ARTIFICIAL INTELLIGENCE AND INSECURITY AS DETERMINANTS OF QUALITY BUSINESS EDUCATION IN NIGERIA: THE MEDIATING ROLE OF TECHNOLOGY ADOPTION LEVEL

[1]Dr. Faruk Abdullahi Suleiman [2]Dr. Lukman Suleiman [3]Dr. Yahuza Shehu

[1, 2 & 3]Department of Vocational Education, Faculty of Technology Education, Abubakar Tafawa Balewa University, Bauchi, Nigeria
lsuleiman@atbu.edu.ng

Abstract

This study investigated artificial intelligence (AI) and insecurity as determinants of quality business education (QBE) in Nigeria, taking into consideration the mediating role of technology adoption level (TAL). The study has two objectives and two hypotheses. A quantitative approach using a cross-sectional survey design was adopted; data were collected from 307 Business Education lecturers in North-East Nigeria and analyzed using SmartPLS-SEM. The results indicated that AI significantly enhances TAL (β = 0.133), which in turn substantially improves QBE (β = 1.391). While AI has a direct positive effect on QBE, TAL was found to partially mediate this relationship. Conversely, while insecurity directly impacts QBE negatively (β = −0.525), it indirectly relates to QBE through its strong prediction of TAL. The study concludes that TAL is a critical driver for translating technological advancements into improved quality business education. Organizations are encouraged to prioritize investment in talent development and learning systems. Future research should examine mediating and moderating variables such as organizational culture, leadership style, or technological readiness, and the study could also be replicated across different sectors or countries.

Keywords: Artificial Intelligence, Insecurity, Quality Business Education, Technology Adoption Level

1.1 Introduction

Quality business education is widely recognised as a critical driver of economic growth, entrepreneurship development, and workforce competitiveness in contemporary economies (UNESCO, 2015; Ayonmike & Okeke, 2020). In Nigeria, business education occupies a strategic position in the educational system, as it is designed to equip learners with relevant knowledge, managerial skills, and entrepreneurial competencies necessary for effective participation in the labour market and national development (Federal Republic of Nigeria [FRN], 2014). However, the ability of business education programmes to deliver quality outcomes has increasingly come under pressure due to technological disruptions and persistent security challenges affecting the country.

Artificial intelligence (AI) has emerged as a transformative force in education, reshaping instructional delivery, assessment practices, and learning experiences (Holmes et al., 2019). In the context of business education, AI-driven applications such as adaptive learning systems, intelligent tutoring platforms, data analytics, and automated assessment tools hold significant potential for improving curriculum relevance, instructional effectiveness, and student learning outcomes (Luckin et al., 2016; Zawacki-Richter et al., 2019). These innovations are particularly relevant for enhancing the quality of business education by aligning graduates' competencies

ISSN –30268656

with the demands of the digital and knowledge-driven economy. Nevertheless, the realisation of these benefits in Nigeria remains uneven, largely due to infrastructural deficits, limited digital skills, and low institutional readiness for advanced technology integration (Afolayan et al., 2022).

Beyond technological challenges, insecurity has become a major constraint to the provision of quality education in Nigeria. Issues such as insurgency, banditry, kidnapping, and communal conflicts have led to frequent school closures, disruption of academic calendars, reduced instructional time, and heightened anxiety among students and lecturers (Adelaja & George, 2019; Okebukola, 2020). These disruptions undermine the stability and continuity required for effective teaching and learning, thereby negatively affecting educational quality. For business education, which relies heavily on consistent engagement, practical exposure, and collaborative learning, insecurity poses a serious threat to achieving intended learning outcomes.

Within this complex environment, technology adoption level plays a crucial mediating role in shaping the relationship between artificial intelligence, insecurity, and the quality of business education. Technology adoption refers to the extent to which institutions, educators, and learners are willing and able to accept, utilise, and integrate digital technologies into teaching and learning processes (Davis, 1989; Rogers, 2003). High levels of technology adoption can enhance the positive impact of AI on instructional quality and also mitigate the adverse effects of insecurity through online learning platforms, virtual classrooms, and flexible delivery modes (Ally & Wark, 2020). Conversely, low adoption levels may limit the effectiveness of AI initiatives and exacerbate the negative consequences of insecurity on educational quality.

Despite growing scholarly interest in AI integration and security challenges in education, empirical studies examining their combined influence on the quality of business education in Nigeria—particularly through the mediating role of technology adoption—remain limited. This study therefore investigates artificial intelligence and insecurity as determinants of quality business education in Nigeria, with specific emphasis on the mediating role of technology adoption level. The study contributes to existing literature by providing empirical insights that can inform policy formulation, institutional planning, and strategic interventions aimed at improving the quality of business education in Nigeria.

1.2 Objectives

1. To examine the mediating role of technology adoption level in the relationship between artificial intelligence and the quality of business education in Nigeria.
2. To assess the mediating role of technology adoption level in the relationship between insecurity and the quality of business education in Nigeria.

1.3 Hypotheses

H_1: Technology adoption level significantly mediates the relationship between artificial intelligence and the quality of business education in Nigeria.

H_2: Technology adoption level significantly mediates the relationship between insecurity and the quality of business education in Nigeria.

2.0 Literature Review

2.1 Quality Business Education

Quality business education has attracted increasing scholarly attention because of its vital role in human capital development, organisational efficiency, and national economic growth (UNESCO, 2015; Ayonmike & Okeke, 2020). Business education is broadly defined as an aspect of education that equips learners with the knowledge, skills, attitudes, and competencies required for effective participation in business, management, and entrepreneurial activities (Okolie & Nwankwo, 2018). Consequently, the quality of business education is assessed not only by the content of instruction but also by the extent to which graduates demonstrate employability skills, innovation capacity, adaptability, and ethical decision-making in real-life business environments (Kolb, 2015). Scholars conceptualize quality business education as a multidimensional construct encompassing curriculum relevance, instructional effectiveness, learning outcomes, assessment practices, and availability of instructional resources (UNESCO, 2015; Ogunleye & Adeyemi, 2019). Curriculum relevance is widely regarded as a core indicator of quality because business education programmes are expected to respond to evolving market dynamics, technological advancements, and global economic trends (Zawacki-Richter et al., 2019). When business education curricula are outdated or poorly aligned with labour market needs, graduates often experience skill mismatches, thereby undermining the overall quality and credibility of the programme (Okolie & Nwankwo, 2018).

Instructional delivery also plays a crucial role in determining the quality of business education. Effective teaching methods, learner-centred pedagogies, and interactive learning strategies enhance students' comprehension and practical application of business concepts (Kolb, 2015; Holmes et al., 2019). Empirical studies have demonstrated that experiential learning approaches such as case studies, simulations, internships, and project-based learning significantly improve students' problem-solving abilities and decision-making skills, which are essential indicators of quality business education (Kolb, 2015; Ogunleye & Adeyemi, 2019). In addition, the professional competence and continuous development of business educators have been identified as key determinants of instructional quality and student learning outcomes (Ayonmike & Okeke, 2020).

In developing countries such as Nigeria, the quality of business education is often constrained by systemic and institutional challenges. These include inadequate funding, insufficient instructional materials, overcrowded classrooms, weak industry linkages, and limited access to modern teaching technologies (Federal Republic of Nigeria [FRN], 2014; Okebukola, 2020). Such constraints negatively affect instructional delivery and limit opportunities for innovation within business education programmes. Furthermore, regional disparities in institutional capacity and exposure to insecurity contribute to uneven quality outcomes across institutions (Adelaja & George, 2019).

ISSN –30268656

Assessment practices constitute another important dimension of quality business education. Quality assessment systems emphasise the evaluation of cognitive, affective, and psychomotor skills, rather than an overreliance on rote memorisation and theoretical recall (Ogunleye & Adeyemi, 2019). Where assessment methods fail to measure practical competence and entrepreneurial skills, the quality of business education is significantly diminished, resulting in graduates who are ill-prepared for dynamic business environments (UNESCO, 2015).

Recent literature increasingly highlights technology integration as a critical factor in enhancing the quality of business education. The adoption of digital technologies, e-learning platforms, and artificial intelligence tools has been shown to improve instructional effectiveness, access to learning resources, and student engagement (Holmes et al., 2019; Zawacki-Richter et al., 2019). However, the extent to which technology improves educational quality depends largely on institutional readiness, lecturer digital competence, and students' ability to effectively utilise technological tools (Davis, 1989; Rogers, 2003).

2.2 Artificial Intelligence

Artificial Intelligence (AI) has emerged as one of the most transformative technologies of the twenty-first century, influencing virtually all sectors of the global economy, including education, healthcare, finance, and business management (Russell & Norvig, 2021; Brynjolfsson & McAfee, 2017). AI broadly refers to the capability of computer systems to perform tasks that normally require human intelligence, such as learning, reasoning, problem-solving, pattern recognition, and decision-making (Russell & Norvig, 2021). The rapid advancement of AI technologies has been driven by improvements in computing power, availability of big data, and developments in machine learning algorithms (Brynjolfsson & McAfee, 2017; Luckin et al., 2016). In the educational context, AI is increasingly recognised as a tool for enhancing teaching effectiveness, learning efficiency, and institutional management (Holmes et al., 2019). AI-powered applications such as intelligent tutoring systems, adaptive learning platforms, learning analytics, and automated assessment tools have been shown to personalise learning experiences and support diverse learner needs (Luckin et al., 2016; Zawacki-Richter et al., 2019). By analysing learners' data, AI systems can provide real-time feedback, identify learning gaps, and recommend tailored instructional content, thereby improving learning outcomes and overall educational quality (Holmes et al., 2019; Zawacki-Richter et al., 2019).

Within business and management education, AI plays a critical role in aligning curriculum delivery with the demands of the digital economy. Scholars argue that AI enhances experiential learning through simulations, predictive analytics, and virtual business environments that enable students to develop practical and analytical skills relevant to contemporary workplaces (Kolbjørnsrud et al., 2016). Furthermore, AI supports institutional decision-making by improving administrative efficiency, resource allocation, and strategic planning in educational institutions (OECD, 2021).

Despite its potential benefits, the adoption of AI in education is not without challenges. Concerns have been raised regarding ethical issues, data privacy, algorithmic bias, and the digital divide,

particularly in developing countries (Floridi et al., 2018). In contexts such as Nigeria, inadequate infrastructure, limited technical expertise, and low levels of digital readiness constrain the effective integration of AI into educational systems (Afolayan et al., 2022). These challenges highlight the need for supportive policies, capacity building, and responsible AI governance (Floridi et al., 2018; OECD, 2021).

2.3 Insecurity

Insecurity has emerged as a significant socio-economic and developmental challenge in many developing countries, particularly in sub-Saharan Africa (Achumba et al., 2013; Akinwale, 2010). Insecurity broadly refers to conditions characterised by threats to life, property, and social stability arising from violence, crime, terrorism, banditry, kidnapping, and communal conflicts (Achumba et al., 2013). In Nigeria, insecurity has intensified in recent decades, affecting governance, economic activities, and the functioning of key social institutions, including education (Adelaja & George, 2019; Okebukola, 2020). Scholarly literature consistently indicates that insecurity undermines institutional stability and social cohesion by creating fear, uncertainty, and persistent disruption of normal activities (Akinwale, 2010; Adelaja & George, 2019). Within the education sector, insecurity manifests through attacks on schools, forced closures of educational institutions, displacement of students and teachers, and prolonged disruption of academic calendars (UNESCO, 2021; Okebukola, 2020). These conditions significantly reduce instructional contact hours and weaken effective teacher–student interaction, leading to poor learning outcomes and compromised educational quality (Adelaja & George, 2019; Okebukola, 2020). Empirical studies further reveal that exposure to insecurity has profound psychological and emotional consequences for learners and educators. Experiences of violence and persistent fear contribute to trauma, anxiety, reduced motivation, and diminished academic engagement (Betancourt et al., 2013; UNESCO, 2021). In higher education and professional disciplines such as business education, insecurity restricts access to internships, industrial attachments, fieldwork, and collaborative learning activities that are essential for practical skills development and employability (Ayonmike & Okeke, 2020).

In the Nigerian context, insecurity has been linked to regional disparities in access to quality education. Institutions located in conflict-prone regions often experience staff shortages, declining student enrolment, infrastructural damage, and reduced funding, which further widen inequalities in educational outcomes (Federal Republic of Nigeria [FRN], 2014; Okebukola, 2020). Additionally, insecurity discourages public and private investment in educational infrastructure, innovation, and technology adoption, thereby limiting opportunities for educational transformation and resilience (Adelaja & George, 2019; UNESCO, 2021).

2.4 Technology Adoption Level

Technology adoption level has been extensively discussed in the literature as a critical determinant of the successful implementation and effective utilisation of technological innovations across organisations and institutions (Rogers, 2003; Davis, 1989). Technology adoption level refers to the degree to which individuals and organisations are willing and able to

ISSN –30268656

accept, integrate, and use technological tools to enhance task performance and achieve organisational objectives (Davis, 1989; Rogers, 2003). In educational settings, technology adoption level reflects institutional readiness, users' attitudes, technical competence, and the availability of supportive infrastructure for digital integration (Holmes et al., 2019).

Theoretical perspectives on technology adoption are largely anchored in established models such as the Technology Acceptance Model (TAM) and the Diffusion of Innovations Theory (Davis, 1989; Rogers, 2003). The Technology Acceptance Model posits that perceived usefulness and perceived ease of use significantly influence users' attitudes toward technology and their intention to adopt it (Davis, 1989). Similarly, the Diffusion of Innovations Theory explains technology adoption as a process shaped by innovation attributes, communication channels, time, and social systems (Rogers, 2003). These frameworks have been widely applied in educational research to explain variations in technology adoption levels among institutions and individuals (Ally & Wark, 2020).

Empirical studies in education indicate that higher levels of technology adoption are associated with improved instructional delivery, enhanced student engagement, and increased access to learning resources (Holmes et al., 2019; Zawacki-Richter et al., 2019). The integration of digital platforms, learning management systems, and artificial intelligence tools enables flexible learning environments and supports continuity of instruction, particularly in contexts affected by insecurity or other disruptions (Ally & Wark, 2020; OECD, 2021). However, these benefits are dependent on educators' digital competence, institutional support, and sustained investment in technological infrastructure (Afolayan et al., 2022).

In developing countries such as Nigeria, technology adoption levels in education remain uneven due to systemic challenges, including inadequate funding, poor internet connectivity, limited access to digital devices, and resistance to organisational change (Federal Republic of Nigeria [FRN], 2014; Afolayan et al., 2022). These constraints limit the effective use of advanced technologies and reduce their potential to enhance educational quality and resilience. Consequently, scholars emphasise the importance of policy support, capacity building, and strategic investment in digital infrastructure to improve technology adoption levels within educational institutions (OECD, 2021; Holmes et al., 2019).

3.0 Methodology

A quantitative cross-sectional survey design was employed to examine the influence of artificial intelligence and insecurity on the quality of business education in Nigeria, with technology adoption level serving as a mediating variable. The study focused on Business Education lecturers in tertiary institutions in North-East Nigeria, with a total population of 307 lecturers. Given the manageable population size, a census approach was adopted to enhance representativeness and minimise sampling bias. Data were collected using a structured questionnaire adapted from validated instruments, with items measuring artificial intelligence, insecurity, technology adoption level, and quality of business education. Responses were captured on a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5).

Data analysis was conducted using Partial Least Squares Structural Equation Modelling (PLS-SEM) with SmartPLS software. The measurement model was assessed for indicator reliability, internal consistency (Cronbach's alpha and composite reliability), convergent validity (average variance extracted), and discriminant validity (Fornell–Larcker criterion and HTMT ratio). The structural model was evaluated using path coefficients, coefficients of determination (R^2), effect sizes (f^2), and predictive relevance (Q^2). Mediation effects were tested using a bootstrapping procedure, and hypotheses were assessed at a 5% significance level.

4.1 Results

The structural equation model assessed the relationship of artificial intelligence and insecurity as determinants of quality business education in Nigeria with the mediating role of technology adoption level among business education lecturers in Nigerian tertiary institutions. The model shows the following:

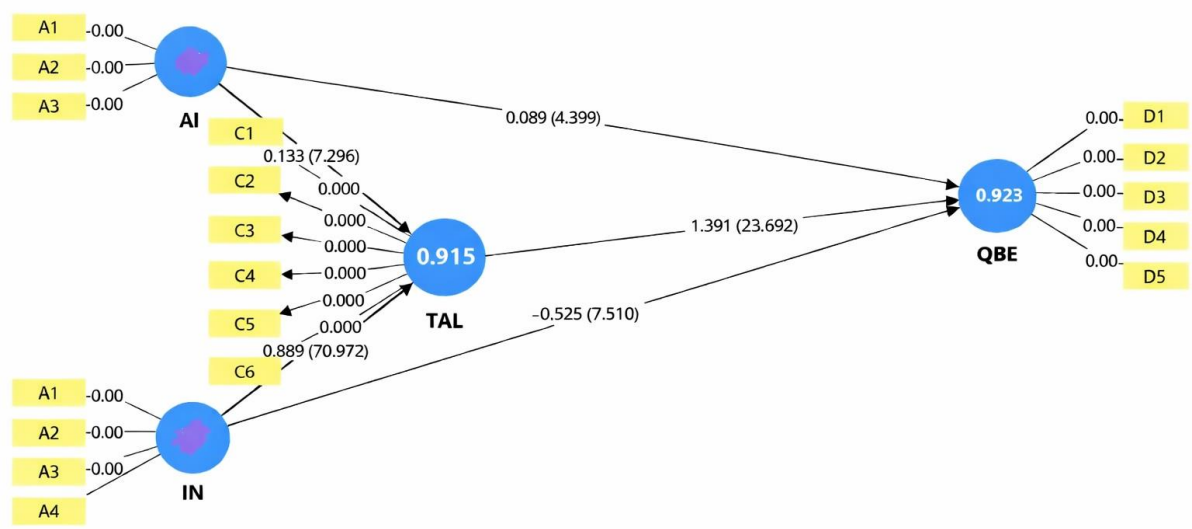

Figure 1: Structural model of artificial intelligence and insecurity on quality business education with the mediating role of technology adoption level.

Table 1: Mediation Test Result for Hypothesis One (H_1)

H_1: Technology adoption level significantly mediates the relationship between artificial intelligence and the quality of business education in Nigeria.

Constructs	t-value	Sig. Level	Decision	Remark
AI → TAL → QBE	23.69	0.05	Supported	Partially Mediates the Relationship

Source: Field Survey (2026)

The results indicate that AI → TAL showed a positive and statistically significant effect (β = 0.133, t = 7.296), indicating that AI significantly enhances TAL, while TAL → QBE had a strong positive and significant effect (β = 1.391, t = 23.692), indicating that TAL substantially improves QBE. Furthermore, AI → QBE showed a positive and significant direct effect (β = 0.089, t = 4.399), suggesting that AI contributes directly to QBE, although the magnitude is

ISSN –30268656

relatively small. For the mediation effect, AI has a significant positive effect on TAL (β = 0.133, t = 7.296) while TAL exerts a strong positive effect on QBE (β = 1.391, t = 23.692). Although AI also demonstrates a significant direct effect on QBE (β = 0.089, t = 4.399), the magnitude of the indirect effect through TAL is substantially stronger. This confirms that TAL partially mediates the relationship between AI and QBE.

Table 2: Mediation Test Result for Hypothesis Two (H_2)

H_2: Technology adoption level significantly mediates the relationship between insecurity and the quality of business education in Nigeria.

Constructs	t-value	Sig. Level	Decision	Remark
IN → TAL → QBE	23.69	0.05	Supported	Strongly Mediates the Relationship

Source: Field Survey (2026)

The results indicate that IN → TAL exhibited a strong positive and significant effect (β = 0.889, t = 70.972), suggesting that IN is the strongest predictor of TAL in the model, where TAL → QBE had a strong positive and significant effect (β = 1.391, t = 23.692), indicating that TAL substantially improves QBE. Conversely, IN → QBE revealed a significant negative direct effect (β = −0.525, t = 7.510), indicating that IN negatively influences QBE when considered as a direct predictor. In terms of the mediation effect, because IN strongly predicts TAL and TAL strongly predicts QBE, TAL plays a strong mediating role in the relationship between IN and QBE. This suggests that while IN has a negative direct effect on QBE, it indirectly enhances QBE through accelerated TAL.

4.2 Discussion

The results of H_1 indicate that AI → TAL showed a positive and statistically significant effect and TAL → QBE had a strong positive and significant effect, while AI → QBE also showed a positive and significant direct effect. For the mediation effect, AI has a significant positive effect on TAL while TAL exerts a strong positive effect on QBE; although AI also demonstrates a significant direct effect on QBE, the magnitude of the indirect effect through TAL is substantially stronger. This confirms that TAL partially mediates the relationship between AI and QBE. The findings align with prior empirical studies emphasizing the pivotal role of technological adoption and innovation in enhancing organizational outcomes (Gundey et al., 2011). Consistent with earlier research, AI significantly improved TAL, suggesting that advanced technologies strengthen learning and capability development (Roopalatha & Sucharita, 2024).

The results of H_2 indicate that IN → TAL exhibited a strong positive and significant effect, suggesting that IN is the strongest predictor of TAL, where TAL → QBE had a strong positive and significant effect, indicating that TAL substantially improves QBE. Thus, IN → QBE revealed a significant negative effect, indicating that IN negatively influences QBE when considered as a direct predictor. In terms of the mediation effect, because IN strongly predicts

TAL and TAL strongly predicts QBE, TAL plays a critical mediating role in the relationship between IN and QBE. This suggests that while IN has a negative direct effect on QBE, it indirectly enhances QBE through TAL. These findings support studies identifying adaptive innovation as a major driver of organizational learning and transformation (Hael et al., 2024). Furthermore, TAL's substantial influence on QBE corroborates evidence that talent development and learning capabilities are critical determinants of performance and quality outcomes (Alabbas et al., 2024; Kisumbe, 2020). Although AI also had a direct positive effect on QBE, its weaker magnitude agrees with studies showing that technology's impact is often amplified through mediating organizational capabilities (Shahzad et al., 2020; Nair & Munusami, 2020). The negative direct effect of IN on QBE suggests that external disruptions undermine existing processes unless supported by adequate learning structures (Wang et al., 2022). Overall, the results reinforce the view that TAL serves as a crucial mechanism through which AI and adaptive responses translate into improved educational quality.

5.1 Conclusion

The study concludes that TAL is the most critical driver of QBE, serving as the primary mechanism through which AI and IN influence performance outcomes. While AI and IN significantly enhance TAL, their direct effects on QBE are comparatively weaker, with IN showing a negative direct impact. This suggests that innovation and technology alone may not guarantee improved outcomes without strong learning and talent development structures. Therefore, educational institutions should prioritize TAL to effectively translate technological and innovative initiatives into sustainable quality and performance improvements.

5.2 Recommendations

1. Tertiary institutions should strengthen technology adoption through continuous training and capacity building for business education lecturers in artificial intelligence and digital teaching tools.
2. Educational authorities and institutional management should develop technology-supported learning systems, such as online platforms, to sustain quality business education despite insecurity.

5.3 Suggestions for Future Studies

Future research should examine additional mediating and moderating variables (e.g., organizational culture, leadership style, or technological readiness) that may influence these relationships. Longitudinal studies are recommended to assess causal effects over time. Further studies could also replicate the model across different sectors or countries to enhance generalizability and compare contextual differences.

REFERENCES

Adelaja, A., & George, J. (2019). Effects of conflict on agriculture: Evidence from the Boko Haram insurgency. World Development, 117, 184–195.

ISSN –30268656

Afolayan, A. O., Olatunji, S. O., & Ogunleye, A. J. (2022). Digital readiness and technology integration in Nigerian higher education institutions. Journal of Education and Practice, 13(7), 45–54.

Ally, M., & Wark, N. (2020). Factors influencing the adoption of mobile learning in developing countries. International Review of Research in Open and Distributed Learning, 21(1), 1–20.

Ayonmike, C. S., & Okeke, B. C. (2020). Business education and sustainable development in Nigeria. Nigerian Journal of Business Education, 7(1), 1–12.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, 13(3), 319–340.

Federal Republic of Nigeria. (2014). National policy on education (6th ed.). NERDC Press.

Hael, M., Belhaj, F. A., & Zhang, H. (2024). Organizational learning and innovation: A bibliometric analysis and future research agenda. Heliyon, 10(11), e31812. https://doi.org/10.1016/j.heliyon.2024.e31812

Holmes, W., Bialik, M., & Fadel, C. (2019). Artificial intelligence in education: Promises and implications for teaching and learning. Center for Curriculum Redesign.

Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). Intelligence unleashed: An argument for AI in education. Pearson.

Okebukola, P. (2020). Education and insecurity in Nigeria: The way forward. Journal of Educational Planning and Administration, 34(2), 123–137.

Rogers, E. M. (2003). Diffusion of innovations (5th ed.). Free Press.

Roopalatha, & Sucharita. (2024). The impact of artificial intelligence on learning and development: Case studies in companies of different sectors. Journal of Social Sciences, 8(1), 49–66. https://journalofsocialsciences.org/pdf/vol8no1/CRJSSH_Vol08_No1_p_49-66.pdf

Shahzad, et al. (2020). Adoption of artificial intelligence and organizational performance in higher education institutions in China: The mediating role of knowledge management. IGI Global.

Taylor, & Vinauskaitė. (2024). The impact of artificial intelligence on learning and development. Journal of Social Sciences.

UNESCO. (2015). Education 2030: Incheon declaration and framework for action. UNESCO Publishing.

Wang, X., Zheng, C., Mutuc, E. B., Su, N., Hu, T., Zhou, H., et al. (2022). How does organizational unlearning influence product innovation performance? Moderating effect of environmental dynamism. Frontiers in Psychology, 13. https://doi.org/10.3389/fpsyg.2022.840775

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education. International Journal of Educational Technology in Higher Education, 16(39), 1–27.