includes formal and informal training for academic and administrative leaders who guide teaching, learning, and institutional processes. There is a long history of leadership development in higher education that is behind the pace of development in other sectors, in part because for a long time academics were thought to have enough subject-matter knowledge to lead their institutions (Gigliotti & Ruben, 2017, p. 98); but effective programmes are now known to help institutions to retain their talent, build connections, and revitalise their institutions. A review of these programmes reveals three components of effective leadership development: habits of mind (conceptual understanding), habits of practice (demonstrated skills), and habits of heart (reflective commitment) (Gigliotti & Ruben, 2017, p. 98). Long-term effects from empirical studies indicate sustained transfer of training up to one year following participation: an 8-week academic leadership programme for academic programme coordinators (APCs) resulted in positive long-term effects, which were maintained up to 12 months after completing the programme (Ladyshewsky & Flavell, 2011, p. 127); a 6-week intervention led to improved awareness of transformational leadership behaviours being sustained for a year following training (Zulfqar et al., 2016). Based on a synthesis of 32 empirical studies, a PRISMA-based analysis reveals that leadership development programmes are effective in improving the communication skills of faculty members, strategic decision-making, collaborative leadership, and involvement in institutional governance, with the most significant results seen in experiential learning, mentoring, and reflective practice (Agarwal, 2026). Findings from Nigerian universities suggest that AI-powered support systems will enhance educational management training if integrated into well-developed development programmes suited to the local context (Dopson et al., 2018, p. 228).

Synthesis of the Reviewed Literature

All the literature reviewed is grounded in the same logical flow: AI becomes the computational substrate (Bond et al., 2024, p. 1; Zawacki-Richter et al., 2019, p. 1); adaptive pedagogy provides the learner-centred instructional rationale (Peng et al., 2019, p. 4; Tetzlaff et al., 2023, p. 2); personalised learning and adaptive learning systems operationalise that rationale technologically (Peng et al., 2019, p. 4; Shemshack & Spector, 2020, p. 5); intelligent tutoring systems deliver measurable learning gains; and AI-based support systems integrate these capabilities within university management (Nara et al., 2026; Zhang & Goyal, 2024). Educational management and its associated training, which are the explicit focus of this study, are the connective tissue for the benefits of AI, as the benefits of AI will only be felt when administrators are trained to interpret the analytics, manage data-driven systems, and lead adaptive institutions (Agarwal, 2026; Ladyshewsky & Flavell, 2011, p. 127; Terrion, 2006). However, the Nigerian literature reveals that the chain is the weakest at the point it is most needed: infrastructural problems, low digital literacy, and lack of proactive capacity building are still major challenges to the adoption of AI in Nigerian universities (FCIMN, 2026; Jesam et al., 2025, p. 136; Luwoye et al., 2024). This study fills two gaps: empirical (few studies have examined AI's role in supporting education management in Nigeria) and developmental (current training models have not systematically linked AI use to education management practice).

Conclusion

The literature examined shows that AI and adaptive pedagogy have significant potential to enhance the educational management training in Nigerian universities. AI-powered support tools can improve personalised professional learning, provide instant feedback, enable institutional intelligence, streamline administration, and facilitate evidence-based

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decision-making. But their effectiveness depends on academic and administrative staff's digital competency, appropriate professional development, adequate infrastructure, institutional support, and ethical and governance frameworks.

While this is the case globally, poor infrastructure, limited connectivity, lack of funding, low digital literacy, lack of skilled personnel, and data privacy concerns remain critical barriers to effective AI implementation in Nigeria. The review also shows an empirical and developmental gap, as there has been little focus on AI-based support systems in educational management training. To enable sustainable adoption, it is essential to provide context-sensitive training, ongoing capacity development, improved digital infrastructure, and responsible AI governance. Addressing these issues will be crucial to designing competent, institutionally relevant AI-based educational management training systems based on AI in Nigerian higher education.

Recommendations

The following suggestions are made based on the review and conclusion made in the study:

1. Nigerian universities must establish a comprehensive training curriculum on educational management using AI that includes adaptive pedagogy, data literacy, digital competence, ethical use of AI, strategic decision-making, and leadership development. The programmes should aim to be an ongoing learning process for both academic and administrative staff and should include hands-on experience with AI tools for decision-making support, learning analytics, personalised learning platforms, and other related digital management solutions. This would enhance university staff's ability to understand AI-generated information, make informed decisions, manage technology-assisted educational processes, and drive adaptive institutional change effectively.
2. University management, government agencies and higher education regulatory bodies should create an enabling institutional framework for the sustainable use of AI-based support systems in universities in Nigeria. These frameworks should include investments in robust digital infrastructure and internet connectivity, sufficient funding, technical support, data protection and cybersecurity protocols, and clear institutional policies and ethical guidelines in using AI responsibly. Special emphasis should also be placed on devising implementation guidelines that reflect the context of Nigerian universities. Improving these institutional conditions would help to make AI-based support systems in educational management training more effective, sustainable and responsible.

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