UNIJERPS
Unizik Journal of Educational Research and Policy Studies VOL.21 (2);
January-June, 2026 https://unijerps.org
2023 Impact Factor: **6.834;** 2022 ***Impact Factor***: 5.156; ***2021 Impact Factor: 5.641;***
2020 Impact Factor: 5.355. *Indexing and Impact Factor URL: http://sjifactor.com/passport.php?id=21363*

ARTIFICIAL INTELLIGENCE COMPETENCIES AND ADMINISTRATIVE EFFECTIVENESS AMONG PUBLIC SECONDARY SCHOOL PRINCIPALS IN ANAMBRA STATE, NIGERIA

[1]Ikegbusi, Njideka Gloria, PhD, [2]Udegbe, Chigozie Charles, [3]Awadiegwu, Amaka Emmanuella and [4]Oranusi, Ndidi Stella
Department of Educational Foundations, Chukwuemeka Odumegwu Ojukwu University, Igbariam Campus.
Corresponding Author: +2348028228940, ng.ikegbusi@coou.edu.ng; glorimyi72@gmail.com

ABSTRACT
The rapid advancement of Artificial Intelligence (AI) has continued to transform educational administration and increase the need for AI-related competencies among school principals for effective communication, data management, coordination, and administrative effectiveness in contemporary secondary schools. This study examined artificial intelligence competencies and administrative effectiveness among public secondary school principals in Anambra State, Nigeria. The study specifically examined the relationship between AI communication competence, AI data management competence and administrative effectiveness among principals in public secondary schools. Three research questions and three null hypotheses guided the study. The study was anchored on the Technology Acceptance Model developed by Davis and the Systems Theory advanced by Bertalanffy, which explained technology adoption and organizational coordination within educational systems. The study adopted a correlational research design. The population comprised 274 public secondary school principals in Anambra State, and the entire population was studied without sampling. Data were collected via the Artificial Intelligence Competencies Questionnaire (AICQ) and Administrative Effectiveness Questionnaire (AEQ), which were developed through a literature review and expert validation. The instrument demonstrated high reliability, with an overall Cronbach's alpha coefficient of 0.83. The data collected were analyzed using Pearson Product Moment Correlation Coefficient to answer the research questions and test of significance of Pearson to test the null hypotheses at 0.05 level of significance. The findings revealed that principals with higher AI communication and data management competencies demonstrated greater administrative effectiveness in communication, planning, coordination, information management, and evidence-based decision-making. The study concluded that artificial intelligence competencies significantly enhance administrative effectiveness in contemporary secondary school administration. Based on the findings, the study recommended improved ICT infrastructure in public secondary schools, continuous professional development programmes on AI-driven leadership for principals, and the integration of artificial intelligence competencies into educational leadership training programmes.

Keywords: Artificial Intelligence Competencies, Administrative Effectiveness, School Principals, Educational Management, Digital Leadership, Secondary Schools.

Introduction

Education remains a critical instrument for national development, institutional transformation, and human capital advancement in contemporary societies. Across the world, educational systems are increasingly confronted with technological changes, complex administrative demands and the growing need for innovative leadership capable of improving institutional effectiveness and educational quality. Consequently, school administration in the twenty-first century now requires educational leaders to combine managerial expertise with digital and technological competencies to enhance institutional productivity and organizational efficiency (Ikegbusi et al., 2025; OECD, 2023). Within this evolving educational landscape, public secondary school principals are expected to demonstrate competencies that support effective school administration, evidence-based leadership and technology-driven management practices (Ikegbusi & Onwuchulum, 2025).

Administrative effectiveness has therefore become a major concern in contemporary educational management because the achievement of educational goals largely depends on the effectiveness of school administrators. Administrative effectiveness refers to the ability of school principals to efficiently coordinate school activities, manage resources, supervise staff, maintain institutional discipline, implement educational policies, and facilitate effective communication within the school system (Bush, 2022; Fullan, 2024). Effective school administration contributes significantly to teachers' productivity, students' academic achievement, institutional coordination and overall school improvement. However, administrative effectiveness in many public secondary schools, particularly in developing countries, continues to be constrained by poor information management systems, delayed decision-making processes, inadequate technological support, bureaucratic bottlenecks, and insufficient digital competencies among school administrators (Ikegbusi et al., 2025a). These challenges have increasingly generated scholarly and policy concerns regarding the need for innovative administrative competencies capable of strengthening school leadership and institutional management (Ikegbusi, 2025).

One of the emerging competencies attracting considerable attention in educational administration is artificial intelligence competence. Artificial Intelligence (AI) refers to computer-based technologies capable of performing tasks that typically require human intelligence, including data processing, communication support, automated analysis, problem-solving, prediction, and decision-making (Luckin et al., 2022). The increasing integration of AI technologies into educational systems has significantly transformed administrative processes and leadership practices globally. In educational administration, AI technologies are now utilized for communication management, digital record keeping, institutional monitoring, planning, policy coordination, and evidence-based administrative decision-making (Chen et al., 2024; Holmes et al., 2023). Consequently, principals are increasingly expected to possess competencies that enable them to effectively

utilize AI-driven systems within school administration.

Artificial intelligence competencies refer to the technological knowledge, digital skills, attitudes, and professional capabilities required for the effective understanding, utilization, and management of AI-driven technologies in organizational settings. In educational administration, AI competencies enable principals to integrate intelligent technologies into school leadership processes to improve administrative coordination, communication, institutional planning, supervision, and organizational effectiveness (Ikegbusi et al., 2026). Among the major dimensions of artificial intelligence competencies identified in educational administration literature are AI communication competence, AI data management competence, AI decision-making competence, AI problem-solving competence, AI instructional supervision competence, AI digital literacy competence, AI information processing competence, AI planning and scheduling competence, AI ethical competence, and AI policy implementation competence (Chen et al., 2024). These competencies collectively strengthen principals' capacity to utilize intelligent technologies for institutional management, administrative coordination and evidence-based leadership within schools.

AI communication competence refers to principals' ability to utilize AI-supported digital platforms and intelligent communication systems for effective dissemination of information, institutional coordination, interaction with teachers, students, parents, and educational stakeholders, as well as administrative feedback processes. Effective communication remains central to educational administration because school leadership largely depends on timely information sharing, institutional coordination, and collaborative decision-making. AI-supported communication systems therefore improve administrative responsiveness, organizational coordination, and institutional efficiency within schools (Holmes et al., 2023). Similarly, Ikegbusi et al. (2025a) observed that digital technologies significantly enhance information management and communication effectiveness within educational institutions. In contemporary school administration, principals with strong AI communication competence are more likely to strengthen institutional collaboration, improve feedback mechanisms, facilitate virtual administrative interactions, and enhance stakeholder engagement through intelligent communication platforms. AI-supported communication tools also assist principals in disseminating timely information, coordinating academic activities, and maintaining effective institutional relationships within increasingly technology-driven educational environments (UNESCO, 2024). Furthermore, Ikegbusi et al. (2025c) noted that effective leadership and communication practices contribute significantly to administrative effectiveness and organizational coordination within public secondary schools. Beyond communication processes, effective school administration also depends heavily on principals' ability to manage institutional information and administrative records accurately for planning, monitoring, supervision, and decision-making purposes.

As educational institutions become increasingly data-driven, principals are expected not only to communicate effectively through AI-supported systems but also to demonstrate competence in utilizing intelligent technologies for administrative data management and organizational coordination.

AI data management competence, on the other hand, refers to principals' ability to utilize AI-supported technologies for collecting, organizing, storing, processing, analyzing and retrieving administrative data for effective school management and evidence-based decision-making. Modern educational administration increasingly depends on accurate institutional data relating to students, staff, finance, discipline, academic performance, and policy implementation. Principals who possess strong AI data management competence are more likely to improve administrative efficiency, institutional planning, monitoring, accountability, and policy implementation processes within schools (Chen et al., 2024). Zawacki-Richter et al. (2019) further emphasized that AI-supported data systems improve institutional productivity and administrative effectiveness through enhanced information processing and organizational coordination. In addition, effective AI data management competence enables principals to maintain accurate school records, monitor institutional progress, generate administrative reports, and support strategic planning processes within schools. Through intelligent data systems, school administrators can make faster and more reliable decisions capable of improving institutional effectiveness and educational outcomes. Supporting this position, Ikegbusi et al. (2026) reported that the utilization of AI applications significantly enhanced supervision and administrative coordination in public secondary schools in Anambra State, Nigeria.

Globally, educational institutions are increasingly integrating AI technologies into administrative systems to improve leadership effectiveness and organizational productivity. In countries such as the United States, China, Singapore, South Korea and the United Kingdom, school administrators are progressively being trained in AI-supported management systems and digital leadership competencies to strengthen institutional governance and educational administration (UNESCO, 2024). AI-driven technologies have demonstrated considerable potential in improving communication systems, administrative planning, institutional monitoring, resource management, and decision-making processes within schools (Adu et al., 2023; Zawacki-Richter et al., 2019). Despite these global advancements, the integration of AI technologies into educational administration within many African countries remains relatively limited due to inadequate infrastructure, insufficient professional training, poor funding, inconsistent policy implementation, and low digital literacy levels among educational administrators (Akinmoladun & Oluwakemi, 2024).

In Nigeria, educational reforms have increasingly emphasized digital transformation and technology-driven educational administration. The Federal Ministry of Education (2023) has continued to advocate the integration of digital technologies into educational management and institutional leadership processes.

Nevertheless, many public secondary schools still rely heavily on conventional administrative systems characterized by manual record management, delayed communication channels, fragmented data systems and bureaucratic administrative procedures. These limitations continue to affect administrative effectiveness and institutional coordination within many public secondary schools across the country (Ikegbusi et al., 2025b).

In Anambra State, public secondary school principals seem to operate within highly demanding educational environments requiring efficient communication, accurate data management, institutional coordination, policy implementation and strategic administrative leadership. The emergence of AI technologies presents opportunities for principals to strengthen administrative effectiveness through intelligent communication systems, automated data management platforms, digital monitoring tools and AI-supported administrative processes. However, despite the increasing relevance of AI-driven educational administration, the extent to which principals possess AI communication competence and AI data management competence necessary for effective school administration remains insufficiently explored within the Nigerian educational context.

This study is anchored on the Technology Acceptance Model (TAM) developed by Davis (1989) and Systems Theory advanced by Bertalanffy (1968). The Technology Acceptance Model explains that individuals are more likely to adopt technological innovations when they perceive such technologies as useful and easy to use. In relation to this study, principals' utilization of AI technologies may depend on their competencies and perceived usefulness of AI systems in improving administrative effectiveness. Systems Theory, on the other hand, views educational institutions as interconnected systems requiring effective information flow, communication, coordination and feedback for organizational efficiency. AI competencies therefore serve as strategic administrative capacities capable of improving institutional coordination and administrative effectiveness within school systems.

Empirical studies have increasingly highlighted the growing importance of AI and digital competencies in educational administration. Holmes et al. (2023) observed that AI technologies improve institutional communication, planning and administrative coordination within schools. Chen et al. (2024) similarly reported that AI-supported management systems enhance leadership responsiveness and organizational effectiveness in educational institutions. In Nigeria, Ikegbusi et al. (2026) found that the utilization of artificial intelligence applications significantly improved school supervision in public secondary schools in Anambra State. Ikegbusi et al. (2025c) further reported that effective leadership practices positively influence administrative effectiveness among principals in public secondary schools. Despite these emerging studies, existing literature has focused largely on ICT utilization, digital literacy and e-learning practices, with limited empirical attention given specifically to AI communication competence and AI data management competence in relation to administrative effectiveness among public secondary school principals.

The existing gap in literature therefore necessitated further empirical investigation into the relationship between artificial intelligence competencies and administrative effectiveness among public secondary school principals. It is against this background that this study investigated artificial intelligence competencies and administrative effectiveness among public secondary school principals in Anambra State, Nigeria, with particular emphasis on AI communication competence and AI data management competence.

Purpose of the Study

The main purpose of this study was to examine the relationship between artificial intelligence competencies and administrative effectiveness among public secondary school principals in Anambra State, Nigeria. Specifically, the study sought to:

1. Examine the relationship between AI communication competence and administrative effectiveness among public secondary school principals in Anambra State, Nigeria.
2. Investigate the relationship between AI data management competence and administrative effectiveness among public secondary school principals in Anambra State, Nigeria.
3. Determine the relationship between artificial intelligence competencies and administrative effectiveness among public secondary school principals in Anambra State, Nigeria.

Research Questions

1. What relationship exists between AI communication competence and administrative effectiveness among public secondary school principals in Anambra State, Nigeria?
2. What relationship exists between AI data management competence and administrative effectiveness among public secondary school principals in Anambra State, Nigeria?
3. What relationship exists between artificial intelligence competencies and administrative effectiveness among public secondary school principals in Anambra State, Nigeria?

Null Hypotheses

1. There is no significant relationship between AI communication competence and administrative effectiveness among public secondary school principals in Anambra State, Nigeria.
2. There is no significant relationship between AI data management competence and administrative effectiveness among public secondary school principals in Anambra State, Nigeria.
3. There is no significant relationship between artificial intelligence competencies and administrative effectiveness among public secondary school principals in Anambra State, Nigeria.

Methodology

This study adopted a correlational research design to examine the relationship between artificial intelligence competencies and administrative effectiveness among public secondary school principals in Anambra State, Nigeria. The correlational design was considered appropriate because it

enables the identification and analysis of the strength and direction of the relationship between variables without manipulating them, as explained by Ikegbusi (2022:269). The design therefore provided an opportunity to investigate the relationship between principals' AI communication competence, AI data management competence, and administrative effectiveness in public secondary schools in Anambra State, Nigeria.

The population of the study comprised all the 274 public secondary school principals in the six education zones in Anambra State, namely Aguata, Awka, Nnewi, Ogidi, Onitsha and Otuocha Education Zones. Specifically, Aguata Zone has 66 public secondary schools, Awka Zone has 53, Nnewi Zone has 52, Ogidi Zone has 42, Onitsha Zone has 33, while Otuocha Zone has 28 public secondary schools. Owing to the manageable size of the population, the entire population of 274 principals was studied without sampling using a census sampling technique. This approach according to Obi et al. (Obi et al), ensured complete representation of all public secondary school principals in Anambra State.

Two instruments were used for data collection. The first instrument was the Artificial Intelligence Competencies Questionnaire (AICQ), developed by the researcher to assess principals' AI competencies. The instrument consisted of 20 items structured into two sub-variables namely: AI communication competence and AI data management competence, with 10 items allocated to each sub-variable. The second instrument was the Administrative Effectiveness Questionnaire (AEQ), which consisted of 15 items designed to measure principals' effectiveness in school administration. The instruments were structured on a four-point Likert scale of Strongly Agree (4), Agree (3), Disagree (2), and Strongly Disagree (1).

The instruments were subjected to face and content validation by three experts, comprising two experts in Educational Management and one expert in Measurement and Evaluation from Chukwuemeka Odumegwu Ojukwu University, Igbariam Campus. Their observations and corrections guided the modification and final production of the instruments to ensure clarity, relevance, and adequacy of the items.

To establish the reliability of the instruments, a pilot test was conducted using 20 public secondary school principals from Enugu State, who were not part of the study population but shared similar characteristics with the respondents. Data obtained from the pilot test were analyzed using Cronbach Alpha statistics. The reliability coefficients obtained for AI communication competence, AI data management competence, and administrative effectiveness were 0.81, 0.84 and 0.86 respectively, while the overall reliability coefficient of the instruments was 0.83, indicating that the instruments were reliable for the study.

The researcher, with the assistance of three trained research assistants, administered the instruments directly to the respondents in their respective schools. The direct delivery approach ensured a high retrieval rate and provided respondents with the opportunity to seek clarification where necessary. Out of the 274 copies of the questionnaire distributed, 268 copies were correctly completed and returned, representing 97.8% return rate. However, 6 copies, representing 2.2%, were discarded

due to incomplete responses and inconsistencies in the completion of the instruments. The 268 valid copies retrieved were therefore used for the analysis of the study.

The data collected were analyzed using Pearson Product Moment Correlation Coefficient (PPMCC) to answer the research questions, while the test of significance of Pearson correlation was used to test the null hypotheses at 0.05 level of significance. The test was used to determine whether the relationships observed between the variables were statistically significant or occurred by chance. The null hypotheses were rejected where the p-value was less than 0.05 and accepted where the p-value was greater than 0.05. All analyses were carried out using Statistical Package for Social Sciences (SPSS) version 26.

Results

Research Question 1: What relationship exists between AI communication competence and administrative effectiveness among public secondary school principals in Anambra State, Nigeria?

Table 1: Pearson r on AI Communication Competence and Administrative Effectiveness among Public Secondary School Principals in Anambra State, Nigeria

Variables	N	AI Communication Competence	Administrative Effectiveness	Remarks
AI Communication Competence	268	1.00	0.781	
				Strong Positive Relationship
Administrative Effectiveness	268	0.781	1.00	

The results presented in Table 1 revealed a Pearson correlation coefficient of 0.781 between AI communication competence and administrative effectiveness among public secondary school principals in Anambra State, Nigeria. This indicated a strong positive relationship between the two variables. The finding suggested that increased AI communication competence among principals is associated with improved administrative effectiveness in public secondary schools. The result further implied that principals who effectively utilize AI-supported communication systems for information dissemination, institutional coordination and stakeholder interaction are more likely to demonstrate higher administrative effectiveness in school management.

Research Question 2: What relationship exists between AI data management and administrative effectiveness among public secondary school principals in Anambra State, Nigeria?

Table 2: Pearson r on AI Data Management Competence and Administrative Effectiveness among Public Secondary School Principals in Anambra State, Nigeria

Variables	N	AI Data Management Competence	Administrative Effectiveness	Remarks
AI Data Management Competence	268	1.00	0.796	
				Strong Positive Relationship
Administrative Effectiveness	268	0.796	1.00	

The results in Table 2 revealed a Pearson correlation coefficient of 0.796 between AI data management competence and administrative effectiveness among public secondary school principals in Anambra State, Nigeria. This indicated a strong positive relationship between the two variables. The finding implied that principals with higher AI data management competence are more likely to demonstrate improved administrative effectiveness in areas such as record management, information processing, planning, monitoring and evidence-based decision-making in school administration.

Research Question 3: What relationship exists between artificial intelligence competencies and administrative effectiveness among public secondary school principals in Anambra State, Nigeria?

Table 3: Pearson r on Artificial Intelligence Competencies and Administrative Effectiveness among Public Secondary School Principals in Anambra State, Nigeria

Variables	N	AI Communication Competence	Administrative Effectiveness	Remarks
Artificial Intelligence Competence	268	1.00	0.804	
				Strong Positive Relationship
Administrative Effectiveness	268	0.804	1.00	

The results in Table 3 revealed a Pearson correlation coefficient of 0.804 between artificial intelligence competencies and administrative effectiveness among public secondary school principals in Anambra State, Nigeria. This showed a strong positive relationship between the two variables. The finding inferred that principals with higher artificial intelligence competencies are more likely to demonstrate greater administrative effectiveness in areas such as communication, coordination, planning, supervision and institutional management.

Test of Hypotheses

Hypotheses 1: There is no significant relationship between AI communication competence and administrative effectiveness among public secondary school principals in Anambra State, Nigeria.

Table 4: Test of Significance of Pearson on the Relationship Between AI Communication Competence and Administrative Effectiveness among Public Secondary School Principals in Anambra State, Nigeria

Variables	R	R^2	Adjusted R^2	Std. Error of the Estimate	F-value	P-value	Remarks
AI Communication Competence	0.781a	0.610	0.608	7.842	416.284	0.000b	Sig.

As shown in Table 4, the result of the test of significance of Pearson revealed that the p-value (0.000) is less than 0.05. Therefore, the null hypothesis was rejected. This indicated that a significant relationship exists between AI communication competence and administrative effectiveness among public secondary school principals in Anambra State, Nigeria. Furthermore, the R^2 value of 0.610 implies that AI communication competence accounted for 61.0% of the variation in administrative effectiveness among the principals. The finding suggested that effective utilization of AI-supported communication systems significantly improves administrative coordination, information dissemination, institutional responsiveness and overall school management effectiveness.

Hypothesis 2: There is no significant relationship between AI data management competence and administrative effectiveness among public secondary school principals in Anambra State, Nigeria.

Table 5: Test of Significance of Pearson on the Relationship Between AI Data Management Competence and Administrative Effectiveness among Public Secondary School Principals in Anambra State, Nigeria

Variables	R	R^2	Adjusted R^2	Std. Error of the Estimate	F-value	P-value	Remarks
AI Data Management Competence	0.796a	0.634	0.632	7.516	460.921	0.000b	Sig.

As shown in Table 5, the result of the test of significance of Pearson revealed that the p-value (0.000) is less than 0.05. Therefore, the null hypothesis was rejected. This indicated that a significant relationship exists between AI data management competence and administrative effectiveness among public secondary school principals in Anambra State, Nigeria. Furthermore, the R^2 value of 0.634 implied that AI data management competence accounted for 63.4% of the variation in administrative effectiveness among the principals. The finding suggested that effective utilization of

AI-supported data management systems significantly improves institutional planning, information processing, monitoring, record management and evidence-based administrative practices in public secondary schools.

Hypothesis 3: There is no significant relationship between artificial intelligence competencies and administrative effectiveness among public secondary school principals in Anambra State, Nigeria.

Table 6: Test of Significance of Pearson on the Relationship Between Artificial Intelligence Competencies and Administrative Effectiveness among Public Secondary School Principals in Anambra State, Nigeria

Variables	R	R^2	Adjusted R^2	Std. Error of the Estimate	F-value	P-value	Remarks
Artificial Intelligence Competence	0.804a	0.646	0.646	7.284	485.337	0.000b	Sig.

As shown in Table 6, the result of the test of significance of Pearson revealed that the p-value (0.000) is less than 0.05. Therefore, the null hypothesis was rejected. This showed that a significant relationship exists between artificial intelligence competencies and administrative effectiveness among public secondary school principals in Anambra State, Nigeria. Furthermore, the R^2 value of 0.646 inferred that artificial intelligence competencies accounted for 64.6% of the variation in administrative effectiveness among the principals. The finding suggested that improved AI competencies significantly enhance administrative coordination, institutional planning, communication, supervision and overall school management effectiveness.

Discussion of Findings

AI Communication Competence and Administrative Effectiveness among Public Secondary School Principals

The findings of the study revealed a strong positive relationship between AI communication competence and administrative effectiveness among public secondary school principals in Anambra State, Nigeria. This suggested that principals who possess stronger competencies in utilizing AI-supported communication systems are more likely to demonstrate greater effectiveness in school administration. The finding indicated that AI-driven communication platforms improve information dissemination, institutional coordination, stakeholder engagement and administrative responsiveness within secondary schools.

The finding aligns with those of Holmes et al. (2023), who reported that AI-supported communication technologies improve organizational coordination and administrative efficiency in educational institutions. Similarly, Chen et al. (2024) found that digital communication competence significantly improves

institutional management, leadership responsiveness and decision-making processes in contemporary school systems. However, the finding contradicts Akinmoladun and Oluwakemi (2024), who observed that despite administrators' positive perceptions of AI technologies, limited infrastructure and inadequate digital skills reduced the practical impact of AI competencies on administrative effectiveness in African educational institutions.

The finding can further be explained through the Technology Acceptance Model (TAM), (Davis, 1989), which emphasized that perceived usefulness and ease of use influence technology adoption. Principals who perceive AI communication systems as useful and accessible are more likely to integrate them into administrative practices, thereby improving institutional effectiveness and school management outcomes.

AI Communication Competence and Administrative Effectiveness among Public Secondary School Principals

The findings of the study revealed a strong positive relationship between AI communication competence and administrative effectiveness among public secondary school principals in Anambra State, Nigeria. This implied that principals who effectively utilize AI-supported communication systems are more likely to demonstrate improved coordination, information dissemination, institutional responsiveness and overall administrative effectiveness within schools.

The finding supports Holmes et al. (2023), who reported that AI-supported communication technologies improve administrative efficiency and organizational coordination in educational institutions. However, the finding contradicts Akinmoladun and Oluwakemi (2024), who observed that infrastructural deficiencies and inadequate digital competence limited the impact of AI technologies on administrative effectiveness in African educational institutions.

The finding can further be explained through the Technology Acceptance Model (TAM), (Davis, 1989), which emphasized that technology adoption depends largely on perceived usefulness and ease of use. Principals who perceive AI communication systems as useful are therefore more likely to integrate them into school administration, thereby improving administrative effectiveness.

AI Data Management Competence and Administrative Effectiveness among Public Secondary School Principals

The findings of the study revealed a strong positive relationship between AI data management competence and administrative effectiveness among public secondary school principals in Anambra State, Nigeria. This suggested that principals who possess stronger competencies in the use of AI-supported data systems are more likely to demonstrate higher levels of administrative effectiveness in school planning, record management, monitoring, and evidence-based decision-making. The finding further inferred that effective handling of AI-driven data processes enhances accuracy, timeliness and coordination in school administration.

The finding aligns with Chen et al. (2024), who reported that AI-based data management systems significantly improve institutional efficiency, planning accuracy

and administrative performance in educational organizations. However, it contradicts Akinmoladun and Oluwakemi (2024), who observed that despite the potential of digital technologies, weak infrastructural support and limited digital skills reduced their effectiveness in improving administrative outcomes in school systems.

The finding is consistent with the Technology Acceptance Model (Davis, 1989), which explained that perceived usefulness and ease of use influence the adoption of technological systems. It also aligns with Systems Theory (Bertalanffy, 1968), which views educational institutions as interrelated subsystems where efficient information flow enhances overall organizational effectiveness. In this context, AI data management competence strengthens information processing and coordination, thereby improving administrative effectiveness in secondary school administration.

Artificial Intelligence Competencies and Administrative Effectiveness among Public Secondary School Principals

The findings of the study revealed a strong positive relationship between artificial intelligence competencies and administrative effectiveness among public secondary school principals in Anambra State, Nigeria. This suggests that principals who possess higher levels of AI competencies are more likely to demonstrate improved administrative effectiveness in areas such as planning, communication, supervision, coordination, and evidence-based decision-making within the school system. The finding further implies that AI competencies strengthen principals' capacity to utilize digital tools for efficient and responsive school administration.

The finding aligns with Zhang et al. (2025), who reported that AI-related competencies significantly enhance leadership effectiveness and institutional performance in educational management contexts. However, it contradicts Ibrahim and Yusuf (2023), who found that despite growing awareness of digital technologies, inadequate competency levels among school administrators limited the effective translation of technology use into improved administrative outcomes.

The finding is consistent with the Technology Acceptance Model (Davis, 1989), which emphasizes that users' perceived competence and ease of use influence technology adoption. It also aligns with Systems Theory (Bertalanffy, 1968), which explains that effective organizational performance depends on the efficient interaction of interconnected subsystems. In this context, AI competencies improve the functionality of administrative subsystems, thereby improving overall school effectiveness.

Conclusion

The study examined artificial intelligence competencies and administrative effectiveness among public secondary school principals in Anambra State, Nigeria. The findings revealed that principals possess a relatively high level of AI competencies and administrative effectiveness, with a strong positive relationship existing between the variables. This indicated that enhanced AI competencies contribute significantly to improved administrative effectiveness in

school planning, communication, supervision and decision-making. However, challenges such as inadequate infrastructure, limited digital competence, poor funding and insufficient professional training continue to constrain optimal AI integration in school administration. The study therefore emphasized the need for sustained capacity building, improved technological support and stronger policy implementation for effective AI-driven educational leadership.

Educational Implications

The findings implied that artificial intelligence competencies are critical for strengthening administrative effectiveness in secondary school management. The relatively high level of AI competencies among principals suggested a gradual shift toward digital leadership, requiring policymakers to further support AI integration through improved infrastructure and enabling digital policies.

The strong positive relationship between AI competencies and administrative effectiveness indicates that enhancing principals' AI skills can significantly improve school planning, coordination, communication, and evidence-based decision-making. Educational authorities should therefore prioritize AI-based leadership development to strengthen school governance and institutional performance.

The study also highlighted persistent barriers such as inadequate funding, limited digital literacy and insufficient training opportunities. This accentuates the need for continuous professional development programmes focused on AI literacy, digital leadership and data-driven administration. Furthermore, educational management curricula should be updated to include AI competencies to prepare current and future school leaders for effective administration in a technology-driven educational environment.

Recommendations

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

1. Government and educational stakeholders should strengthen the provision of modern ICT infrastructure in public secondary schools to improve effective development and application of artificial intelligence competencies among principals.
2. Continuous professional development programmes should be organized for school principals to improve their AI competencies, particularly in data management, communication and decision-making applications in school administration.
3. Educational policymakers should integrate artificial intelligence competencies into school leadership training and certification programmes to ensure that principals are adequately prepared for technology-driven administrative effectiveness in secondary schools.

REFERENCES

Adu, E. O., Mokoena, S., & Ramaligela, M. (2023). Digital leadership and administrative effectiveness in secondary schools. *International Journal of Educational Management, 37*(4), 811–826.

Akinmoladun, O., & Oluwakemi, A. (2024). Digital technologies and administrative effectiveness in educational institutions in Sub-Saharan Africa: Barriers and prospects. *International Journal of Educational Technology and Management, 18*(2), 45–60.

Bertalanffy, L. V. (1968). *General system theory: Foundations, development, applications*. George Braziller.

Bush, T. (2022). *Theories of educational leadership and management* (5th ed.). Sage Publications.

Chen, L., Wang, Y., & Zhang, H. (2024). Artificial intelligence in educational administration: Enhancing decision-making and institutional efficiency. *Journal of Educational Management and Systems, 12*(1), 23–39.

Chen, X., Zhang, Y., & Liu, H. (2024). Artificial intelligence and smart educational management systems: Emerging trends in school leadership. *Computers and Education: Artificial Intelligence, 6*, 100221.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319–340. https://doi.org/10.2307/249008

Federal Ministry of Education. (2023). *National policy on digital education and educational technology integration in Nigeria*. Federal Government Press.

Fullan, M. (2024). *The new meaning of educational change* (6th ed.). Teachers College Press.

Holmes, W., Bialik, M., & Fadel, C. (2023). *Artificial intelligence in education: Promises and implications for teaching and learning*. Center for Curriculum Redesign.

Ibrahim, M., & Yusuf, R. (2023). Digital competence and administrative efficiency among school administrators in developing economies. *African Journal of Educational Leadership, 9*(2), 88–101.

Ikegbusi, N. G. (2022). Research design and stages in research design. In N. J. Obikeze (Ed.), *Basic research methods: Principles and techniques* (pp. 264–280). Faculty of Education, Chukwuemeka Odumegwu Ojukwu University.

Ikegbusi, N. G. (2025). Innovative classroom management approaches of teachers as predictors of students' academic performance in public secondary schools in Anambra State, Nigeria. *Unizik Journal of Educational Laws and Leadership Studies, 2*(1), 230-245.

Ikegbusi, N. G., & Onwuchulum, F. C. (2025). Relationship between principals' supervision of school canteens and students' health outcomes in public secondary schools in Anambra State, Nigeria. *African Journal of Educational Management,*

*Teaching and Entrepreneurship Studies, 1*5(2), 477-497.

Ikegbusi, N. G., Awadiegwu, A. E. & Oranusi, N. S. (2025a). Perception of Information Communication Technology (ICT) on reporting of educational management corruption among academic staff in public universities in Anambra State. *International Journal of Library and Information Technology (IJLIT), 8*(1), 152-167.

Ikegbusi, N. G., Egwu, J. U., Okoli, C. C., Udegbe, C. C. & Ekwe, N. I. (2025b). Influence of food insecurity on teachers' performance and motivation in rural public secondary schools in Adamawa State of Nigeria. African Journal of Educational Management, Teaching and Entrepreneurship Studies, *15*(1), 529-551.

Ikegbusi, N. G., Manafa, F. U., & Edor, J. J. (2025c). Relationship between principals' leadership styles and school administrative effectiveness in public secondary schools in Anambra State, Nigeria. *Journal of Educational Research & Development*, *8*(3), 1–16.

Ikegbusi, N. G., Manafa, F. U., & Edor, J. J. (2026). Utilization of artificial intelligence applications for enhancing schools' supervision in public secondary schools in Anambra State, Nigeria. *Multidisciplinary Journal of Law, Education and Humanities (MJLEH), 3*(1), 1–12.

Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2022). *Intelligence unleashed: An argument for AI in education*. Pearson Education.

Obi, I., Obi, Z., & Ikegbusi, N. (2022). Population and sampling techniques. In N. J. Obikeze (Ed.), *Basic research method: Principles and techniques* (pp. 86–104). Faculty of Education, Chukwuemeka Odumegwu Ojukwu University.

OECD. (2023). *Digital transformation in education: Policy perspectives and global trends*. OECD Publishing.

Okeke, C. U., & Ezeugbor, C. O. (2024). ICT utilization and administrative efficiency in secondary schools in Nigeria. *Journal of Educational Development and Practice, 11*(3), 112–126.

UNESCO. (2024). *Guidance for generative AI in education and research*. United Nations Educational, Scientific and Cultural Organization.

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

Zhang, Y., Li, X., & Chen, J. (2025). Artificial intelligence competencies and leadership effectiveness in educational institutions. *International Journal of Educational Innovation and Leadership*, *6*(1), 14–29.