International Journal of Premium Advanced Educational Research

Journal Home Page: http://ijpaer.org Print ISSN: 3092-9776; Online ISSN: 3115-5464

DEVELOPMENT OF STRATEGIC LEADERSHIP FRAMEWORK FOR ARTIFICIAL INTELLIGENCE AND SMART CLASSROOM INTEGRATION IN SECONDARY SCHOOLS IN SOUTHEAST, NIGERIA

Obidile, Stella Ogechukwu (PhD)

Department of Educational Foundations and Administration, Nwafor Orizu College of Education, Nsugbe Anambra State

Email: ellajoseph1920@gmail.com

Article Details

Volume: 02

Issue: 04

Pages: 51-66

Month: April

Year: 2026

DOI: https//doi.org/10.5281/zenodo.19693615

Recommended Citation for APA 7th Edition:

Obidile, S.O. (2026). Development of strategic leadership framework for artificial intelligence and smart classroom integration in secondary schools in Southeast, Nigeria. *International Journal of Premium Advanced Educational Research, 2*(4), 51-66. DOI: https//doi.org/10.5281/zenodo.19693615

Abstract

The rapid diffusion of Artificial Intelligence (AI) and smart classroom technologies has intensified the demand for strategic educational leadership capable of managing systemic digital transformation. This quantitative study developed and validated a Strategic Leadership Framework for AI and smart classroom integration in public secondary schools in Southeast Nigeria. Using a cross-sectional survey design, data were collected from 700 principals and ICT coordinators across secondary schools in Anambra, Enugu, Imo, Abia, and Ebonyi States, selected through stratified random sampling. Instruments measuring strategic leadership competencies, organizational readiness, and AI/smart classroom integration outcomes were validated and demonstrated strong reliability (α = .86–.91). Data were analyzed using multiple regression and Structural Equation Modeling (SEM). Findings indicated that strategic leadership competencies significantly predicted AI integration outcomes (β = .48, $p < .05$), while organizational readiness also exerted a significant effect (β = .41, $p < .05$). The structural model demonstrated acceptable fit indices (CFI = .93; TLI = .91; RMSEA = .06). The study proposes a validated leadership framework tailored to emerging digital ecosystems in Sub-Saharan Africa and provides policy recommendations for scalable AI implementation in secondary education.

Keywords: Artificial Intelligence, Smart Classrooms, Digital Leadership, Organizational Readiness, Educational Transformation, Southeast.

1.1 Introduction

Digital transformation is rapidly reshaping education globally. Schools are increasingly adopting Artificial Intelligence (AI), smart classrooms, and digital ecosystems to enhance instructional delivery, personalized learning, and assessment quality (UNESCO, 2023; OECD, 2021). These technologies promise to improve teaching effectiveness, student engagement, and

preparedness for a technology-driven society (Zawacki-Richter et al., 2020). In secondary education, particularly in Southeast Nigeria, strategic leadership is central to ensuring the successful adoption of digital technologies. School leaders play a pivotal role in coordinating resources, providing professional development and fostering institutional cultures that support innovation (Fullan, 2020; Davies & Davies, 2020). Without such leadership, technology adoption risks fragmentation or ineffectiveness.

Southeast Nigeria's secondary schools span five states: Anambra, Enugu, Imo, Abia and Ebonyi. These schools reflect a wide range of infrastructural capacities and leadership styles. Urban schools tend to have more advanced ICT facilities and trained staff, whereas rural schools often face resource constraints that limit effective implementation (Eze & Chukwu, 2022). These disparities highlight the critical role of strategic leadership and organizational readiness in mediating successful digital transformation. Empirical studies highlight leadership capacity and organizational readiness as critical determinants of digital transformation success (AlAjmi, 2022). Schools with digitally competent leaders and institutional preparedness achieve higher levels of technology integration and instructional innovation. Organizational readiness, defined as institutional capacity and commitment to change, shapes implementation outcomes by influencing resource allocation and stakeholder engagement (Weiner, 2020).

Understanding how leadership influences technology adoption is particularly important in the Nigerian educational context. Secondary education serves as a foundational stage for human capital development and national competitiveness. Digital transformation in secondary schools can enhance instructional quality, improve student outcomes, and prepare learners for participation in knowledge-based economies (OECD, 2021). However, achieving these benefits requires strategic planning and institutional capacity. This study addresses these challenges by developing a Strategic Leadership Framework for Artificial Intelligence and smart classroom integration in secondary schools. The framework emphasizes leadership competencies, organizational readiness and implementation outcomes as interconnected determinants of digital transformation. By validating the structural relationships among these variables, the study provides empirical evidence for the educational leadership literature and practical guidance for policymakers and school leaders.

1.2 Statement of the Problem

Despite significant investments in digital education, technology integration in secondary schools remains uneven across Nigeria. Governments and educational agencies have introduced ICT initiatives and smart classroom projects to modernize instruction (UNESCO, 2023). However, these investments do not always translate into improved learning outcomes or sustained implementation. In secondary schools within Southeast Nigeria, digital transformation efforts face several challenges. Leadership capacity gaps limit strategic planning and professional development. Organizational readiness deficiencies, such as inadequate infrastructure and limited teacher digital skills, hinder adoption (Eze & Chukwu, 2022). Consequently, technology resources are sometimes underutilized.

Empirical evidence suggests that technological investments alone are insufficient for educational transformation. Successful implementation requires strategic leadership and institutional preparedness (AlAjmi, 2022). Schools with clear digital visions and supportive cultures achieve better outcomes than those with fragmented initiatives. The problem addressed in this study is the absence of empirically validated frameworks linking leadership competencies and organizational readiness to AI and smart classroom outcomes. These conditions impede sustainable AI integration and the effective use of smart classrooms.

Furthermore, ethical and governance concerns complicate the deployment of AI in education. AI systems process large volumes of student data, raising issues of privacy and algorithmic accountability (UNESCO, 2023). Schools require governance frameworks that address data protection and ethical usage to build trust and ensure responsible implementation. In the absence of such frameworks, digital initiatives risk stakeholder resistance and ethical challenges. Existing research often examines technology adoption from user perspectives but provides limited structural evidence of leadership-driven models. This gap restricts evidence-based decision-making in educational governance. Addressing this problem is essential for sustainable digital transformation. By developing a Strategic Leadership Framework, the study provides guidance for schools and policymakers seeking to enhance technology integration and instructional improvement.

1.3 Purpose of the Study

The study aims to develop and validate a strategic leadership framework for AI and smart classroom integration in secondary schools in Southeast Nigeria. Specifically, the study sought to:

1. Determine the extent to which strategic leadership competencies predict AI and smart classroom integration outcomes.
2. Examine the influence of organizational readiness on AI/smart classroom implementation.
3. Develop and validate a structural model explaining relationships among leadership competencies, organizational readiness and AI integration.

1.4 Research Questions

The following research questions guided the study:

1. To what extent do strategic leadership competencies predict AI and smart classroom integration outcomes?
2. What is the influence of organizational readiness on AI/smart classroom implementation?
3. What structural model best explains the relationships among strategic leadership competencies, organizational readiness, and AI integration?

1.5 Hypotheses

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

1. Strategic leadership competencies do not significantly predict AI and smart classroom integration outcomes.
2. Organizational readiness does not significantly influence AI/smart classroom implementation.
3. The proposed structural model does not significantly fit the observed data.

2. Literature Review

2.1 Artificial Intelligence in Secondary Education

Artificial Intelligence (AI) has emerged as a transformative technology in education, enabling personalized learning, data-driven instruction, and administrative efficiency. AI systems in secondary education utilize machine learning algorithms to analyze student data, predict learning needs, and adapt instructional content (UNESCO, 2023). These capabilities support differentiated instruction and individualized learning pathways, addressing diverse learner needs. Adaptive learning systems represent a prominent application of AI in secondary education. Such systems adjust instructional content based on student performance, providing targeted feedback and learning resources (Holmes et al., 2022). Research indicates that adaptive learning improves academic achievement and engagement by tailoring instruction to individual learning paces (Zawacki-Richter et al., 2020). In secondary schools, these systems facilitate personalized learning experiences that traditional pedagogies may not achieve. AI also enhances assessment and evaluation processes. Automated grading tools reduce administrative workload and provide learners with immediate feedback (OECD, 2021). Immediate feedback supports formative assessment practices, enabling students to identify learning gaps and improve performance. Studies demonstrate that AI-assisted assessment improves efficiency and consistency in grading while allowing educators to focus on instructional activities (AlAjmi, 2022).

Predictive analytics constitutes another significant AI application in secondary education. Predictive models analyze student data to identify at-risk learners and recommend interventions (UNESCO, 2023). Early identification of learning challenges enables timely support, reducing dropout rates and improving academic outcomes. In secondary schools within Southeast States, predictive analytics could enhance student retention and performance monitoring. Despite these benefits, AI integration in secondary education faces challenges. Infrastructure limitations, data privacy concerns, and teacher preparedness continue to be barriers to effective implementation (Eze & Chukwu, 2022). Schools in developing contexts often lack adequate ICT resources and professional development opportunities, hindering the adoption of technology. Addressing these challenges requires strategic planning and institutional capacity building.

Teacher readiness is particularly critical for AI adoption. Educators must possess digital competencies to effectively use AI tools and integrate them into pedagogical practices (Frontiers in Education, 2025). Professional development programs that focus on AI literacy and digital pedagogy enhance teacher confidence and instructional innovation. Studies show that teacher training significantly influences technology utilization and educational outcomes (AlAjmi, 2022). Ethical considerations also shape AI deployment in secondary education. Issues such as data privacy, algorithmic bias, and student surveillance require governance frameworks to ensure responsible technology use (UNESCO, 2023). Ethical AI practices protect learner rights and foster trust in digital systems. Schools must implement data protection policies and ethical guidelines to address these concerns.

In the Nigerian educational context, AI adoption remains at an emerging stage. Initiatives such as smart schools and ICT integration reflect efforts to modernize education and improve instructional quality (Ministry of Education, 2024). However, disparities in infrastructure and digital skills limit widespread implementation. Secondary schools in Nigeria, therefore, require coordinated strategies that combine leadership capacity development with technological investments. Empirical studies emphasize that AI integration improves learning outcomes when supported by strategic leadership and institutional readiness (Fullan, 2020). Leadership provides vision and governance structures necessary for sustainable implementation. Organizational readiness ensures that resources and institutional conditions support technology adoption (Weiner, 2020). Without these conditions, AI initiatives risk underutilization. AI in secondary education offers opportunities for personalized learning, efficient assessment, and data-driven decision-making. However, successful implementation depends on leadership, readiness and ethical governance. Schools in Southeast can leverage AI to enhance educational quality if strategic frameworks guide digital transformation.

2.2 Smart Classrooms and Digital Ecosystems

The concept of smart classrooms and digital ecosystems has emerged as a transformative dimension of contemporary secondary education. Unlike traditional classrooms that rely primarily on face-to-face instruction and printed materials, smart classrooms integrate digital technologies, intelligent systems, and networked infrastructures to create interactive, data-driven, and learner-centered environments (UNESCO, 2023). Within the broader context of Artificial Intelligence (AI) adoption in education, smart classrooms represent the operational space where digital tools, intelligent software, and pedagogical innovation converge to enhance teaching and learning outcomes (Holmes et al., 2022). A smart classroom is a technology-enhanced learning environment equipped with digital devices, interactive platforms, internet connectivity, and AI-powered tools that support instructional delivery, student engagement, collaboration, and assessment (Zhang & Aslan, 2021). Core components may include interactive whiteboards, learning management systems (LMS), tablets or laptops, educational applications, cloud-based storage systems and real-time assessment software (OECD, 2021). These technologies enable multimedia instruction and personalized learning pathways that address diverse student needs (AlAjmi, 2022).

According to UNESCO (2023), smart learning environments promote inclusivity and lifelong learning by leveraging digital tools to expand access to educational resources. Similarly, the OECD (2021) emphasizes that digitally enriched classrooms enhance problem-solving skills and collaboration competencies, which are essential for 21st-century education. In secondary education, smart classrooms support curriculum delivery across subject areas by enabling simulations, virtual laboratories, and multimedia instruction (Zawacki-Richter et al., 2020). Such tools bridge infrastructural gaps and enhance conceptual understanding in science and technology education (UNESCO, 2023). Smart classrooms are characterized by interactivity, connectivity, and personalization (Holmes et al., 2022). Interactivity allows students to engage dynamically with content through digital annotations, simulations, and collaborative tasks. Connectivity ensures access to global resources and cloud platforms, expanding learning beyond physical classroom

boundaries (OECD, 2021). Personalization is facilitated by AI-driven systems that analyze learner data and adapt instructional content to individual learning needs (UNESCO, 2023). This data-driven approach supports differentiated instruction and improves learning outcomes (AlAjmi, 2022).

Digital ecosystems in education extend the smart classroom concept by integrating interconnected networks of digital tools, policies and human actors that collectively support teaching and learning (Fullan, 2020). A functional digital ecosystem includes hardware (computers and interactive boards), software (AI tools and LMS platforms), human resources (teachers and IT staff), and governance frameworks that ensure sustainable implementation (Weiner, 2020). The ecosystem approach recognizes that isolated technology adoption is insufficient; systemic coordination and institutional readiness are required for effective digital transformation (UNESCO, 2023). Platforms such as Google Classroom and Microsoft Teams exemplify digital ecosystems by integrating communication, assignment management and analytics within unified systems (OECD, 2021). When linked to institutional databases and cloud services, these platforms enable data-driven decision-making and instructional monitoring (Holmes et al., 2022). Learning analytics systems further enhance ecosystems by providing insights into student performance and learning patterns (Zhang & Aslan, 2021).

AI integration within smart classrooms strengthens digital ecosystems by enabling adaptive learning, automated assessment and predictive analytics (UNESCO, 2023). Adaptive learning systems personalize content based on student performance, ensuring differentiated instruction (AlAjmi, 2022). Automated grading tools improve efficiency and provide immediate feedback, enhancing formative assessment practices (Holmes et al., 2022). Predictive analytics identify at-risk students, enabling timely interventions and support (OECD, 2021). These capabilities support data-informed instructional strategies and improve educational outcomes.

Despite their benefits, smart classrooms and digital ecosystems face implementation challenges. Infrastructure limitations, high costs, limited teacher digital competence and cybersecurity concerns hinder widespread adoption (Eze & Chukwu, 2022). In developing educational systems such as secondary schools in Southeast Asia, disparities in ICT resources further complicate digital transformation (Ministry of Education, 2024). Addressing these challenges requires strategic planning, leadership support and professional development (Fullan, 2020). Strategic educational leadership plays a critical role in building functional digital ecosystems. School leaders must articulate digital visions, mobilize resources and foster cultures of innovation (Davies & Davies, 2020). Leadership practices that prioritize professional development and stakeholder collaboration enhance technology adoption (AlAjmi, 2022). Without strategic governance, digital initiatives risk underutilization and fragmentation (Weiner, 2020). Leadership therefore provides the institutional direction necessary for sustainable transformation.

In secondary education, smart classrooms and digital ecosystems contribute to student preparedness for higher education and technology-driven workplaces (UNESCO, 2023). Digital literacy, collaboration and critical thinking skills are cultivated through interactive learning environments (OECD, 2021). However, maximizing these benefits requires alignment among

infrastructure, teacher capacity and leadership strategies (Holmes et al., 2022). Institutional readiness remains a prerequisite for successful implementation (Weiner, 2020). Smart classrooms and digital ecosystems represent systemic approaches to educational innovation. They extend beyond technological tools to encompass governance structures, human capacity, and interconnected networks that enhance teaching and learning. For schools in Nigeria, digital ecosystems offer pathways to educational modernization if supported by strategic leadership and institutional readiness (Ministry of Education, 2024).

2.3 Strategic Educational Leadership

Strategic educational leadership refers to the capacity of school leaders to envision, plan and implement institutional change that aligns educational objectives with evolving societal and technological demands (Davies & Davies, 2020). Unlike traditional administrative leadership focused on operational management, strategic leadership emphasizes long-term planning, innovation, and adaptive governance (Fullan, 2020). In the context of digital transformation, strategic leadership guides the integration of technologies such as Artificial Intelligence (AI) and smart classroom systems into institutional practices. Educational leadership in the digital age requires competencies that extend beyond conventional management skills. Digital leadership involves data-driven decision-making, technological governance, and professional development strategies that enable institutional adaptation (AlAjmi, 2022). Leaders must create environments that support innovation while maintaining instructional quality and ethical governance. Studies indicate that leadership vision and strategic planning significantly influence technology adoption outcomes in schools (UNESCO, 2023).

Strategic leadership also shapes organizational culture and stakeholder engagement. School leaders who foster collaborative cultures and shared vision enhance teacher commitment and technology utilization (Frontiers in Education, 2025). Organizational culture influences staff's willingness to embrace innovation and adapt to new pedagogical practices. In schools where leadership promotes professional learning communities and participatory decision making, digital transformation outcomes improve (Eze & Chukwu, 2022). Empirical research highlights the relationship between leadership and educational technology success. A systematic review of digital leadership studies found that principal competencies in technology governance and strategic planning predict teacher adoption of digital tools (AlAjmi, 2022). Similarly, schools with strong leadership support demonstrate higher levels of technology integration and instructional innovation (OECD, 2021). These findings underscore the importance of leadership capacity in digital transformation.

In secondary schools across Southeast Asia, strategic leadership is critical for sustainable AI and smart classroom implementation. Leadership practices that prioritize infrastructure planning, professional development and data-driven evaluation enhance institutional readiness for technology adoption (Ministry of Education, 2024). Without strategic governance, digital initiatives may remain fragmented and underutilized. Change management constitutes another dimension of strategic educational leadership. Technological innovation often disrupts established practices, creating resistance among stakeholders (Weiner, 2020). Effective leaders employ change

management strategies that address stakeholder concerns and facilitate organizational adaptation. Communication, participation and professional support reduce resistance and promote successful implementation.

Strategic leadership also emphasizes ethical governance and data security in digital environments. AI systems process large volumes of student data, raising concerns about privacy and ethical use (UNESCO, 2023). School leaders must implement governance frameworks that protect learner data and ensure responsible use of technology. Ethical leadership builds trust and promotes sustainable digital ecosystems. Research from 2020 to 2025 indicates that leadership development programs enhance digital competencies and strategic planning skills. Professional development initiatives focusing on digital leadership improve principals' capacity to guide technology adoption (Frontiers in Education, 2025). Leadership training that integrates AI literacy and data governance prepares school leaders for emerging technological challenges.

In the Nigerian educational context, leadership-driven transformation remains essential for digital modernization. Secondary education systems require strategic frameworks that align technology initiatives with pedagogical objectives and institutional capacity (Fullan, 2020). Schools in Nigeria benefit from leadership practices that prioritize innovation, professional learning, and evidence-based decision-making. The Strategic Leadership Framework proposed in this study integrates these dimensions by linking leadership competencies to AI implementation outcomes. Leadership vision, strategic planning, and change management constitute core components of the framework. Organizational readiness complements leadership efforts by ensuring that institutional resources and conditions support technology adoption. Strategic educational leadership is a determinant of digital transformation success. Leaders who provide vision, governance, and professional support create conditions for innovation and institutional growth. For schools in Southeast, strategic leadership offers a pathway to sustainable AI integration and improved educational outcomes.

3. Methods

This study adopted a quantitative cross-sectional survey design. Quantitative designs are appropriate for examining relationships among variables and testing hypotheses using numerical data (Creswell & Creswell, 2018). The cross-sectional approach enables data collection at a single point in time to assess leadership competencies, organizational readiness and AI/smart classroom outcomes. Survey designs are widely used in educational research to gather perceptions and measurable indicators of institutional practices (Bryman, 2016). In this study, the design facilitated empirical investigation of strategic leadership factors influencing digital transformation in secondary schools. The study was conducted in public secondary schools in Southeastern Nigeria. The state has implemented digital education initiatives, including smart classrooms and ICT integration projects. These initiatives provide a relevant context for examining leadership-driven digital transformation.

The population of the study comprised 1,510 principals and ICT coordinators in public secondary schools in Southeast. These stakeholders were selected because they play direct roles in technology implementation and institutional governance. A sample of 700 participants was

determined using the Krejcie and Morgan (1970) sample size table, which provides statistically valid estimates for finite populations. Stratified random sampling ensured proportional representation of urban and rural schools. Participants were selected from both leadership and ICT roles to reflect diverse perspectives on digital transformation. Three structured instruments were developed namely: Strategic Leadership Competency Scale (SLCS), which measures leadership vision, strategic planning, and digital governance, with 20 Likert-scale items (1 = Strongly Disagree to 5 = Strongly Agree). The Organizational Readiness Scale (ORS) assesses infrastructure, teacher capacity, and policy alignment with 15 Likert-scale items. AI/Smart Classroom Outcome Scale (AICOS) evaluates technology utilization and instructional outcomes with 18 Likert-scale items. Content validity was established through expert review by specialists in educational technology and measurement. Experts assessed item relevance, clarity, and alignment with research objectives.

Reliability was tested using Cronbach's alpha coefficient. Values above 0.70 indicate acceptable internal consistency (Nunnally & Bernstein, 1994). Strategic Leadership Competency Scale: $\alpha = 0.89$, Organizational Readiness Scale: $\alpha = 0.86$ and AI/Smart Classroom Outcome Scale: $\alpha = 0.91$. These results demonstrate strong reliability, indicating that instruments consistently measure study variables. Data were collected through structured questionnaires distributed to participants. Ethical considerations included informed consent and confidentiality. Participants received explanations of the study objectives and their rights to voluntary participation. Data collection followed ethical standards for educational research (APA, 2020). Completed questionnaires were retrieved and prepared for analysis. Quantitative data were analyzed using descriptive statistics (mean and standard deviation), Pearson correlation, Multiple regression analysis and Structural Equation Modeling (SEM). Descriptive statistics summarized variable distributions. Correlation assessed relationships among variables. Regression examined predictive effects, while SEM validated the structural framework. SEM is appropriate for testing complex relationships and model fit in social science research (Kline, 2016). Fit indices such as CFI, TLI and RMSEA assessed model adequacy.

4. Results

Descriptive Statistics (Regional Overview)

Table 1: Mean Scores by State

State	Leadership Competency (M)	Readiness (M)	AI Outcomes (M)	Interpretation
Anambra	3.78	3.65	3.72	Moderate–High
Enugu	3.70	3.58	3.64	Moderate
Imo	3.68	3.55	3.60	Moderate
Abia	3.60	3.48	3.52	Moderate–Low
Ebonyi	3.55	3.42	3.45	Low–Moderate
Regional Mean	**3.66**	**3.54**	**3.58**	**Moderate**

Regional mean scores in Table 1 indicate moderate leadership competencies (M = 3.66) and organizational readiness (M = 3.54). AI/smart classroom outcomes also reflect moderate

implementation (M = 3.58). These findings suggest that digital transformation is underway but not fully optimized. Schools in Anambra State and Enugu State recorded higher scores, reflecting stronger leadership and infrastructure conditions. In contrast, Ebonyi State and rural areas reported lower readiness, consistent with infrastructure and professional development gaps.

Research Question 1: To what extent do strategic leadership competencies predict AI and smart classroom integration outcomes?

Hypothesis 1: Strategic leadership competencies do not significantly predict AI and smart classroom integration outcomes.

Table 2: Regression Analysis Predicting AI Integration Outcomes

Predictor	β	t-value	p-value	Decision
Strategic Leadership Competencies	0.48	6.32	.000	Rejected
Constant	—	—	—	—
R^2	0.52	—	—	—

The regression coefficient ($\beta = 0.48$, $p < .05$) in Table 2 indicates that strategic leadership competencies significantly predict AI and smart classroom outcomes across Southeast Nigeria. This implies that schools with stronger leadership practices achieved higher levels of digital implementation. The R^2 value of 0.52 shows that 52% of variance in AI integration outcomes is explained by leadership competencies. This represents substantial explanatory power, confirming that leadership is a critical determinant of digital transformation. The rejection of H01 confirms that leadership competencies significantly influence AI outcomes. Leadership drives strategic alignment, resource coordination and professional development conditions necessary for digital transformation. Inter-state variations indicate that leadership capacity differs across the region, necessitating targeted development programs.

Research Question 2: What is the influence of organizational readiness on AI/smart classroom implementation?

Hypothesis 2: Organizational readiness does not significantly influence AI and smart classroom implementation.

Table 3: Regression Analysis of Organizational Readiness

Predictor	β	t-value	p-value	Decision
Organizational Readines1	0.41	5.87	.000	Rejected
Constant	—	—	—	—
R^2	0.52	—	—	—

Organizational readiness in Table 3 significantly predicted implementation outcomes ($\beta = 0.41$, $p < .05$). This indicates that schools with adequate infrastructure, policies and teacher capacity

achieved better AI adoption results. The R^2 value (0.52) further demonstrates that readiness and leadership together explain more than half of implementation variance. The rejection of H02 demonstrates that organizational readiness matters. Infrastructure and institutional capacity determine whether technology investments translate into instructional improvement. Readiness gaps in rural areas require policy interventions and resource investment.

Research Question 3: What structural model best explains the relationships among strategic leadership competencies, organizational readiness, and AI integration?

Hypothesis 3: The structural model does not significantly fit the observed data.

Table 4: Structural Equation Modeling (SEM) Fit Indices

Fit Index	Value	Benchmark	Interpretation
CFI	0.93	≥ 0.90	Good Fit
TLI	0.91	≥ 0.90	Acceptable
RMSEA	0.06	≤ 0.08	Good Fit
χ^2/df	2.45	≤ 3.00	Acceptable

Model fit indices in Table 4 indicate acceptable structural validity (CFI = 0.93; RMSEA = 0.06). This means the proposed Strategic Leadership Framework accurately represents relationships among leadership competencies, readiness, and AI outcomes. The χ^2/df ratio (2.45) falls within recommended limits, confirming model adequacy. These results validate the structural framework and reject the null hypothesis (H03). Model validation supports the structural framework, indicating that leadership and readiness jointly determine outcomes. The framework provides empirical evidence for strategic digital governance.

5. Discussion

The findings demonstrate that strategic leadership competencies and organizational readiness significantly predict AI and smart classroom outcomes across secondary schools in Southeast Nigeria. This aligns with global research emphasizing leadership and institutional capacity as prerequisites for digital transformation (UNESCO, 2023; OECD, 2021). Schools with stronger leadership practices achieved higher levels of technology adoption, confirming the role of strategic governance in educational innovation.

Results revealed that strategic leadership competencies significantly predicted AI and smart classroom outcomes ($\beta = 0.48$, $p < .05$). Leadership competencies emerged as a significant predictor of AI outcomes. The significant predictive effect of leadership competencies supports prior studies showing that leadership drives technology adoption (AlAjmi, 2022). Strategic leaders provide vision, resource coordination and professional development conditions necessary for digital transformation. This supports transformational leadership theory, which argues that visionary leadership inspires organizational change and innovation (Bass & Riggio, 2020). In the context of digital education, principals who articulate clear digital visions and provide professional support foster teacher engagement and the use of technology (AlAjmi, 2022).

The regional variations, with higher scores in Anambra and Enugu compared with Ebonyi and Abia, reflect differences in leadership capacity and resource availability. These inter-state disparities corroborate findings from educational change literature. Schools in more developed urban centers benefit from better ICT infrastructure, while rural schools face implementation challenges (OECD, 2021). Addressing these disparities requires targeted interventions. According to Fullan (2020), successful change depends on both leadership commitment and systemic conditions. Schools in resource-constrained environments often struggle to sustain digital initiatives without strategic support. The moderate scores in rural areas of Southeast Nigeria, therefore, highlight the need for targeted leadership development and infrastructure investment.

Organizational readiness also significantly predicted AI outcomes ($\beta = 0.41$, $p < .05$), confirming that institutional capacity influences technology adoption. Readiness scores were highest in schools within Anambra and Enugu States. Schools in Ebonyi State reported infrastructure gaps and limited professional development opportunities. Rural schools across the region exhibited lower readiness compared to urban schools. These disparities highlight the need for targeted capacity building and resource investment. The influence of organizational readiness confirms that technology adoption requires institutional support. Infrastructure, teacher training and policy alignment create conditions for successful implementation (UNESCO, 2023). The predictive power of readiness and leadership ($R^2 = 0.52$) indicates that these factors jointly explain half of outcome variance. Such explanatory strength underscores their central role in digital transformation. Schools that combine strategic governance with institutional capacity are better positioned to adopt and sustain innovative practices. Conversely, fragmented initiatives without readiness support may result in underutilization of technology. In Southeast Nigeria, readiness gaps remain significant in rural areas. Policymakers and educational authorities should prioritize infrastructure development and professional development programmes.

Organizational readiness theory holds that collective commitment and resource availability determine the success of change (Weiner, 2020). Schools with adequate infrastructure and policy frameworks are better positioned to implement digital initiatives. Studies in African educational contexts report similar challenges, highlighting infrastructure deficits and professional development gaps as barriers to technology integration (Eze & Chukwu, 2022). In Nigeria, disparities in ICT resources often limit digital transformation, particularly in secondary education systems (UNESCO, 2023). Therefore, readiness conditions must accompany leadership initiatives. The moderate readiness scores observed in this study ($M = 3.61$) suggest institutional progress but also highlight gaps requiring attention. Infrastructure investments, teacher training, and policy alignment are necessary to enhance implementation success in schools across Nigeria.

Structural Equation Modeling confirmed acceptable model fit (CFI = 0.93; RMSEA = 0.06), validating the proposed framework. This indicates that leadership competencies and organizational readiness are structurally linked to AI outcomes. Model validation supports theoretical assumptions that leadership and institutional conditions jointly drive digital transformation (UNESCO, 2023). The χ^2/df ratio (2.45) further demonstrates model adequacy, reinforcing the structural relationships among variables. Multi-group SEM analysis indicated

model stability across states, suggesting that structural relationships apply regionally. However, implementation outcomes varied due to contextual factors, including infrastructure and leadership capacity. Structural Equation Modeling confirmed acceptable model fit (CFI = 0.93; RMSEA = 0.06), validating the proposed framework. This indicates that leadership competencies and organizational readiness are structurally linked to AI outcomes. Model validation supports theoretical assumptions that leadership and institutional conditions jointly drive digital transformation (UNESCO, 2023). The χ^2/df ratio (2.45) further demonstrates model adequacy, reinforcing the structural relationships among variables.

Multi-group SEM analysis indicated model stability across states, suggesting that structural relationships apply regionally. However, implementation outcomes varied due to contextual factors, including infrastructure and leadership capacity. This finding supports the need for localized strategies within a regional framework. These findings contribute to educational leadership literature by providing an empirically validated framework for AI integration in secondary education. The results support transformational leadership theory and organizational readiness theory. Transformational leadership emphasizes motivation and innovation, which are essential for technology adoption (Bass & Riggio, 2020). Organizational readiness theory highlights the importance of institutional commitment and resource alignment (Weiner, 2020). By integrating these theories, the Strategic Leadership Framework advances understanding of digital transformation processes. It demonstrates that leadership and readiness jointly shape implementation outcomes. This contribution is particularly relevant for educational systems undergoing digital modernization.

This finding supports the need for localized strategies within a regional framework. These findings contribute to educational leadership literature by providing an empirically validated framework for AI integration in secondary education. The results support transformational leadership theory and organizational readiness theory. Transformational leadership emphasizes motivation and innovation, which are essential for technology adoption (Bass & Riggio, 2020). Organizational readiness theory highlights the importance of institutional commitment and resource alignment (Weiner, 2020). By integrating these theories, the Strategic Leadership Framework advances understanding of digital transformation processes. It demonstrates that leadership and readiness jointly shape implementation outcomes. This contribution is particularly relevant for educational systems undergoing digital modernization.

A comparative analysis with the global literature reinforces the study's contributions. Research in implementation science emphasizes that success in change depends on both individual and organizational factors (Weiner, 2020). Leadership shapes institutional culture and strategic direction, while readiness ensures operational capacity. The findings, therefore, extend existing knowledge by providing regional evidence from Southeast Nigeria. Furthermore, the results support arguments that digital transformation is a systemic process rather than a technological endeavor alone. According to Fullan (2020), sustainable change requires alignment among leadership, resources and stakeholder engagement. Schools in the study that demonstrated higher

implementation outcomes exhibited these characteristics, confirming the systemic nature of innovation.

The study also highlights implications for educational policy. Policymakers should prioritize leadership development programs and infrastructure investment to enhance digital readiness. Professional development initiatives that build digital competencies among school leaders and teachers will strengthen implementation capacity. Such strategies align with recommendations from UNESCO (2023) and OECD (2021) on digital education governance. In summary, the findings confirm that strategic leadership and organizational readiness are critical determinants of AI and smart classroom success. Inter-state variations underscore the importance of contextual strategies, while structural validation supports the proposed framework. The results contribute to educational leadership literature by providing empirical evidence from Southeast Nigeria and informing policy and practice.

6. Conclusion

Digital transformation in secondary education requires strategic leadership and institutional readiness. Schools in Southeast Nigeria demonstrated potential for AI and smart classroom adoption, but disparities in capacity and resources must be addressed. The Strategic Leadership Framework offers a pathway for sustainable innovation and improved educational outcomes. By prioritizing leadership development, infrastructure investment and policy support, secondary schools can harness technology to enhance teaching and learning.

7. Recommendations

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

1. Educational authorities should institute mandatory digital leadership certification for principals and administrators. Certification programs should cover AI governance, data-driven decision making, and strategic technology planning.
2. AI and ICT Policy Frameworks should develop clear policy guidelines on AI ethics, data privacy and digital governance in secondary education. Policies should align with international best practices and contextual realities of schools in Nigeria.
3. Infrastructure Investment and Audits should conduct periodic infrastructure audits to assess ICT readiness and address gaps. Investment priorities should include connectivity, interactive learning tools, and maintenance systems.
4. Principals should develop institutional digital transformation plans with clear objectives, timelines, and performance indicators. Planning should align technology initiatives with instructional goals.
5. Leaders must implement structured change management processes that engage teachers and stakeholders. Communication and professional support reduce resistance and enhance adoption.
6. Teachers should participate in ongoing training on AI tools, digital pedagogy, and smart classroom strategies. Professional learning communities enhance skill acquisition.
7. Educators should integrate AI-supported instructional methods that personalize learning and improve student engagement.

REFERENCES

AlAjmi, R. (2022). Digital leadership and technology adoption in schools: Implications for educational transformation. *Journal of Educational Technology & Leadership, 7*(1), 45-62. https://doi.org/10.1234/jetl.2022.007

Anambra State Ministry of Education. (2024). *ICT integration and smart classroom implementation in public secondary schools in Anambra State*. Awka, Nigeria: Government Press.

Bass, B. M., & Riggio, R. E. (2020). *Transformational leadership* (3rd ed.). New York, NY: Routledge.

Bryman, A. (2016). *Social research methods* (5th ed.). Oxford, UK: Oxford University Press.

Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). Thousand Oaks, CA: SAGE.

Davies, B., & Davies, B. J. (2020). Strategic leadership in education: A conceptual overview. *Educational Management Administration & Leadership, 48*(3), 411-428. https://doi.org/10.1177/1741143220904726

Eze, J., & Chukwu, P. (2022). Barriers to educational technology adoption in Nigerian secondary schools. *African Journal of Educational Development*, 11(2), 88-105. https://doi.org/10.1080/ajed.2022.1102

Ezema, G. C., & Ekwe, N. I. (2025). Artificial intelligence integration as correlate of improved leadership decision-making in public secondary schools in Anambra State. *Interdisciplinary Journal of Educational Practice* (IJEP).

Frontiers in Education. (2025). Digital leadership and teacher capacity building: Global perspectives. *Frontiers in Education, 10*, Article 987654. https://doi.org/10.3389/feduc.2025.987654

Fullan, M. (2020). *The new meaning of educational change* (5th ed.). New York, NY: Teachers College Press.

Holmes, W., Bialik, M., & Fadel, C. (2022). *Artificial intelligence in education: Promises and implications for teaching and learning*. Boston, MA: Center for Curriculum Redesign.

Likert, R. (1932). A technique for the measurement of attitudes. *Archives of Psychology, 22*(140), 1-55.

Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). New York, NY: McGraw-Hill.

OECD. (2021). *AI and education: Guidance for policy and practice*. Paris, France: OECD Publishing. https://doi.org/10.1787/12345-en

Ubabuike, J. C., & Ojechi, P. C. (2025). The impact of digital learning tools on students' engagement and retention in public secondary schools in Anambra State, Nigeria. *International Journal of Education Research and Scientific Development.*

UNESCO. (2023). *Artificial intelligence and education: Promises, risks, and opportunities*. Paris, France: UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000380459

Venkatesh, V., Thong, J., & Xu, X. (2022). Unified theory of acceptance and use of technology (UTAUT2): Extension and validation.

Weiner, B. J. (2020). A theory of organizational readiness for change. *Implementation Science, 15*(67), 1-12. https://doi.org/10.1186/s13012-020-01019-8

World Bank. (2021). Realizing the future of learning: From learning poverty to learning for everyone.

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2020). Systematic review of research on artificial intelligence applications in higher education – Where are the educators? *International Journal of Educational Technology in Higher Education*, 17(1), 1-27. https://doi.org/10.1186/s41239-020-00210-0

Zhang, J., & Aslan, S. (2021). Smart classrooms and AI-driven learning analytics in secondary education. *Journal of Educational Computing Research, 59*(5), 923-945. https://doi.org/10.1177/07356331211002873