

Artificial intelligence governance and digital leadership as predictors of organizational effectiveness in public secondary schools and primary healthcare centres: evidence from Anambra State, Nigeria

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ABSTRAK

Penelitian ini mengkaji tata kelola kecerdasan buatan (AI) dan kepemimpinan digital sebagai prediktor efektivitas organisasi di sekolah menengah negeri dan pusat layanan kesehatan primer di Negara Bagian Anambra, Nigeria. Studi ini menggunakan desain penelitian korelasional yang menargetkan populasi sensus sebanyak 609 administrator, dengan 590 di antaranya mengembalikan kuesioner yang telah diisi lengkap. Data dikumpulkan menggunakan tiga kuesioner yang dikembangkan oleh peneliti—mengenai tata kelola AI, kepemimpinan digital, dan efektivitas organisasi—yang memiliki koefisien reliabilitas berkisar antara 0,84 hingga 0,88. Analisis regresi linear sederhana dan berganda digunakan untuk menganalisis data. Hasil penelitian menunjukkan bahwa tata kelola AI dan kepemimpinan digital secara positif memprediksi efektivitas organisasi, masing-masing menjelaskan 38,2% dan 45,0% dari variansnya. Secara bersama-sama, kedua prediktor tersebut menyumbang 57,5% terhadap varians efektivitas organisasi, di mana kepemimpinan digital menunjukkan kontribusi relatif yang lebih kuat dibandingkan tata kelola AI. Studi ini menyoroti relevansi yang saling melengkapi antara tata kelola AI yang bertanggung jawab dan kepemimpinan digital yang efektif terhadap efektivitas organisasi, serta merekomendasikan penguatan kedua kemampuan tersebut melalui kebijakan institusional yang tepat dan program pengembangan kapasitas yang berkelanjutan.

Kata Kunci: tata kelola kecerdasan buatan; kepemimpinan digital; efektivitas organisasi; sekolah menengah negeri; pusat layanan kesehatan primer

ABSTRACT

This study examined artificial intelligence (AI) governance and digital leadership as predictors of organizational effectiveness in public secondary schools and primary healthcare centres in Anambra State, Nigeria. A correlational research design was adopted, targeting a census population of 609 administrators, of whom 590 returned completed questionnaires. Data were collected using three researcher-developed questionnaires on AI governance, digital leadership, and organizational effectiveness, with reliability coefficients ranging from 0.84 to 0.88. Simple and multiple linear regression analyses were used for data analysis. The findings revealed that AI governance and digital leadership positively predicted organizational effectiveness, explaining 38.2% and 45.0% of its variance, respectively. When considered together, both predictors accounted for 57.5% of the variance in organizational effectiveness, with digital leadership showing a stronger relative contribution than AI governance. The study highlights the complementary relevance of responsible AI governance and effective digital leadership to organizational effectiveness and recommends strengthening both capabilities through appropriate institutional policies and continuous capacity-building programmes.

Keywords: artificial intelligence governance; digital leadership; organizational effectiveness; public secondary schools; primary healthcare centres

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1. INTRODUCTION

Artificial intelligence (AI) has become an increasingly important component of organizational transformation, reshaping decision-making, information management, resource utilization, accountability, and service delivery across public institutions. Through intelligent automation, predictive analytics, and data-driven decision-making, AI provides opportunities for organizations to improve administrative processes and institutional performance (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2021; Organisation for Economic Co-operation and Development [OECD], 2025). These developments are particularly relevant to education and healthcare, where institutional leaders are required to manage complex administrative responsibilities, coordinate resources, implement policies, and respond to rapidly changing technological environments (Holmes & Tuomi, 2022; Ikegbusi et al., 2026a; Topol, 2019). However, technological availability alone does not ensure organizational effectiveness. The institutional mechanisms governing the responsible use of AI and the leadership capabilities required to direct digital transformation are equally important.

Artificial intelligence governance and digital leadership represent two distinct but complementary organizational capabilities in this context. Artificial intelligence governance encompasses the policies, principles, ethical standards, accountability mechanisms, privacy safeguards, transparency requirements, and institutional arrangements that guide the responsible use of AI technologies (UNESCO, 2021; OECD, 2025). Within public secondary schools, such governance provides a framework for the responsible use of intelligent technologies in administration, planning, resource management, and decision-making. Within primary healthcare centres, it is relevant to the responsible management of digital health information, administrative processes, and technology-supported service delivery. AI governance can therefore be understood as an institutional capability through which organizations establish the conditions for responsible and accountable technology use.

Digital leadership, in contrast, concerns leaders' capacity to strategically utilize digital technologies, facilitate innovation, support technology-enabled decision-making, and manage organizational change associated with digital transformation (Vial, 2019). In public secondary schools, digital leadership is relevant to administration, communication, planning, instructional support, and resource management, whereas in primary healthcare centres it is associated with information management, workforce coordination, digital communication, and technology-supported healthcare delivery. Digital leadership therefore represents a more operational leadership capability through which institutional resources and technologies can be mobilized in response to changing organizational needs. Existing evidence from Nigerian educational institutions also indicates the relevance of digital technology utilization and leadership practices to institutional governance and administrative effectiveness (Ikegbusi et al., 2025a; Ikegbusi et al., 2025b).

Both capabilities are theoretically relevant to organizational effectiveness, which in this study refers to an institution's capacity to achieve its goals through the effective utilization of human, technological, financial, and material resources while maintaining efficient administration, coordination, service delivery, adaptability, and accountability. Although public secondary schools and primary healthcare centres have different service mandates, both operate as public-service institutions whose administrators are responsible for resource coordination, information management, policy implementation, decision-making, and institutional adaptation. In schools, organizational effectiveness is reflected in effective administration, resource management, policy implementation, and support for the learning environment, whereas in primary healthcare centres it is reflected in efficient service delivery, workforce coordination, resource utilization, programme implementation, and responsiveness to community health needs. These shared administrative demands provide a basis for examining AI governance and digital leadership across the two institutional settings while recognizing their sector-specific functions.

The relationship among these constructs can be understood through the Dynamic Capabilities Theory of Teece, Pisano, and Shuen (1997). The theory proposes that organizations sustain effectiveness by integrating, building, and reconfiguring resources and capabilities in response to technological and environmental change. From this perspective, AI governance can be viewed as an institutional capability that establishes mechanisms for responsible, transparent, and accountable technology use, while digital leadership represents a leadership capability for mobilizing digital resources, facilitating adaptation, and directing organizational transformation. Organizational effectiveness represents the institutional outcome with which these capabilities are expected to be associated. The theory therefore provides a conceptual basis for examining whether AI governance and digital leadership, individually and jointly, predict organizational effectiveness rather than assuming that technological adoption itself is sufficient to produce effective organizational outcomes.

This issue is particularly relevant in the Nigerian public sector. Nigeria has pursued digital transformation and responsible AI adoption through national initiatives intended to strengthen governance and public service delivery. Nevertheless, the literature reviewed in this study points to continuing challenges

concerning governance frameworks, digital competencies, organizational accountability, information management, leadership capacity, and readiness for digital transformation (Federal Ministry of Communications, Innovation and Digital Economy, 2023; Ikegbusi & Edor, 2025; Onyiorah, 2025). Similar challenges are relevant to public secondary schools and primary healthcare centres, where administrators operate within increasingly digital environments while remaining responsible for institutional coordination and service delivery. Existing studies have highlighted the use of AI in school supervision, AI competencies among school administrators, and the importance of leadership and governance in educational and public-health settings (Ikegbusi et al., 2026a; Ikegbusi et al., 2026c; Onyeneto et al., 2026). These observations suggest that examining technological utilization alone may provide an incomplete account of organizational effectiveness.

The existing literature nevertheless leaves an important conceptual and empirical gap. Previous research has largely approached digital change through technology adoption, digital transformation, technology utilization, competencies, and related aspects of organizational digitalization (Dwivedi et al., 2021; Vial, 2019). Such perspectives do not fully explain whether the institutional governance mechanisms surrounding responsible AI use and the leadership capabilities directing digital transformation independently and jointly predict organizational effectiveness. Furthermore, the literature considered in this study provides limited evidence from institutional leaders across both public secondary education and primary healthcare. Examining these two capabilities together is theoretically important because governance frameworks may establish the conditions for responsible technology use, whereas leadership capabilities may determine how digital resources and organizational change are mobilized within those conditions. Their joint consideration therefore provides a more integrated organizational perspective than examining technology adoption or either capability in isolation.

The cross-sector perspective also represents an important feature of the present study. Public secondary schools and primary healthcare centres differ in their substantive objectives and service delivery functions; therefore, the study does not assume that the two sectors are organizationally identical. Rather, they are examined together because both constitute public-service settings in which institutional leaders perform comparable governance, coordination, decision-making, resource-management, and technological adaptation functions. Accordingly, the pooled perspective is intended to identify the overall predictive pattern of AI governance and digital leadership across these public institutional settings rather than to establish that the magnitude of these relationships is necessarily identical between the education and healthcare sectors.

Against this background, this study examined artificial intelligence governance and digital leadership as predictors of organizational effectiveness among public secondary school principals and primary healthcare centre managers in Anambra State, Nigeria. Specifically, the study determined the predictive value of AI governance, assessed the predictive value of digital leadership, and examined their joint predictive value on organizational effectiveness. Accordingly, the following null hypotheses were tested: (H01) artificial intelligence governance has no significant predictive value on organizational effectiveness; (H02) digital leadership has no significant predictive value on organizational effectiveness; and (H03) artificial intelligence governance and digital leadership have no significant joint predictive value on organizational effectiveness in public secondary schools and primary healthcare centres in Anambra State, Nigeria.

2. RESEARCH METHOD

This study employed a correlational research design to examine the predictive relationships between artificial intelligence (AI) governance, digital leadership, and organizational effectiveness in public secondary schools and primary healthcare centres in Anambra State, Nigeria. The design was considered appropriate because it enabled the examination of the individual and joint predictive values of the independent variables without manipulating the study variables (Ikegbusi, 2022).

The study population comprised 609 institutional administrators, consisting of 274 public secondary school principals and 335 primary healthcare centre managers in Anambra State. These respondents were selected because they served as the chief administrators of their respective institutions and were responsible for institutional governance, leadership, and organizational management. Given the manageable population size, a census approach was adopted, whereby all 609 eligible respondents were targeted for participation (Obi et al., 2022). Of the 609 questionnaires administered, 590 were successfully retrieved, while 19 were not returned, representing a response rate of 96.9%. Accordingly, the study was based on the 590 successfully retrieved questionnaires.

Data were collected using three researcher-developed instruments: the Artificial Intelligence Governance Questionnaire (AIGQ), Digital Leadership Questionnaire (DLQ), and Organizational Effectiveness Questionnaire (OEQ). Each instrument contained 10 items rated on a four-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (4). The AIGQ assessed governance practices relating to policies, ethical standards, accountability, privacy, transparency, and the responsible use of AI in institutional

management. The DLQ assessed leadership practices relating to the strategic use of digital technologies, digital innovation, technology-enabled decision-making, organizational change, and digital transformation. The OEQ measured organizational effectiveness in terms of administrative efficiency, quality service delivery, effective resource management, organizational coordination, and goal attainment.

The instruments were subjected to expert validation by specialists in Educational Management, Public Health, and Measurement and Evaluation at Chukwuemeka Odumegwu Ojukwu University, Igbariam Campus, Anambra State, Nigeria. The validation focused on the clarity, content validity, and suitability of the instruments for the study. A pilot test was subsequently conducted with 30 respondents comprising 15 public secondary school principals and 15 primary healthcare centre managers in Enugu State, outside the study area. Internal consistency was assessed using Cronbach's alpha. The AIGQ, DLQ, and OEQ yielded reliability coefficients of 0.84, 0.86, and 0.88, respectively. As all coefficients exceeded the recommended threshold of 0.70, the instruments demonstrated satisfactory internal consistency (Hair et al., 2019).

Prior to data collection, approval was obtained from the Anambra State Post Primary Schools Service Commission and the Anambra State Primary Health Care Development Agency. Informed consent was obtained from the respondents before questionnaire administration. Two research assistants, one with a background in Educational Management and the other in Public Health, were trained on the objectives of the study and the ethical administration of the instruments. The researchers and research assistants personally administered the questionnaires and facilitated their retrieval. Participation was voluntary, and respondents' anonymity and confidentiality were maintained throughout the study.

The data were analysed using simple and multiple linear regression. Simple linear regression was used to determine the individual predictive values of AI governance and digital leadership on organizational effectiveness, whereas multiple linear regression was used to examine their joint predictive value. The strength of the predictive relationships was evaluated using the reported regression coefficients and coefficients of determination. The null hypotheses were tested at the 0.05 level of significance. A null hypothesis was rejected when the associated p-value was less than 0.05 and was not rejected when the p-value was equal to or greater than 0.05.

3. RESULTS AND DISCUSSION

The regression analyses indicated that artificial intelligence (AI) governance and digital leadership were positively associated with organizational effectiveness, both individually and when considered jointly. Table 1 presents the simple linear regression results for AI governance and organizational effectiveness.

Table 1. Simple Linear Regression of AI Governance on Organizational Effectiveness

Predictor	B	β	t	p
Constant	16.284	—	4.629	< .001
AI Governance	0.684	0.618	12.374	< .001

Model summary: $R = 0.618$; $R^2 = 0.382$; *Adjusted* $R^2 = 0.379$; $F = 153.116$; $p < .001$.

AI governance showed a positive predictive relationship with organizational effectiveness ($R = 0.618$, $R^2 = 0.382$). The model explained 38.2% of the variance in organizational effectiveness, while the adjusted R^2 of 0.379 indicated that approximately 37.9% of the variance was explained after adjustment for model complexity. AI governance had a positive standardized regression coefficient ($\beta = 0.618$) and was statistically significant ($t = 12.374$, $p < .001$). Thus, the null hypothesis that AI governance has no significant predictive value on organizational effectiveness was rejected.

This finding indicates that higher levels of AI governance were associated with higher levels of organizational effectiveness among the public secondary schools and primary healthcare centres examined. Within the context of this study, AI governance encompassed policies, ethical standards, accountability, privacy, transparency, and responsible AI use. The observed relationship may therefore reflect the organizational value of having institutional mechanisms that provide direction and accountability for the use of emerging technologies. Such mechanisms may support more structured decision-making, clearer responsibilities, and more responsible integration of digital technologies into institutional processes.

The finding is consistent with the Dynamic Capabilities Theory of Teece et al. (1997), particularly its proposition that organizations respond to technological and environmental change by developing and reconfiguring strategic capabilities. From this perspective, AI governance can be interpreted as an institutional capability that provides rules, accountability mechanisms, and structures through which technological resources are managed. The finding is also consistent with OECD (2025), which emphasizes the importance of governance mechanisms in supporting accountable and effective AI implementation.

However, the result should not be interpreted to mean that AI governance automatically produces organizational effectiveness. Aina and Salau (2024) reported that AI governance initiatives may yield limited organizational outcomes when implementation structures and institutional capacity are inadequate. Considered alongside the present finding, this suggests that the existence of governance mechanisms may be important,

but their organizational relevance may also depend on the institutional capacity to translate governance principles into practice. Moreover, because the present study employed a correlational design, the observed relationship represents predictive association rather than evidence of causation.

Table 2 presents the simple linear regression results for digital leadership and organizational effectiveness.

Table 2. Simple Linear Regression of Digital Leadership on Organizational Effectiveness

Predictor	B	β	t	p
Constant	14.967	—	4.130	< .001
Digital Leadership	0.731	0.671	14.027	< .001

Model summary: $R = 0.671$; $R^2 = 0.450$; *Adjusted* $R^2 = 0.447$; $F = 196.757$; $p < .001$.

Digital leadership demonstrated a positive predictive relationship with organizational effectiveness ($R = 0.671$, $R^2 = 0.450$). The model explained 45.0% of the variance in organizational effectiveness, with an adjusted R^2 of 0.447, indicating that approximately 44.7% of the variance was explained after adjustment for model complexity. Digital leadership had a positive standardized regression coefficient ($\beta = 0.671$) and was statistically significant ($t = 14.027$, $p < .001$). Accordingly, the null hypothesis that digital leadership has no significant predictive value on organizational effectiveness was rejected.

The finding suggests that higher levels of digital leadership were associated with higher organizational effectiveness in the institutions examined. In the present study, digital leadership represented leadership practices involving the strategic use of digital technologies, digital innovation, technology-enabled decision-making, organizational change, and digital transformation. The relationship may therefore reflect the importance of leadership capacity in translating technological resources into organizational practices. Leaders who are better positioned to coordinate digital processes, support technology-enabled decision-making, and manage organizational change may also operate within institutions characterized by stronger administrative coordination and effectiveness.

This interpretation is consistent with the Dynamic Capabilities Theory (Teece et al., 1997), as digital leadership can be viewed as an adaptive organizational capability through which leaders mobilize and reconfigure technological resources in response to changing institutional demands. The finding is also consistent with UNESCO (2025), which emphasizes the importance of leadership capacity in institutional digital transformation.

Nevertheless, digital leadership should not be interpreted independently of the organizational environment in which it operates. Eze and Okafor (2024) reported that the organizational contribution of digital leadership may be limited where technological infrastructure and institutional support are inadequate. The difference between that observation and the present finding suggests that leadership capability alone may not fully determine organizational outcomes; rather, its relevance may depend on the institutional conditions that enable digital strategies to be translated into organizational practices. As with AI governance, the present result demonstrates a statistically significant predictive association and does not establish a causal effect.

The joint contribution of AI governance and digital leadership was examined using multiple linear regression, as presented in Table 3.

Table 3. Multiple Linear Regression of AI Governance and Digital Leadership on Organizational Effectiveness

Predictor	B	β	t	p
Constant	12.846	—	3.995	< .001
AI Governance	0.428	0.382	6.781	< .001
Digital Leadership	0.516	0.497	8.462	< .001

Model summary: $R = 0.758$; $R^2 = 0.575$; *Adjusted* $R^2 = 0.572$.

The combined model produced an R value of 0.758 and an R^2 value of 0.575, indicating that AI governance and digital leadership jointly accounted for 57.5% of the variance in organizational effectiveness. The adjusted R^2 of 0.572 indicates that approximately 57.2% of the variance was explained after adjustment for model complexity. Within the combined model, both AI governance ($\beta = 0.382$, $t = 6.781$, $p < .001$) and digital leadership ($\beta = 0.497$, $t = 8.462$, $p < .001$) made positive and statistically significant contributions to the prediction of organizational effectiveness.

A comparison of the standardized coefficients within the combined model indicates that digital leadership ($\beta = 0.497$) made a stronger relative contribution than AI governance ($\beta = 0.382$). This comparison is restricted to the present model and should not be interpreted as evidence that digital leadership is universally more important than AI governance. Rather, it indicates that, when both predictors were considered simultaneously in this study, digital leadership showed the larger standardized regression coefficient.

The joint findings provide further insight into the complementary roles of governance and leadership capabilities. AI governance establishes institutional mechanisms concerning responsible technology use,

accountability, ethical standards, privacy, and transparency, whereas digital leadership concerns the capacity to mobilize digital technologies, support innovation, facilitate decision-making, and manage organizational transformation. Their simultaneous contribution to organizational effectiveness is therefore consistent with the Dynamic Capabilities Theory (Teece et al., 1997), which emphasizes the integration and reconfiguration of multiple organizational capabilities in response to environmental and technological change.

Importantly, the combined model explained a larger proportion of variance in organizational effectiveness ($R^2 = 0.575$) than either of the separate models for AI governance ($R^2 = 0.382$) or digital leadership ($R^2 = 0.450$). This pattern supports the conceptual argument that organizational effectiveness in digitally changing public institutions may be better understood by considering governance and leadership capabilities together rather than treating technological governance or leadership as isolated organizational attributes. Governance may provide the institutional framework within which technology is expected to be used responsibly, while leadership may provide the organizational capacity required to translate digital resources and strategies into institutional practices.

The comparatively stronger standardized contribution of digital leadership in the joint model may indicate that leadership practices are more directly associated with the operational dimensions of organizational effectiveness measured in this study, including administrative efficiency, service delivery, resource management, coordination, and goal attainment. This interpretation remains tentative, however, because the study did not directly test the mechanisms through which either predictor influences organizational effectiveness. The findings therefore support the relevance of considering AI governance and digital leadership as complementary organizational capabilities without establishing causal pathways between these variables.

The cross-sector nature of the study should also be considered when interpreting these findings. The results represent the overall predictive pattern obtained from the pooled responses of public secondary school principals and primary healthcare centre managers. They therefore demonstrate that AI governance and digital leadership were associated with organizational effectiveness across the combined institutional sample, but they do not establish whether the magnitude of these relationships was identical in the education and healthcare sectors. Sector-specific differences would require separate comparative analyses that were not part of the reported analysis.

4. CONCLUSION

This study examined artificial intelligence (AI) governance and digital leadership as predictors of organizational effectiveness in public secondary schools and primary healthcare centres in Anambra State, Nigeria. The findings demonstrated positive predictive relationships between AI governance, digital leadership, and organizational effectiveness. Individually, AI governance accounted for 38.2% of the variance in organizational effectiveness, while digital leadership accounted for 45.0%. When considered simultaneously, the two predictors accounted for 57.5% of the variance in organizational effectiveness. Within the combined model, digital leadership showed a stronger standardized contribution ($\beta = 0.497$) than AI governance ($\beta = 0.382$), indicating that leadership capability had the stronger relative association with organizational effectiveness when both predictors were considered together. Overall, the findings highlight the complementary relevance of institutional governance mechanisms and digital leadership capabilities in understanding organizational effectiveness within the public-service institutions examined.

The findings have practical implications for educational management and public health administration. The Anambra State Government, relevant education and health agencies, and institutional administrators should consider strengthening governance frameworks for the responsible, ethical, transparent, and accountable use of AI while simultaneously developing the digital leadership capabilities of school principals and primary healthcare centre managers. Capacity-building initiatives may focus on responsible AI use, digital decision-making, technology-enabled administration, and the management of organizational change. Public secondary schools and primary healthcare centres may also consider incorporating AI governance and digital leadership into their strategic management practices. Such initiatives should be accompanied by appropriate institutional evaluation to determine whether improvements in these capabilities translate into measurable changes in administrative efficiency, coordination, service delivery, and organizational effectiveness.

The findings should, however, be interpreted within the limitations of the study. First, the correlational research design establishes predictive associations but does not demonstrate causal relationships between AI governance, digital leadership, and organizational effectiveness. Second, the study relied on self-reported questionnaire responses and may therefore reflect respondents' perceptions of governance, leadership, and organizational effectiveness. Third, public secondary school principals and primary healthcare centre managers were analysed within a pooled model; consequently, the findings do not establish whether the magnitude of the observed relationships differs between the education and healthcare sectors. Fourth, although the researcher-developed instruments underwent expert content validation and demonstrated satisfactory internal

consistency, factor-analytic evidence of construct validity was not available in the reported analysis. In addition, diagnostic statistics for regression assumptions were not available and therefore could not be independently evaluated. Future research could address these limitations by examining the sectors separately, extending the investigation to other geographical and institutional settings, incorporating additional measurement validation and regression diagnostics, and employing longitudinal or mixed-method designs to provide a more comprehensive understanding of how AI governance and digital leadership relate to organizational effectiveness.

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