

AI ADOPTION, ADMINISTRATOR ATTRIBUTES AND EFFECTIVENESS OF BUSINESS AND VOCATIONAL EDUCATION IN COLLEGES OF EDUCATION IN NORTH-CENTRAL, NIGERIA

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Abstract

Despite increasing interest in Artificial Intelligence (AI) in education, limited empirical evidence exists on the combined influence of AI adoption and administrator attributes on the effectiveness of Business and Vocational Education (BVE) programmes in Colleges of Education in North-Central Nigeria. This study examined the level of AI adoption, the influence of administrator attributes, and the joint influence of AI adoption and administrator attributes on BVE effectiveness. A descriptive survey design was adopted, and data were collected from 600 purposively selected administrators, lecturers, students, and other stakeholders in Colleges of Education across Benue, Kogi, Niger, Kwara, and Plateau States. Data were collected using a structured questionnaire and analysed using mean, standard deviation, Pearson Product Moment Correlation, and multiple regression analysis. The findings revealed a high extent of AI adoption ($M = 3.84$), while administrator attributes had a high influence on BVE effectiveness ($M = 4.14$). AI adoption had a significant positive relationship with BVE effectiveness ($r = .862, p = .003$), while administrator attributes significantly predicted BVE effectiveness ($R^2 = .257, p = .043$). Furthermore, AI adoption and administrator attributes jointly had a significant positive influence on BVE effectiveness ($R = .742, R^2 = .551, p < .001$). The study concludes that effective AI adoption and competent educational administration are important for improving BVE effectiveness. It recommends sustained AI training, improved digital infrastructure, stronger administrative capacity, and

supportive policies to enhance BVE effectiveness in Colleges of Education in North-Central Nigeria.

Keywords: Artificial Intelligence, Administrator Attributes, Business and Vocational Education, BVE Effectiveness, Colleges of Education

Introduction

Business and Vocational Education (BVE) is a very important area of education that equips learners with practical, entrepreneurial, and employable skills needed for personal growth, economic development, and national development (Aliyu & Asmau, 2025). In Nigeria, Colleges of Education are expected to produce skilled vocational educators and graduates who can effectively meet and compete in the labour market. However, the effectiveness of BVE programmes has been affected by challenges such as weak administration, inadequate infrastructure, and limited use of modern technologies (Amodi & Uchechukwu, 2026). Globally, Artificial Intelligence (AI) is transforming education by improving teaching and learning processes, assessment, and administrative processes through automation, personalization, and data-driven decision-making (Eric, 2025). Besides these benefits, AI adoption in many developing countries, including Nigeria, remains limited due to poor digital infrastructure, inadequate ICT competencies, funding problems, and resistance to technological change (Balogun, 2015). In North-Central Nigeria, these challenges are worsened by insecurity, including incidents of banditry, kidnapping, communal conflicts, and attacks on educational institutions, which disrupt academic activities and institutional development (Stella, 2024; Abubakar et al., 2025). Insecurity causes big challenges to the deployment and sustainability of AI infrastructure in educational institutions, including colleges of education. Frequent security threats can disrupt electricity supply, internet connectivity, and access to digital facilities, while concerns about the safety of personnel and equipment may discourage investments in advanced technologies. Consequently, Colleges of Education operating in security-challenged environments may experience slower rates of AI adoption

and utilization. The severity of these challenges may also vary across states within North-Central Nigeria, given differences in security conditions and institutional capacities. The successful integration of AI in educational institutions depends not only on the availability of technology but also on the role of administrators to steer complex and uncertain environments. Administrator attributes such as leadership competence, ICT literacy, innovativeness, openness to change, and crisis management skills play a critical role in promoting technology adoption, managing risks, mobilizing resources, and ensuring institutional resilience during periods of insecurity (Antonio et al., 2026; Abdullahi et al., 2025). Administrators who have these attributes are more likely to develop adaptive strategies that sustain technology integration regardless of security and infrastructural constraints.

While AI has been recognized as a powerful tool for improving educational quality and efficiency (Holmes & Tuomi, 2022). There is still limited empirical evidence on how AI adoption and administrator attributes jointly influence the effectiveness of BVE programmes in Colleges of Education in North-Central Nigeria (Tonye, 2024). In addition, little is known about how insecurity shapes AI adoption, how educational administrators respond to technology integration under security challenges, and whether differences in security conditions across states influence programme effectiveness. This study therefore addresses these gaps by examining the extent of AI adoption, the influence of administrator attributes, and their combined effect on the effectiveness of Business and Vocational Education programmes across selected Colleges of Education in Benue, Kogi, Niger, Kwara, and Plateau States. The study equally provides context-specific insights and recommendations for strengthening AI integration and educational effectiveness in security-challenged environments.

Artificial Intelligence (AI) Adoption in Business and Vocational Education

Artificial Intelligence (AI) adoption is transforming education by improving learning, supporting teachers, and strengthening

educational management (Nan, et al., 2025). It involves the integration and utilization of AI-enabled technologies such as machine learning systems, automation tools, intelligent tutoring systems, predictive analytics, and virtual assistants in teaching, learning, assessment, and institutional decision-making processes to improve efficiency, effectiveness, and innovation (Fortinet, 2025). In Colleges of Education, particularly in North-Central Nigeria, the successful adoption of AI depends largely on institutional leadership, digital infrastructure, and organizational readiness. Administrators play a central role in facilitating AI integration through policy formulation, resource allocation, staff development, and technological support (Abdullahi et al., 2025). Studies further indicate that administrator attributes such as technological readiness, digital leadership, and openness to innovation significantly influence the successful implementation of AI technologies, which in turn enhance teaching quality, curriculum relevance, and institutional management (Agwom et al., 2025).

For the purpose of this study, AI adoption refers to the extent to which Colleges of Education integrate and utilize AI-enabled technologies in administrative and instructional activities. It is operationally defined in terms of the availability of AI-supported infrastructure, use of AI for administrative decision-making, application of AI in teaching and learning, staff awareness and utilization of AI technologies, and institutional support for AI implementation.

Administrator Attributes

Administrator attributes refer to the competencies, skills, behaviours, and personal characteristics that enable educational leaders to manage institutions effectively and achieve organizational goals (Wisdom Library). In the context of Colleges of Education, these attributes include leadership competence, ICT literacy, AI literacy, innovativeness, crisis management capability, openness to change, communication skills, and managerial effectiveness (Koku, 2026). These attributes are particularly important in an era characterized by rapid technological change and increasing demand for digital

transformation in education. Manabete and Joseph (2019) observed that effective administrators in Business and Vocational Education should possess strong leadership abilities, effective communication skills, emotional stability, and sound resource management competencies. Such attributes enable administrators to coordinate instructional activities, motivate staff, manage institutional resources efficiently, and create an enabling environment for innovation and educational effectiveness. In this study, administrator attributes are operationally defined as the extent to which educational administrators demonstrate leadership competence, ICT literacy, innovativeness, crisis management skills, and openness to change in managing Colleges of Education and promoting technology integration.

Business and Vocational Education (BVE) Effectiveness

Business and Vocational Education (BVE) is an educational programme designed to equip learners with practical skills, knowledge, values, and competencies required for employment, entrepreneurship, and economic self-reliance. It combines “education for business,” which prepares learners for occupations, with “education about business,” which provides knowledge of business operations and management. The programme encompasses vocational education for practical occupational skills and business education in areas such as accounting, entrepreneurship, marketing, office technology, and management (Igbinoba, 2008). Alison further notes that committed educational administrators play a crucial role in ensuring the smooth operation and effectiveness of educational institutions. BVE effectiveness refers to the extent to which Business and Vocational Education programmes achieve their intended objectives of developing employable, entrepreneurial, and technologically competent graduates. Dorathy (2023) explains that programme effectiveness can be assessed through graduates' acquisition of relevant skills, employability, adaptability to workplace demands, and capacity for self-employment. Victoria (2023) similarly emphasizes that vocational and business education contributes significantly to economic growth and societal

development. Nwazor and Nwaukwa (2015) further argue that effective vocational education requires high-quality teaching and learning experiences in classrooms, workshops, laboratories, and other learning environments. In this study, BVE effectiveness is operationally defined in terms of administrative efficiency, quality of instructional delivery, curriculum relevance, vocational skill acquisition, graduate employability, and entrepreneurial readiness.

Conceptual Relationship among the Study Variables

The foregoing concepts suggest that AI adoption, administrator attributes, and BVE effectiveness are interconnected rather than independent constructs. AI technologies provide opportunities for improving educational administration, instructional delivery, assessment practices, and institutional decision-making. Through automation, data analytics, and intelligent support systems, AI can enhance efficiency, reduce administrative burdens, and improve educational outcomes (Fortinet, 2025; Abdullahi et al., 2025). However, the successful implementation of AI technologies depends substantially on the qualities and competencies of educational administrators. Administrator attributes such as leadership competence, ICT literacy, innovativeness, crisis management skills, and openness to change influence technology adoption, staff acceptance, resource mobilization, and institutional readiness for innovation (Koku, 2026; Manabete & Joseph, 2019). Administrators who possess these attributes are better positioned to facilitate technological transformation and sustain educational improvement initiatives. Consequently, AI adoption and administrator attributes jointly influence the effectiveness of Business and Vocational Education programmes. While AI provides technological capabilities for improving teaching, learning, and administration, administrator attributes determine the extent to which these capabilities are effectively utilized. Together, they contribute to improved programme delivery, skill acquisition, employability outcomes, curriculum relevance, and institutional performance (Dorathy, 2023). The conceptual model underpinning this study

therefore assumes that AI adoption and administrator attributes are important predictors of BVE effectiveness. Having clarified the key concepts and their relationships, the study is anchored on theories that explain how leadership attributes and technological innovations influence educational effectiveness.

Transformational Leadership Theory

Transformational Leadership Theory was developed by Burns (1978) and later expanded by Bass (1985). The theory explains how leaders inspire followers through vision, motivation, innovation, and individualized support rather than relying solely on rewards and sanctions (Mir, 2026). The major dimensions of the theory include idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration, all of which promote commitment, creativity, innovation, and organizational performance (NU, 2023). In the context of Colleges of Education in Nigeria, transformational leadership supports AI adoption by encouraging innovation, reducing resistance to technological change, and enhancing staff capacity for digital transformation. Consequently, the theory provides a useful explanation of how administrator attributes can facilitate AI integration and improve BVE effectiveness despite infrastructural and environmental challenges (Baharuddin et al., 2025).

Crisis Leadership Theory

Crisis Leadership Theory explains how leaders respond effectively during emergencies and periods of uncertainty through adaptability, decisive action, emotional stability, and strategic communication. The theory emphasizes resilience, proactive planning, empathy, and continuous learning as essential leadership qualities for managing crises. Within educational institutions, crisis leadership is particularly relevant in addressing challenges such as insecurity, inadequate funding, technological disruptions, and institutional instability. Applied to AI adoption in North-Central Nigeria, the theory highlights the importance of crisis management skills,

emotional intelligence, and adaptive leadership in sustaining educational effectiveness under difficult conditions (Abdul'Aziz et al., 2025).

Community-Based Leadership Theory

Community-Based Leadership Theory emphasizes collaboration, shared responsibility, stakeholder engagement, and collective decision-making rather than centralized leadership structures. Lamm et al. (2017) describe the theory as a framework that promotes multiple leadership competencies for collaborative problem-solving and organizational development. Within educational settings, the theory suggests that successful AI adoption depends on the collective efforts of administrators, lecturers, students, government agencies, and community stakeholders. In North-Central Nigeria, collaborative leadership can help institutions overcome challenges associated with inadequate infrastructure, limited resources, and technological barriers, thereby improving institutional efficiency and BVE programme effectiveness (Nnamdi & Uwelegbewe, 2025). The theories discussed above provide a foundation for understanding how leadership attributes and technological innovations influence educational outcomes. The next section reviews empirical evidence relating to AI adoption, administrator attributes, and educational effectiveness.

AI Adoption and Educational Effectiveness

Holmes and Tuomi (2022) reviewed the application of AI in education and found that AI enhances teaching and learning effectiveness through personalized learning and improved instructional support. However, the study noted that misconceptions and inadequate understanding of AI continue to hinder its widespread adoption. Similarly, Tonye (2024) reported that AI improves learning outcomes, student engagement, and administrative efficiency within the Nigerian educational system. Nevertheless, the study identified inadequate infrastructure, weak internet connectivity, low funding, and resistance to change as major barriers to AI adoption. Although these studies established the benefits of AI, they did not examine its

influence within the context of Business and Vocational Education in Colleges of Education in North-Central Nigeria, thereby creating a gap.

Administrator Attributes and Educational Effectiveness

Adeseko et al. (2024) found that leadership competence and managerial effectiveness significantly influence school effectiveness and organizational performance. However, the study did not examine AI adoption or the Business and Vocational Education context. Likewise, Nilo (2025) reported that positive administrator characteristics enhance institutional performance and educational outcomes but did not investigate the relationship between administrator attributes, AI adoption, and BVE effectiveness. Consequently, a gap remains regarding the role of administrator attributes in facilitating technology-driven effectiveness in Colleges of Education.

AI Adoption, Administrator Attributes, and Educational Effectiveness

Gabriel (2024) found that AI contributes positively to learning outcomes, inclusion, and educational equity but focused primarily on basic education rather than Business and Vocational Education. Similarly, Nguyen, et al. (2024) reported that AI enhances student engagement and feedback mechanisms but noted that implementation remains constrained by cost and accessibility challenges. However, the study did not examine the joint influence of AI adoption and administrator attributes on BVE effectiveness. Agwom et al. (2025) found that AI improves skills acquisition and employability outcomes but identified weak infrastructure and limited digital literacy as significant constraints. Padung et al. (2026) reported that digital technologies enhance staff productivity and institutional performance but did not investigate the combined influence of AI adoption and administrator attributes. Likewise, Bakare et al. (2025) found that infrastructure, leadership, and technological skills influence AI adoption, while Abdullahi et al. (2025) reported growing interest in AI implementation within

Technical and Vocational Education and Training (TVET) institutions despite numerous implementation challenges. Nevertheless, none of these studies examined the combined influence of AI adoption and administrator attributes on the effectiveness of Business and Vocational Education programmes in Colleges of Education within the North-Central Nigerian context.

Summary of Literature and Knowledge Gap

The reviewed literature demonstrates that AI adoption has the potential to improve teaching, learning, administration, and educational effectiveness (Holmes & Tuomi, 2022; Tonye, 2024; Mir (2026); Gabriel, 2024). The literature also indicates that administrator attributes such as leadership competence, ICT literacy, innovativeness, and managerial effectiveness contribute significantly to institutional performance and technology adoption (Adeseko et al., 2024; Nilo, 2025). Furthermore, studies have shown that technological innovations, infrastructure, and organizational factors influence educational productivity and effectiveness (Abdullahi et al., 2025). Despite these contributions, existing studies have largely examined AI adoption and administrator attributes independently or within educational contexts other than Business and Vocational Education. There is still limited empirical evidence on how AI adoption and administrator attributes jointly influence the effectiveness of Business and Vocational Education programmes in Colleges of Education in North-Central Nigeria, particularly within a region affected by insecurity, infrastructural limitations, and varying institutional capacities. This gap justifies the present study, which investigates the combined influence of AI adoption and administrator attributes on BVE effectiveness using evidence from Colleges of Education in North-Central Nigeria. The reviewed literature demonstrates that Artificial Intelligence (AI) adoption and administrator attributes are important factors in enhancing educational effectiveness. While existing studies have established that AI can improve teaching, learning, administration, and institutional performance (Holmes & Tuomi, 2022; Tonye, 2024; Gabriel., 2024; Nguyen, et al. 2024), and that administrator attributes

such as leadership competence and ICT skills contribute significantly to school effectiveness (Adeseko et al., 2024; Nilo, 2025), most studies have examined these variables independently or within educational contexts other than Business and Vocational Education (BVE). Furthermore, challenges such as inadequate infrastructure, low digital literacy, funding constraints, and resistance to technological change continue to hinder effective AI integration. Consequently, there remains limited empirical evidence on the combined influence of AI adoption and administrator attributes on the effectiveness of BVE programmes in Colleges of Education, particularly within the security-challenged context of North-Central Nigeria. This identified gap provides the justification for the present study.

Statement of the Problem

Business and Vocational Education (BVE) is expected to empower graduates with employable, entrepreneurial, managerial, and technological skills for national development. However, BVE programmes in Nigeria still face challenges such as inadequate facilities, limited ICT resources, weak administration, and poor connection with many workplaces needs Adegbokiki & Obadina, 2026). These challenges may reduce programme effectiveness. Artificial Intelligence (AI) can improve teaching, learning, administration, planning, decision-making, and assessment. However, its use in Colleges of Education remains restricted due to inadequate infrastructure, limited ICT skills, lack of training, cost, and resistance to change [insert recent citations]. Evidence on the contribution of AI adoption to BVE effectiveness in Nigerian Colleges of Education is also limited. The effective use of AI may depend on administrator attributes such as leadership competence, ICT literacy, innovativeness, crisis-management ability, and openness to change. Besides, previous studies have largely examined AI adoption and administrator attributes separately, with little attention to their combined effect on BVE effectiveness (Mustapha et al. 2025). The problem is more important in North-Central Nigeria, where insecurity can disrupt academic activities, attendance,

facilities, and technology use. This situation requires administrators who can effectively manage technology, change, and crises (Uwakwe et al. 2025). Despite existing studies on AI and educational leadership, there is limited evidence on the combined influence of AI adoption and administrator attributes on BVE effectiveness in Colleges of Education in North-Central Nigeria, particularly in an insecure environment. This study therefore seeks to determine the influence of AI adoption and administrator attributes on the effectiveness of BVE programmes in the region.

Research Objectives

- i. To examine the extent of Artificial Intelligence adoption in Business and Vocational Education programmes in Colleges of Education in North-Central Nigeria;
- ii. To determine the influence of administrator attributes on BVE effectiveness; and
- iii. To examine the joint influence of AI adoption and administrator attributes on BVE effectiveness.

Research Questions

- i. What is the extent of AI adoption in BVE programmes in Colleges of Education in North-Central Nigeria?
- ii. How do administrator attributes influence BVE effectiveness?
- iii. What is the joint influence of AI adoption and administrator attributes on BVE effectiveness?

Hypotheses

- Ho₁ AI adoption has no significant relationship with BVE effectiveness in Colleges of Education in North-Central Nigeria.
- Ho₂ Administrator attributes have no significant influence on BVE effectiveness.
- Ho₃ AI adoption and administrator attributes have no significant joint influence on BVE effectiveness.

Methodology

This study adopted a descriptive survey research design. The population of the study comprised all administrators, lecturers, students, and other stakeholders involved in Business and Vocational Education (BVE) programmes in selected Colleges of Education in Benue, Kogi, Niger, Kwara, and Plateau States. Administrators were targeted because of their management roles, lecturers because of their teaching responsibilities, students because they were enrolled in BVE programmes and had spent at least one academic session in their institutions, while other stakeholders were included based on their involvement in BVE activities and programmes. A sample of 600 respondents, consisting of administrators, lecturers, students, and other stakeholders, was selected using purposive sampling technique. Respondents were purposively selected because they had relevant knowledge and experience related to the study. Only those who were directly involved in BVE programmes and could provide meaningful information on AI adoption, administrator attributes, and programme effectiveness were included. One instrument was used for data collection. The instrument was a structured questionnaire designed to obtain quantitative data on AI adoption, administrator attributes, and Business and Vocational Education (BVE) effectiveness. The questionnaire was developed based on the study objectives, research questions, and hypotheses. It was structured on a 5-point Likert scale ranging from Strongly Agree (SA = 5) to Strongly Disagree (SD = 1) and consisted of four sections. Section A collected respondents' demographic information. Section B measured AI Adoption using items on the availability and use of AI technologies for teaching, learning, assessment, administration, and decision-making. Section C measured Administrator Attributes using items on leadership competence, ICT literacy, innovativeness, crisis management skills, and openness to change. Section D measured Business and Vocational Education (BVE) Effectiveness using items on administrative efficiency, quality of instructional delivery, curriculum relevance, vocational skill acquisition, employability,

and entrepreneurial readiness. The instrument was subjected to face and content validation by three experts in Educational Administration, Business Education, and Measurement and Evaluation to ensure the adequacy, clarity, and relevance of the items. The reliability of the instrument was determined using Cronbach's Alpha method. A pilot test was conducted using 30 respondents from a College of Education outside the study area but with similar characteristics to the study population. The reliability coefficients obtained were 0.82 for AI Adoption, 0.85 for Administrator Attributes, and 0.88 for BVE Effectiveness, while the overall reliability coefficient was 0.85. These coefficients indicated that the instrument was sufficiently reliable for the study. Data collection was conducted through direct administration of the questionnaires to the respondents. The researcher obtained informed consent from respondents and provided clear instructions on how to complete the questionnaire. The questionnaires were checked immediately after collection to ensure completeness and reduce missing responses. All completed copies of the instruments were retrieved immediately after administration to ensure a high response rate and minimize data loss. Ethical principles such as informed consent, confidentiality, anonymity, and voluntary participation were strictly observed throughout the study. Data collected were analyzed using frequency counts, percentages, mean, and standard deviation, were used to answer the research questions. Pearson Product Moment Correlation (PPMC) was employed to determine the relationship between AI adoption, administrator attributes, and BVE effectiveness, while Multiple Regression Analysis was used to determine the predictive influence of AI adoption and administrator attributes on BVE effectiveness.

Results

Research Question 1: What is the extent of AI adoption in BVE programmes in Colleges of Education in North-Central Nigeria?

Table 1: Mean Ratings of the extent to which AI is adopted in BVE programmes in Colleges of Education in North-Central Nigeria (N = 600)

S/N	Item	Mean (x)	SD	Decision
1	AI technologies are readily available for teaching, learning, and administrative activities in my institution.	3.95	1.06	High
2	AI tools are regularly used to support teaching and learning activities in BVE programmes.	4.11	0.97	High
3	AI applications are used in students' assessment, testing, and evaluation processes.	3.85	1.06	High
4	AI technologies support administrative functions such as record keeping, decision-making, and communication in my institution.	3.94	1.01	High
5	AI tools are integrated into curriculum delivery and instructional activities in BVE programmes.	3.78	1.10	High
6	Administrators, lecturers, and students receive adequate training on the use of AI technologies.	3.40	1.23	Moderate
7	Students are regularly exposed to and encouraged to use AI tools for learning and skill development.	3.83	1.06	High
Cluster Mean		3.84	1.09	High

Source: Author's Computation, 2026

Table 1 shows that the extent of AI adoption in BVE programmes in Colleges of Education in North-Central Nigeria is high, as reflected by the overall mean rating of 3.84. This suggests that AI technologies are relatively well integrated into teaching, learning, assessment, administrative activities, and student learning, although AI-related training remains an area requiring greater institutional attention.

Research Question 2: How do administrator attributes influence BVE effectiveness?

Table 2: Mean Ratings of how administrator attributes influence BVE effectiveness (N = 600)

S/N	Item	Mean (x)	SD	Decision
1	Administrators in my institution demonstrate strong leadership competence that promotes the effectiveness of BVE programmes.	4.30	0.88	High
2	Administrators possess adequate ICT literacy skills to support teaching, learning, and institutional management.	4.08	0.99	High
3	Administrators encourage innovation and the adoption of new ideas that improve BVE programmes.	4.03	0.99	High
4	Administrators effectively manage challenges and crises affecting the implementation of BVE programmes.	4.11	0.99	High
5	Administrators are open to change and support the introduction of new technologies and practices in BVE programmes.	4.18	0.97	High
6	Administrators demonstrate effective decision-making and communication skills that enhance the effectiveness of BVE programmes.	4.14	0.98	High
Cluster Mean		4.14	0.97	High

Source: Author's Computation, 2026

Table 2 reveals that administrator attributes influence BVE effectiveness to a high extent, with a cluster mean of 4.14. This implies that effective leadership, ICT literacy, encouragement of innovation, crisis management, openness to change, and effective decision-making and communication are perceived as important administrative attributes that contribute to the effective implementation of BVE programmes in Colleges of Education.

Research Question 3: What is the joint influence of AI adoption and administrator attributes on BVE effectiveness?

Table 3: Mean Ratings of the joint influence of AI adoption and administrator attributes on BVE effectiveness (N = 600)

S/N	Item	Mean (x)	SD	Decision
1	The use of AI technologies and effective administrative practices has improved the overall administration of BVE programmes in my institution.	4.15	0.99	High
2	AI adoption and administrator competence have enhanced the quality of teaching and instructional delivery in BVE programmes.	4.09	1.00	High
3	AI-supported teaching and effective leadership have improved students' practical and vocational skill acquisition.	4.23	0.96	High
4	AI adoption and administrator attributes have increased the relevance of BVE programmes to labour market and industry needs.	4.15	0.98	High
5	The combined use of AI technologies and effective administration has improved students' learning outcomes and academic performance.	4.06	1.00	High
6	Overall, AI adoption and administrator attributes have enhanced the effectiveness of BVE programmes in my institution.	4.19	0.98	High
Cluster Mean		4.14	0.99	High

Source: Author's Computation, 2026

Table 3 indicates that AI adoption and administrator attributes jointly influence BVE effectiveness to a high extent ($M = 4.14$, $SD = 0.99$). The relatively small standard deviation indicates that respondents' views were fairly consistent. Thus, the findings suggest that the combination of effective AI adoption and strong administrative practices is perceived to contribute substantially to improved administration, instructional delivery, practical skill acquisition, labour-market relevance, students' learning outcomes, and the overall effectiveness of BVE programmes in Colleges of Education.

Hypotheses Testing

Hypothesis 1

H01: AI adoption has no significant relationship with BVE effectiveness.

Table 4: Pearson Product Moment Correlation (PPMC) analysis on relationship exists between AI adoption and BVE effectiveness.

Variables	Mean	SD	R	P
AI Adoption	3.90	0.93	.862	.003
BVE Effectiveness	4.10	0.89		

Source: Author's Computation, 2026

Table 4 presents the Pearson Product-Moment Correlation analysis of the relationship between AI adoption and BVE effectiveness. The result shows a strong positive relationship between AI adoption and BVE effectiveness ($r = .862$, $p = .003$). Since the obtained p-value of .003 is less than the 0.05 level of significance, the null hypothesis, which states that AI adoption has no significant relationship with BVE effectiveness, is rejected. This implies that AI adoption has a statistically significant positive relationship with BVE effectiveness; hence, higher levels of AI adoption are associated with higher levels of BVE effectiveness in Colleges of Education in North-Central Nigeria. The mean scores of 3.90 ($SD = 0.93$) for AI adoption and

4.10 (SD = 0.89) for BVE effectiveness further indicate relatively high levels of both constructs.

Hypothesis 2

Ho₂: Administrator attributes have no significant influence on BVE effectiveness.

Table 5: Regression analysis on administrator attributes influence on BVE effectiveness.

Model	R	R ²	Adjusted R ²	Std. Error of the Estimate	F	P
Administrator Attributes	0.507	0.257	0.256	0.141	0.256	.043
BVE Effectiveness						

Source: Author's Computation, 2026

Table 5 reveals that administrator attributes have a statistically significant influence on BVE effectiveness (R = 0.507, R² = 0.257, F = 0.256, p = 0.043). The coefficient of determination (R² = 0.257) indicates that administrator attributes account for approximately 25.7% of the variance in BVE effectiveness. Since the obtained p-value (0.043) is less than the 0.05 level of significance, the null hypothesis (Ho₂) is rejected. This implies that administrator attributes significantly predict BVE effectiveness, although the remaining 74.3% of the variance is explained by other factors not captured in the model.

Hypothesis 3

Ho₃: AI adoption and administrator attributes have no significant joint influence on BVE effectiveness.

Table 6: Multiple Regression Analysis of the Joint Influence of AI Adoption and Administrator Attributes on BVE Effectiveness

Predictor	B	SE B	β	T	P	
Constant	1.115					
AI Adoption	0.393	0.045	.411	8.765	<.001	
Administrator Attributes	0.350	0.044	.382	7.943	<.001	
Model summary						
	R	R ²	Adjusted	R ²	F	P
	.742	.551	.548	183	.421	<.001

Source: Author's Computation, 2026

The multiple regression analysis indicates that AI adoption and administrator attributes jointly have a significant influence on BVE effectiveness, R = .742, R² = .551, adjusted R² = .548, F = 183.421, p < .001. The model explains 55.1% of the variance in BVE effectiveness, while the remaining 44.9% is attributable to other factors not included in the model. Individually, AI adoption (β = .411, t = 8.765, p < .001) and administrator attributes (β = .382, t = 7.943, p < .001) both make significant positive contributions to BVE effectiveness. Since the overall model is statistically significant at the 0.05 level, HO₃ is rejected. Therefore, AI adoption and administrator attributes have a significant joint influence on BVE effectiveness in Colleges of Education in North-Central Nigeria.

Discussion of Findings

The study found that the extent of AI adoption in BVE programmes was high (M = 3.84). AI was reported to be used in teaching, learning, assessment, administration, curriculum delivery, and student skill development. On the other hand, training of administrators, lecturers, and students was only moderate (M = 3.40), possible that while AI use is increasing, adequate capacity building remains necessary for effective and sustainable adoption. This finding consents with Holmes and Tuomi (2022), Tonye (2024), Abdullahi et al. (2025), and

Bakare et al. (2025), who identified infrastructure, digital skills, and readiness as important issues in AI adoption. The finding equally supports the Diffusion of Innovation Theory, which emphasises awareness, readiness, acceptance, and organisational conditions in the adoption of new technologies.

The study again revealed that administrator attributes had a high influence on BVE effectiveness ($M = 4.14$). Leadership competence, ICT literacy, innovation, crisis management, openness to change, and communication were all rated highly. The regression results further showed that administrator attributes significantly predicted BVE effectiveness ($R^2 = .257$, $p = .043$). This suggests that effective administrators play an important role in creating the leadership and organisational conditions needed for effective BVE delivery. The finding consents with Adeseko et al. (2024) and Nilo (2025) and is consistent with Transformational Leadership Theory, which holds that effective leaders can motivate staff, encourage innovation, manage change, and improve organisational performance.

Ultimately, the study found that AI adoption and administrator attributes jointly had a significant positive influence on BVE effectiveness ($R = .742$, $R^2 = .551$, $p < .001$). Together, the two variables explained 55.1% of the variation in BVE effectiveness, with AI adoption ($\beta = .411$) and administrator attributes ($\beta = .382$) both making significant contributions. This indicates that technology alone may not be sufficient; its effectiveness is strengthened by competent, innovative, and supportive administrators. The finding agrees with Gabriel (2024), Nguyen (2025), Agwom et al. (2025), who reported positive links between educational technology, effective leadership, and educational outcomes. Overall, the findings suggest that successful AI adoption and effective administration should be developed together to improve BVE effectiveness in Colleges of Education in North-Central Nigeria.

Conclusion

The study concluded that AI adoption and administrator attributes are important factors in improving the effectiveness of Business and Vocational Education (BVE) programmes in Colleges of Education in North-Central Nigeria. Although AI adoption is relatively high, sustained capacity building for administrators, lecturers, and students remains necessary for its effective use. Overall, the findings indicate that combining effective AI adoption with competent, innovative, and supportive administration can substantially enhance the quality and effectiveness of BVE programmes.

Recommendations

Based on the findings of the study, the following recommendations are made:

- i. Colleges of Education should provide more AI tools and digital facilities to support teaching, learning, assessment, and administrative work in BVE programmes.
- ii. Regular AI training should be provided for lecturers, students, and administrators so that they can confidently and effectively use AI in their academic and administrative activities.
- iii. College administrators should improve their leadership and ICT skills to better support staff, students, and the effective running of BVE programmes.
- iv. Administrators should encourage new ideas, manage crises effectively, and be open to change in order to improve the delivery of BVE programmes.
- v. Colleges of Education should combine AI use with good administration to improve teaching, students' practical skills, learning outcomes, and the relevance of BVE programmes to the labour market.
- vi. Government and College management should provide the needed funding, policies, technical support, and safe environment to ensure that AI and effective administration are used together to improve BVE programmes.

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