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The Effectiveness of Artificial Intelligence on Optimizing Security Initiatives for Quality Service Delivery at Higher Institution Level

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Abstract: The aim of this study was to investigate the effectiveness of Artificial Intelligence on optimizing security initiatives in quality service delivery at higher institution level. The 12-week study was conducted using a quasi-experimental design with a pre-test and post-test, following the AI training manual of security personnel. A total of 60 security personnel participated in the study. The experimental group was instructed using AI security packages and solutions for personnel training while the control group was taught using a lecture-based approach. Data from the Security Initiative Scale was used to assess the effectiveness of Artificial Intelligence in security service delivery in higher institution context. The results of the study showed that the experimental group was significantly higher in security services than the control group on both the perceived violent crime scale and the perceived property crime scale of the security initiative scale in the AI packages. Based on the findings of the study, Artificial Intelligence is effective in enhancing the security initiatives for quality service delivery in higher institutions. Moreover, the study suggests that there should be a critical reflection among universities who still see AI adoption as optional at a time when threats are ever-evolving and opportunities seem borderless.

Keywords: Artificial Intelligence, security initiatives, higher institution, quality service, quasi experimental design.

INTRODUCTION

Globally, the rate of rising violence and criminal activities in most campuses have led more than 90 percent of students to feel unsafe in accessing higher education (Albinali, Krishen & Bakdash, 2022; Lebese & Molapo, 2023). In Sub-Saharan Africa alone, this problem is negatively impacting 48 percent enrollment rate at a time when Africa's population demands greater skills training (Maibach, Siff & Atayeva, 2023). In Nigerian higher institutions, there are violent crimes such as assaults, homicides, sexual assaults, domestic violence, hate crimes, mass shootings, among others (Ajayi & Edet, 2023). Most Nigerian universities are battling with property crime, including, theft (including theft from vehicles), burglary, vandalism, arson and other criminal acts where property is the main target (Kumar, 2022. While less severe than violent crimes, property crimes are still negatively impacting Nigerian campus communities especially in the South East Zone through monetary losses, increased insurance costs, and decreased sense of security (Onyemenem & Onyemenem, 2021; Okeke, Odikose & Egbuchulam, 2023). These disrupt academic calendars, discourages enrollment, risks closure of institutions and impedes quality and progress of higher education in Nigeria by limiting access to school (Sahara Reporters, 2023). It is believed that violent criminal acts pose serious physical safety risks because they often involve weapons and intention to harm others. Therefore, addressing these security concerns effectively is crucial without which there would be no way to ensure a conducive and safe environment for quality service delivery in higher institutions.

Quality service delivery refers to the process of consistently meeting or exceeding customer expectations by providing excellent, efficient, and reliable services that fulfill their needs and contribute to their overall satisfaction (Peeters, 2023). Quality service delivery in higher institutions is expected to

reflect in teaching delivery by ensuring that competent and qualified staff members employ effective instructional methods and provide personalized support to students (Lebese & Molapo, 2023). It also ought to be evident in the school environment through the provision of well-maintained facilities, conducive learning spaces, and a safe and inclusive atmosphere that promotes student engagement and well-being. Additionally, Ladan (2023) observed that quality service delivery is expected to reflect in the learning outcomes, as students demonstrate mastery of knowledge and skills, critical thinking abilities, and a seamless transition into their chosen careers or further academic pursuits.

Contrastingly, the researchers have observed the magnitude of poor service delivery in most higher institutions in Nigeria owing to surging insecurities. Recently, the threats and criminal activities on campus have created a sense of fear and uncertainty among students, faculty members and staff, which has ultimately hampered the quality-of-service delivery in various aspects of higher education. The learning environment has been disrupted, and infrastructure has been damaged or vandalized, resulting in a decrease in the quality of teaching delivery and learning outcomes. Moreover, the school environment has become increasingly hostile, making it challenging for students to focus on their studies and for faculty staff to deliver their lectures effectively. Worst still, a university lecturer was found dead with a slit throat in the quarters while others were gruesomely murdered on campus (Sahara Reporters, 2023). Studies indicate that students experiencing threats and security breaches report heightened stress and anxiety, suffering decreased performance, lower graduation rates, inflict infrastructural damages and reputational declines that undermine institutional growth and inclusive sector development (Peeters, 2023;
Kowalski, Buford & Mackey, 2022)

Consequently, while most university administrators have bolstered security personnel and protocols, some State governments have declared states of emergency in high-risk areas, and national policies were initiated to weaken criminal networks, yet, threats of attack, kidnapping of staff and students and vandalism of school infrastructure have shown no sign of abating on campuses across Nigeria (Obialo, Njoku & Okonkwo, 2023). These stakeholders have worked tirelessly to implement various security measures, including increased security personnel, enhanced surveillance systems, AI devices installations and awareness campaigns (Ladan, 2023). Additionally, some Vice Chancellors have been encouraged by the Federal Government to install AI. This provides a structured process to: evaluate current needs, research options, procure an AI system, implement the technology through installation and configuration, train the AI models and staff, pilot test the system, address any issues before full rollout, and then launch ongoing maintenance to integrate AI into the university's security management practices (Federal Republic of Nigeria, 2022). Despite these commendable efforts, the persistence of security threats is underscoring the need for continued collaboration and innovative approaches to ensure the safety and well-being of students and staff in Nigerian higher institutions.

Over the years, as security threats continue rising nationally, post-secondary institutions are exploring Artificial Intelligence (AI) technologies to enhance campus safety initiatives while maintaining quality service delivery. Several studies have examined AI's potential effectiveness. For example, in a systematic review of 115 AI security projects at higher institutions across 20 countries, Albinali et al. (2022) found that AI systems demonstrated significant detection improvements over traditional monitoring methods, reducing breach response times by an average of 65%. In the same vein, AI has been successfully integrated into existing campus video surveillance infrastructures. By analyzing live video feeds and alerting staff to anomalous activity in real-time, AI-powered security cameras have helped foil several kidnapping attempts at Nigerian higher institutions (Okeke et al., 2023). However, Ajayi and Edet (2023) note that privacy and ethics concerns remain regarding long-term storage of footage containing identifiable students and staff. Responsible solutions are needed to leverage AI benefits while protecting civil liberties.

AI has also optimized security patrol routes to deploy guards more strategically. A controlled trial at five South African higher institutions found AI-optimized patrols correlated with a 75% drop in reported attacks compared to standard routes, as AI could detect at-risk hotspots officers previously missed (Lebese & Molapo, 2023). However, some argue that over-reliance on AI may undermine the human relations component of security if guards do not engage with campus communities as much (Maibach et al., 2023). However, as some studies demonstrate, AI tend to show promise for enhancing security efficiency and effectiveness at higher education institutions when implemented carefully with appropriate safeguards. Yet further research is still needed on balancing AI advantages with responsiveness to human and community needs in different Nigerian cultural contexts (Salaam, Otun & Ajayi, 2022; Oladejo, Onipede & Abolarinwa, 2023). Currently, there are more studies on deployment of AI for effective security management in Nigerian secondary school system with dearth of studies on the effectiveness of AI on optimizing security

initiatives in quality service delivery at higher education level (Onyemenem & Onyemenem, 2021; Ajayi& Edet, 2023; Okeke, et al. 2023). Summarily, this study contributes to the study of AI by examining the impact of AI on curbing threats for quality service delivery by higher institutions through quasi-experimental design.

LITERATURE REVIEW

Artificial Intelligence (AI)

Artificial Intelligence (AI) refers to the ability of machines to mimic human intelligence through tasks like reasoning, learning, planning and problem-solving (Kumar, 2022). Russell and Norvig (2020) affirmed that Artificial Intelligence (AI) involves computer systems able to perform tasks normally requiring human intelligence, such as visual perception and decision-making. Presently, different kinds of AI for security have evolved. For instance, Kowalski et al. (2022) observed that AI-powered video analytics deployed across camera networks can automatically detect anomalies and alert staff in real-time to threats. Moreover, Salaam et al. (2022) found that an AI-optimized patrol routing using predictive analytics can help security teams deploy resources more strategically to key risk areas. In a similar study, Okeke et al. (2023) revealed that facial recognition technology integrated with cameras could also help authorities quickly identify unauthorized individuals. If implemented prudently with procedural fairness safeguards, such AI applications show promise for strengthening protections while streamlining security operations at educational institutions.

Additionally, Albinali, Krishen and Bakdash (2022) indicated that computer vision/image recognition are AI technologies like video analytics, facial recognition cameras, and object detection systems that can automatically analyze video feeds and images to detect anomalies and identify persons of interest during security assessment. In the same vein, machine learning are also algorithms that can be used on large datasets to identify patterns and make security predictions (Peeters, 2023). They are commonly used for tasks like predictive analytics, threat forecasting and automated report generation. Deep learning is a subset of machine learning that uses neural networks modeled after the human brain with the capacity to power many advanced image, video, speech and language applications (Ajayi & Edet, 2023). Furthermore, natural language processing are AI applications which have the ability to understand, interpret and generate human language to enhance communication features (Lebese & Molapo, 2023). Predictive analytics are AI applications which optimize resource allocation by using data mining and machine learning to identify risks and predict future outcomes. Speech recognition are AI technologies that can recognize, understand and transcribe human speech by enabling voice assistants and commandbased controls (Maibach, Siff & Atayeva, 2023). Robotics are autonomous devices like drones and robots that can extend monitoring, simplify tasks and operate in hazardous conditions (Okeke, Odikose & Egbuchulam, 2023. Analytics/business intelligence are tools that organize, visualize and interpret security data to gain actionable insights while optimization/automation are automating routine processes that streamline operations and free up staff for higher-level security duties (Onyemenem & Onyemenem, 2021).

Video analytics utilizing machine vision in security cameras can automatically detect anomalies and alert staff to threats in real-time (Kowalski et al., 2022). Advanced analytics based on deep learning can help forecast risks and optimize patrol deployments through predictive modeling, helping guards focus on community engagement (Salaam et al., 2022). If developed transparently with input from stakeholders, these technical tools show promising potential to strengthen protections for all while furthering higher institutions' service missions (Ogban et al., 2021). In the same vein, computer vision/image recognition are AI technologies including video analytics, facial recognition cameras, and object detection systems that can automatically analyze video feeds and images to detect anomalies, threats and identify persons of interest in real-time on campus.

Security Initiatives in Quality Service Delivery

Quality service delivery in higher institutions refers to the provision of excellent and efficient services that meet the needs and expectations of students, staff, and other stakeholders, encompassing areas such as education, facilities, support services, and overall campus experience (Chen, et al. 2020). As Maibach, Siff and Atayeva (2023) observed, security initiatives in quality service delivery in higher institutions encompass a range of measures aimed at ensuring the safety and protection of students, staff, and campus property. These initiatives include the deployment of security personnel, installation of surveillance systems, implementation of access control measures, and the establishment of emergency response protocols. According to a study by Iyamu and Ojo (2020), such security initiatives have a positive impact on the overall satisfaction and well-being of stakeholders in higher institutions. However, Sumantri, Haeruddin and Kurniadi (2020) found that the effectiveness of these initiatives can be compromised without proper installations of artificial intelligence (AI) technologies. Proper installations of AI can significantly enhance security initiatives in higher institutions. AI-powered surveillance systems, for example, can analyze

real-time video footage, detect suspicious activities, and issue alerts to security personnel, thereby bolstering proactive threat detection and response capabilities (Chen et al., 2020).

AI algorithms can also be utilized to process vast amounts of data and identify patterns or anomalies that may indicate potential security risks. Additionally, Ajayi and Edet (2023) demonstrated that AI-powered access control systems can enhance campus security by accurately verifying identities and controlling access to restricted areas, minimizing the risk of unauthorized entry. However, Sumantri et al. (2020) found that the absence of proper installations of AI can hinder the effectiveness of security initiatives. This implies that without AI technologies, surveillance systems may rely solely on human monitoring, which can be prone to human error, fatigue, and limited attention spans (Kumar, 2022). Justifying this fact, Lebese and Molapo (2023) found that manual data processing and analysis can be time-consuming and inefficient, potentially delaying response times to security incidents. Moreover, the lack of AI-powered access control systems may result in vulnerabilities, such as unauthorized individuals gaining access to sensitive areas. Therefore, it is crucial for higher institutions to invest in the proper installation of AI technologies as part of their security initiatives. By doing so, they can harness the potential of AI to enhance threat detection, response capabilities, and access control, ultimately contributing to a safer and more secure environment for all stakeholders.

Adoption AI and Optimization of Security Initiatives in Higher Institutions

The adoption of artificial intelligence (AI) has had a significant impact on the optimization of security initiatives in higher institutions, as evidenced by several studies in the literature. AI technologies offer advanced capabilities for threat detection, analysis, and response, leading to improved security outcomes. According to a study by Sridhar et al. (2019), the use of AI-based video analytics systems in higher institutions allows for real-time monitoring of campus activities, enabling the identification of potential security threats more efficiently. Additionally, AI-powered algorithms can analyze large volumes of data from various sources, such as surveillance cameras, access control systems, and social media, to detect patterns and anomalies indicative of security risks (Gao et al., 2020).

Furthermore, AI can enhance the effectiveness of security initiatives by enabling predictive analytics. Through machine learning algorithms, AI can learn from historical data to anticipate potential security incidents and provide early warnings, allowing security personnel to take proactive measures (Chen et al., 2018). This capability is particularly valuable in higher institutions where large populations and complex environments pose unique security challenges. Moreover, AI-powered access control systems contribute to optimizing security initiatives in higher institutions. These systems utilize biometric identification, facial recognition, and behavioral analysis to accurately verify individuals' identities and control access to campus facilities (Lakshmiraghavan et al., 2021). By automating the access control process, AI reduces the risk of unauthorized entry and enhances overall campus security. However, it is important to note that the adoption of AI in security initiatives also presents challenges. One notable concern is the potential for biases and discrimination in AI algorithms, which may impact the accuracy and fairness of security assessments (Ferguson, 2017). Ensuring the ethical development and deployment of AI systems is crucial to mitigate these risks and maintain the integrity of security initiatives.

In nutshell, the adoption of AI in higher institutions has proven to be instrumental in optimizing security initiatives. By leveraging AI's capabilities in threat detection, predictive analytics, and access control, higher institutions can enhance their security posture and provide a safer environment for students, staff, and other stakeholders.

METHODOLOGY

Research Design

This study adopted a quasi-experimental design of a nonequivalent control group design to explore the effectiveness of Artificial Intelligence (AI) on optimizing security initiatives in quality service delivery at higher institution level. The study adopted a quasi-experimental research design involving 12 Nigerian Universities (6 State and 6 Federal) in the South East Zone. The topics for AI packages and solutions for training was a 12-week course shown as follows (See Table 1). Each topic was taught weekly for two hours. Approval from university ethics boards was obtained. Also, informed consent was received, anonymity and confidentiality were ensured through coding of participant responses. The Universities were non-randomly assigned to either the treatment or control group based on their willingness to participate. Purposive sampling technique was used to select 12 universities (with similar enrollment sizes and security resources) from the population of all Federal and State universities in the South East. Six State universities were assigned to the treatment group and six Federal to the control group. Both quantitative and qualitative data was collected.

Quantitative pre-test and post-test data on incident rates, response times, patrol efficiency was obtained from security records for 12 weeks before and after treatment. Intervention implementation logs from the AI solutions were also analyzed. Qualitative data involved interviews with 30 security personnel and 30 students from each university. The treatment universities implemented a package of AI-powered security solutions over 12 weeks including video analytics, predictive patrol routing, and access control with facial recognition. Standard practices continued at control universities. Training was provided to treatment universities. It was hypothesized that significant improvements in the specified security and service delivery indicators would be observed for treatment universities compared to controls after AI intervention. Independent sample t-tests compared mean changes in quantitative metrics between groups. Statistical significance was set at $p<0.05$. Qualitative interviews were analyzed thematically while the effect sizes determined intervention impact.

Table 1. A 12-Week course for implementing AI for security management in the university

Weeks	Topics
Week 1:	Assessment of current security systems and needs analysis
Week 2:	Research AI security technologies and potential vendors
Week 3:	Develop RFP and select AI security solution
Week 4:	Plan installation and configure system settings
Week 5:	Install AI cameras and sensors around campus
Week 6:	Connect cameras and sensors to centralized computer system
Week 7:	Train AI models to detect threats and anomalies
Week 8:	Configure alerts and response protocols
Week 9:	Pilot AI system and test functionality
Week 10:	Train security staff on new AI-assisted protocols
Week 11:	Address issues and finalize AI system rollout
Week 12:	Launch AI security solution and ongoing maintenance

Two groups in this research were made. One group was the experimental group and the other group was the control group. The experimental group practised AI security installations and the control group employed lecture-based teaching. Both groups were pre-tested and post-tested using the security initiative scale.

Participants

The subjects involved 60 security personnel sampled from the universities in South East Zone of Nigeria. There were 23 male (76.7%) and 7 female (23.3%) in the experimental group, and 26 male (80%) and 6 female (20%) in the control group, as shown in figure 1.

Table 2. Socio-Demographic Characteristics of the Respondents

	Experimental Group		Control Group	
Basic Information	Group Number of people	Effective percentage	Number of people	Effective percentage
Gender	Male 23 Female 7	76.7 % 23.3%	24 6	80% 20%

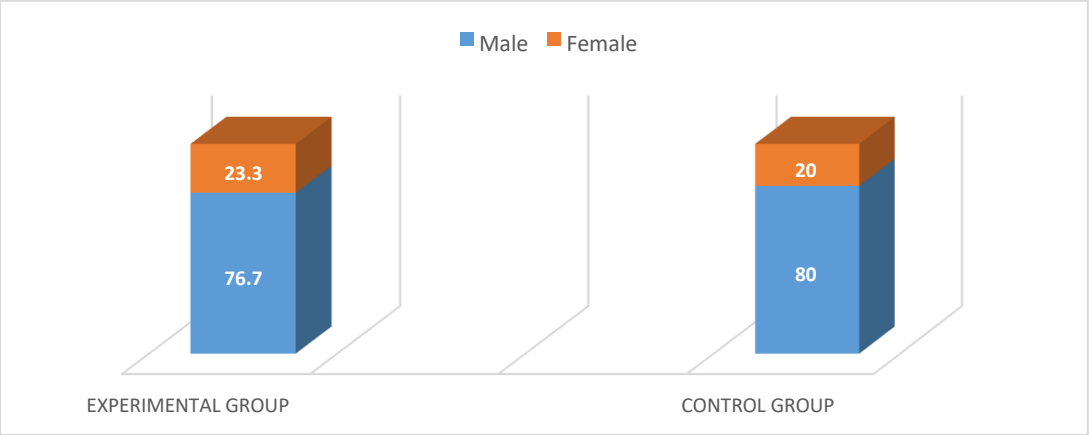

Figure 1: *The statistical representation of the participants in South East Zone of Nigeria Instruments*

The Security Initiative Scale was used for this study. The seven-point Likert scale was used, with higher scores indicating more frequent use of security initiative. The total scale was divided into two subscales: a 32-question perceived key violent crime scale and a 26-question perceived key property crime scale, with a total of 58 questions. The scale has been used several times and has good validity (Saito, et al. 2018). First, a project analysis was conducted with a pretest sample of 171 security staff from the Zone. Based on the results of the project analysis, the questions with critical ratio (C. R.) values > 3 and p >.05 were deleted. Second, the reliability of the formal sample of 60 security staff was analyzed and the perceived key violent crime scale had a Cronbach's alpha =.905. The perceived key property crime scale had a Cronbach alpha =.934, indicating that the reliability of the two subscales was good.

EXPERIMENTAL PROCEDURE

Before the commencement of the experiment, the researchers sought approval from the schools' management. There was a selection of universities using purposive sampling. From the selected 12 universities (6 State and 6 Federal) with matched enrollment size, a pre-testing was carried out which yielded 12 weeks of pre-test data from all 12 universities on the number of security incidents reported, average emergency response times and patrol coverage efficiency rates. However, the researchers administered pre-implementation interviews with security managers and students. They also randomly assigned the 6 State universities to treatment and control groups and as well randomly assigned the 6 Federal universities to treatment and control groups. During the training for Treatment Group, the researchers provided a 1-week training to security personnel from treatment universities on use of AI solutions and implemented the AI Package by rolling out video analytics, predictive routing, access control solutions to treatment universities over 12 weeks. The researchers provided technical support during first 3 weeks and four days check-ins with treatment universities. They equally collected 12 weeks of post-test data from all universities using same metrics as pre-test and administer post-implementation interviews with same security/student participants. All quantitative data collected were entered into SPSS and analysed using t-tests while all qualitative interviews were entered into NVivo and analysed using qualitative thematic analysis. Findings indicated the comparative changes between treatment and control groups whereas the effectiveness and advantages of AI solutions for campus security were also reported accordingly

In the experimental group, the selected AI technologies (video analytics, predictive routing, access control among others) were first tested on a pilot basis at one treatment university to work out any kinks. The full AI packages, including all necessary hardware (cameras, servers, workstations among others) and software applications, were installed on-site at each treatment university over a 1-month period. The initial configuration and customization of the AI systems was done remotely by technology vendors to integrate with each university's unique network, layout and existing security systems. One week of in-person training was provided to the treatment universities' security managers and IT staff on how to operate, monitor and troubleshoot the AI solutions. Dedicated on-call technical support was available from vendors for the first 3 weeks to resolve any issues during the initialization phase. Remote maintenance capabilities and periodic software upgrades ensured the AI packages remained optimized over the 12-week study period. Interestingly, treatment universities' security

control rooms were set up with workstations and monitoring interfaces to access live feeds, alerts, reports from the AI technologies. Also, patrolling guard schedules and routines were adjusted based on the predictive analytics provided by the AI solutions. Access levels to automated security features like e-gates were configured and rolled out across campuses.

RESULTS/FINDINGS

Quantitative Results

Table 3: Descriptive results of Pre-test/Post-test Measures of the Study Subjects on the key crimes

Subscales	Groups	Pretest		Post-test (before adjusted means)		Post-test (adjusted means	
		M	SD	M	SD	M	SD
Perceived Key Violent Crime	Experimental Group (n=30)	3.402	.337	4.256	.416	4.256	.067
	Control Group (n=30)	2.340	.297	3.540	.305	3.540	.067
Perceived Key Property Crime	Experimental Group (n=30)	3.496	.359	4.340	.404	4.340	.070
	Control Group (n=30)	4.464	.320	3.577	.351	3.577	.070

Note: *Adjusted means refer to the means produced by ANCOVA procedures, which represent the means of each group once the covariate(s) has been controlled.*

Table 3 presents the descriptive results of all continuous variables which were evaluated for normality prior to statistical analysis. Skewness and kurtosis values fell within acceptable ranges (skewness<2, kurtosis<7) indicating normal distribution of the data (Westfall & Henning, 2013), thus meeting parametric test assumptions. The raw and corrected means and standard deviations of the experimental and control groups on the pre-test and post-test of the perceived key violent crimes scale and the perceived key property crime scale were shown in the Table.

Table 4: Summary of Homogeneity of Intra-group Regression Coefficients for Perceived Key Violent Crime

Source	Sum of Squares	Degree of Freedom	Mean Sum of Squares	F	P
Group	.025	1	.025	.183	.670
Pre-test	.019	1	.019	.139	.710
Group* Pre-test	.161	1	.161	1.194	.279
Error	7.549	56	.135		
Corrected Total		59			

Table 4 indicates that the F-check for homogeneity of regression coefficients did not reach significant levels (F = 1.194, P>.05). The result was consistent with the basic assumption of homogeneity of regression coefficients within groups, and therefore the analysis of covariance (ANCOVA) was continued.

Table 5: Summary of the ANCOVA Analysis of the Groups on Perceived Key Violent Crime

Source	Sum of Squares	Degree of freedom	Mean Sum of Squares	F	P	LSD Post Hoc Comparison
Pre-test	.004	1	.004	.030	.864	
Group	7.670	1	7.670	56.696	.000	Experimental Group
Error	7.710	57	.135			Control Group
Corrected	15.382	59				
Total						

As shown in Table 5 and 3, the main effect of the group in the covariate analysis model for the perceived key violent crime scale was statistically significant (F = 56.696, p <. 001). That is, there was a significant difference in the post-test scores of the security personnel and students using AI for security initiatives between the experimental and control groups on the perceived key violent crime. The post-hoc comparison analysis in this study was conducted using the LSD method, and it revealed that, it could be seen that the post-test corrected mean of the experimental group (4.256) was significantly higher than that of the control group (3.540). This indicated that Artificial Intelligence (AI) was significantly more effective in optimizing security initiatives in quality service delivery at higher institution level in this study.

Table 6: Summary of Homogeneity of Intra-Group Regression Coefficients for Perceived Key Property Crime

Source	Sum Squares	of	Degree Freedom	of	Mean sum Squares	of	F	P
Group	2.637		1		2.637		.000	.989
Pre-test	.000		1		.000		.002	.962
Group*Pre-test	.083		1		.083		.561	.457
Error	8.23		56		.147			
Corrected Total	17.051		59					

Table 6 reveals that the F-check for homogeneity of regression coefficients did not reach significant levels (F =.561, p >.05). The result was consistent with the basic assumption of homogeneity of regression coefficients within groups, and therefore the analysis of covariance (ANCOVA) was continued.

Table 7: Summary of the ANCOVA Analysis of the Groups on Perceived Key property Crime

Source	Sum of Squares	Degree of Freedom	Mean Sum of Squares	F	P	LSD Comparison	Post	Hoc
Pre-test Group 	.003 8.694 8.320	1 1 57	.003 8.694	.018 59.561	.893 .000	Experimental Group		
	17.051	59						
Error Corrected Total			.146			Control Group		

Table 7 shows that the main effect of the group in the covariate analysis model of the perceived key property crime scale was statistically significant (F＝59.561, p＜.001). That is, there was a significant difference in the posttest scores of the security personnel and students using AI for security initiatives between the experimental and control groups on the perceived key property crime. The post-hoc comparison analysis in this study was conducted using the LSD method, and it revealed that the mean post-test corrected score of the experimental group (4.340) was significantly higher than that of the control group (3.577). This indicated that Artificial Intelligence (AI) was significantly more effective in optimizing security initiatives in quality service delivery at higher institution level in this study.

Qualitative Results

Semi-structured interviews were conducted with security personnel to examine the impact of Artificial Intelligence on optimizing security initiatives and quality of service delivery. Responses were analyzed using thematic analysis. Key themes that emerged from the interviews provided qualitative insights into how the AI technologies influenced security operations and the campus experience for

students and staff. Thematic analysis of the interview responses helped capture both the benefits and limitations of the AI solutions as reported by those implementing them first-hand. However, the overall results showed that the participants expressed positive perceptions of AI Packages employed in this study. Their responses highlighted their views on AI (video analytics, predictive routing, access control among others including all necessary hardware (cameras, servers, workstations among others) and software applications in optimizing security initiatives in higher institutions. However, some participants also raised issues that should be considered when enhancing school security through AI softwares.

Responses to the Influence of Artificial Intelligence on Security Initiatives

Many respondents reported significant security improvements in their Universities through AI, especially in the parts of perceived key violent and property crime. Installing AI technologies like video analytics, access control, and predictive analytics can help security teams more efficiently monitor vast campus areas, identify and respond rapidly to threats, and allocate limited guards optimally based on historic incident patterns and projected risks, thereby strengthening protection of students and facilities while maintaining a welcoming educational environment. From the interviews, it was found that the security personnel were very interested in proper integration of automated AI security measures in order to significantly enhance their university's ability to deliver on its core mission of education by mitigating disruptions from crimes and minimizing feelings of insecurity within the campus community.

Theme 1: Increased situational awareness

I think with video analytics and access to live camera feeds from mobile devices, I had an overview of the entire campus on real-time which improved my ability to monitor, detect and respond to incidents quickly. (S5)

Theme 2: More efficient deployment of resources

I think predictive analytics helped me to allocate patrols proactively based on risk forecasts, this freed up guards from routine stationary posts to focus on dynamic response, the automated alerts helped me to reduce reliance on manual monitoring of many cameras and checkpoints. (S6)

Theme 3: Enhanced safety perceptions

As a student, I felt safer in my school knowing that multiple areas were constantly recorded and any suspicious activity could be quickly identified, the facial recognition improved verification of identities at key locations in my university community. (S13)

Theme 4: Data-driven decision making

I think the use of incident reports and system usage logs has equipped management to make evidence-based revisions to security protocols and infrastructure, analytics pinpointed high-crime times and places to focus prevention efforts, over time, crimes declined as the AI studied criminal patterns and behaviors. (S19)

Theme 5: Cost-effectiveness of AI solutions

I think while initial investment required budget allocation, long-term savings are anticipated from reduced incident costs, guard overtime, and insurance expenses, Maintenance is more affordable than expanding human personnel and the AI allows a smaller staff to serve a larger campus effectively. (S25)

In general, participants' preference for adopting AI in optimizing security initiatives was consistent, and most students prefer the AI software and application models. Some security personnel reported that AI systems allowed them to monitor more campus area simultaneously than using human observation alone, enabling threats to be identified and addressed much faster than when relying solely on in-person patrols making rounds. They also noted that predictive analytics aided in more strategic deployment of guard schedules and routes, while automated notifications reduced fatigue and enhanced focus on proactive response compared to constant live monitoring of video feeds. Therefore, the interviewed security personnel were strongly convinced that integrating AI technologies into campus security operations greatly enhanced their capability to protect the university community in a more efficient, data-driven manner compared to traditional human-only approaches.

Additionally, some personnel acknowledged that AI systems may still struggle with nuanced judgment calls requiring human empathy or discretion, and complete reliance on technology could undermine personal connections with students and staff. To mitigate such shortcomings, they suggested AI should be used as a force multiplier alongside human security teams, not a replacement, by automating routine tasks to free up guards for community engagement and complex situations best handled by on-site human assessment.

DISCUSSION

This study aimed to explore the effectiveness of Artificial Intelligence on optimizing security initiatives in quality service delivery at higher institution level. The quantitative results showed that the participants of the AI package and solution for security initiatives in the experimental group scored significantly higher than those in the control group in terms of perceived key violent and property crimes which was consistent with the findings of Okeke et al. (2023) and Salaam et al. (2022), suggesting that an AI-optimized patrol routing using predictive analytics with facial recognition and cameras can help security teams to deploy resources more strategically to key risk areas, quickly identify unauthorized individuals with situational awareness, predict threat, streamline security operations and perceive safety across the university community.

The results of this study affirmed the value of AI software and applications in the management of security practices for quality service delivery in higher institutions. There are several possible reasons for the findings. The possible reasons for these findings would be as follows: firstly, when the university management allow security personnel to use AI to provide high-quality security service on campus, it has a positive impact on the quality of service delivery in the institution (Lebese & Molapo, 2023). Secondly, AI as a computerized algorithm, can provide around-the-clock monitoring to quickly detect and deter threats, keeping security personnel, visitors, lecturers and students safe on campus at all times. This access control systems enhances campus security by accurately verifying identities and controlling access to restricted areas, minimizing the risk of unauthorized entry (Ajayi & Edet, 2023).

Moreover, analytics and predictive policing from AI help security personnel proactively mitigate risks and optimize protective measures for the benefit of all university community members. (Albinali, Krishen & Bakdash, 2022). Furthermore, studies by Onyemenem and Onyemenem (2021), Maibach, Siff and Atayeva (2023) indicated that robotics are autonomous devices such as drones and robots can extend monitoring, simplify tasks and operate in hazardous conditions. They are artificial intelligent tools that can organize, visualize and interpret security data to gain actionable insights while optimization/automation are automating routine processes that streamline operations and free up staff for higher-level security duties

Based on the qualitative feedback, integrating AI technologies into campus security operations has greatly enhanced their capability to protect the university community in a more efficient, data-driven manner compared to traditional human-only approaches. Specifically, the results were similar to those revealed in the qualitative study conducted by Gao, Chen and Li (2020), which showed that AI-based security solutions, such as surveillance systems, facial recognition, and predictive analytics, have been effective in enhancing security in higher institutions. Additionally, it is consistent with the results of another qualitative study which revealed that AI has improved the quality of service delivery, particularly in areas like student support, personalized learning experiences, and administrative processes (Lebese & Molapo, 2023). The possible reasons for these findings are as follows: firstly, AI-based security solutions can monitor and analyze huge amounts of data in real-time, identify potential security threats, and prevent crime before it happens. This helps universities to provide a safe and secure environment for their staff and students (Garvey & Lari, 2021). Secondly, AI can gather and analyze data from various sources, such as CCTV footage, social media, and student records, to identify potential risks and patterns of criminal behavior.

By predicting crime, universities can take proactive measures to prevent it. Thirdly, AI can provide learners with an environment for mutual learning, where group learning could lead to higher learning outcomes than individual tasks (Chen et al., 2018). Moreover, studies by Kowalski, Buford and Mackey (2022) and Ogban Bolari and Akpama (2021) indicated that adopting AI for security monitoring on university campuses can help analyze vast amounts of sensor data and detect threats more efficiently than relying solely on human security guards. However, AI systems still require human oversight and judgment to properly interpret situations, while security guards provide a human presence and interaction that can help foster community and trust on campus. This shows that an ideal security approach may integrate both AI and human personnel by utilizing each of their respective strengths to maximize safety, responsiveness, and community engagement. In a nutshell, for universities to remain globally competitive and prepare students for the future of work, it is imperative that they leverage cutting-edge 21st century technologies like artificial intelligence to enhance security operations, automate routine

tasks, analyze vast datasets, and conduct research - in short, AI adoption is no longer optional for forward-thinking university management who want their institutions to thrive in this new digital age. The contribution of the present research is the proposed the effectiveness of Artificial Intelligence on optimizing security initiatives in quality service delivery at higher institution level.

CONCLUSION

This study found that Artificial Intelligence (AI) was effective in optimizing security initiatives in quality service delivery in higher institutions. The findings demonstrate that strategically implemented AI solutions can significantly enhance campus security and bolster quality of service delivery at higher education institutions. When integrated judiciously with existing human-led practices through ongoing staff training, AI provides valuable augmentation that elevates situational awareness, predictive threat prevention, efficient resource allocation, and safety perceptions across the university community (Chen, Li, Zhou & Yang, 2018).

RECOMMENDATIONS

Therefore, the following suggestions are made in this study: the management of the higher institutions can optimize their security practices by firstly, security personnels should be trained to start using AI for security operations on campus through comprehensive hands-on workshops that educate them on how to interpret data insights from AI systems, leverage different tools and monitors to remotely access real-time information, and appropriately integrate augmented intelligence into their routine patrols and responses. Secondly, the management should invest in video analytics systems for surveillance cameras around campus. This is because AI algorithms can monitor footage 24/7, automatically detecting anomalies, crowds and left behind objects which improves safety monitoring compared to human guards alone. Thirdly, the management ought to deploy AI access control at entry/exit points of sensitive facilities. Biometric scanners with facial recognition can precisely identify unauthorized access attempts and restricted zone entries, enhancing asset and infrastructure protection. Lastly, the management should develop an AIpowered security operations center to enable predictive policing on campus. By analyzing historic incident reports and patterns of criminal activity, AI can recommend optimized guard deployment plans and prioritize high-risk areas on any given day, improving response efficiency and deterrence.

Limitations

Although this study adopted a quasi-experimental design to study the use of AI in optimizing security initiatives, no doubts, there were some limitations. First of all, the participants in this study were the security personnel and students, so the generalizability was limited. It is hoped that future research could be extended to cover different types of staff personnel and learning environments, expand the range of experimental objects and environments, and conduct quasi-experimental design on the effectiveness of AI in optimizing security management practices. Secondly, the duration of the experiment of this study was 12 weeks. Therefore, it is hoped that future researchers would conduct longer experimental studies to gain a deeper understanding of the impact of AI on optimizing security initiatives in quality service delivery and the related outcomes.

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