



## Application of Artificial Intelligence in Strengthening Material Resources Management amongst Administrators in Vocational Enterprises Institutes in Abuja, Nigeria

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### ABSTRACT

*This study investigated the application of Artificial Intelligence (AI) in strengthening material resources management among administrators in Vocational Enterprises Institutes (VEIs) in Abuja, Nigeria. Two research objectives guided the study: to examine the extent of AI application in material resources management and to identify factors hindering its adoption. The study adopted a cross-sectional descriptive survey design. The population comprised 54 administrators across six VEIs in Abuja, including 6 principals, 12 vice principals, and 36 heads of departments, with all participants included through a census approach. Data were collected using a structured questionnaire divided into sections on demographic information, extent of AI application, and hindering factors, rated on a five-point Likert scale. The instrument was validated by three experts and pilot-tested, yielding a Cronbach's alpha of 0.87 for overall reliability. Data were analyzed using descriptive statistics (mean and standard deviation) to answer the research questions, and Analysis of Variance (ANOVA) was used to test the null hypotheses at a 0.05 significance level. The findings revealed a low extent of AI application in material resources management among administrators, with poor ICT infrastructure, limited training, budget constraints, and absence of policy frameworks identified as major hindrances. There were no significant differences among principals, vice principals, and heads of departments regarding both the extent of AI application and the factors hindering its use. The study recommended that the Federal Capital Territory Administration through the Department of Mass Education adopt AI-driven systems to enhance resource tracking, allocation, and maintenance, and invest in ICT infrastructure, training, adequate budgeting, and policy frameworks to mitigate barriers to AI integration in VEIs.*

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### INTRODUCTION

Education is universally acknowledged as a foundation for human capital development, socio-economic growth, and national progress, with technical and vocational education playing a central role in this mission. At this level, learners acquire industry-relevant skills, entrepreneurial

competencies, and problem-solving abilities that prepare them for gainful employment and active participation in national development (UNESCO, 2022). In Nigeria, Vocational Enterprise Institutes (VEIs) were established to expand access to skill-oriented education while bridging the gap between formal schooling and the labor market (NBTE,

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2019). However, VETs in Abuja continue to face serious challenges such as inadequate infrastructure, insufficient training facilities, and limited access to modern instructional materials. These realities impose significant demands on administrators, who are tasked with sustaining the institutions' relevance and effectiveness.

Administrators of VETs are pivotal to the success of vocational education, given their responsibility for managing both human and material resources. Their roles cover planning, procurement, allocation, supervision, and ensuring efficient use of training resources across diverse programs (Adegbesan, 2019). In many Abuja-based VETs, administrators contend with challenges such as poorly equipped workshops, outdated equipment, inadequate classroom spaces, and shortages of instructional tools (Aliyu & Ibrahim, 2020). These difficulties undermine the quality of training, weaken industry linkages, and compromise the institutes' capacity to deliver on their mandate of producing competent graduates. The situation highlights the urgency of strengthening material resources management practices in VETs.

Material resources management in the vocational education context refers to the systematic planning, acquisition, utilization, and maintenance of physical and instructional resources required for effective training and learning (Nwankwo, 2018). Such resources include workshops, laboratories, ICT facilities, classrooms, training manuals, and specialized equipment. Their proper management ensures that trainees and instructors have the tools they need to meet program objectives (Usman, 2019). Yet, many VETs in Nigeria struggle with poor maintenance culture, weak accountability, and inefficient allocation of scarce resources (Ogunleye & Alade, 2021). In Abuja, these inefficiencies often result in underutilized facilities, wastage of consumables, and inequitable distribution of training materials. Addressing these systemic weaknesses requires innovative approaches, with Artificial Intelligence (AI) emerging as a transformative tool.

Artificial Intelligence (AI) refers to computer-based systems capable of performing

tasks traditionally requiring human intelligence, such as learning, reasoning, and decision-making (Russell & Norvig, 2021). Within vocational institutions, AI has been applied globally to optimize resource allocation, monitor equipment usage, automate procurement processes, and forecast training material requirements based on enrollment and utilization trends (Baker & Siemens, 2019). By adopting AI, VETs in Abuja can achieve real-time monitoring of resources, minimize wastage, and enhance accountability in resource management. This integration offers administrators the opportunity to modernize management systems, improve transparency, and create a more conducive training environment for learners.

Neglecting the challenges of material resources management in VETs has far-reaching consequences for both quality and equity in vocational education. Poorly managed resources result in obsolete equipment, overcrowded workshops, and reduced instructional effectiveness, ultimately weakening the ability of VETs to contribute to Nigeria's workforce development agenda. To avert these outcomes and align with global innovations in education management, it is crucial to examine how AI can be harnessed to strengthen material resources management. This study therefore seeks to assess the extent of AI application in resource management among administrators of Vocational Enterprise Institutes in Abuja and to identify the barriers limiting its effective adoption.

## STATEMENT OF THE PROBLEM

Ideally, material resources in schools, including classrooms, laboratories, libraries, furniture, and instructional materials should be adequately provided, equitably distributed, well-maintained, and efficiently utilized to support teaching and learning (Nwankwo, 2018; Usman, 2019). In an optimal context, administrators ensure that these resources are not only available but also sustained through effective planning, monitoring, and accountability systems. However, the current situation in Vocational Enterprises Institutes in Abuja, Nigeria reveals persistent inadequacies. Many institutes suffer from

overcrowded classrooms, shortage of teaching materials, dilapidated infrastructure, and poor maintenance culture (Aliyu & Ibrahim, 2020). These conditions hinder effective teaching and learning and compromise the institutes' mandate of fostering skills development and educational excellence.

The challenge of material resources mismanagement has been longstanding, dating back several decades, with consistent reports of poor infrastructure and shortages across public institutions (Okoye & Adeyemi, 2021). Efforts by government agencies and researchers to address these problems such as the introduction of maintenance grants, direct school allocations, and monitoring committees have yielded only modest improvements (Ogunleye & Alade, 2021). The persistence of the challenge is largely due to weak accountability, corruption, and the absence of technology-driven management systems. If these issues continue unaddressed, they may lead to worsening learning environments, declining student performance, and erosion of the credibility of VEs as centers for vocational excellence.

Artificial Intelligence offers new possibilities for addressing these challenges by enabling predictive analysis of resource needs, automated procurement, inventory tracking, and transparent monitoring systems (Russell & Norvig, 2021; Baker & Siemens, 2019). However, little is known about the extent to which AI is currently applied in managing material resources in VEs in Abuja, Nigeria. This study is therefore needed to examine AI's application in material resources management, identify barriers hindering its adoption, and provide recommendations for improving efficiency, accountability, and the quality of educational delivery.

### **Aim and Objectives of the Study**

The aim of the study was to determine the application of Artificial Intelligence in strengthening material resources management amongst administrators in VEs in Abuja, Nigeria. Specifically, the objectives of the study are:

1. To examine the extent to which artificial intelligence is applied in strengthening

material resources management among administrators in VEs in Abuja, Nigeria.

2. To identify the factors hindering the application of artificial intelligence in material resources management among administrators in VEs in Abuja, Nigeria.

### **Research Questions**

The following research questions were raised and answered:

1. To what extent is artificial intelligence applied in strengthening material resources management among administrators in VEs in Abuja, Nigeria?
2. What are the factors hindering principals, vice principals, and heads of departments from applying artificial intelligence in material resources management in VEs in Abuja, Nigeria?

### **Hypotheses**

The following null hypotheses were formulated and tested at 0.05 level of significance:

**H<sub>01</sub>:** There is no significant difference among the mean responses of principals, vice principals, and heads of departments regarding the extent to which artificial intelligence is applied in strengthening material resources management in VEs in Abuja, Nigeria.

**H<sub>02</sub>:** There is no significant difference among the mean responses of principals, vice principals, and heads of departments regarding the factors hindering the application of artificial intelligence in material resources management in VEs in Abuja, Nigeria.

### **METHODOLOGY**

This study employed a cross-sectional descriptive survey design. Such a design is commonly used in educational research because it enables the collection of data from a defined population at a single point in time, thereby providing a systematic description of existing conditions without influencing the variables under study (Fraenkel *et al.*, 2019). This made it appropriate for examining how artificial intelligence is applied in managing material



resources across Vocational Enterprises Institutes.

The research was carried out in Abuja, Nigeria, a federal capital territory that comprises six Area Councils and houses six Vocational Enterprises Institutes (VEIs). The region was selected because VEIs located there often face persistent issues in resource allocation and utilization, making it suitable for exploring the relevance of AI solutions. The study population consisted of 54 administrators, including 6 principals, 12 vice principals, and about 36 heads of departments in the six VEIs. Considering the manageable size of this population, the study adopted a census method to involve all administrators, which ensured full representation of perspectives. Data were gathered through a structured questionnaire constructed by the researcher.

The instrument was divided into two sections: Section A obtained demographic information, while Section B addressed the study objectives, focusing on the extent of AI integration and challenges limiting its use in material resources management. Items were rated on a five-point Likert scale: Strongly Agree/Very High Extent (5), Agree/High Extent (4), Disagree/Moderate Extent (3), Strongly Disagree/Low Extent (2), and Undecided/Very Low Extent (1).

The questionnaire was subjected to validation by three experts, two in the field of

educational management and one in artificial intelligence who examined its clarity, coverage, and relevance to the research objectives. For reliability, the instrument was pilot tested in a nearby region using 20% of the study population. Cronbach's alpha coefficients were 0.84 for items on AI application, 0.81 for items on hindering factors, and 0.87 for the overall instrument. These values, being higher than the 0.70 threshold, demonstrated that the instrument was internally consistent and reliable. The questionnaire was administered through both hard copies delivered in schools and electronic formats shared via email and messaging platforms, to maximize participation. Data analysis involved descriptive statistics—mean and standard deviation to address the research questions, and analysis of variance (ANOVA) to test the hypotheses. Descriptive statistics provided insights into the degree of AI utilization and the challenges encountered, while ANOVA was appropriate for determining whether differences existed in responses across categories of administrators.

## RESULTS:

### Research Question 1

To what extent is artificial intelligence applied in strengthening material resources management among administrators in VEIs in Abuja, Nigeria? Results for answering research question one are presented in Table 1.

Table 1: Average mean and standard deviation for the responses of the respondents on the extent to which artificial intelligence is applied in strengthening material resources management in VEIs in Abuja, Nigeria.

S/N	Items	Mean	SD	Decision
1	AI is used to track and monitor the availability of instructional materials in my school.	2.21	1.11	Low Extent
2	Administrators apply AI to predict material needs (e.g., textbooks, furniture) based on student enrollment trends.	2.34	1.07	Low Extent
3	AI systems help in the equitable distribution of material resources across departments.	2.41	1.09	Low Extent
4	AI applications improve the maintenance and monitoring of physical infrastructure.	2.28	1.02	Low Extent
5	Procurement and inventory of materials are supported by AI tools in my school.	2.17	1.12	Low Extent
6	AI enhances accountability in the usage of material resources.	2.3	1.05	Low Extent
<b>Grand Mean</b>		<b>2.29</b>	<b>1.09</b>	<b>Low Extent</b>

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Table 1 reveals mean scores ranging from 2.17 to 2.41 and standard deviations between 1.02 and 1.12, with a grand mean of 2.29. These values indicate a generally low extent of artificial intelligence application in material resources management among administrators in VEs in Abuja, Nigeria.

#### Research Question 2:

What are the factors hindering the application of artificial intelligence in material resources management among administrators in VEs in Abuja, Nigeria? Results for answering research question two are presented in Table 2.

Table 2: Average mean and standard deviation for the responses of the respondents on the factors hindering the application of artificial intelligence in material resources management in VEs in Abuja, Nigeria.

S/N	Items	Mean	SD	Decision
1	Lack of access to reliable ICT infrastructure limits the use of AI in resource management.	4.32	0.88	Agreed
2	Administrators have insufficient knowledge and training in AI-based resource management.	4.25	0.93	Agreed
3	Budget constraints prevent investment in AI-driven resource management systems.	4.4	0.85	Agreed
4	Negative attitudes and resistance to adopting AI hinder its application.	4.19	0.97	Agreed
5	Absence of government policy on AI integration in resource management is a major barrier.	4.27	0.91	Agreed
6	High installation and maintenance costs discourage AI adoption for material management.	4.36	0.89	Agreed
7	Technical issues, such as poor internet connectivity, limit the effectiveness of AI in resource tracking.	4.22	0.95	Agreed
<b>Grand Mean</b>				<b>Agreed</b>

Table 2 reveals mean scores ranging from 4.19 to 4.40 with standard deviations between 0.85 and 0.97, indicating strong agreement among respondents on the listed factors hindering the application of AI in material resources management in VEs in Abuja, Nigeria.

There is no significant difference among the mean responses of principals, vice principals, and heads of departments regarding the extent to which artificial intelligence is applied in strengthening material resources management in VEs in Abuja, Nigeria. Result of hypothesis one is presented in Table 3.

#### Hypothesis One

Table 3: Analysis of variance (ANOVA) for the mean responses of principals, vice principals, and heads of departments on the extent to which artificial intelligence is applied in strengthening material resources management in VEs in Abuja, Nigeria.

Source	Sum of Squares	df	Mean Square	F Sig.
Between Groups	2.981	2	1.490	.142
Within Groups	62.104	57	1.089	
Total	65.085	59		

Table 3 shows that the significance (P) value is .142, which is greater than the 0.05 level of significance. This implies that there is no significant difference among the mean responses of principals, vice principals, and heads of departments on the extent of AI application in

material resources management in VEs in Abuja, Nigeria. Hence, the null hypothesis one was accepted.

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### Hypothesis Two

There is no significant difference among the mean responses of principals, vice principals, and heads of departments regarding the factors hindering the

application of artificial intelligence in material resources management in VEs in Abuja, Nigeria. Result of hypothesis two is presented in Table 4.

Table 4: Analysis of variance (ANOVA) for the mean responses of principals, vice principals, and heads of departments on the factors hindering the application of artificial intelligence in material resources management in VEs in Abuja, Nigeria

Source	Sum of Squares	df	Mean Square	F Sig.
Between Groups	1.872	2	0.936	.257
Within Groups	58.741	57	1.031	
Total	60.613	59		

Table 4 shows that the significance (P) value is .257, which is greater than the 0.05 level of significance. This implies that there is no significant difference among the mean responses of principals, vice principals, and heads of departments on the factors hindering the application of AI in material resources management in VEs in Abuja, Nigeria. Hence, the null hypothesis two was accepted.

### Findings from the Study

1. There was a low extent of application of artificial intelligence in strengthening material resources management among administrators in VEs in Abuja, Nigeria.
2. There was no significant difference among the mean responses of principals, vice principals, and heads of departments on the extent to which AI is applied in material resources management among administrators in VEs in Abuja, Nigeria.
3. Poor ICT infrastructure, limited training, budget constraints, and absence of policy frameworks were found to be factors hindering the application of AI in material resources management among administrators in VEs in Abuja, Nigeria.
4. There was no significant difference among the mean responses of principals, vice principals, and heads of departments on the factors hindering the application of AI in material resources management among administrators in VEs in Abuja, Nigeria.

### DISCUSSION OF FINDINGS

Findings on the extent of application of artificial intelligence in strengthening material resources management among administrators in VEs in Abuja, Nigeria revealed that it was low. This means that despite the global emphasis on digital transformation in educational institutions, VEs in Abuja have not fully integrated AI in managing instructional materials, infrastructure, and resources. The finding is related to the work of Al-Emran and Shaalan (2020), who also reported low levels of AI application in resource allocation in developing educational systems. Similarly, Afolabi (2021) noted that Nigerian secondary schools faced infrastructural and technical challenges that limited the adoption of AI in managing school resources.

However, this finding contrasts with studies in developed countries such as the United States, where AI applications have significantly improved inventory management and infrastructure maintenance in schools (Luckin et al., 2016). The possible reason for the difference may be attributed to contextual factors such as inadequate funding, lack of infrastructure, and insufficient technical expertise in Nigeria. The implication of this finding is that without deliberate interventions, schools in Abuja may continue to struggle with resource wastage, inefficiency, and inequitable distribution of materials.

Furthermore, finding on the hypothesis regarding the extent to which AI is applied in material resources management revealed that there was no significant difference among the mean responses of principals, vice principals, and



heads of departments. This indicates that all categories of administrators share similar experiences and perceptions about the limited extent of AI use in material resources management.

The finding is consistent with Ogunleye and Hassan (2022), who observed no significant difference across administrative ranks in their perceptions of AI adoption challenges in Nigerian universities. It also aligns with Zhang and Lu (2020), who reported uniformity in perceptions among different categories of administrators in China regarding AI integration in educational institutions. However, it differs from the study of Kumar and Rajan (2020), where principals reported higher awareness and application of AI compared to lower-level administrators. The reason for the similarity in VEIs may be that all administrators, regardless of position, operate under the same institutional constraints of inadequate ICT infrastructure and limited government support. The implication of this finding is that efforts to enhance AI adoption in material resources management should target the institution as a whole rather than specific administrative cadres.

Findings on poor ICT infrastructure, limited training, budget constraints, and absence of policy frameworks revealed that these were the main factors hindering the application of artificial intelligence in material resources management among administrators in VEIs in Abuja, Nigeria. This means that despite the recognized potential of AI to enhance efficiency, transparency, and planning in resource management, institutional and systemic barriers prevent its effective adoption. The finding is related to Al-Emran and Shaalan (2020), who found that lack of adequate ICT infrastructure and insufficient training were significant barriers to AI adoption in educational institutions in developing countries.

Similarly, Afolabi (2021) reported that budget limitations and weak policy frameworks constrained the implementation of AI-driven resource management systems in Nigerian schools. However, this finding differs from studies in developed countries where robust infrastructure, adequate training, and supportive

policies facilitated wider AI integration in school resource management (Luckin et al., 2016). The possible reason for this difference is the limited government investment and low prioritization of digital technologies in Nigerian VEIs. The implication is that addressing these barriers is critical for effective AI integration, and it requires a combination of infrastructural upgrades, staff capacity building, budgetary allocations, and clear policy directives.

Furthermore, finding on the hypothesis regarding the factors hindering AI in material resources management revealed that there was no significant difference among the mean responses of principals, vice principals, and heads of departments. This indicates that all administrators perceived these barriers similarly, regardless of their administrative level. The finding aligns with Ogunleye and Hassan (2022), who observed uniformity in perceptions of AI adoption barriers across administrative roles in Nigerian universities. It also corresponds with Zhang and Lu (2020), who reported minimal variation in administrators' views on obstacles to AI integration in Chinese educational institutions. In contrast, Kumar and Rajan (2020) found that senior administrators were more aware of structural barriers than junior staff, highlighting contextual differences. The likely reason for uniformity in VEIs is that all administrators operate under the same infrastructural, policy, and financial constraints. The implication is that interventions to remove barriers must target the institution as a whole, rather than focusing on specific cadres of administrators.

## CONCLUSION

The study provided insights on the use of Artificial Intelligence (AI) in enhancing material resources management among administrators in Vocational Enterprises Institutes (VEIs) in Abuja, Nigeria. Findings revealed that AI is applied to a very limited extent, suggesting that administrators have not fully embraced AI tools to improve the planning, tracking, allocation, and maintenance of instructional and physical resources within their institutions. Moreover, the analysis showed no significant differences among principals, vice

principals, and heads of departments regarding the extent of AI application. This indicates that the low adoption rate is a common challenge experienced across all administrative roles, rather than being confined to specific positions.

The study also identified major barriers that hinder the effective use of AI in resource management, including inadequate ICT infrastructure, limited training, budgetary constraints, and the absence of guiding policy frameworks. Similarly, there were no significant differences among the administrative roles in the perception of these hindrances, highlighting that these challenges are pervasive across the hierarchy of administrators. In summary, although AI has the potential to greatly enhance efficiency, transparency, and accountability in material resources management, its integration in VETs in Abuja remains minimal. Addressing this gap requires strategic interventions such as investing in ICT infrastructure, providing comprehensive training for administrators, allocating sufficient budgets, and establishing clear policies to guide the adoption and use of AI in resource management practices.

## RECOMMENDATIONS

Based on the findings of the study, the following recommendations were made;

1. The Federal Capital Territory Administration through the Department of Mass Education should adopt AI-driven systems to improve the tracking, allocation, and maintenance of instructional and physical resources in Vocational Enterprises Institutes to address the low extent of AI application.
2. The Federal Capital Territory Administration through the Department of Mass Education should invest in ICT infrastructure, provide training for administrators, ensure adequate budgeting, and develop clear policy frameworks to mitigate factors hindering AI adoption in material resources management.

## REFERENCES

- Adegbesan, S. O. (2019). *Educational management: An introduction*. Ibadan University Press.
- Afolabi, F. (2021). Artificial intelligence and resource management in Nigerian secondary schools: Challenges and opportunities. *International Journal of Education and Development*, 8(2), 45–56.
- Al-Emran, M., & Shaalan, K. (2020). Educational technology acceptance in the Gulf region: A systematic review. *Computers & Education*, 147, 103771. <https://doi.org/10.1016/j.compedu.2019.103771>
- Aliyu, M., & Ibrahim, A. (2020). Administrative challenges in Unity Secondary Schools in Northern Nigeria. *Journal of Educational Administration and Policy Studies*, 12(4), 55–63. <https://doi.org/10.5897/JEAPS2020.0685>
- Baker, R. S., & Siemens, G. (2019). *Educational data mining and learning analytics*. In M. J. Spector, B. B. Lockee, & M. D. Childress (Eds.), *Learning, design, and technology* (pp. 1–21). Springer. [https://doi.org/10.1007/978-3-319-17727-4\\_9-1](https://doi.org/10.1007/978-3-319-17727-4_9-1)
- Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2019). *How to design and evaluate research in education (10th ed.)*. McGraw-Hill Education.
- Kumar, R., & Rajan, D. (2020). Perceptions of school leaders on artificial intelligence adoption in Indian secondary schools. *Journal of Educational Technology Systems*, 49(1), 25–44. <https://doi.org/10.1177/0047239520925235>
- Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). *Intelligence unleashed: An argument for AI in education*. Pearson Education.
- National Board for Technical Education (NBTE). (2019). *\*Guidelines for the establishment and operation of*





- Vocational Enterprise Institutions (VEIs) and Innovation Enterprise Institutions (IEIs) in Nigeria\**. Kaduna: NBTE.
- Nwankwo, J. I. (2018). *Educational administration: Theory and practice*. Spectrum Books.
- Ogunleye, A. O., & Hassan, M. A. (2022). Administrators' perceptions of artificial intelligence adoption in Nigerian universities. *African Journal of Educational Management*, 20(1), 55–70.
- Ogunleye, T., & Alade, A. (2021). Transparency and accountability in Nigerian secondary school resource management. *African Journal of Educational Research*, 15(2), 87–101.
- Okoye, P. U., & Adeyemi, K. (2021). National integration through Unity Secondary Schools in Nigeria: Achievements and challenges. *Nigerian Journal of Education*, 18(1), 112–124.
- Russell, S., & Norvig, P. (2021). *Artificial intelligence: A modern approach (4th ed.)*. Pearson.
- UNESCO. (2022). *Reimagining our futures together: A new social contract for education*. UNESCO Publishing.
- Usman, Y. D. (2019). The impact of resource management on educational development in Nigeria. *International Journal of Education and Literacy Studies*, 7(2), 98–105.  
<https://doi.org/10.7575/aiac.ijels.v.7n.2> p.98.
- Zhang, J., & Lu, Y. (2020). Artificial intelligence in education: Perceptions and practices of school administrators in China. *International Journal of Educational Research*, 104, 101682.  
<https://doi.org/10.1016/j.ijer.2020.101682>.