

PRINCIPALS AND HEAD TEACHERS' LEADERSHIP IN SMART SCHOOL ENVIRONMENT: COMPETENCIES REQUIRED FOR EFFECTIVE DIGITAL SCHOOL MANAGEMENT IN ENUGU STATE

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Abstract

The study investigated the critical digital leadership competencies required for effective management within the evolving "smart school" environments of Enugu State, Nigeria. Two research questions guided the study. This study adopts a descriptive survey design to identify the technical, pedagogical, and administrative competencies essential for principals and head teachers to navigate this digital transformation. This population consisted of 260 junior secondary school principals and 260 primary school head teachers in Enugu state. The sample size was 128 principals and 128 head teachers. Data was collected using the Principal and Head teachers' Digital Leadership Competency questionnaire (PHDLCQ). Findings suggest that while there is a high level of awareness regarding the benefits of smart school environments, a significant "competency gap" exists among school leaders. The study also found that respondents agreed that all the identified strategies would improve principals' and head teacher's digital competencies for effective smart school management. This implies that respondents recognised continuous professional development, adequate digital infrastructure, increased funding, cyber security training, artificial intelligence training, mentoring, and regular monitoring as essential mechanisms for strengthening principals' and head teachers' digital leadership competencies. Based on the findings of the study, it was recommended amongs others that government should provide smart schools with adequate digital facilities, reliable internet access, and sufficient funding to support effective digital school management.

Keywords: Principal leadership, smart school, digital competency, digital school management, ICT

Introduction

Digital technologies and artificial intelligence have drastically changed the way in which society's schools are organized and run today. As a result of these, the notion of smart school has gained ground as an educational paradigm for reform that involves purposeful integration of digital tools into educational practices in teaching and learning, school administration, communication processes, assessment practices, and decision making. While smart schools have been identified primarily through the presence of ICT infrastructure, smart schools are defined also by the integration of coordinated digital ecosystems to facilitate data-driven leadership, continuous institutional improvement, and technology-enhanced teaching and learning (Sheninger, 2019; UNESCO, 2023).

However, new research is increasingly highlighting the role of leadership within school administrations in effectively and sustainably managing digital transformation to ensure the success of smart school initiatives. The evolving nature of education has positioned school principals and head teachers as central figures in determining whether digital transformation succeeds or fails within their institutions. Their roles include developing institutional vision, coordinating the integration of ICT, supervising the implementation of teaching and learning, providing allocation of digital resources, and facilitating professional development for teachers. Thus, the definition of digital leadership competency has been established as a key factor for successful school transformation in the digital era (Leithwood et al., 2020; Bush, 2020). This suggests that school leadership is a significant factor, and it is supported by empirical evidence. A landmark meta-analysis by

Leithwood et al. (2020), drawing on over 8,000 studies conducted across 43 countries, revealed that the quality of school leadership accounts for 25 % of the variation seen in student learning outcomes. In a similar study, Hamilton et al. (2019) noted that principals and head teachers who had high digital literacy were 3.2 times more likely to integrate ICT meaningfully into schools than principals and head teachers who had low digital literacy skills. These findings support the view that digital transformation in education is basically a leadership challenge and not a technology challenge.

The global trend towards the promotion of digitally competent school leadership has also shaped educational reform in Africa, especially in Nigeria. The efforts towards digital transformation in education have been strengthened through the various national and state level policies including the National Digital Economy Policy and Strategy (2020-2030), the revised National Policy on Education (FRN, 2023), and other initiatives related to ICT. For example, several initiatives have been introduced to promote the use of ICTs in education, such as the establishment of ICT centres in secondary schools and the provision of ICT infrastructure, while in Enugu State, e-learning projects have been implemented to improve teaching and administrative efficiency (Enugu State Ministry of Education, 2023). Even with these investments, evidence indicates that the transformation of digital infrastructure into a functional school management is not uniform and is hindered by the lack of leadership skills, a poor ICT governance and institutional capacity.

This problem is emphasized by empirical studies undertaken in Enugu State. 63.4% of secondary school principals, as reported by Ugwuanyi (2022), felt their ICT skills were not adequate for effective ICT management in schools. In a similar vein, Onuoha and Ugwuanyi (2023) found that the lack of leadership ability, not just infrastructural limitations, was the major cause of the inadequacy of ICTs in schools. In line with this, Nwachukwu (2023) noted that principals who had weak competencies in using ICTs used the facilities 2.7 times less effectively than the principals who had strong competencies. Perhaps more worrisome is the fact that just 19.3% of principals were found to be proficient in data-driven decision-making, and skills in cybersecurity and e-learning oversight were still quite low. The results of these findings indicate that the current challenge that faces smart school implementation in Enugu State is not simply technological access but a lack of readiness of the leadership to manage the smart school.

Theoretically, this study is based on Transformational Leadership. This Theory describes the process of how leaders can encourage organisational change by motivating employees, influencing the culture of the organisation, and stimulating innovation through idealized influence, inspirational motivation, intellectual stimulation and individualized consideration (Bass & Avolio, 1994). These leadership characteristics are essential in digital school environments to drive transformative change and promote a culture of ongoing innovation. This is supported by empirical studies, such as those conducted by Petrie (2020), who concluded that transformational leadership has a positive impact on facilitating the integration of ICT in schools, and Okeke and Mbah (2022) who reported the same effect on principals of secondary schools in Enugu State. So, this theory offers an explanatory lens when looking at how the behaviour of leaders can have an impact on the outcomes of digital transformation.

Empirical literature also shows four prevalent points of interest regarding school leadership research in the context of digitalization. First, research on leadership competencies also highlights that effective leaders today need to possess more than the simple technical skills of ICT literacy; they need multidimensional skills, such as strategic planning, digital communication, and instructional leadership (Sheninger, 2019; UNESCO, 2023). Second, regarding research on ICT integration, there is consistently evidence that digitally competent principals greatly improve teachers' ICT integration and the success of

the school's improvement efforts (Leithwood et al., 2020; Fullan, 2021). Okeke and Mbah (2022) in Nigeria, found that there was a significant relationship between the training of ICT and effective school management. Lastly, research on Data Driven Leaders shows that principals have long standing weaknesses in leveraging digital data for decision-making. Only 19.3% of principals exhibited an acceptable level of competence in this area, which is similar to Onuoha and Ugwuanyi (2023), who noted the same level of incompetence in instructional monitoring. The literature shows good agreement that digital leadership becomes a key factor in the management of the smart school. Yet, there is a huge gap in the contextualization of global competency frameworks in Nigerian schools, especially the universal basic education schools in Enugu State. Most studies have concentrated on the isolated aspects of ICT integration instead of creating an ICT competency model specific to local realities. Therefore, this study makes its contribution by identifying and validating from the empirical evidence the digital leadership competencies that are needed for effective management of smart school in the context of Enugu State Universal Basic Education schools.

Although there are policy and institutional interest in digital education, there are no empirically validated and context-specific frameworks to define the digital leadership competencies needed in the management of smart school to be effective in Enugu State schools. Although the ISTE Standards for Education Leaders (2022) and UNESCO's ICT Competency Framework (2023) are good global reference points, they do not adequately reflect the infrastructural, administrative and socio-educational environment of schools in Nigeria. This area is a great challenge from a theoretical and practical perspective because there is no local competency framework, which could impact on how effective and sustainable digital transformation is. With this background, the study explores the competency attributes of digital leaders for effective smart school management in Enugu State, Nigeria, and highlights the gap between the required and actual competency attributes of the school principals and head teachers in Enugu State, Nigeria.

Statement of the Problem

The Enugu State Government's investment in smart school infrastructure represents a significant public commitment to educational modernization. However, without principals and head teachers who are equipped to lead and manage digital school environments effectively, this investment risks yielding sub-optimal returns. Principals are the pivotal agents through whom school-level digital transformation is either realized or stifled. Research across diverse educational contexts consistently identifies principal leadership as one of the strongest determinants of ICT integration success in schools. Principals who possess a digital vision, who can build institutional culture around technology use, facilitate teacher professional development, manage digital infrastructure, leverage data for decision-making, and engage stakeholders in digital governance create the enabling conditions for smart school environments to flourish. Conversely, principals without these competencies become bottlenecks unable to leverage available technology effectively regardless of its sophistication. There is a notable shortage of studies focused specifically on primary school head teachers' perceptions, readiness, and management practices around smart schools in Nigeria. International research on smart school settings, found that digital leadership and digital competence exert a positive and statistically significant influence on teacher performance, underscoring the centrality of the head teacher's own digital leadership capacity. A study on head teachers and ICT in Machakos, Kenya found that while most head teachers had basic ICT literacy, only a few actually integrated ICT in teaching and learning, pointing to the gap between literacy and competent application. A study in Niger State examined the competencies of head teachers and their capacity-building needs, findings revealed that head

teachers' competencies in key management functions were below expected performance, and that there is a significant need for capacity-building. In Enugu State, as in much of Nigeria's South-East geopolitical zone, questions about the digital leadership competency of secondary school principals have received little systematic empirical attention. The extant literature on principal leadership in Enugu State has largely focused on conventional administrative competencies; financial management, staff welfare, curriculum oversight, and student discipline, leaving the domain of digital school management significantly underexplored. This study fills this gap by systematically assessing the digital leadership competencies of secondary school principals and primary school head teachers in Enugu State and identifying the specific competency needs that must be addressed to enable effective management of smart school environments

Purpose of the Study

The study investigated the critical digital leadership competencies required for effective management within the evolving "smart school" environments of Enugu State, Nigeria. Specifically, the study seeks to:

1. identify the digital competencies required for effective management of smart school environments by principals in Enugu State secondary schools.
2. determine the extent to which principals in Enugu State secondary schools currently possess the identified digital leadership competencies.

Research Questions

The following research questions guided the study:

1. What digital competencies are required for effective management of smart school environments by principals in Enugu State secondary schools?
2. What strategies can be adopted to improve principals' digital competencies for effective management of smart school environments in Enugu State secondary schools?

Methods

The study used descriptive survey research design since there was no manipulation of variables in the study and it aimed at systematically assessing and comparing the attitudes of secondary school principals and head teachers towards the digital leadership competencies required to effectively manage a smart school. They deemed it suitable for the purposes of a competency profile, the level of competency possessed and the perception gap between the school leader categories. The use of the instrument is similar to some studies conducted by some scholars in educational leadership (Onuoha & Ugwuanyi, 2023). The study was carried out in Enugu State, Nigeria with 260 junior secondary smart school principals and 260 head teachers from the Enugu state smart green school. The state was identified as appropriate for the study due to the current government efforts on digital education such as the provision of ICT and e-learning interventions in public secondary schools. The population consisted of the total number of 260 principals and 260 head teachers of smart school in Enugu state. The sample size is 118 headteachers and 118 principals of smart schools. The researcher-developed Principal and Head Teachers Digital Leadership Competency Scale (PHDLCS) was used to collect data, which consists of 21 items organized with the two research questions and relevant empirical research. One expert in measurement and evaluation and two experts in educational administration validated the instrument. Content validity was conducted with 30 principals and 30 head teachers of government secondary schools in the State that has similar demographic and administrative characteristics as the target population. Mean and standard deviation were used to answer the research questions.

Results

Table 1: Digital competencies required for effective management of smart school environments by principals in Enugu State Smart schools

S/N	Digital Competency	Mean	SD	Decision
1	Ability to use computers and digital devices for school administration.	3.39	0.71	R
2	Ability to use school management information systems effectively.	3.35	0.73	R
3	Ability to manage digital records and information securely.	3.35	0.73	R
4	Ability to communicate effectively through digital platforms.	3.33	0.72	R
5	Ability to organise and manage virtual meetings.	3.26	0.76	R
6	Ability to supervise teaching and learning through digital technologies.	3.32	0.83	R
7	Ability to analyse digital data for informed decision making.	3.35	0.70	R
8	Ability to promote teachers' integration of digital technologies into classroom instruction.	3.33	0.75	R
9	Ability to lead digital innovation initiatives in the school.	3.27	0.77	R
10	Ability to implement policies on the responsible use of technology.	3.39	0.69	R
Cluster Summary		3.33	0.74	R

*R = Required

The findings in Table 1 indicate that respondents considered all the identified digital competencies as required for effective management of smart school environments by principals in Enugu State secondary schools, as all the mean ratings exceeded the criterion mean of 2.50 and ranged from 3.26 to 3.39. The highest rated competencies were the ability to use computers and digital devices for school administration and the ability to implement policies on the responsible use of technology (Mean = 3.39 each), while the ability to organise and manage virtual meetings received the lowest mean rating (Mean = 3.26), although it was still regarded as required. The cluster mean of 3.33 with a standard deviation of 0.74 indicates that respondents generally agreed that the identified digital competencies are required for effective management of smart school environments in Enugu State secondary schools.

Table 2: Strategies for improving digital competencies for effective smart school management

S/N	Item Statement	Mean	SD	Decision
1	Provide regular digital leadership training for principals.	3.09	0.71	Agree
2	Organise continuous ICT professional development programmes.	3.15	0.73	Agree
3	Provide adequate digital infrastructure in schools.	3.25	0.73	Agree
4	Ensure reliable internet access in schools.	3.13	0.72	Agree
5	Train principals on cyber security and data protection.	3.60	0.76	Agree
6	Promote mentoring among digitally competent principals.	3.22	0.83	Agree
7	Increase funding for digital technologies in schools.	3.55	0.70	Agree
8	Train principals on the use of artificial intelligence in school management.	3.33	0.75	Agree
9	Include digital competence in principals' performance	3.27	0.77	Agree

evaluation.

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|----|---|------|------|-------|
| 10 | Monitor and evaluate principals' digital leadership competencies regularly. | 3.39 | 0.69 | Agree |
|----|---|------|------|-------|

Cluster Summary

3.30 0.74 Agree

The findings in Table 2 show that respondents agreed that all the identified strategies would improve principals' digital competencies for effective smart school management, as all the mean ratings exceeded the criterion mean of 2.50 and ranged from 3.09 to 3.60. The highest rated strategies were training principals on cyber security and data protection (Mean = 3.60) and increasing funding for digital technologies in schools (Mean = 3.55), while providing regular digital leadership training for principals received the lowest mean rating (Mean = 3.09), although it was still agreed upon by the respondents. The cluster mean of 3.30 with a standard deviation of 0.74 indicates overall agreement that the identified strategies are effective for improving principals' digital competencies for smart school management in Enugu State secondary schools.

Discussion of Findings

The study found that respondents considered all the identified digital competencies as required for effective management of smart school environments by principals in Enugu State secondary schools. This finding suggests that school leaders recognise that effective management of smart schools requires competencies beyond traditional administrative skills, including digital communication, data driven decision making, technology integration, digital innovation, and implementation of digital policies. The finding may be attributed to the increasing digital transformation of educational systems, which has made digital competence an essential requirement for school leadership. As schools continue to adopt digital technologies for teaching, learning, communication, and administration, principals are expected to possess the competencies needed to lead these changes effectively. The finding is consistent with Abdullah and Abdul Kadir (2023), who found a significant positive relationship between principals' digital leadership and teachers' digital competency, indicating that principals require strong digital competencies to effectively lead technology integration in schools. It also agrees with Nawaz et al. (2023), who reported that digital leadership competencies significantly enhanced teachers' performance and improved institutional effectiveness through the effective use of technology. However, the finding contradicts Suratman et al. (2020), who found no significant relationship between digital leadership competencies and teachers' job performance, suggesting that digital leadership alone may not always translate into improved educational outcomes.

The study also found that respondents agreed that all the identified strategies would improve principals' digital competencies for effective smart school management. This implies that respondents recognised continuous professional development, adequate digital infrastructure, increased funding, cyber security training, artificial intelligence training, mentoring, and regular monitoring as essential mechanisms for strengthening principals' digital leadership competencies. This finding may be due to the rapid evolution of digital technologies, which requires school leaders to continuously update their knowledge and skills in order to manage smart school environments effectively. It also reflects the understanding that developing digital competencies requires not only individual commitment but also institutional support through training opportunities, adequate resources, and supportive policies. The finding agrees with Hamzah et al. (2025), who identified continuous professional development, organisational support, and competency development as critical requirements for effective digital leadership in educational institutions. It also corroborates the findings of Abdullah and Abdul Kadir (2023), who recommended sustained training and capacity building programmes for school leaders to strengthen their digital leadership competencies. However, the finding disagrees with Suratman et al. (2020), who reported that

leadership development initiatives alone did not significantly improve organisational performance where institutional support and technological readiness were inadequate.

Conclusion

The study concludes that effective management of smart school environments in Enugu State secondary schools depends largely on principals possessing adequate digital leadership competencies. The findings revealed that respondents considered competencies such as digital communication, use of school management information systems, digital data management, technology integration, digital innovation, and implementation of digital policies as essential for effective digital school management. The study also established that improving these competencies requires deliberate strategies, including regular digital leadership training, continuous professional development, provision of adequate digital infrastructure, reliable internet connectivity, increased funding, cyber security training, artificial intelligence training, mentoring, and continuous monitoring of principals' digital leadership.

Recommendations

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

1. The Enugu State Ministry of Education should organise regular training programmes to improve head teachers and principals' digital leadership competencies for effective management of smart school environments.
2. Government should provide smart schools with adequate digital facilities, reliable internet access, and sufficient funding to support effective digital school management.
3. The Post Primary Schools Management Board should regularly assess principals' digital competencies and encourage continuous professional development through mentoring and capacity building programmes.

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