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## **Integrating Artificial Intelligence and Digital Connectivity in Remote School Management for Enhanced Educational Outcomes among Secondary Schools in Imo State, Nigeria**

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### **Abstract**

*This study examined the integration of artificial intelligence and digital connectivity in remote school management to enhance educational outcomes in Imo State secondary schools. A descriptive survey design was employed, guided by two research questions and one null hypothesis. The study sampled 542 staff, including 372 teachers and 170 principals, from 296 public secondary schools. A validated questionnaire on “Artificial Intelligence and Digital Connectivity in Remote School Management for Enhanced Educational Outcomes” (QAIDCRSMEEO) with a reliability index of 0.84 was used to collect data, which was analyzed using mean scores, standard deviation, and t-test statistics at 0.05 level of significance. From the findings, the study revealed insufficient digital literacy, limited ICT infrastructure, staff resistance, inadequate funding, unreliable internet, and unstable power supply as the challenges of integrating artificial intelligence and digital connectivity in remote school management for enhanced educational outcomes in secondary schools. The study also revealed that principals can be supported in integrating artificial intelligence and digital connectivity in remote school management for enhanced educational outcomes in secondary schools through capacity-building programs, resource allocation, and infrastructure provision, regular monitoring, community engagement, professional standards, and government incentives for ICT adoption. The study concluded that integrating artificial intelligence and digital connectivity in remote school management has the potential to enhance educational outcomes in secondary schools.*

**Key Words:** Artificial Intelligence, Connectivity, Digital, Management, Secondary Schools

### **Introduction**

The integration of Artificial Intelligence (AI) and digital connectivity in education has revolutionized the way schools operate, particularly in remote settings. Artificial Intelligence (AI) is a specific area of digital technology that enables machines to think, learn, and act like humans, supporting intelligent tutoring systems, chat bots and performance assessments. Digital technology encompasses electronic tools and systems that enhance learning, including hardware, software, and networks. Digital connectivity is a key enabler of AI that allows access to online resources, remote learning and global collaboration. With the increasing demand for accessible and quality education, leveraging AI and digital connectivity can bridge geographical gaps, enhance learning experiences and streamline school management. Remote school management refers to the use of digital technologies to administer school operations from a distance. It encompasses online platforms for tasks like student registration, attendance tracking and grade management, as well as digital communication tools for teachers, students and parents. Virtual classrooms and online learning management systems enable remote teaching and learning. This approach improves communication, reduces administrative burdens and enhances student outcomes, making it particularly beneficial for schools in remote areas. The potential of AI-powered tools and digital platforms enable remote schools to improve administrative efficiency, personalize learning and foster global connections. Effective remote school management is crucial for improving educational outcomes and principals play a vital role in this process. As chief executives, principals coordinate resources to maximize quality in schools. The advent of Artificial Intelligence (AI) and digital connectivity has transformed work attitudes and behaviours in addition; remote management has gained attention globally. According to Otiveira-Pereira et al. (2023), remote management maintains



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organizational balance and helps achieve defined objectives. Digital management is positively connected to long-term success and organizational sustainability (Khaw et al., 2022). School administrators who exhibit technology management practices by integrating Artificial Intelligence (AI) and digital connectivity support teachers in accessing ICT resources and integrating technology into teaching and learning (Mwawas, 2014). As schools become more technology-dependent, leaders adapt to manage workers using technology in e-learning environments (Husting et al., 2013). Effective technology integration supports teachers' instructional processes (Richardson & Bathon, 2013). Remote management requires technological competence and is crucial for school administrators, especially during crises. Despite its benefits, remote management faces challenges, including financial limitations, teachers' opposition to change (Sincar, 2013), frequent power outages, lack of support from government and the community (Ayodele & Olutola, 2025). Computer expertise significantly impacts technology management practices (Seyal, 2012). Remote management offers opportunities for collaboration, improved learning outcomes and virtual learning environments. It enables educational institutions to tap into global talent pools and encourages collaboration without geographical limitations. Potential bottlenecks in implementing remote management in schools include lack of equitable access to functional technology, digital illiteracy and poverty-driven economic challenges. These obstacles are rooted in national management failures. To overcome these challenges, educational stakeholders must prepare principals with necessary skills and knowledge to lead technology integration effectively (Banoğlu et al., 2023).

### **Statement of the Research Problem**

Secondary schools in Imo State, Nigeria, face significant challenges in leveraging artificial intelligence (AI) and digital connectivity to support effective school management, despite the potential benefits of remote management in enhancing educational outcomes. Principals lack the necessary skills, resources and infrastructure to utilize digital tools, hindering their ability to manage schools remotely and respond to emerging challenges. This limitation negatively impacts teaching quality, student learning outcomes and overall educational progress. Furthermore, insecurity and pandemic-related disruptions have plagued Nigerian secondary schools, disrupting educational stability and highlighting the need for innovative solutions. Remote management practices have been proposed as a potential solution, but principals face personal and team-level constraints that must be addressed for successful implementation. There is a need to explore how AI and digital connectivity can be harnessed to enhance remote management practices in Imo State secondary schools, addressing unique challenges and opportunities in addition to improving educational outcomes for students.

### **Purpose of the Study**

The main purpose of this study is to examine the integration of artificial intelligence and digital connectivity in remote school management to enhance educational outcomes in Imo State secondary schools. Specifically, the objectives are to:

1. Find out the challenges of integrating artificial intelligence and digital connectivity in remote school management for enhanced educational outcomes in Imo state secondary schools;
2. Determine how principals can be supported in integrating artificial intelligence and digital connectivity in remote school management for enhanced educational outcomes in Imo state secondary schools.

### **Research Questions**

1. What are the challenges of integrating artificial intelligence and digital connectivity in remote school management for enhanced educational outcomes in Imo state secondary schools?
2. How can principals be supported in integrating artificial intelligence and digital connectivity in remote school management for enhanced educational outcomes in Imo state secondary schools?

### **Research Hypothesis**

H<sub>01</sub>: There is no significant difference in the mean responses of principals and teachers on how principals can be supported in integrating artificial intelligence and digital connectivity in remote school management for enhanced educational outcomes in Imo state secondary schools.

### **Methodology**

The study adopted a descriptive survey design. This study sought the opinions of principals and teachers on integrating artificial intelligence and digital connectivity in remote school management for enhanced educational outcomes in Imo state secondary schools. The study was carried out in public secondary schools in Imo state. The population comprised 5,697 staff made up of 296 principals and 5,401 teachers in 296 public secondary schools in Imo State, Nigeria. A sample



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of 542 staff comprising 170 principals and 372 teachers were drawn through proportionate stratified random sampling technique in the area of the study. A structured questionnaire on “Artificial Intelligence and Digital Connectivity in Remote School Management for Enhanced Educational Outcomes” (QAIDCRSMEEEO) with 12 items built on two clusters, structured on a four-point scale of Strongly Agree (SA); Agree (A); Disagree (D) and Strongly Disagree (SD) was developed by the researchers as an instrument for data collection for this study. The instrument (QAIDCRSMEEEO) was face validated by three experts in the field of Educational Management; Measurement and Evaluation units whose suggestions and corrections were incorporated into the final draft of the instrument. The reliability of the instrument was established using Cronbach Alpha Method. The researchers administered the questionnaire on 4 principals and 16 teachers in 4 public secondary schools in Enugu state. The questionnaire were retrieved and analyzed after filling by the staff on which an overall reliability co-efficient of 0.84 was obtained and thus considered appropriate for the study. With the help of six (5) research assistants, data for the study was delivered and collected personally by the researchers. All the 542 copies administered were completed and used for the study. Mean and Standard deviation scores were used in answering the two research questions while t-test statistics was used to test the null hypothesis at 0.05 level of significance. A mean of 2.50 and above was adopted as the decision rule for the items.

### Presentation of Results

**Research Question One:** What are the challenges of integrating artificial intelligence and digital connectivity in remote school management for enhanced educational outcomes in Imo state secondary schools?

**Table 1: Descriptive Statistics on the challenges of integrating artificial intelligence and digital connectivity in remote school management for improved educational outcomes**

S/N	ITEMS	Principals n=170 ( $\bar{X}$ ) SD		Teachers n=372 ( $\bar{X}$ ) SD		Overall Remark ( $\bar{X}$ ) SD DL		
1.	Insufficient digital literacy among secondary school administrators and staff	3.41	0.67	3.42	0.61	3.42	0.64	A
2.	Limited ICT infrastructure and internet access	3.29	0.72	3.50	0.50	3.40	0.61	A
3.	Staff resistance to adopting new technology	3.35	0.68	3.52	0.50	3.44	0.59	A
4.	Inadequate government funding for secondary schools	3.76	0.98	3.34	0.66	3.05	0.82	A
5.	Unreliable internet connectivity, particularly in rural areas	3.41	0.67	3.46	0.54	3.44	0.61	A
6.	Unstable electricity power supply	3.36	0.64	3.47	0.51	3.42	0.58	A
	<b>CLUSTER MEAN</b>	<b>3.27</b>	<b>0.73</b>	<b>3.45</b>	<b>0.55</b>	<b>3.36</b>	<b>0.64</b>	<b>A</b>

**Key:** ( $\bar{X}$ ) =Mean; SD = Standard Deviation; DL = Decision Level; A= Agree; n = Number of Respondents

Analysis in Table 1 shows the descriptive statistics on challenges of integrating artificial intelligence and digital connectivity in remote school management for enhanced educational outcomes in Imo state secondary schools. The result revealed all the items in the table as challenges of integrating artificial intelligence and digital connectivity in remote school management for enhanced educational outcomes in Imo state secondary schools with the overall mean score of 3.36 indicating agreed.

**Research Question Two:** How can principals be supported in integrating artificial intelligence and digital connectivity in remote school management for enhanced educational outcomes in Imo state secondary school?

**Table 2: Descriptive Statistics on how principals can be supported in integrating artificial intelligence and digital connectivity in remote school management for improved educational outcomes**

S/N	ITEMS	Principals n=170 ( $\bar{X}$ ) SD		Teachers n=372 ( $\bar{X}$ ) SD		Overall Remark ( $\bar{X}$ ) SD DL		
7.	Capacity-building programs for school principals and staff	3.40	0.61	3.53	0.49	3.47	0.55	A
8.	Adequate resource allocation and infrastructure provision	3.48	0.55	3.48	0.53	3.48	0.54	A
9.	Regular monitoring and evaluation	3.42	0.47	3.45	0.56	3.44	0.51	A



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10.	Community engagement and partnership	3.48	0.55	3.53	0.49	3.51	0.52	SA
11.	Professional standards for school leadership	3.40	0.61	3.46	0.53	3.43	0.57	A
12.	Government incentives for ICT adoption	3.55	0.49	3.70	0.45	3.63	0.47	SA
<b>CLUSTER MEAN</b>		<b>3.46</b>	<b>0.56</b>	<b>3.53</b>	<b>0.51</b>	<b>3.49</b>	<b>0.53</b>	<b>A</b>

**Key:** ( $\bar{X}$ ) =Mean; SD = Standard Deviation; DL = Decision Level; SA =Strongly Agree; A= Agree; n = Number of Respondents

Analysis in Table 2 shows the descriptive statistics on how principals can be supported in integrating artificial intelligence and digital connectivity in remote school management for enhanced educational outcomes in Imo state secondary school. The result revealed the responses of principals and teachers with the overall mean score of 3.49 as how principals can be supported in integrating artificial intelligence and digital connectivity in remote school management for improved educational progress. This indicates a decision level of strongly agree. Thus, the table confirms all the items as how principals can be supported in integrating artificial intelligence and digital connectivity in remote school management for improved educational progress.

**H<sub>01</sub>:** There is no significant difference in the mean responses of principals and teachers on how principals can be supported in integrating artificial intelligence and digital connectivity in remote school management for enhanced educational outcomes in Imo state secondary schools.

**Table 3: t-test analysis of differences in perceptions on how principals can be supported in integrating artificial intelligence and digital connectivity in remote school management for improved educational outcomes**

Staff	n	$\bar{X}$	SD	t-value	Df	Alpha level	Sig	Decision
Principals	170	3.46	0.56	1.96	540	0.05	0.76	NS (Ho Not Rejected)
Teachers	372	3.53	0.51					

**Key:** N=Number of Respondents;  $\bar{X}$  =Mean; SD=Standard Deviation. NS= Not Significant, df= Degree of Freedom = (n<sub>1</sub> - 1) + (n<sub>2</sub> - 1) = (170-1) + (372-1) = 540

The result indicated that a t-value of 1.96 with a degree of freedom of 540 at an alpha level of 0.05 and a significant value of 0.76 were obtained. Since the significant value of 0.76 is not less than 0.05 set as the level of significance for testing the hypothesis, it means that the result is not significant. Hence, this indicates that the difference between the mean scores of principals and teachers on how principals can be supported in integrating artificial intelligence and digital connectivity in remote school management for enhanced educational outcomes in Imo state secondary schools is statistically not significant.

### Discussion of Findings

The research questions that guided this study focused on challenges of integrating artificial intelligence and digital connectivity in remote school management for enhanced educational outcomes in secondary schools and, how principals can be supported in integrating artificial intelligence and digital connectivity in remote school management for enhanced educational outcomes in secondary schools. The findings revealed that insufficient digital literacy among secondary school administrators and staff in addition to limited ICT infrastructure and internet access together with staff resistance to adopting new technology plus inadequate government funding for secondary schools, unreliable internet connectivity, particularly in rural areas and unstable electricity power supply are the challenges of integrating artificial intelligence and digital connectivity in remote school management for enhanced educational outcomes in secondary schools. The findings align with Sincar (2013), who identified financial constraints and teacher resistance to change as significant barriers to adopting AI-driven management systems in schools. Similarly, Ayodele & Olutola (2025) observed that frequent power outages, lack of government support, and community apathy hinder the implementation and sustainability of these systems. In Nigerian secondary schools, inadequate infrastructure, such as unreliable internet access and insufficient computers, further exacerbates the challenge. Staff reluctance due to job security concerns, unfamiliarity and skepticism also hinders adoption. Moreover, principals and staff often lack the necessary digital skills to effectively utilize these systems. This is compounded by insufficient resource allocation by the government and stakeholders (Ebirim et al., 2023). Addressing these



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challenges is crucial for successful integration. The findings also revealed that principals can be supported in integrating artificial intelligence and digital connectivity in remote school management for enhanced educational outcomes in secondary schools through providing capacity-building programs for school principals and staff, adequate resource allocation and infrastructure provision in addition to regular monitoring and evaluation plus community engagement and partnership as well as professional standards for school leadership and government incentives for ICT adoption. The findings suggest that supporting principals in integrating artificial intelligence (AI) and digital connectivity in remote school management can positively impact educational progress in secondary schools. To achieve this, providing regular and mandatory ICT training programs can equip principals and staff with the necessary digital skills and knowledge. This aligns with the assertion of Banoğlu et al. (2023) that educational stakeholders must prepare principals with the necessary skills and knowledge to lead technology integration effectively. By investing in principals' digital literacy and AI integration skills through targeted training and development opportunities, schools can harness the potential of technology to enhance educational progress. As schools increasingly rely on technology, effective leadership becomes crucial in managing technology integration in e-learning environments (Husting et al., 2013). To leverage this potential, schools require reliable digital infrastructure, including internet, computers, and software, to support AI-driven management systems. Ongoing assessment of AI integration and digital connectivity is vital to identify areas for improvement. According to Richardson and Bathon (2013), effective technology integration enhances teachers' instructional processes, ultimately benefiting students. To ensure successful integration, it is essential to foster collaboration between schools, communities and stakeholders to promote digital inclusion and support. Additionally, establishing clear guidelines and standards for principals helps ensure effective AI and digital technology integration. Offering incentives, such as funding or grants, can motivate schools to adopt and integrate AI and digital technologies. As expressed by Mwawas (2014), school administrators can enable teachers to access ICT resources and integrate technology into teaching and learning by demonstrating technology management practices.

Meanwhile, the null hypothesis was not rejected. This is based on the ground that the significant value of 0.84 is higher than 0.05 established as the level of significance for testing the hypothesis. This is an indication that both the principals and teachers shared the same view in their opinion on the items provided as how principals can be supported in integrating artificial intelligence and digital connectivity in remote school management for enhanced educational outcomes in secondary schools.

## **Conclusion**

Integrating artificial intelligence and digital connectivity in remote school management has the potential to improve educational progress in schools. However, challenges such as insufficient digital literacy, limited ICT infrastructure, staff resistance, inadequate funding, and unreliable internet connectivity need to be addressed. To overcome these challenges, a multifaceted support framework is essential, comprising capacity-building programs, adequate resource allocation, regular monitoring and evaluation, community engagement and government incentives.

## **Recommendations**

On the basis of the findings, the following recommendations were made:

1. The government and educational authorities should develop a comprehensive support framework. This framework should encompass several key elements such as capacity-building programs to enhance digital literacy and AI integration skills among administrators and staff; investments in ICT infrastructure, internet access, and electricity supply, particularly in rural areas; and strategies to overcome staff resistance, such as change management workshops and incentives for technology adoption.
2. The government and educational authorities should ensure adequate infrastructure provision, including reliable internet and digital devices, and establish regular monitoring and evaluation mechanisms to assess effectiveness. Community engagement initiatives should be implemented to foster collaboration and promote digital inclusion. The government should also increase funding for secondary schools, offering incentives such as grants to encourage the adoption and integration of AI and digital technologies.

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