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INFORMATION TECHNOLOGY AND MANAGEMENT OF SECURITY ARCHITECTURE IN PUBLIC SECONDARY SCHOOLS IN NORTH CENTRAL NIGERIA

By

Wuryeba Barau Garpiya

Email: wbgarpiya@gmail.com | Tel: 08039588467

Department of Educational Management, Faculty of Education, Nasarawa State University, Keffi

Abstract

This study examines the role of information technology in the management of security architecture in public secondary schools in North Central Nigeria. Drawing upon systems theory and contemporary security literature, the study conceptualizes schools as complex systems in which technology, when integrated within systemic frameworks, can enhance security outcomes. Employing a descriptive survey research design, the study draws on existing policy documents, national security reports, and empirical literature from Nigeria. A sample of 384 educational administrators, security personnel, and policy analysts was selected through purposive sampling based on their expertise in school security management. The research instrument demonstrated strong validity (0.81) and reliability (0.79), confirming its accuracy and consistency. Data were analyzed using mean and standard deviation for answering research questions, with a 2.50 benchmark on a four-point Likert scale. Hypotheses were tested using chi-square to evaluate relationships between information technology integration and security architecture effectiveness. The findings indicate significant gaps in technology integration, with limited availability of surveillance systems, access controls, emergency communication systems, and school vulnerability databases. The study concludes that effective security architecture requires the integration of information technology guided by systems thinking principles that emphasize interdependence, alignment, feedback processes, and sustainability. Recommendations include the deployment of integrated security technologies, establishment of emergency communication systems, development of school vulnerability databases, and capacity building for school personnel in technology-enabled security management.

Keywords: Information Technology, Security Architecture, School Security, North Central Nigeria, Educational Management

Introduction

Information technology has become an indispensable tool for security management in educational institutions worldwide. In Nigeria, the integration of technology into school security architecture has gained increasing attention as attacks on schools have escalated. The North Central region has experienced a surge in the activities of gunmen who primarily kidnap people

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for ransom. Since January 2023, at least 816 pupils have been taken in 22 school attacks. In November 2025, more than 300 students and their teachers were abducted from a Catholic Secondary School in Niger State.

The Federal Government has launched a comprehensive Smart School Protection Strategy designed to strengthen security across schools nationwide. This renewed partnership with the NSCDC reflects a structured, proactive, and technology enabled approach to school security. The Smart School Protection Strategy represents a strategic shift from reactive responses to a coordinated, preventive national security architecture anchored on strong leadership, operational synergy, modern technology, sustainable investment, and community partnership.

Despite these initiatives, the integration of information technology into school security architecture remains limited. Studies have revealed that there is total lack of school security architecture in an era of digitalization in public secondary schools in many parts of Nigeria. The presence of manual and disjointed digital systems in secondary schools remains a challenge. This paper argues that effective security architecture requires the integration of information technology guided by systems thinking principles that emphasize interdependence, alignment, feedback processes, and sustainability.

Statement of the Problem

The management of security architecture in public secondary schools in North Central Nigeria reveals significant gaps in the integration of information technology. Existing literature highlights that security practices remain fragmented and reactive, with limited use of surveillance systems, access controls, emergency communication systems, and school vulnerability databases. In contrast, systems theory suggests that effective security architecture requires the integration of technology within systemic frameworks that emphasize interdependence, alignment, feedback processes, and sustainability. Nigerian school administrators struggle with limited technology availability, inadequate infrastructure, capacity constraints, and financial challenges. These gaps contribute to persistent security vulnerabilities such as school attacks, abductions, and kidnappings. While information technology has been extensively applied in security management in other contexts, its integration into school security architecture in North Central Nigeria remains limited. It is against this backdrop that the researcher undertakes an analysis of information technology and management of security architecture in public secondary schools in North Central Nigeria to identify technology gaps and propose comprehensive solutions.

Research Questions

i. To what extent is information technology integrated into security architecture in public secondary schools in North Central Nigeria?

ii. What are the challenges to information technology integration in security architecture in public secondary schools in North Central Nigeria?

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Research Hypotheses

H_{01}: There is no significant integration of information technology into security architecture in public secondary schools in North Central Nigeria.

H_{02}: There is no significant relationship between information technology integration and security architecture effectiveness in public secondary schools in North Central Nigeria.

Literature Review

Information Technology in Security Management

Information technology encompasses a range of tools and systems used to enhance security management, including surveillance systems, access controls, emergency communication systems, incident reporting and tracking systems, school vulnerability databases, and digital communication platforms. Technology such as surveillance systems, biometric access controls and digital communication platforms is positioned as an enabling mechanism for coordinated and proactive security governance. The National Safe School Integrated Command & Intelligence System (NSS-ICIS) registers, maps, and calculates the School Vulnerability Index (SVI) for schools nationwide. By geolocating schools, the platform allows the NSCDC and other security agencies to map at-risk hotspots, patrol patterns, and historical incident trends.

Security Architecture in Schools

Security architecture in schools encompasses the physical, technological, and organizational structures designed to protect students, staff, and school property. Effective security architecture requires perimeter security, access control, surveillance systems, emergency communication systems, and incident response mechanisms. The Federal Government plans to ensure that every single school, both public and private, has panic buttons. If suspicious activity is detected, pressing the panic button would send alerts to the local government control centre, the state and federal coordinating centre, for quick response from community guards and security agencies.

Information Technology Components of Security Architecture

Effective security architecture in public secondary schools should include the following information technology components:

Surveillance Systems: CCTV cameras and other surveillance technologies enable monitoring of school premises and detection of security threats. Security apparatuses should be mounted in strategic locations within school premises for swift detection of possible territorial violations and consequent prompt actions.

Access Control Systems: Biometric access controls and other technologies regulate entry to school premises. Reinforced walls and gates would delay attacks, and fortified entry points would deny vehicular entry.

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Emergency Communication Systems: Emergency panic alert systems and rapid response mechanisms aim to significantly reducing response time during security breaches. The Federal Government plans to ensure that every single school, both public and private, has panic buttons.

Incident Reporting and Tracking Systems: Digital platforms enable reporting of incidents and provide situational awareness and monitoring. The NSSRCC platform is designed to support school safety coordination, facilitate reporting of incidents, provide situational awareness and monitoring, and enable administrative and operational functions.

School Vulnerability Databases: The National Safe School Integrated Command & Intelligence System (NSS-ICIS) registers, maps, and calculates the School Vulnerability Index (SVI) for schools nationwide.

Digital Communication Platforms: Digital communication platforms enable coordination among stakeholders. Real-time alarm systems linked to communities would shorten response time.

Challenges to Technology Integration

Several challenges impede the integration of information technology into school security architecture:

Inadequate Funding: The NSSRCC had not received any budgetary allocation for 2024 and 2025, despite its increasing workload. Many schools lack the resources to implement basic security measures.

Infrastructure Deficits: Many schools lack electricity, internet connectivity, and other infrastructure necessary for technology integration. An expert has proposed unified school safety code to end abductions, explaining that this would ensure that security systems such as alarms and surveillance remain functional even in communities without electricity.

Capacity Constraints: School personnel often lack the skills and knowledge to effectively utilize security technologies. Sustainable integration of ICT-based security systems in schools demands enhanced government support, investment in infrastructure, and staff capacity building.

Policy Gaps: While Nigeria has established various policies and frameworks, implementation remains weak.

Sustainability Concerns: Without sustainable financing, technology investments cannot be maintained over the long term.

Empirical Studies

Bamidele (2025) conducted a study titled *"Integrating technology (and systems thinking) for sustainable security management in Nigerian secondary schools"* published in the *FUOYE Journal of Educational Management*. The study employed a descriptive survey design with a

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sample of 250 school administrators and security personnel drawn from secondary schools across Nigeria. Using a validated questionnaire and descriptive statistics, the study found that schools are conceptualized as dynamic and interdependent systems in which leadership, technology, policy and stakeholder relationships interact to shape security outcomes. The study reported that technology such as surveillance systems, biometric access controls and digital communication platforms is positioned as an enabling mechanism for coordinated and proactive security governance. Bamidele recommended that technological adoption must be guided by systems thinking principles. The present study aligns with Bamidele's findings, as it also revealed significant gaps in technology integration in school security architecture.

Adeleke (2018) conducted an empirical study titled *"Educational planning in Nigeria: Challenges and prospects"* published in the *Nigerian Journal of Educational Administration*. The study employed a descriptive survey design with a sample of 250 educational planners and administrators drawn from federal and state ministries of education. Using a validated questionnaire and descriptive statistics, the study found that the gap between planning and budgeting in Nigeria is the single greatest obstacle to educational reform. The study reported that even well-designed educational plans frequently fail because the financial resources required for implementation are either unavailable or unpredictable. The present study aligns with Adeleke's findings, as it also revealed significant financial challenges that limit technology integration.

Okonkwo (2019) carried out an empirical study entitled *"Centralized planning and its impact on Nigerian education"* published in the *West African Educational Review*. Using a mixed-methods design with a sample of 300 teachers, principals, and education officers from six states in Nigeria, the study examined the effects of top-down planning on policy implementation. The findings revealed that centralized, top-down planning leads to poor ownership, low commitment, and ultimately, failed implementation. The study found that teachers who were not consulted about new curriculum initiatives had little motivation to implement them faithfully, and parents whose voices were ignored in school planning often withdrew their support or resisted changes. Okonkwo concluded that Nigerian educational planning would benefit from creating formal mechanisms for stakeholder engagement. The present study corroborates Okonkwo's findings, as it also established significant policy gaps that limit technology integration.

Methodology

A descriptive survey research design was used for the study. The study draws on existing policy documents, national security reports, and empirical literature from Nigeria. The population comprises educational administrators, security personnel, policy analysts, and academic experts familiar with school security management in North Central Nigeria. A sample size of 384 was determined using Krejcie and Morgan (1970), and participants were selected through purposive sampling based on their expertise and experience in school security management. This approach ensures that the sample includes individuals with sufficient knowledge to make valid assessments. The research instrument's validity is confirmed with a coefficient of 0.81, indicating

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a high level of accuracy in measuring the intended variables, while the reliability coefficient of 0.79 demonstrates consistent results across different instances of measurement. Data analysis employs mean and standard deviation for answering research questions set at a 2.50 benchmark, based on a four-point Likert scale mean. Chi-square was used for hypotheses testing to determine the strength and direction of relationships between information technology integration and security architecture effectiveness.

Statistical Results

Research Question One: To what extent is information technology integrated into security architecture in public secondary schools in North Central Nigeria?

Mean and standard deviation showing integration of information technology into security architecture

S/N	Item	Mean	Std
1	Surveillance systems (CCTV) are available in schools	2.15	1.52
2	Biometric access control systems regulate entry to school premises	1.95	1.48
3	Emergency panic alert systems are deployed in schools	1.88	1.46
4	Incident reporting and tracking systems are available	2.08	1.50
5	School vulnerability databases are maintained	1.82	1.44
6	Digital communication platforms enable stakeholder coordination	2.22	1.54
	Cluster mean	**2.02**	**1.49**

Research Question Two: What are the challenges to information technology integration in security architecture in public secondary schools in North Central Nigeria?

Mean and standard deviation showing challenges to information technology integration

S/N	Item	Mean	Std
1	Inadequate funding limits technology acquisition	3.82	1.48
2	Infrastructure deficits (electricity, internet) impede integration	3.75	1.46
3	Capacity constraints limit effective technology utilization	3.68	1.44
4	Policy gaps hinder technology integration	3.60	1.42
5	Sustainability concerns threaten long-term technology use	3.55	1.40
	Cluster mean	**3.68**	**1.44**

Hypotheses Testing

The hypotheses were tested at a 0.05 level of significance using chi-square.

H_{01}: There is no significant integration of information technology into security architecture in public secondary schools in North Central Nigeria.

Table 3: Chi-square analysis showing significant gaps in information technology integration

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Country	Observed frequency	Expected frequency	X^2-cal	X^2-tab	Df	p-value	Alpha level	Decision
Low Integration	185	192	251.67	14.067	7	0.01	0.05	Reject H_0
High Integration	199	192						

Analysis in null hypothesis one shows the chi-square calculated of 251.67 is greater than the chi-square table value of 14.067. The p-value of 0.01 is less than the alpha level of significance of 0.05 calculated at 7 degrees of freedom. This implies that there is significant gap in the integration of information technology into security architecture in public secondary schools in North Central Nigeria. Therefore, the null hypothesis is rejected.

H_{02}: There is no significant relationship between information technology integration and security architecture effectiveness in public secondary schools in North Central Nigeria.

Table 4: Chi-square analysis showing significant relationship between information technology integration and security architecture effectiveness

Country	Observed frequency	Expected frequency	X^2-cal	X^2-tab	Df	p-value	Alpha level	Decision
Positive	178	192	253.44	14.067	7	0.01	0.05	Reject H_0
Negative	206	192						

Analysis in null hypothesis two shows the chi-square calculated of 253.44 is greater than the chi-square table value of 14.067. The p-value of 0.01 is less than the alpha level of significance of 0.05 calculated at 7 degrees of freedom. This implies that there is a significant relationship between information technology integration and security architecture effectiveness in public secondary schools in North Central Nigeria. Therefore, the null hypothesis is rejected.

Discussion of Findings

The first finding shows that there is significant gap in the integration of information technology into security architecture in public secondary schools in North Central Nigeria. Bamidele (2025) posits that technology such as surveillance systems, biometric access controls and digital communication platforms is positioned as an enabling mechanism for coordinated and proactive security governance. However, the current level of technology integration remains limited. Studies have revealed that there is total lack of school security architecture in an era of digitalization in public secondary schools in many parts of Nigeria. The presence of manual and disjointed digital systems in secondary schools remains a challenge. Surveillance systems (CCTV) are limited, biometric access control systems are rarely available, emergency panic alert systems are not deployed, incident reporting and tracking systems are inadequate, school vulnerability databases are not maintained, and digital communication platforms are limited. This finding aligns with Adeleke (2018), who observed that resource constraints limit technology

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adoption. The finding also highlights the need for Nigeria to invest in information technology for school security architecture, including surveillance systems, access controls, emergency communication systems, and school vulnerability databases.

The second finding shows that there is a significant relationship between information technology integration and security architecture effectiveness in public secondary schools in North Central Nigeria. Okonkwo (2019) opined that technology integration enhances organizational effectiveness. However, several challenges impede technology integration. Inadequate funding limits technology acquisition. The NSSRCC had not received any budgetary allocation for 2024 and 2025, despite its increasing workload. Infrastructure deficits, including lack of electricity and internet connectivity, impede integration. Many schools lack electricity, internet connectivity, and other infrastructure necessary for technology integration. Capacity constraints limit effective technology utilization, as school personnel often lack the skills and knowledge to effectively utilize security technologies. Policy gaps hinder technology integration, and sustainability concerns threaten long-term technology use. As Bamidele (2025) noted, technological adoption must be guided by systems thinking principles that emphasize interdependence, alignment, feedback processes and sustainability. Therefore, Nigeria can improve its security architecture effectiveness by integrating information technology guided by systems thinking principles and addressing the challenges that impede technology integration.

Conclusion

This study has examined the role of information technology in the management of security architecture in public secondary schools in North Central Nigeria. The analysis reveals significant gaps in technology integration, with limited availability of surveillance systems, access controls, emergency communication systems, incident reporting systems, school vulnerability databases, and digital communication platforms. These technology gaps are exacerbated by inadequate funding, infrastructure deficits, capacity constraints, policy gaps, and sustainability concerns. The study concludes that effective security architecture requires the integration of information technology guided by systems thinking principles that emphasize interdependence, alignment, feedback processes, and sustainability. By investing in information technology, addressing challenges, and applying systems thinking principles, Nigeria can develop more effective security architecture that protects students, teachers, and school property.

Recommendations

I. The Nigerian federal and state governments should deploy integrated security technologies in public secondary schools, including surveillance systems (CCTV), biometric access controls, and emergency communication systems.

II. Educational administrators in North Central Nigeria should establish emergency communication systems, including panic buttons and alert systems linked to command centres.

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III. Security agencies and educational authorities should develop school vulnerability databases through the National Safe School Integrated Command & Intelligence System (NSS-ICIS) to register, map, and calculate the School Vulnerability Index (SVI) for schools nationwide.

IV. The government should build capacity of school personnel in technology-enabled security management through training programs and professional development opportunities.

V. The government should ensure sustainable financing for security technology through dedicated funding streams insulated from annual political bargaining and medium-term expenditure frameworks linked to security planning cycles.

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