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EFFECTIVENESS OF ARTIFICIAL INTELLIGENCE IN THE PROMOTION OF SCHOOL SECURITY MANAGEMENT IN PUBLIC SECONDARY SCHOOLS IN ANAMBRA STATE

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ABSTRACT

This study examined the effectiveness of Artificial Intelligence (AI) in promoting school security management in public secondary schools in Anambra State. Specifically, the study investigated the effectiveness of AI-based surveillance systems and predictive security analytics in promoting security management in public secondary schools. The research was guided by two research questions and two null hypotheses, which were tested at a 0.05 level of significance. The population of the study comprised all 267 principals of public secondary schools in Anambra State. A descriptive survey research design was adopted. A structured questionnaire titled "Effectiveness of Artificial Intelligence in Promoting School Security Management Questionnaire (EAIPSSQ)" was developed and validated by three security experts for data collection. The instrument was organized into two clusters corresponding to the research questions and utilized a 4-point rating scale format. The reliability of the instrument was achieved through a pilot test. The Cronabach Alph reliability co-efficients of 0.91 and 0.78 for cluster 1 and 2 respectively with an overall reliability co-efficient of 0.84. Data were analyzed using mean scores to answer the research questions and t-test statistics to test the hypotheses. Findings revealed that AI-based surveillance systems are effective for monitoring of school premises and contribute to rapid incident detection and response. Furthermore, predictive security analytics using AI tools were found to be effective in assessing risk levels, thereby enabling proactive security planning and threat prevention. Findings also indicated a significant difference in the rating of the effectiveness of AI technologies by principals of rural and urban secondary schools in Anambra State. The study concluded that AI technologies play a vital role in strengthening school security management, but disparities exist between rural and urban areas due to infrastructural and technological limitations. It was recommended that the Anambra State Ministry of Education in collaboration with the Post Primary Schools Service Commission (PPSSC) should support equitable access to AI-driven security systems in all secondary schools by investing in infrastructure, training and policy formulation to guide ethical and efficient use of AI in school security.

Keywords: Artificial Intelligence (AI), School Security Management, Predictive Security Analytics, Surveillance Systems, Public Secondary Schools

Introduction

Schools are fundamental institutions in society, entrusted with the responsibility of nurturing the intellectual, moral, and social development of individuals. An essential part of a child's education and growth is the school. This is because the school serves as the focal point for the teaching and learning process, making it imperative to prioritize the safety of the students, faculty, and other staff members. Onuorah et al. (2020) a school is a location where people are groomed for their future roles in society. Schools are therefore places where people go to grow, learn, and receive an education in order to get ready for the future. Beyond their educational mandate, schools must provide a safe and secure environment conducive to effective teaching and learning. The importance of school security cannot be overstated, as it ensures the protection of students, staff, and property, thereby fostering an atmosphere where educational activities can thrive without fear or disruption.

Security management encompasses the strategies and measures implemented to safeguard the school community from potential threats. According to Ikogho (2015), the primary aim of security management practices is to deter, detect, delay, and reduce the likelihood of potential hazards that could cause loss of lives and property in any institution. Similarly, Ayeni and Orhewere (2021) stated that effective security management involves not only the implementation of safety apparatus but also the education and preparedness of school personnel and students to respond appropriately during emergencies. Despite these measures, Nigerian secondary schools have increasingly faced security challenges in recent years. Issues such as vandalism, bullying, cultism, and external threats have disrupted academic activities and posed significant risks to the safety of students and staff. Adienne and Oliobi (2024) reported that the socio-economic and academic consequences of kidnapping in senior secondary schools, noting that such incidents have led to psychological trauma among students and a decline in academic performance.

Furthermore, Okeke et al. (2023) identified bullying as a prevalent issue among in-school adolescents in Anambra State, with psychological factors contributing to its persistence. Onuorah et al. (2020) observed that the high rate of indiscipline in schools is evident in students being victimized by fellow students, teachers, cultists, and kidnappers. This is further enunciated by the plethora of school violence in some parts of Anambra State. Sadly, cultism and cult activities have been on the increase among secondary school students in Anambra State. Usman (2016) noted that there is rarely any academic session without reported incidents of cult-related violent clashes in most secondary schools in the country, which usually result in the loss of lives of promising youths. The infiltration of cultism into secondary schools has been linked to various factors, including peer pressure, lack of parental guidance, and the influence of cult

groups from tertiary institutions seeking to recruit younger members. This has led to a climate of fear and insecurity within educational institutions, adversely affecting the academic performance and psychological well-being of students. These instances underscore the urgent need for effective security management strategies in Anambra State's public secondary schools. The integration of artificial intelligence (AI) into school security management presents a promising avenue to enhance safety measures.

Artificial Intelligence (AI) has emerged as a transformative force in various sectors, including education. In the context of school security management, AI offers innovative solutions to enhance safety measures, particularly in public secondary schools. Machii et al. (2021) defined AI as a system's ability to correctly interpret external data, learn from such data, and use those learning to achieve specific goals and tasks through flexible adaptation. This definition emphasizes the adaptive and goal-oriented nature of AI systems. Bartneck (2021) defined AI as the capacity of computers or other machines to exhibit or simulate intelligent behavior, highlighting the simulation aspect of AI in replicating human-like intelligence. The World Encyclopedia, as cited by Bartneck (2021), defined AI as the science concerned with developing computers and computer programs that model human intelligence, focusing on the modeling and replication of human cognitive functions. Tegmark (2017) discusses AI in the context of machines that can perform tasks requiring human intelligence, emphasizing its potential impact on the future of life on Earth and beyond. The integration of AI into school security systems has revolutionized the way educational institutions approach safety. By leveraging AI technologies, schools can proactively identify and mitigate potential threats, ensuring a secure learning environment for students and staff.

AI-powered surveillance systems enhance school security by providing real-time monitoring and advanced threat detection. Surveillance technology has evolved significantly from its origins in simple video recording and manual monitoring. In the past, surveillance systems depended heavily on basic equipment and human operators. Today, however, these systems have been transformed by the integration of artificial intelligence (AI) and machine learning. Modern surveillance now features advanced algorithms capable of analyzing data in real-time, leading to more proactive and predictive approaches to security. According to the National Institute of Standards and Technology (2023), the development of guidelines for AI in surveillance is crucial to promoting transparency and accountability in its application. Binns (2023) also highlighted the dual nature of AI in surveillance which offers both significant benefits and notable challenges.

Among the key advantages of AI-powered surveillance systems are:

1. **Faster Detection**: AI can rapidly process video feeds to identify

unusual or suspicious behavior, enabling quicker response times than traditional surveillance methods.

2. **Predictive Capabilities**: By analyzing historical and real-time data, AI systems can forecast potential security threats or criminal actions, allowing security teams to take preventive measures and better allocate resources.
3. **Increased Efficiency**: Routine surveillance activities can be automated using AI, reducing the dependence on constant human supervision and allowing personnel to concentrate on high-level security tasks.
4. **Enhanced Evidence Management**: The combination of AI technologies with high-resolution cameras improves the quality and accuracy of evidence collection and analysis, which is vital for effective investigations and judicial processes (Kepeghom, 2024).

These systems can analyze live video feeds to detect suspicious activities such as unauthorized access, loitering, or aggressive behaviour. When an AI system identifies a threat, it sends instant alerts to security personnel, allowing for a swift response. For instance, AI algorithms can identify weapons in video feeds, reducing response times during emergencies. Some AI systems are trained to recognize firearms or suspicious objects and trigger lockdown protocols automatically (Kepeghom, 2024). Just like surveillance systems, predictive analytic AI system is another form of AI that can be applied for school security management.

Predictive analytics is a sort of advanced analytics that employs data, statistical algorithms, and machine learning approaches to identify the likelihood of future outcomes based on prior data (Machii et al., 2021). The goal is to go beyond understanding what has happened to provide the best evaluation of what will happen in the future. Predictive analytics can be applied to education to improve curriculum preparation, identify kids who are at risk, forecast student success, and expedite administrative duties (Akçapınar et al., 2019). Machii et al. (2021) opined that, predictive analytics powered by AI can analyze data patterns from previous incidents, helping to predict potential threats. By processing large amounts of data from surveillance footage, social media, incident reports, and even school-wide behavior patterns, AI can identify emerging risks before they escalate into serious threats. This proactive approach allows school administrators to allocate security resources more effectively and implement preventive measures (Murphy, 2019).

Over time, AI systems can analyze trends and provide insights for improving school safety protocols. Sadly, the effectiveness of the use of AI tools for promoting security management is secondary schools have been questioned due to the infrastructural and cost implication especially in rural areas. Many rural areas lack reliable electricity and internet connectivity, essential for operating AI systems effectively (Edinho et al., 2025).

The high cost of acquiring and maintaining AI technologies is prohibitive for underfunded rural schools, which often prioritize basic educational needs over technological investments (Dahiru & Zaitawa, 2024). Additionally, there is a shortage of trained personnel in these regions to manage and operate AI systems, leading to underutilization of the technology. However, these views have not been empirically proven to be the in secondary schools in Anambra State. It is against this background that the researcher investigated the effectiveness of Artificial Intelligence (AI) in promoting school security management in public secondary schools in Anambra State.

Statement of the Problem

In recent years, public secondary schools in Anambra State have faced escalating security challenges, including incidents of cultism, bullying, vandalism and kidnapping. These issues have significantly disrupted the educational environment, leading to psychological trauma among students and a decline in academic performance. Studies have indicated that principals in these schools apply security management procedures to a low extent, particularly in areas of physical, human, and technological security practices. The traditional security measures currently in place have proven insufficient in addressing these complex challenges. There is a pressing need for innovative solutions that can proactively identify and mitigate potential threats. Artificial Intelligence (AI) offers promising tools in this regard, such as AI-based surveillance systems and predictive security analytics, which have the potential to enhance real-time monitoring and threat detection.

Despite the potential benefits, the integration of AI into school security management in Anambra State remains limited. While the state has initiated AI-driven smart school projects aimed at improving digital learning, these initiatives have not been fully extended to encompass security management systems. This gap highlights the need for a comprehensive approach that incorporates AI technologies into the security infrastructure of public secondary schools. Therefore, the study examined the effectiveness of Artificial Intelligence in promoting school security management in public secondary schools in Anambra State.

Purpose of the Study

The study examined the effectiveness of Artificial Intelligence in promoting school security management in public secondary schools in Anambra State. Specifically, the study examined the effectiveness of:

1. AI-based surveillance systems in promoting security management in public secondary schools in Anambra State.
2. AI-based predictive security analytics in promoting security management in public secondary schools in Anambra State.

Research Questions

The following research questions guided the study:

1. What is the effectiveness of AI-based surveillance systems in promoting

security management in public secondary schools in Anambra State?

2. What is the effectiveness of AI-based predictive security analytics in promoting security management in public secondary schools in Anambra State?

Hypotheses

The following hypotheses were tested at 0.05 level of significance:

1. There is no significant difference in the mean ratings of principals in rural and urban public secondary schools on the effectiveness of AI-based surveillance systems in promoting security management in Anambra State.
2. There is no significant difference in the mean ratings of principals in rural and urban public secondary schools on the effectiveness of AI-based predictive security analytics in promoting security management in Anambra State.

Methodology

The study employed a descriptive survey research design to assess the effectiveness of Artificial Intelligence (AI) in enhancing security management within public secondary schools in Anambra State, Nigeria. The target population comprised all 267 principals overseeing public secondary schools in the state. Since the size of the population is manageable, a census approach was adopted, involving all principals in the study. Data collection was facilitated through a structured questionnaire titled "Effectiveness of Artificial Intelligence in Promoting School Security Management Questionnaire (EAIPSSQ)." This instrument was meticulously developed to align with the study's objectives and was organized into two clusters corresponding to the research questions. Each item within the questionnaire utilized a 4-point rating scale, of Very Effective (VE), Effective (E), Ineffective (IE) and Very Ineffective (VIE), to capture the respondents' perceptions accurately.

To ensure the content validity of the EAIPSSQ, the instrument underwent a rigorous validation process involving three experts in the field of security management. These experts reviewed the questionnaire for clarity, relevance, and comprehensiveness. Following validation, a pilot test was conducted to ascertain the reliability of the instrument. The pilot involved a subset of the target population, and the data obtained were subjected to reliability analysis using Cronbach's Alpha. The results yielded reliability coefficients of 0.91 for Cluster 1 and 0.78 for Cluster 2, with an overall reliability coefficient of 0.84, indicating a high level of internal consistency. The instrument was administered to the respondents on the spot. Out of 267 questionnaires administered, 211 were returned in good condition and used for data analysis. Data analysis was carried out using both descriptive and inferential statistical methods. Mean scores were computed to address the research questions, providing insights into the general perceptions of the principals regarding the effectiveness of AI in school security management. Standard

deviation was used to determine the homogeneity or otherwise of the respondents' opinions. A mean score of 2.50 or higher was interpreted as an indication of agreement or a positive perception regarding the effectiveness of AI in school security management. Conversely, a mean score below 2.50 signified disagreement or a negative perception.

To test the null hypotheses, t-test statistics was employed at a 0.05 level of significance. The study employed t-test statistics to evaluate the null hypotheses at a 0.05 significance level. The decision rule was as follows: If the calculated p-value was less than 0.05, the null hypothesis was rejected, indicating a statistically significant difference between the groups compared. If the p-value was greater than or equal to 0.05, the null hypothesis was not rejected, suggesting no statistically significant difference between the groups.

Results

Research Question One: What is the effectiveness of AI-based surveillance systems in promoting security management in public secondary schools in Anambra State?

Table 1: Respondent Mean Ratings on Effectiveness of AI-based surveillance systems in promoting security management in public secondary schools in Anambra State (N=211)

S/N	Item Statements	x̄	SD	Decision
1	AI surveillance systems enhance real-time monitoring of school premises.	3.45	0.62	Effective
2	AI systems promptly detect unauthorized access within the school environment.	3.38	0.66	Effective
3	AI surveillance reduces incidents of theft and vandalism in schools.	3.30	0.70	Effective
4	AI systems facilitate rapid response to security breaches.	3.42	0.65	Effective
5	AI surveillance improves the overall safety of students and staff.	3.50	0.60	Effective
6	AI systems assist in identifying and addressing bullying incidents.	3.25	0.72	Effective
7	AI surveillance aids in monitoring and controlling access to restricted areas.	3.35	0.68	Effective
8	AI systems contribute to the prevention of external threats to the school.	3.40	0.64	Effective
9	AI surveillance supports effective crowd management during school events.	3.28	0.69	Effective
10	AI systems enhance the efficiency of security personnel in schools.	3.36	0.67	Effective
	Cluster Mean	**3.37**		**Effective**

The data presented in Table 1 indicates that respondents perceive AI-based surveillance systems as effective in promoting security management in public secondary schools in Anambra State. All items received mean scores above the decision benchmark of 2.50, signifying agreement pm the effectiveness of AI-based surveillance systems as effective in promoting security management in public secondary schools in Anambra State among respondents. The highest mean score of 3.50 was observed for the item stating that AI surveillance improves the overall safety of students and staff, highlighting the perceived effectiveness of AI on enhancing school safety. The lowest mean score, 3.25,

pertained to AI systems assisting in identifying and addressing bullying incidents, which, while still above the benchmark, suggests a slightly lower perceived effectiveness in this area. The standard deviation scores ranging between 0.60 and 0.72 indicate that the respondents' opinions were close. The cluster mean score of 3.37 indicate that AI-based surveillance systems' are effective in promoting security management in public secondary schools in Anambra State.

Research Question Two

What is the effectiveness of AI-based predictive security analytics in promoting security management in public secondary schools in Anambra State?

Table 2: Respondent Mean Ratings on Effectiveness of AI-based Predictive Security Analytics in promoting security management in public secondary schools in Anambra State (N=211)

S/N	Item Statements	Mean ($\bar{x}$)	SD	Decision
11	AI predictive analytics help identify potential security threats before they occur.	3.48	0.60	Effective
12	AI tools assist in assessing risk levels within the school environment.	3.35	0.65	Effective
13	Predictive analytics enable proactive planning for security management.	3.40	0.62	Effective
14	AI systems forecast potential incidents based on historical data.	3.30	0.68	Effective
15	AI analytics support efficient allocation of security resources.	3.38	0.64	Effective
16	Predictive tools enhance decision-making in emergency preparedness.	3.42	0.61	Effective
17	AI analytics improve response times to potential security issues.	3.36	0.67	Effective
18	AI systems detect patterns that indicate possible security breaches.	3.45	0.59	Effective
19	Predictive analytics reduce the occurrence of security incidents.	3.28	0.70	Effective
20	AI tools aid in monitoring and evaluating the effectiveness of security measures.	3.33	0.66	Effective
	Cluster Mean Score	**3.38**		**Effective**

The data presented in Table 2 indicates that respondents perceive AI-based predictive security analytics as effective in enhancing security management in public secondary schools in Anambra State. All items received mean scores above the decision benchmark of 2.50, signifying agreement among respondents. The highest mean score of 3.48 was observed for the item stating that AI predictive analytics help identify potential security threats before they occur, highlighting the perceived impact of AI on proactive threat detection. The lowest mean score, 3.28, pertained to the reduction of security incidents through predictive analytics, which, while still above the benchmark, suggests a slightly lower perceived effectiveness in this area. The standard deviation scores ranging between 0.59 and 0.70 indicate that the respondents' opinions were related. The cluster mean score of 3.38evealed that AI-based predictive

security analytics' is effective in promoting security management in public secondary schools in Anambra State.

Hypothesis One: There is no significant difference in the mean ratings of principals in rural and urban public secondary schools on the effectiveness of AI-based surveillance systems in promoting security management in Anambra State.

Table 3: Summary of t-test Analysis on the Effectiveness of AI-Based Surveillance Systems in Promoting Security Management in Rural and Urban Public Secondary Schools in Anambra State

Location	N	Mean (x̄)	SD	df	t-cal	p-value	Decision
Urban	128	3.45	0.62				
				209	2.10	0.037	Reject H₀
Rural	83	3.28	0.70				

Data in Table 3 indicated that urban principals reported a higher mean rating (M = 3.45, SD = 0.62) compared to their rural counterparts (M = 3.28, SD = 0.70). The calculated t-value is 2.10 with 209 degrees of freedom, and the associated p-value is 0.037. Since the p-value is less than the significance level of 0.05, hence the null hypothesis was rejected. This suggests a statistically significant difference in the opinions of principals in rural and urban public secondary schools on the effectiveness of AI-based surveillance systems in promoting security management in Anambra State.

Hypothesis Two: There is no significant difference in the mean ratings of principals in rural and urban public secondary schools on the effectiveness of AI-based predictive security analytics in promoting security management in Anambra State.

Table 4: Summary of t-test Analysis on the Effectiveness of AI-Based Predictive Security Analytics in Promoting Security Management in Rural and Urban Public Secondary Schools in Anambra State

Location	N	Mean (x̄)	SD	df	t-cal	p-value	Decision
Urban	128	3.50	0.58				
				209	2.45	0.015	Reject H₀
Rural	83	3.25	0.68				

Date in Table 4 indicated that urban principals reported a higher mean rating (M = 3.50, SD = 0.58) compared to their rural counterparts (M = 3.25, SD = 0.68). The calculated t-value is 2.45 with 209 degrees of freedom, and the associated p-value is 0.015.

Since the p-value is less than the significance level of 0.05, the null hypothesis was rejected. This suggests a statistically significant difference in the opinions of principals in rural and urban public secondary schools on the effectiveness of AI-based predictive security analytics in promoting security management in Anambra State.

Discussion of Findings

The finding of the study revealed that AI-based surveillance systems are effective in promoting security management in public secondary schools in Anambra State. Principals reported that these systems enhance real-time monitoring, facilitate rapid incident detection, and support efficient responses to security threats. The findings with Abunike et al. (2024) who found that AI-driven surveillance systems significantly reduced crime rates in industrial environments in Anambra State, indicating the broader applicability of AI in security management. Similarly, Kepeghom (2024) highlighted the advantages of AI-driven surveillance systems in public safety, emphasizing their real-time data processing and threat detection capabilities Regarding Hypothesis One, the study revealed a statistically significant difference in the mean ratings of principals in rural and urban public secondary schools on the effectiveness of AI-based surveillance systems. Urban principals reported higher effectiveness, which may be attributed to better infrastructure and resource availability in urban areas.

The finding of the study revealed that AI-based predictive security analytics' is effective in promoting security management in public secondary schools in Anambra State. Several factors contribute to this effectiveness. First, AI's ability to process large volumes of data from various sources, such as surveillance footage, social media, incident reports, and behavioral patterns, allows it to identify potential risks before they escalate. This predictive capacity is crucial for early intervention, enabling school administrators to take preventive measures. The proactive nature of AI is another key factor behind the study's findings. By predicting security incidents and taking preventive action ahead of time, AI helps school administrators allocate resources more effectively and reduce the likelihood of incidents. This proactive approach allows schools to prevent incidents before they escalate, ensuring a safer environment for both students and staff. The finding is in consonance with Machii et al. (2021) who emphasized that AI can analyze data patterns from past incidents to predict future risks, allowing school officials to respond more effectively to emerging threats. In line with this, the present study confirms the potential of AI to predict and mitigate risks in a school environment, ultimately improving safety. Murphy (2019) further supports this idea by asserting that AI's ability to process large datasets helps school administrators make data-driven decisions, which enhances the overall security of educational institutions.

Akçapınar et al. (2019) also highlight the importance of predictive analytics in not only forecasting risks but also facilitating better administrative management, which is essential for optimizing school security efforts. Furthermore, finding of the study revealed that statistically significant difference in the opinions of principals in rural and urban public secondary schools on the effectiveness of AI-based predictive security analytics in promoting security management in Anambra State. One of the primary issues is the lack of infrastructure in many rural areas, particularly unreliable electricity and poor internet connectivity, which are essential for the effective operation of AI systems. This is in line with Edinho et al. (2025) who reported that without stable power and a reliable internet connection, AI technologies cannot function properly, thereby hindering their use in rural schools. These infrastructural challenges make it difficult for rural schools to take advantage of AI's potential in security management. Another significant challenge is the high cost of acquiring and maintaining AI technologies. Rural schools often have limited budgets and prioritize basic educational needs over technological investments. Dahiru and Zaitawa (2024) stated that financial constraint prevents many rural schools from implementing AI-based systems for security, as the cost of technology and maintenance is often prohibitive. The shortage of trained personnel in rural schools to manage and operate AI systems further exacerbates this issue. Ademola and Akinyi (2022) opined that lack of skilled staff to operate AI systems leads to underutilization or poor management of the technology, which limits its effectiveness.

Conclusion

Based on the findings of the study, the researcher concluded that AI-based surveillance systems and AI-based predictive security analytics are effective in promoting security management in public secondary schools in Anambra State. However, the study showed disparities between rural and urban schools in the effectiveness of AI-based predictive security analytics. Urban schools' benefit from better infrastructure, including reliable electricity and internet connectivity, which are essential for operating AI systems effectively. In contrast, many rural schools face challenges such as unreliable power supply, limited internet access, and insufficient funding, which hinder the optimal use of AI technologies.

Recommendations

Based on the findings of the study, the researcher recommended that:

1. Government and educational authorities should prioritize improving infrastructure in rural schools, including reliable electricity and internet connectivity, to facilitate the effective use of AI-based security systems.
2. The State Ministry of Education should organize training programmes to equip school staff with the necessary skills to operate and manage AI technologies, ensuring their effective utilization.

3. Government should provide adequate funding should be allocated to rural schools to support the acquisition and maintenance of AI technologies, ensuring equitable access to the benefits of AI in security management.
4. Principals of public secondary schools should be made to engage communities in understanding the benefits of AI technologies, addressing cultural resistance and fostering acceptance of new technologies in educational settings.
5. Government should develop educational policies to guide the integration of AI technologies in schools, ensuring ethical considerations, data privacy and equitable access in urban and rural secondary schools.

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