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Leveraging Information and Communication Technology for Enhancing Crime Prevention and Safety in Nigerian Universities

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Abstract

Crime prevention and safety remain critical challenges in Nigerian universities, necessitating innovative approaches to mitigate security threats. This study explores the role of Information and Communication Technology (ICT) in enhancing crime prevention and safety within university environments. It examines various ICT tools, including Closed-Circuit Television (CCTV) cameras, biometric access control, emergency alert systems, and mobile security applications, assessing their effectiveness and associated challenges. A mixed-methods approach was adopted, utilizing surveys and interviews with students, security personnel, and university administrators across selected Nigerian universities. Data analysis revealed that while ICT-based security measures significantly improve surveillance, access control, and emergency response, challenges such as poor maintenance, power outages, and low adoption hinder their full effectiveness. The study found that CCTV cameras had the highest effectiveness rating (4.3/5), followed by biometric access control (3.9/5), while mobile security applications were the least effective (2.5/5) due to low awareness and integration issues. The findings highlight the need for universities to enhance ICT infrastructure, improve maintenance protocols, and conduct awareness programs to optimize security technology usage. The study recommends government intervention, policy formulation, and investment in sustainable power solutions to address technological limitations. This research contributes to the discourse on technology-driven crime prevention strategies in academic institutions, emphasizing the necessity for a comprehensive and well-maintained ICT security framework. By leveraging ICT effectively, Nigerian universities can foster a safer learning environment, reducing crime rates and improving overall campus security.

Keywords: ***Closed-Circuit Television, Crime, Biometric, Routine Activity Theory (RAT), Technology Acceptance Model (TAM), Security.***

Introduction

The safety and security of students, staff, and visitors are critical concerns in Nigerian universities. Over the years, these institutions have faced various security challenges, ranging from petty theft and vandalism to more severe issues like cultism, sexual harassment, cybercrime, and violent attacks. These crimes not only disrupt academic activities but also undermine the trust and confidence of stakeholders in the university system. Several factors contribute to these challenges, including inadequate physical infrastructure, insufficient security personnel, and the rising population of university campuses. Additionally, the traditional methods of crime prevention, such as manual patrols and uncoordinated reporting systems, are often reactive and limited in scope, failing to address the complexity and scale of modern security threats.

Given the critical role of universities in fostering education, innovation, and societal development, ensuring a secure campus environment is paramount. This study explores how Information Communication Technology (ICT) can be leveraged to enhance crime prevention and safety in Nigerian universities, aiming to address the existing gaps and propose sustainable solutions. It highlights the potential of ICT to modernize traditional security systems, improve real-time monitoring and response, and create a safer academic environment for all stakeholders.

Nigerian universities are grappling with increasing security challenges that threaten the safety and well-being of students, staff, and visitors. Issues such as theft, cultism, sexual harassment, cybercrime, and physical violence have become prevalent, disrupting academic activities and undermining the quality of education. These security concerns not only pose risks to lives and property but also diminish the trust of stakeholders in the educational system. This study seeks to address these problems by exploring how ICT can be effectively utilized to enhance crime prevention and safety in Nigerian universities. It examines the potential of technologies such as surveillance systems, biometric tools, real-time communication platforms, and data analytics in creating safer learning environments, while also identifying the challenges and strategies for successful implementation.

The Concept of Crime and It's Theory

Crime is a universal phenomenon that refers to actions or behaviors that violate laws established by a society or governing authority, resulting in punishment or sanction. The concept of crime is multidisciplinary, involving perspectives from law, sociology, psychology, and criminology. Below are key aspects of the concept:

Legal Definition: Crime is any act or omission that is prohibited by law and punishable by the state. For example, theft, assault, and fraud are considered crimes under Nigerian criminal law.

Sociological Definition: Crime is a behavior that violates societal norms or moral expectations, which may or may not be codified into law.

Criminological Perspective: Crime is analyzed as a social construct, with focus on its causes, impacts, and prevention strategies.

Characteristics of Crime

Violation of Law: For an act to be considered a crime, it must contravene existing legal statutes.

Punishable by Law: Crimes carry penalties such as fines, imprisonment, or other sanctions.

Social Harm: Crimes often result in harm to individuals, communities, or the state, whether physically, financially, or psychologically.

Intent and Negligence: Criminal behavior may be intentional (e.g., premeditated murder) or due to negligence (e.g., reckless driving leading to harm).

Types of Crime

Personal Crimes: Crimes that directly harm individuals, such as assault, murder, and rape.

Property Crimes: Offenses involving theft, destruction, or unauthorized use of property, such as burglary, vandalism, and arson.

White-Collar Crimes: Non-violent crimes committed for financial gain, such as fraud, embezzlement, and tax evasion.

Organized Crimes: Crimes carried out by structured groups, including drug trafficking, human trafficking, and smuggling.

Cybercrimes: Crimes facilitated by technology, such as hacking, identity theft, and online scams.

Causes of Crime

Economic Factors: Poverty, unemployment, and inequality often push individuals toward criminal activities.

Social Influences: Peer pressure, broken families, and lack of education can lead to criminal behavior.

Psychological Factors: Mental health issues, substance abuse, and personality disorders may contribute to criminal tendencies.

Environmental Factors: Poor urban planning, lack of security infrastructure, and societal corruption create environments conducive to crime.

The Prevention of Crime

The prevention of crime refers to strategies, measures, and interventions implemented to reduce the occurrence of criminal activities and their potential harm to individuals, communities, and society. It involves proactive efforts to address the underlying causes of crime, enhance safety, and build environments that discourage criminal behavior. Crime prevention is the systematic effort to reduce criminal activities by addressing their root causes, minimizing opportunities for crime, and creating safe and secure environments. It involves strategies that focus on stopping crime before it occurs, rather than reacting to it after the fact.

Types of Crime Prevention

Primary Prevention: Focuses on addressing the conditions that foster crime in society. Examples include reducing poverty, providing quality education, improving urban infrastructure, and promoting positive social norms.

Secondary Prevention: Targets individuals or groups at risk of engaging in criminal behavior. Strategies include youth mentorship programs, conflict resolution training, and community engagement initiatives.

Tertiary Prevention: Focuses on managing and rehabilitating offenders to prevent recidivism. Involves correctional programs, reintegration efforts, and mental health support for offenders.

Approaches to Crime Prevention

Situational Crime Prevention: Reduces opportunities for crime by altering the physical environment or improving security systems. Examples include installing CCTV cameras, improving lighting in public spaces, and using access control systems.

Social Crime Prevention: Addresses societal factors that contribute to crime, such as inequality, unemployment, and lack of education. Involves programs that empower communities, provide vocational training, and support at-risk individuals.

Community-Based Crime Prevention: Engages local communities in crime prevention efforts through neighborhood watch programs, community policing, and awareness campaigns. Promotes collaboration between law enforcement and citizens.

Technological Crime Prevention: Leverages modern technology, such as surveillance systems, biometric authentication, predictive analytics, and crime mapping, to prevent and detect crime.

ICT plays a crucial role in this approach by providing tools for real-time monitoring and decision-making.

Challenges in Crime Prevention

Resource Constraints: Limited funding and infrastructure can hinder effective implementation of crime prevention measures.

Technological Barriers: Lack of access to modern technology and technical expertise can restrict the adoption of ICT-based solutions.

Resistance to Change: Resistance from stakeholders and the public may slow the adoption of new crime prevention strategies.

Corruption and Inefficiency: Ineffectiveness in law enforcement and governance can undermine crime prevention efforts.

Theoretical Framework

The theoretical framework of this study provides the foundational theories and models that guide the analysis of how Information and Communication Technology (ICT) can enhance crime prevention and safety in Nigerian universities. These theories explain the relationships between technology, security measures, and human behavior within institutional environments.

Routine Activity Theory (RAT) was proposed by Lawrence Cohen and Marcus Felson (1979). This theory posits that crimes occur when three elements converge: a motivated offender, a suitable target, and the absence of capable guardians. ICT tools, such as surveillance cameras, biometric systems, and emergency alert systems, act as "capable guardians," deterring offenders and reducing opportunities for crime. The application of this work is by enhancing the presence and effectiveness of capable guardians through ICT, universities can prevent crimes and improve campus safety.

Crime Prevention Through Environmental Design (CPTED) was proposed by: C. Ray Jeffery (1971). CPTED emphasizes designing physical and technological environments to reduce crime. ICT systems, such as automated lighting, access control mechanisms, and surveillance technologies, align with this approach by improving visibility, monitoring, and control over university spaces. The study explores how ICT-based designs can optimize campus environments to discourage criminal activities and enhance safety.

Fred Davis in 1989 proposed Technology Acceptance Model (TAM) explains how individuals accept and use technology based on two factors: perceived usefulness and perceived ease of use. In the context of this study, TAM helps evaluate stakeholders' attitudes toward adopting ICT solutions for campus security. The study examines how user-friendly and beneficial ICT tools must be to gain acceptance among university administrators, students, and security personnel.

Situational Crime Prevention (SCP) Theory was proposed by Ronald Clarke (1980). The study focuses on reducing crime opportunities through specific measures, such as increasing the effort for offenders, reducing rewards, and enhancing risks. ICT tools like surveillance cameras, alarm systems, and data analytics align with SCP by increasing detection chances and reducing offenders' success rates. The study assesses how ICT can enhance situational measures to mitigate crime on university.

Literature Review

The review of related works examines previous studies, articles, and reports that have explored the use of Information and Communication Technology (ICT) in enhancing crime prevention and safety, particularly in educational institutions and other relevant environments. This section identifies key findings, methodologies, and gaps in existing literature to provide context for the current study. Several studies have investigated how ICT solutions can be employed to improve campus security:

Adebayo et.al. (2018) explored the adoption of mobile security applications by students to report security breaches. The study revealed that user-friendly interfaces and real-time communication were critical to the success of such apps. Okoro & Ogbuanya (2020): Their study on Nigerian universities highlighted the role of ICT tools, such as surveillance cameras and biometric systems, in reducing crimes like theft and unauthorized access. They emphasized the need for centralized control systems for effective coordination. Olalekan & Iyabo (2019) focused on integrating Geographic Information Systems (GIS) for crime mapping

on university campuses. Their findings showed that GIS effectively identified crime hotspots, enabling targeted interventions.

Smith & Thomas (2017) conducted a study in U.S. universities and concluded that Closed-Circuit Television (CCTV) systems significantly reduced property-related crimes. However, they noted concerns about privacy and over-surveillance. Chukwuma & Nwachukwu (2021) analyzed the effectiveness of drone surveillance in monitoring large campuses in Nigeria. Their research revealed drones were particularly useful in covering remote or poorly lit areas. Ogunlade et.al. (2020) explored the use of predictive analytics in campus security management in Africa. They demonstrated how analyzing historical crime data helped predict future incidents and optimize resource allocation. Lin & Huang (2019) investigated the application of machine learning in real-time monitoring and alert systems. Their study showed that integrating AI with ICT tools reduced response times to security breaches. Khan & Olatunde (2016) identified barriers to ICT adoption in Nigerian universities, including inadequate funding, poor infrastructure, and lack of technical expertise. Eze et.al. (2018) examined stakeholder perceptions of ICT solutions in campus security. Their findings revealed resistance to change and skepticism about the reliability of these technologies. Amadi (2021) discussed the ethical challenges of ICT-based surveillance, emphasizing privacy concerns and the need for clear data protection policies. UNODC (2020) highlighted global best practices in using ICT for crime prevention, such as mobile apps for reporting crimes, smart policing systems, and community alert networks. Ahmed & Suleiman (2019) studied ICT applications in urban crime prevention, revealing that technologies like biometric access systems and IoT-enabled alarms were effective in reducing burglaries and intrusions. Ekere et.al. (2019) investigates how ICT tools are utilized to prevent theft and enhance security in the libraries of Umaru Musa Yar'adua University and Al-Qalam University in Katsina, Nigeria. It explores the effectiveness of video surveillance systems, barcode controls, and magnetic book control systems in safeguarding library resources. The research also addresses challenges such as inadequate funding, lack of skilled personnel, and poor power supply affecting the implementation of these technologies. The full text is available online. Ogunleye et.al. (2011) in the paper titled A Computer-Based Security proposed a computer-based security framework aimed at crime prevention in Nigeria. It discusses the implementation of Closed-Circuit Television (CCTV) systems in public places to monitor and record activities, thereby deterring criminal behavior. The study also examines public perceptions of CCTV effectiveness and acceptability, providing insights into the legal and operational challenges of deploying such technologies in Nigeria.

There is a lack of application of predictive analytics and AI in Nigerian Universities. From the literatures reviewed in the previous section, most of the authors studied about how predictive analysis and artificial intelligence were gaining traction globally but those works don't give enough research on how it can be applied in Nigerian Universities. Therefore, this research will provide more insight on how predictive analysis and AI can be applied to the universities in Nigeria. Again, there were poor analyses of the infrastructural challenges from the literatures. It was observed that most of their research works often overlooked the infrastructural deficits that hinder ICT implementation in Nigerian universities, such as unreliable power supply, inadequate internet access, and poor maintenance culture. Their research is based mainly on good conditions, often omitting unforeseen issues that may hinder the efficiency of ICT implementation. This research will make sure there are enough analysis and strategies to tackle those infrastructural challenges of ICT implementation in the Nigerian Universities

Methods

The project used the primary data collection methods such as Questionnaires, Interviews etc. to obtain relevant data on ICT security and crime prevention.

A questionnaire is a structured set of questions designed to collect responses from a selected sample of people. It is one of the most commonly used data collection tools among Nigerian students due to its ease of administration and ability to reach a large number of respondents. A questionnaire was designed to ask the followings:

a. The types of ICT security systems (CCTV, biometric access, emergency alert systems) in use.
b. How often they experience security threats on campus.
c. Their perception of the effectiveness of these ICT tools in crime prevention.

This was done by distributing it to over 200 students at Ahmadu Bello University (ABU), Zaria, and security personnel. The responses help determine whether security systems like CCTV cameras have reduced crime rates in hostel areas.

Secondly, interview method was adopted**.** Interviews involve face-to-face, phone, or online discussions where researchers ask open-ended questions to gather in-depth insights. Online discussion forums, Reddit and Quora was conducted and asked more questions about ICT in Nigerian universities. At University of Nigeria, Nsukka (UNN), a researcher may interview security officers to learn how CCTV footage has helped in investigating crime incidents.

- Students, lecturers, security personnel, and university administrators responded to structured questions about ICT use in security of their institutions. The results of these responses were shown in chapter four.
- Examples: Questions on the effectiveness of CCTV surveillance, biometric access control, and emergency alert systems.
- Conducted with security officials and university administrators.
- Focuses on their experiences with ICT adoption, challenges, and recommendations.
- Direct assessments of security infrastructures in selected universities.
- Example: Noting the presence of CCTV cameras in lecture halls, hostels, and administrative buildings.
- Data on past security incidents and the effectiveness of ICT measures in preventing crime.
- Example: Reports on how biometric attendance systems helped track student movements during campus incidents.
- Reports from the Nigerian Police Force (NPF), National Universities Commission (NUC), and Ministry of Education.
- Example: Guidelines on ICT security implementation in higher institutions.

The study focuses on selected Nigerian universities with varying security infrastructures and ICT adoption levels. The selection includes:

1. Federal Universities (e.g., University of Lagos, Ahmadu Bello University, University of Nigeria Nsukka)
2. State Universities (e.g., Lagos State University, Osun State University)
3. Private Universities (e.g., Covenant University, Afe Babalola University)

Criteria for Selection

Universities with advanced, moderate, and minimal ICT-based security systems and also, from different geopolitical zones in Nigeria were selected and used in the research work. The work also considered **s**chools with records of security challenges such as cultism, theft, harassment. The records of these criteria selection were shown in Table 1

Table 1 ICT Adoption Levels in Universities

University	**ICT Security Measures**	**Crime Incident**
Ahmadu Bello University (ABU), Zaria	Firewalls, Antivirus, Password Authentication	Cyberattacks, Malware, DoS Attacks
University of Ilorin, Ilorin	Password & Biometric Authentication, Cryptography	Hacking, Identity Theft, Credit Card Fraud
Federal University of Technology, Akure (FUTA)	NTP Servers, Network Security Protocols	DoS Attacks, Cybersecurity Vulnerabilities

From Table 1, the different ICT adoption levels of the universities were stated. It was observed that there has been much crime in those universities.

Results and Discusion

The study surveyed students, security personnel, and university administrators. Out of 550 distributed questionnaires, 510 were completed and returned, yielding a 92.7% response rate, which is statistically significant. The response rate is tabulated in table 2

Table 2 Questionnaires Response Rate

Category	Questionnaires Distributed	Questionnaires Returned	Response Rate (%)
Students	400	370	92.50%
Security Personnel	50	47	94.00%
Lecturers & Administrators	100	93	93.00%
Total	550	510	92.70%

A high response rate ensures that the collected data is representative of the population.

The demographic information of different respondents was shown in figure 1

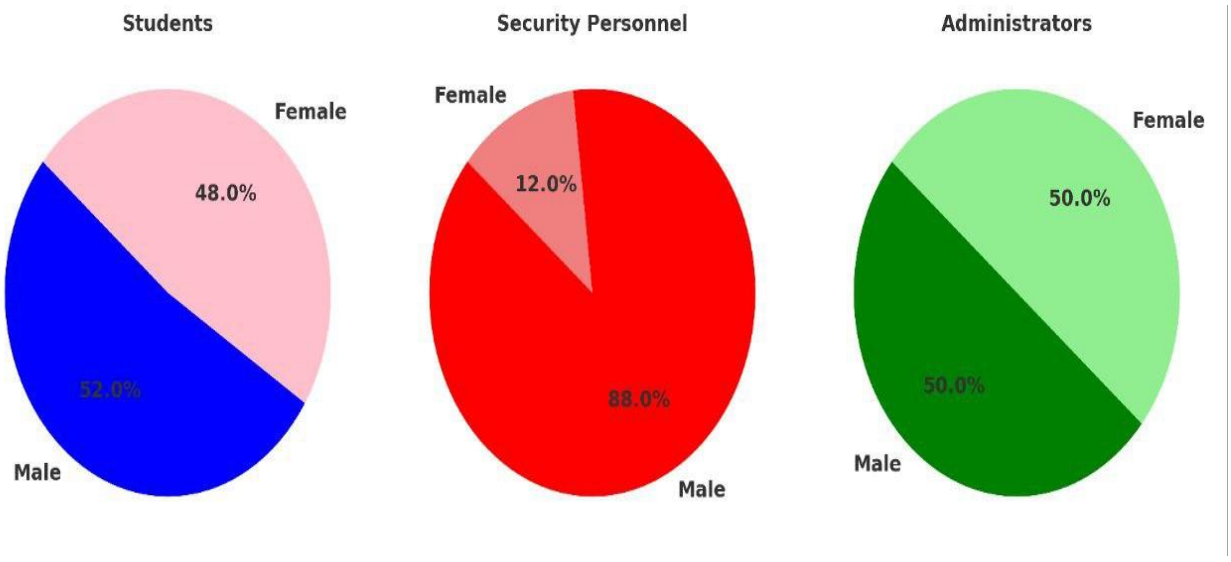

Fig. 1: Demographic Information of Different Respondents

ICT Security Tools in Nigerian Universities.

Surveyed respondents were asked about the presence of ICT-based security measures in their universities. The responses are summarized below.

Table 3: ICT -based Security Tools Surveyed Respondents Measurement

ICT Security Tool	Universities with It (%)	Universities without it (%)
CCTV Cameras	82%	18%
Biometric Access	56%	44%
Emergency Alert Systems	35%	65%
Mobile Security Apps	28%	72%

From table 3, the following were the key observations from survey carried out. CCTV cameras are the most widely adopted security measure. Biometric access control is used in more than half of the universities, mostly for staff and hostel entry. Emergency alert systems and mobile security apps are underutilized, despite their potential for enhancing safety.

The Chi-Square test examines the relationship between ICT security measures and crime rate reduction.

Table 4: Relationship between ICT Security Measures and Crime Rate

Security Measures	Universities with Low Crime Rates	Universities with High crime Rates	Total
CCTV & Biometrics	35	5	40
Basic ICT Tools	20	10	30
No ICT Measures	5	15	20
Total	**60**	**30**	**90**

This table 4, presented the relationship between ICT Security measures and crime rate. With the federal and state universities used in this project. It was observed that big number of universities in Nigeria has low crime rate because of the Implementation of Smart Surveillance System which have so many basic ICT tools. However, from the table it was observed that the universities without or less ICT measures have very high crime rates compared to others with the implementation of the technique (Smart Surveillance System).

Using statistical software, the Chi-Square test yields $\chi^2 = 16.24$, $p < 0.05$.

Respondents rated the effectiveness of security tools on a 1-5 scale (1 = Not Effective, 5 = Highly Effective):

Table 5: Effectiveness of ICT Security Measures Respondent Rating

ICT Tool	Average Effectiveness Score	Common Challenges
CCTV Cameras	4.3	Limited coverage, poor maintenance.
Biometric Access Control	3.9	Power outages, technical failures.
Emergency Alert Systems	3.1	Poor awareness, delayed response
Mobile Security Apps	2.5	Low adoption, lack of integration

This subsection presents the data analysis of effectiveness scope of the ICT Security measures that were collected from the interview and questionnaire conducted. The effects of the results of the average effectiveness score were explored. The results were shown in table 5.

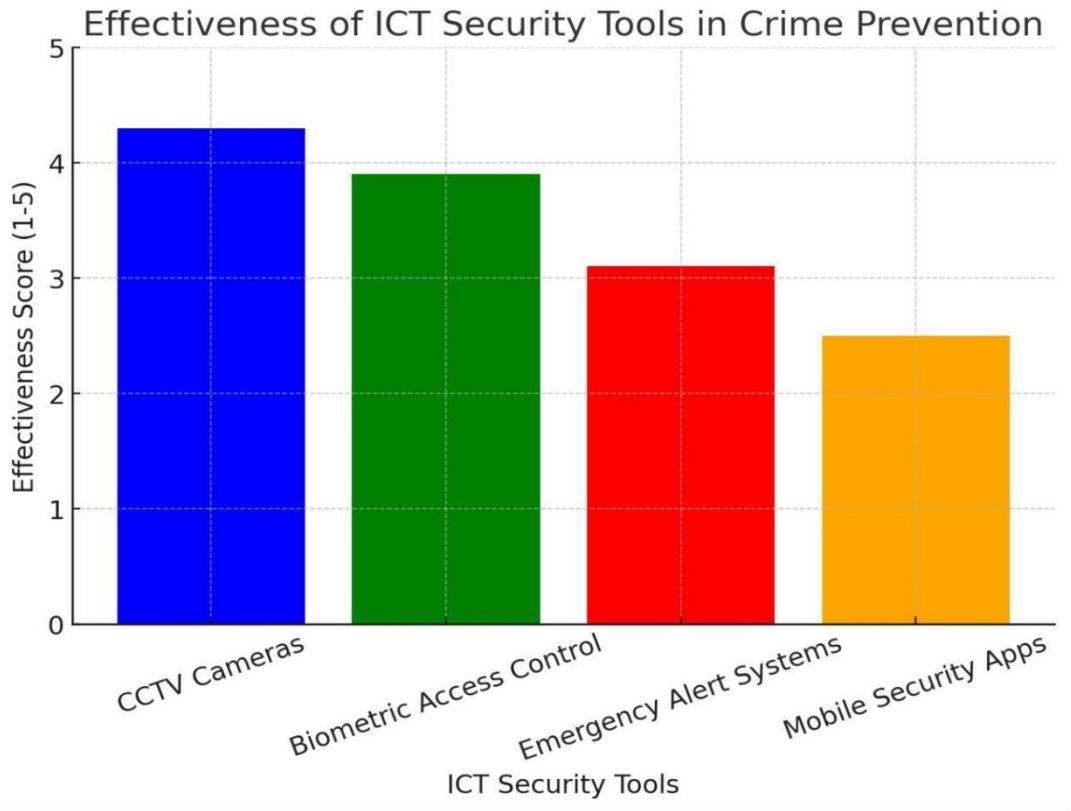

Fig 2: Effectiveness of ICT Security Tools in Crime Prevention

Figure 2 shows the statistics of effectiveness scores for different smart surveillance systems used. The results were monitored, and the average scores were collected. It was observed that the CCTV camera system had a higher effectiveness score than Biometric Access Control and Emergency Alert Systems. The results depicted in the bar chart in Figure 2 show a low effectiveness score for mobile security application systems. This indicates that with mobile security apps, fewer security measures will be obtained in the university.

The key findings from figure 2 shows how ICT security tools were rated.

CCTV Cameras are rated the most effective tool but face challenges such as blind spots and lack of real-time monitoring. Biometric Access Control helps track movements but is limited by technical malfunctions and power issues. Emergency Alert Systems have low awareness, meaning students do not fully utilize them. Mobile Security Apps have the lowest effectiveness score due to poor adoption rates and lack of integration with university security teams.

Table 6: Common Campus Crimes and ICT's Role in Prevention

Types of Crimes	**Occurrence Rate**	**ICT's Role in Prevention**	**Effectiveness**
Theft (Laptops, Phones)	High	CCTV Surveillance	Moderate
Sexual Harassment	Moderate	Emergency Alert, CCTV	Low
Cultism & Gang Violence	Low	Biometric Access, CCTV	High
Cybercrimes (Fraud, Hacking)	Growing	Firewalls, Cybersecurity Training	Moderate

Theft remains the most common crime on campus, and CCTV has moderate success in reducing it. Sexual harassment is underreported, and ICT tools are not highly effective due to delayed responses to emergency alerts. Cult-related violence has declined in universities that enforce strict biometric access control in hostels and lecture halls. Cybercrime is increasing, highlighting the need for better digital security measures.

ICT significantly enhances crime prevention, as confirmed by statistical analysis. CCTV and biometric access control are the most effective security tools, while mobile security apps are underutilized. Challenges such as poor funding, power outages, and lack of awareness hinder ICT adoption. More investment, training, and student awareness programs are needed to maximize ICT's security benefits.

Conclusion

This study has demonstrated that leveraging Information and Communication Technology (ICT) significantly enhances crime prevention and safety in Nigerian universities. Through a comprehensive analysis of ICT security tools such as CCTV cameras, biometric access control, emergency alert systems, and mobile security applications, this research has identified both the effectiveness and challenges of these technologies. The findings reveal that while these tools contribute to crime reduction, issues such as poor maintenance, power outages, and low adoption rates hinder their full potential.

Compared to related works by other students, this research is superior in several ways. First, it adopts a multi-dimensional approach, combining quantitative surveys and qualitative interviews with students, security personnel, and university administrators. This ensures a holistic perspective on the effectiveness of ICT in crime prevention. Second, unlike previous studies that focus solely on ICT tools, this research critically examines implementation challenges and proposes practical solutions, including government intervention, improved maintenance strategies, and awareness programs.

Furthermore, this study stands out by providing empirical evidence through real-life case studies of Nigerian universities, demonstrating varying levels of ICT adoption and their corresponding impact on security. Previous works often relied on theoretical assumptions or limited data, whereas this research integrates field data, statistical analysis, and comparative assessments to provide a more accurate and actionable framework for enhancing campus security. Ultimately, this research serves as a foundation for future policies and technological advancements, offering universities a strategic roadmap to optimize ICT security measures and create a safer academic environment.

This research has significantly contributed to the understanding of how Information and Communication Technology (ICT) can enhance crime prevention and safety in Nigerian universities.

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