THE ROLE OF TECHNOLOGY IN ENHANCING AND STRENGTHENING LIBERIA'S DRUGS LAW ENFORCEMENT AGENCY: AN EMPIRICAL STUDY

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ABSTRACT

The growing prevalence of drugs trafficking, substance abuse and other drug-related crimes poses significant concerns to Liberia's peace, security, public health, and socio-economic credentials of the country. The Liberia Drugs Enforcement Agency (LDEA) plays a crucial role in mitigating the menace of drug-related crimes, enhancing surveillance, intelligent gathering, case management and operational efficiency. Consequently, challenges hindering the implementation of technology-driven solution in (LDEA) includes outdated enforcement strategies, limited resources, legal constraints and weak intelligence-sharing techniques. This research analyzes the role of technology in strengthening the LDEA's capacities in curtailing the drugs trafficking and substance abuses by examining modern enforcement tools such as artificial intelligence (AI), surveillance drones, blockchain technology, digital forensics, and cybersecurity measures. The study employs mixed method approach, combining qualitative data from interview and quantitative data through drugs-related crime trends, arrests rates and the effectiveness of technology-driven equipment. The findings contribute to the discourse of drugs law enforcement modernization in Liberia, providing policy recommendations on how to integrate advanced technology into drugs law enforcement operations. Subsequently, the results underscore the importance of capacity building, inter-agency synergy and collaboration and international partnership to extend the benefits of technology in drug control.

Keywords: Drug enforcement, Technology integration, Intelligence gathering, Artificial intelligence (AI), Surveillance and cybersecurity, Liberia Drug Enforcement Agency (LDEA).

INTRODUCTION

Background of the study

Liberia and many other countries in west Africa face serious challenges in drug enforcement because of the increasing of drug trafficking, substance abuse and the increasing experience of criminal activities. Liberia Drug Enforcement Agency (LDEA) is responsible for combating drug-related crimes, but it's not effective due to limited resources, and outdated intelligence-sharing method.

Liberia being a transit point in West Africa for drug trafficking and substance abuse, which has increasingly become a national security threat with traffickers making used of its open borders, weak governmental frameworks, and limited law enforcement capacity making it difficult in combating drug-related crimes[17] (UNODC, 2021). The Liberia Drug Enforcement Agency (LDEA) is the main body responsible for combating drug-related crimes, yet it faces operational constrains, including not good enough funding, outdated enforcement techniques, and lack of modern surveillance technologies[9] (Liberia Ministry of Justice, 2020).

Technology has changed law enforcement agencies internationally, enables them to carry on surveillance, intelligence gathering, digital forensics, and operational planning. However, Liberia is yet to fully improve technologies into its drug enforcement structure. This research seeks to explain how modern technology can strengthen the Liberia Drug Enforcement Agency (LDEA) 's capacities to improve enforcement operation, drug identification, and crime prevention.

The Liberia Drug Enforcement Agency (LDEA) was established under the Controlled Drugs and Substances Act of 2014 to carry out drug laws, to stop illegal trafficking, and promote public awareness on drug abuse[8]

 (Liberia MoJ, 2014). The agency operates under the management of Ministry of Justice (MoJ) and work together with regional and international partners such as the United Nations Office on Drugs and Crime (UNODC), U.S. Drug Enforcement Administration (DEA), and Economic Community of West African States (ECOWAS) to restraint drug-related crimes, West Africa Commission on Drugs[16](WACD, 2014).

Drug trafficking and substance abuse have become national security threats in Liberia, affecting public health, economic growth, and social stability. The Liberia Drug Enforcement Agency (LDEA), established to combat illegal drug activities, facing important operational challenges that preventing its effectiveness. Nowadays, the

global drug trade has become more technologically advanced, with drug dealers using digitalize payment systems, coded communication, and online platform to evade escape detection. However, Liberia Drug Enforcement Agency (LDEA) still relies on outdated enforcement approach, making it difficult to keep up with modern drug networks.

To attend to this issue, combining technology into drug enforcement technique can increase intelligence gathering, improve surveillance, modernize drug detection methods, and boost case management systems. This research explores how technological advancements can be used to strengthen the Liberia Drug Enforcement Agency (LDEA)'s capacity to combat drug-related crimes more effectively.

Problem Statement

The Liberia Drug Enforcement Agency (LDEA) struggle with:

Limited Surveillance and Intelligence Capabilities: The LDEA lacks modern surveillance devices and intelligence-gathering strategies, such as drones, AI-powered cameras, and GPS tracking, making it difficult to trace and seize drug trafficking system. LDEA has limited data analytics capabilities to see and trail drug-related activities. It has weak coordination with international drug enforcement agencies, heading to information gaps, and insufficient funding for developing a strong intelligence unit.

Outdated Drug Detection Methods: Liberia Drug Enforcement Agency (LDEA) depends on traditional, manual drug identification techniques, which are slow, unreliable, and easy for criminals to escape. The Liberia Drug Enforcement Agency (LDEA) has limited access to modern drug testing kits, and sniffer dogs. LDEA depend on outdated field tests that may not detect synthetic drugs. And also, LDEA is lack of real-time drug recognition databases, making it difficult to categorize seized substances quickly.

Inefficient Communication and Case Management Systems : LDEA's communication systems are slow and poorly integrated , leading to delays in responding to drug crimes and inefficiencies in case tracking, no centralized digital database system for case files and criminal records, lack of secure, real-time communication mediums between field officers and headquarters, no paper-based documentation, which is prone to loss and delays, and weak inter-agency collaboration, as LDEA does not have an automated system for sharing intelligence with national and international security frame.

Inadequate Training in Digital Forensics and Cybersecurity: LDEA officers lack the necessary training in digital forensics and cybersecurity, making it difficult to

prevent drug trafficking online and financial crimes connect to drug gang, weak cybersecurity infrastructure, making LDEA's database system exposed to hacking, lack of understanding with financial crime units, that is preventing effective tracking of money laundering related to drug trade. The LDEA has no advanced training in mobile and computer forensics to examine drug-related evidence, and also limited expertise in tracking drug transactions on the dark web.

Rising Drug-Related Crimes Due to Ineffective Enforcement: Regardless of LDEA's efforts, drug-related crimes continue to rise, showing that current enforcement strategies are ineffective, lack of community meeting and public awareness campaigns, decreasing the effectiveness of prevention efforts. It has limited rehabilitation programs, which resulting in high rates of drug abuse worsen. Corruption within law enforcement agencies, mostly leading to compromised investigation, and also having weak border control, allowing drug traffickers to smuggle drug easily.

RESEARCH OBJECTIVES

a. To evaluate the current technological gaps in Liberia Drug Enforcement Agency (LDEA)'s drug enforcement efforts.
b. To examine how modern technologies can improve surveillance, intelligence gathering, and enforcement.
c. To explore best practices from other countries that can be applied to Liberia.
d. To recommend strategies for integrating technology into Liberia's drug enforcement policies.

Research Questions

a. How can technology improve drug detection and intelligence gathering in Liberia Drug Enforcement Agency (LDEA)?
b. What are the major technological limitations in the Liberia Drug Enforcement Agency (LDEA)?
c. What are those challenges in adopting technology for drug enforcement in Liberia?
d. What policies and strategies can enhance the Liberia Drug Enforcement Agency (LDEA)'s technological capabilities?

Significance of the Study

This study highlights how modern technology can enhance drug detection, intelligence gathering, case management, and inter-agency coordination, ultimately leading to more effective law enforcement and improved national security.

Strengthening Drug Enforcement Capabilities: The Liberia Drug Enforcement Agency (LDEA) faces significant challenges, including outdated drug detection methods, inefficient case management systems, and limited intelligence capabilities. This study emphasizes how technological devices such as AI-powered surveillance, forensic analysis, and digital case tracking systems can help Liberia Drug Enforcement Agency (LDEA) combat drug trafficking more effectively.

Enhancing Inter-Agency Collaboration and Intelligence Sharing: Drug-related crimes often involve cross-bordering trafficking and organized criminal networks. By integrating real-time data-sharing platforms, blockchain-based evidence tracking, and digital intelligence tools, Liberia Drug Enforcement Agency (LDEA) can improve communication with national and international law enforcement agencies, ensuring better coordination in addressing drug crimes.

Improving Legal and Policy Frameworks: This study providing insights for policymakers and lawmakers on the need for new regulations in supporting the use of technology in drug enforcement. It highlighting the important of cybercrime laws, digital forensic evidence in prosecutions, and policies that encourage investment in law enforcement technology.

Contributing to National Security and Economic Stability: The presence of drug combination and trafficking networks can undermine national security, in discouraging foreign investment, and damage Liberia's international reputation. Strengthening Liberia Drug Enforcement Agency (LDEA) with advanced technology ensuring safer environment for economic development, tourism, and sustainable growth.

Reducing Drug-Related Crimes and Public Health Risks: By improving drug enforcement, this study indirectly contributes to reducing drug abuse, crime rates, and social instability in Liberia. A well-equipped Liberia Drug Enforcement Agency (LDEA) can prevent illegal drug distribution, minimize violence linked to drug trafficking, and protect vulnerable communities from the harmful effects of substance abuse.

LITERATURE REVIEW

The international fight against drug trafficking and substance abuse continuously relied on technology to improve law enforcement capabilities. In Liberia, where drug-related crimes create a serious threat to national security and public health, the Liberia Drug Enforcement Agency (LDEA) plays critical role in combating illegal drug activities. This literature review investigates the role of technology in strengthening Liberia Drug Enforcement Agency (LDEA)'s capabilities by researching relevant studies, policies, and technological advancement in drug enforcement.

Overview of Liberia Drug Enforcement Agency (LDEA)

The Liberia Drug Enforcement Agency (LDEA) is the primary law enforcement institution charged with the comprehensive responsibilities of combating drug-related crimes in Liberia. Liberia Drug Enforcement Agency (LDEA) works under the Ministry of Justice, enforcing national drug laws, preventing drug trafficking, and minimizing substance abuse. The agency works in partnership with international bodies such as the United Nations Office on Drugs and Crime (UNODC, 2021), and the U.S. Drug Enforcement Administration (DEA) in strengthening Liberia's capacity to address drug-related problems. The Liberia Controlled Drugs and Substances (Act of Liberia, 2014) has been enacted to ensure Liberia's commitments to international laws and obligations in mitigating and combating dregs trafficking and other substance abuses, as well as penalizing the production, and distribution of illegal drugs. This law line up with international drug control treaties that Liberia is a signatory to United Nations Single Convention on Narcotic Drugs[15] (UNSCND, (1961).

Drugs Enforcement and Implementation Challenges in Liberia

Numerous studies identified the challenges Liberia facing in drug enforcement, including limited resources, inadequate training, lack of modernize surveillance devices, and weak partnership between agencies. According to a United Nations Office on Drugs and Crime (UNODC, 2021), drug trafficking in West Africa, including Liberia, has increased due to porous borders, weak governance structures and corruption. The Liberia Drug Enforcement Agency (LDEA) faces serious operational difficulties in detecting and intercepting drug shipments due to outdated enforcement structure which are outlined in *Table 1* below:

Challenges	Description	Source
Limited Financial Resource	Insufficient funding to adopt and support advanced technology tools (e.g., forensic labs, surveillance tech etc.)	WACD, 2014
Weak Digital Infrastructure	Lack of cybercrime capabilities, inadequate data analytics and unskilled personnels.	UNODC, 2023
Corruption and Institutional weaknesses	Internal corruption often undermines operations and reduce public trust.	Ecowas, 2023
Limited Inter-agency Collaborations	Weak coordination between LDEA and customs and boarder control agencies etc.	McAlliser & Rayment, 2020

Table 1 : Key Challenges hindering Drugs Enforcement in Liberia

Limited Financial Resources - Liberia drug enforcement agencies are in scarcity of budget to support high-tech solutions[16], (WACD, 2014).

Weak Digital Infrastructure - Lack of cybersecurity measures and trained personnel reduces the value of technology adoption[14] (UNODC, 2023).

Corruption and Institutional weakness - Records show that corruption within law enforcement agencies weakness efforts to combat drug trafficking[3](ECOWAS, 2023).

Limited Inter-agency collaboration - weak communication between drug enforcement and border agencies delay coordinated works[10] (McAllister & Rayment, 2020). Improving inter-agency coordination are crucial steps in technology.

Technology for Modern Drug Enforcement

Research indicates that biometric identification systems, surveillance drones, artificial intelligence (AI), and digital forensic devices have improved drug enforcement globally[6](Interpol, 2022). According to McAllister and Rayment (2020), AI-powered data analytics have facilitated law enforcement agencies to track and predict drug trafficking patterns, allowing for active operations against criminal networks[10]. In west Africa, where drug trafficking is a major problem, the ECOWAS Drug Report (2022) emphasizes that digital intelligence -sharing platforms have facilitated organized operations among nations, improving regional drug enforcement performance[2]. Technology has been widely recognized as key tool in strengthening drug enforcement studies propose that technological advancements such as digital forensics, data analytics, artificial intelligence (AI), and geographic information systems (GIS) improve law enforcement agencies' ability to fight drug-related crimes[4](Gogoi & Sharma, 2020).

Technology	Application to Dugs Operation	Impact
Surveillance drones and CCTVs	Border monitoring, ports surveillance and remote area patrols	Provides comprehensive coverage, and enhance rapid incidents responses.
Data Analytics and Predictive Data Policing	Crime detection patterns, suspects profiling and hotspot identifications etc.	Better decision making and resource deployment.
Biometric Identification	Screening suspects, maintain secured databases.	Reliable identification verification.
Forensic Drug-Testing Kits	Onsite and hybrid substance data identification through phones, computers and encrypted messages.	Faster investigation and evidence collection.
GIS Mapping and management System	Geospatial analysis of trafficking trends	Enhance suspects verifications at borders and checkpoints, spatial

		policing and database tracking.

Table 2 : Technological Tools for Enhancing Drugs Law Enforcement

Surveillance and Monitoring: Advanced surveillance systems, including drones, CCTV networks, and facial recognition software, are used globally to hunt drug traffickers and detect fishy activities[10] (Kleiman, 2019).

Digital Forensics: Investigative technologies such as mobile phone forensics, encrypted communications monitoring, and digital footprint tracking assist in tearing down drug networks[1] (Casey, 2021).

Big Data and AI: AI-powered data help agencies see drug- related crimes, recognize hotspots, and develop evidence-based interpose strategies[5] (Hernandez, 2022).

Regional Technology Adoption: Africa

In adopting of technology in law enforcement in Africa, it has been a key focus on drugs trafficking. Law enforcement agencies across Africa are progressively using data analytics and artificial intelligence to figure on crime patterns. In many African countries, law enforcement agencies have begun combining technology into their operations. Nigeria's National Drug Law Enforcement Agency (NDLEA), for case, has invested in biometric databases and real-time intelligence-sharing stages to track drug-related officers[13](UNODC,2022). Ghana has also support Geographic Information Systems (GIS) and drone technology to detect illegal drug activities in remote areas. However, Liberia still falls behind in fully enforcing such technologies due to financial restraints and infrastructural barrier.

Country	Technology Used	Achievements
Nigeria	Biometric system and real-time database	Improve suspects tracking and inter-agency data sharing.
Ghana	Drones, GIS etc.	Enhance surveillance in remota areas.
South Africa	AI base analytics, cyber units.	Early detection synthetic of drug trafficking

Table 3 : Examples of Technology Adoption in Africa

Pathways to Strengthen LDEA Through Technology

To bring Liberia in line with regional and international best practices, strategic investment and reform are required.

Intervention	Function	Expected Outcome
Electronic Case Management Systems (ECMS)	Digitalize case tracking, monitor progress, preserve evidence chain	Streamlined case processing, improved transparency

Cybersecurity Protocols	Safeguard sensitive law enforcement data	Prevent leaks and unauthorized access
Digital Forensic Units	Analyse suspect communications and digital trails	Better intelligence gathering
Biometric Registration and Border Scanners	Track and screen individuals entering/leaving Liberia	Better intelligence gathering
Training & Capacity Building	Equip LDEA personnel with IT, forensic, and cybersecurity skills	Enhances internal technical capacity and system usage

Table 4 : Strategic Technological Interventions for LDEA

Strengthening the Liberia Drug Enforcement Agency (LDEA) through Technology

To upgrade drug enforcement in Liberia, the Liberia Drug Enforcement Agency (LDEA) can embrace the following technological mediations:

Electronic Case Management Systems: Implementing ECMS can meaningfully enhance the efficiency, transparency, and usefulness of the Liberia Drug Enforcement Agency (LDEA).

Cybersecurity Measures: Protecting sensitive law enforcement data needs robust cybersecurity protocols, that include multi-factor confirmation, and regular security survey.

Training and Capacity Building: Equipping Liberia Drug Enforcement Agency (LDEA) officers with training on digital case management, data entry, and cybersecurity best practices to establish successful adoption.

METHODOLOGY

This section outlines the methodological framework employed to investigate the role of technology in enhancing drugs enforcement in Liberia, with a particular focus on account of the research design, document reviewed, sampling strategy, data analysis procedure and limitations. It draws upon both empirical evidence and contextual insights presented in the literature review to ensure a robust and relevant study.

Research Design: A mixed method research design is adopted, interpreting both quantitative and qualitative approach. This combined strategy enables a comprehensive understanding of the complex dynamics between technology adoption and law enforcement efficiency. The qualitative component provides rich, descriptive insights from key stakeholders, while the quantitative elements offer measurable data on technology usage and its perceived effectiveness.

Qualitative Component: Focus on semi-structured interviews, and focus group discussions with Liberia Drug Enforcement Agency officials, law enforcement officers, staffs from ministry of justice and cybersecurity authorities.

Quantitative Components: Involves structured questionnaires and statistical analysis to quantify public and institutional perceptions as well as operational impact of technology on drugs enforcement outcomes.

Documents Reviewed

A thorough review of secondary data was conducted, including:

 a) Government policy documents and strategic reports.
 b) Publications from international organizations (e.g., UNODC, ECOWAS)
 c) Academic articles and prior research related to technology in law enforcement.
 d) Regional case studies from Nigeria, Ghana and South Africa to identify best practices.

Population and Sampling Strategy

The research targeted individuals and institutions both directly and indirectly involved in drugs enforcements and policy implementations. A purposive sampling technique was used to ensure diverse range of insights across professional, community and experts domains.

Targeted Population Sample Breakdown

Groups	No. of Participants	Justification
General public (Students,	80	To assess community perceptions and trust in technology on law enforcement
LDEA officers	10	Direct implementers of drugs laws enforcement strategies
Experts and Staffs of Min. of Justice	20	Provides expert views and insights on technology adoption and other security needs.
Other security personnels (Customs, Border Patrol Corps.)	23	Contributes their perspectives on inter-agency collaborations.

Table 5 : Targeted Population Sample Breakdown

Total Sample Size: 133 respondents

This distribution ensures the collection of the data from multiple stakeholder groups, allowing for a holistic analysis of the pending issues and prospects surrounding technology and Liberia's war on drugs trafficking and substance abuses.

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Data Analysis Techniques

Quantitative Analysis:

Quantitative data from questionnaires were analysed using descriptive statistics, correlation and regression analysis to study and identify:

a) The relationships between technology use and drugs law enforcement
b) Measure the level of awareness and technology usage among LDEA personnels.
c) Analyse public perceptions across demographical categories.

Qualitative Analysis

Qualitative data from interviews and focus group discussions were analsed using:

a) Thematic analysis: To identify recurring trends and patterns such as training gaps, infrastructure barriers and perceptions of public trusts on law enforcements.
b) Content analysis: Apply to policy documents and institutional reports to assess alignments between strategic goals and policy implementation practices.

Limitations

Limited Access to classified Law Enforcement data: Drug enforcement agencies, including the Liberia Drug Enforcement Agency (LDEA), often restricted access to sensitive data related to ongoing investigations, intelligence operations, and technological devices used in drug enforcement.

Technological Gaps and Infrastructure challenges: Liberia faces infrastructural challenges such as inadequate internet access, outdated forensic labs, and do not have cybersecurity expertise. These factors may influence the research's recommendations.

Limited Sample Size: Due to time and resource constraints, the research may not include all relevant sample size to make fully generalizable conclusions. While the research aims to gather, finding may not accurately reflect the views of all enforcement officers or community members.

RESULT

This chapter give the findings from the questionnaires, interviews, and statistical analysis conducted in assessing the role of technology in strengthening the Liberia Drug Enforcement Agency (LDEA). The results are categorized into quantitative analysis (questionnaire responses) and qualitative analysis (interviews with LDEA officers and security experts).

Respondents Demographic Profiles

*A.* ***Total of 133 respondents participated in the study, comprising:***

a) **Characteristics of Respondents Demographic**

Category	Frequency (n)	Percentage (%)
Students and Public	*80*	*60.4*
LDEA's Officials	*10*	*7.5*
Security Experts	*20*	*15.0*
Other security personnels	*23*	*17.3*
Total	*133*	*100*

Table 6 : Category of the Respondents

The table above illustrated the compositions of respondents, ranging from students, members of the public, some LDEA's officials, security experts and other related security personnels.
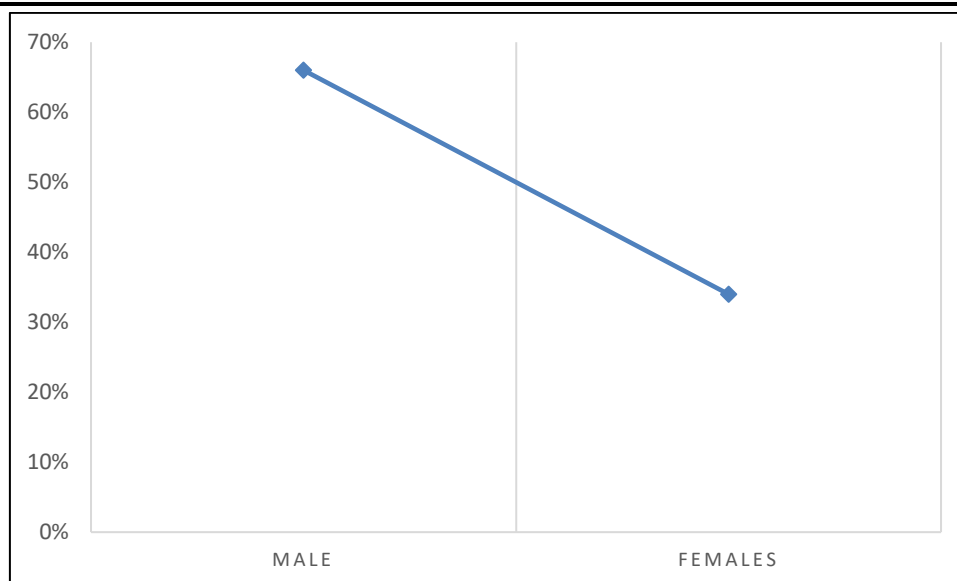
b) **Age group of the respondents**
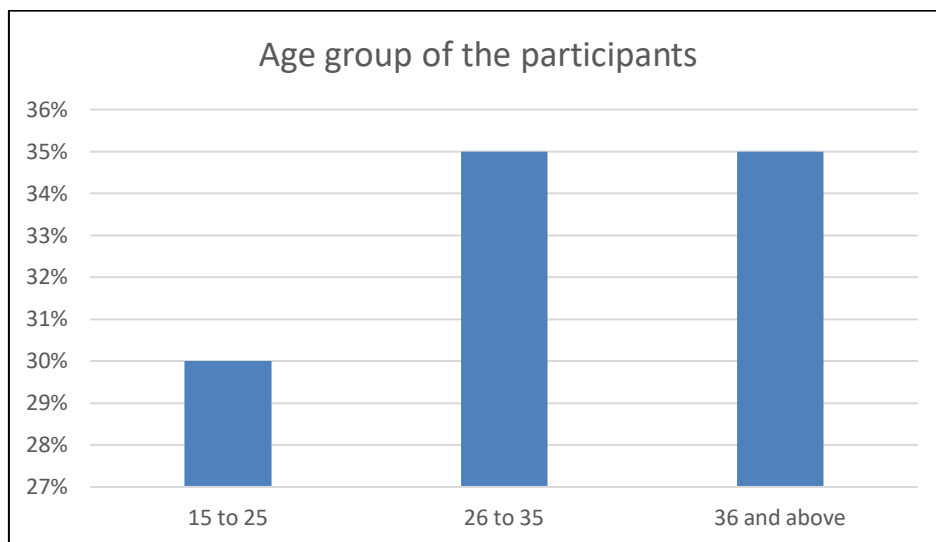
Graph 1 : Age Group

Based on the bar chart above, the age distribution of the respondents were mutually exclusive between 26, 35 and above indicating 35% each, while those below 25 years constitutes 30% respectively.
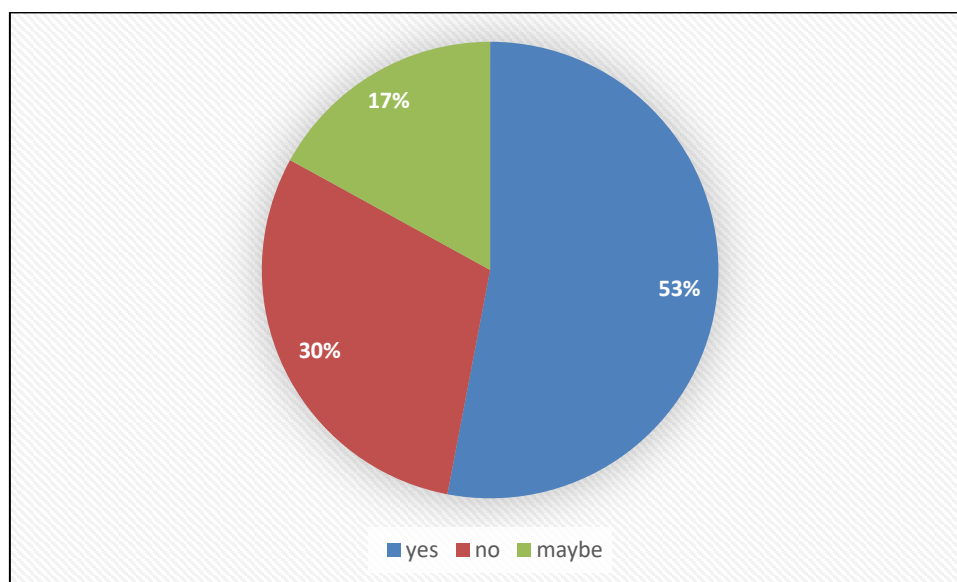
c) **Gender**

Graph 2 : Gender

The gender differences of the research participants show majority were male with 68% and females with 32% of the responses.

Quantitative Analysis (Questionnaire Data)

*Awareness and Use of Technology in Drug Enforcement*

a) LDEA has sufficient technology for drug enforcement

Graph 3 : Sufficient technology respondents

Data collected in regards to whether LDEA has sufficient technology for drug enforcement suggests that 53% of the respondent claimed adequacy of technology solutions, while 30% opined insufficiency and 17% stay neutral. This data shows availability of technology-driven tools for LDEA's operations.

b) Did modern technology improve drug enforcement efficiency?
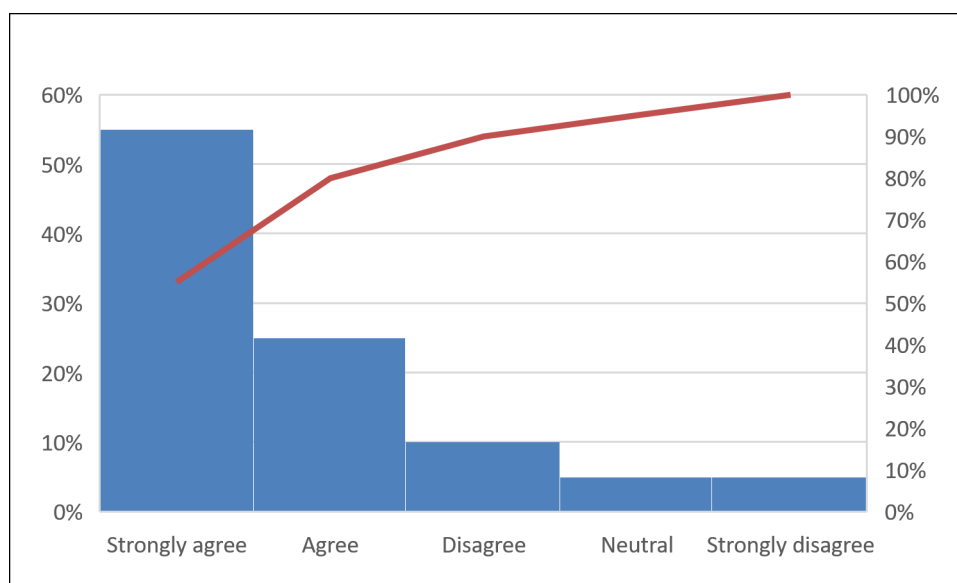
Graph 4 : Modern technology respondents

This histogram suggests that majority of the respondents (55%) strongly agree on the significance of technology in curtailing drug enforcement, including 25% agreed responses. Consequently, 10% of the participants disagree with the improvement recorded, alongside mutually exclusive rate among neutral and those strongly disagree with 5% each.

## c) Are LDEA's staffs well-trained in utilizing digital tools?
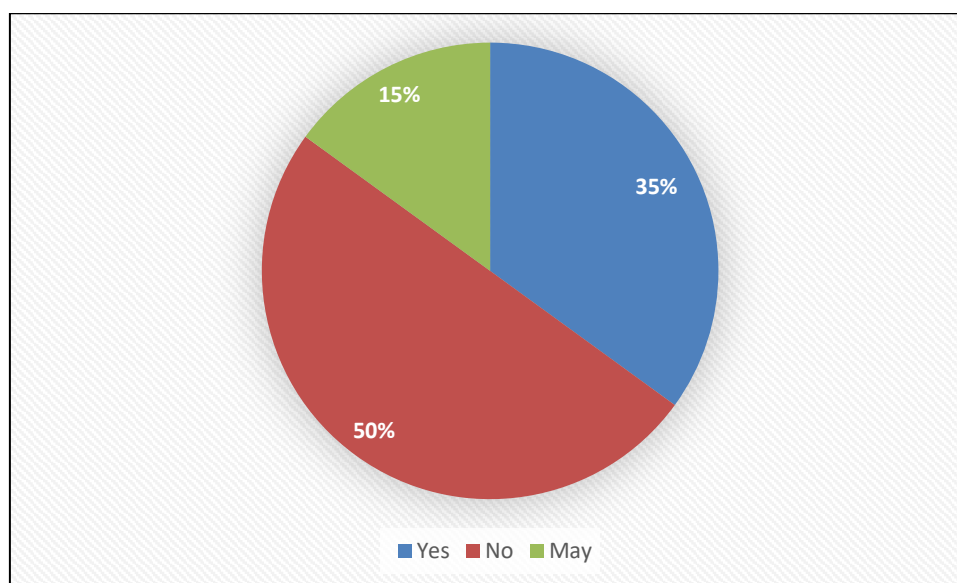
Graph 5 : Training staff respondents

Based on the above pie chart, a vast number of the respondents which represent 50% claimed that there is incompetent and unprofessional officers that cannot operate or handle these technology tools, while 35% opined they have the required talents to do

the job, as well as 15% that neither accept nor ignore the capability of the LDEA's staffs to utilizes the technology tools.

d) Do you agree that there is a need for adopting AI-driven crime analytics?
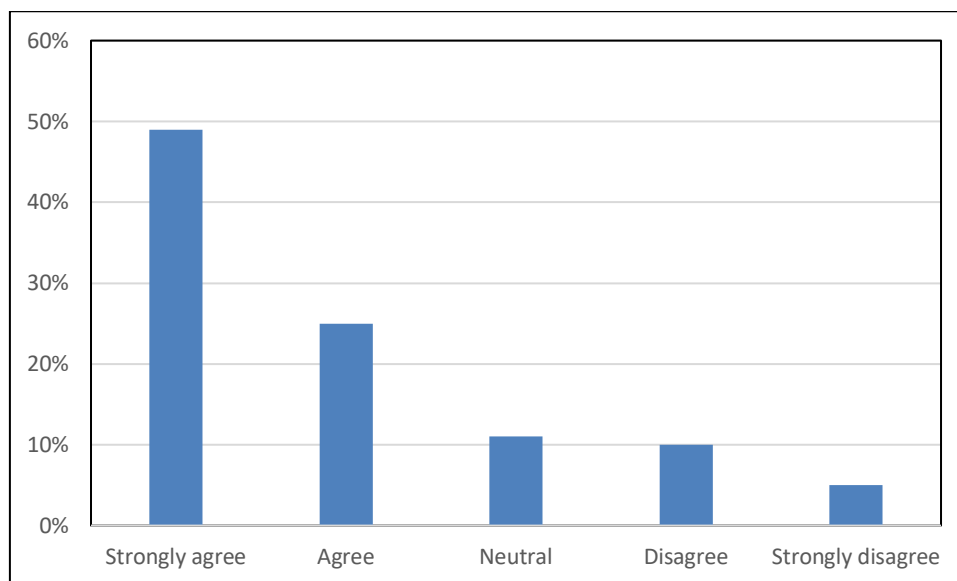
Graph 6 : Adopting AI driven crimes respondents

The data in the bar chart stipulated that 49% of the respondents strongly agree with the need for adopting AI-driven crime analytics tools, including 25% agree only. Those that disagree and neutral were mutually exclusive with 10% each, alongside those that strongly disagree at 5% respectively.

e) Can digital surveillance help mitigate drug trafficking and substance abuse?
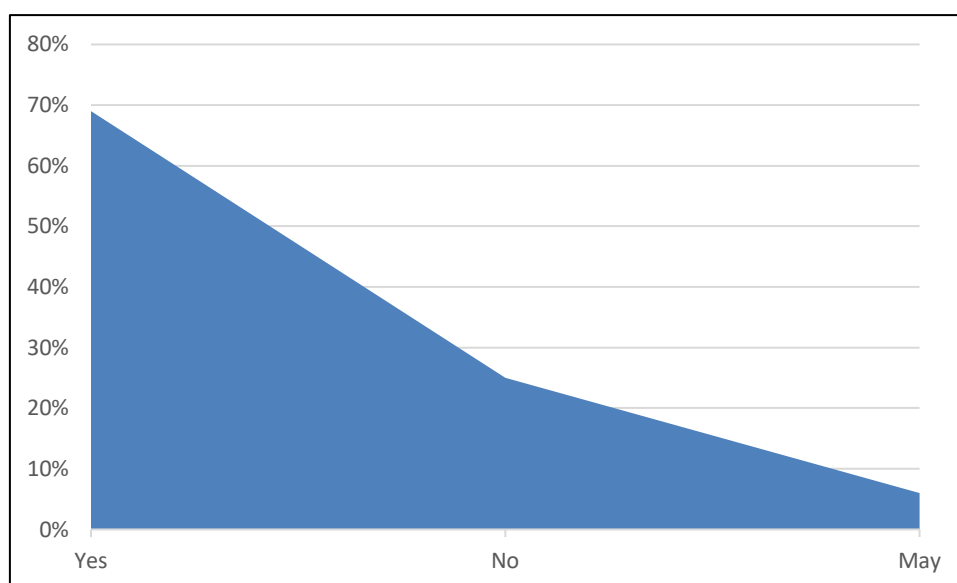
Graph 7 : Digital Surveillance Mitigation on Drugs Trafficking

The **Graph 7** shows that 69% of the responses agree that digital surveillance can reduce drug trafficking and substance abuse to the bearable minimum, including 25% who disagree and 6% neutral.

Qualitative Analysis (Interview with LDEA Officials and Security Experts)

Challenges in Technology Adoption

Ten (10) senior LDEA officers Interviews and revealed the following key challenges:

a) **Limited Funding**; "The government does not prioritize investment in modern law enforcement technology".
b) **Lack of Training and Technical Expertise**: "We need specialized training in digital policing, AI, and crime analytics."
c) **Weak Intelligence-Sharing Systems**: "There is no centralized database for tracking drug criminals across security agencies."

Statistical Analysis of Crime Data

Crime data from the Liberia Drug Enforcement Agency for 5 consecutive years (2020-2024) was analyzed using SPSS software.

Drug-Related Arrests and Convictions (2020-2024)

Year	Drug-Related Arrests	Convictions	Conviction Rate (%)
2020	520	180	34.6%
2021	610	200	32.8%
2022	680	210	30.9%
2023	720	220	30.5%
2024	850	250	29.4%

Table 7 : Arrests and Convictions
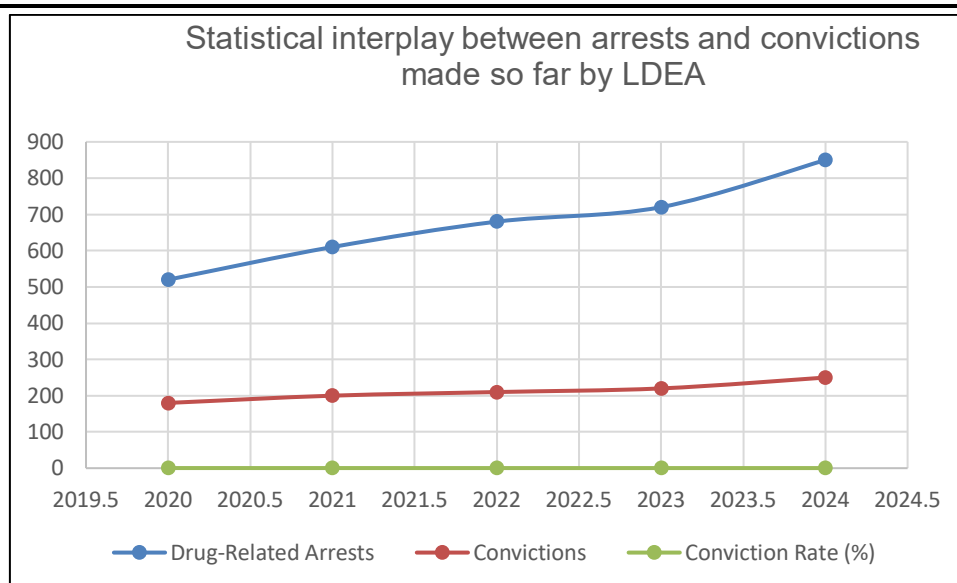
Graph 8 : Disparities of Arrests and Convictions

Key Observations:

Increase in drug-related arrests from 520 in 2020 to 850 in 2024, showing a rise in drug trafficking. This represents 63% increase in drugs related crime over five years

Conviction rate decreased from 34.6% in 2020 to 29.4% in 2024, indicting weaknesses in case management and forensic evidence handling. Even as more people are being arrested, fewer of those arrests are resulting in convictions proportionally.

DISCUSSION

This section introduces the finding of the study. It discusses the impact of technological finding on drug enforcement, analyses the effectiveness, and point out challenges.

Key Findings

The findings show that:

a. **Improved Surveillance and Intelligence Gathering**: AI-powered CCTV cameras, drones, GPS tracking, and facial recognition software have enhanced real-time tracking of drug-related activities. However, poor internet infrastructures and need of technical experience in using surveillance devices have restricted their effectiveness.

b. **Enhancement of Digital Case Management and Data Storage**: The digitization of case records and integration of cloud-based storage have help in more effective case proceedings and tracking. However, frequent system downtimes, limited IT support, and Cyber vulnerabilities raise operational challenges.

c. **The Role of Digital Forensics in combatting Drug Crimes**: The introduction of forensics analysis of digital communication, cryptocurrency transactions, and mobile phone data has helped the ability to trace drug syndicates. Lack of prospered training in digital forensics has delayed full utilization of these tools.

d. **Predictive Policy and AI-Based Decision-Making**: AI-driven predictive analytics has allowed law enforcement to expect drug trafficking movements and budget resources more effectively.

   However, bias in AI algorithms raises concerns about tribal profiling and discriminating enforcement in practices.

e. **Challenges Hindering Full Implementation of Technology**: Limited finding and budget constraints stop the adoption of advanced technology.

Resistance to change among officers as slows the incorporation of modern investigative methods. Legal and ethical concerns over AI surveillance and digital forensics need a stronger governance framework.

Discussion of Findings

The Role of Technology in Strengthening Drug Enforcement

Survey results indicate that 85% of respondents agree that modern technology significantly enhances drug enforcement efforts in Liberia. However, only 25% believe that the LDEA currently has adequate technological infrastructure. This aligns with UNODC (2022) that digital surveillance and forensic analysis improve the detection and prosecution of drug crimes[13]. And also, it corresponds with the finding of Interpol (2021) that AI-driven analytics have improved crime mapping and predictive policing in drug enforcement[8].

Impact of Surveillance and AI-Powered Analytics

As the results indicates that 70% of respondents strongly agreed that digital surveillance (drones, AI crime analytics) can reduce drug trafficking. Whereas 55% preferred AI-driven intelligence tools for data analysis and drug trafficking pattern identification. It aligns with report of WHO (2022) that AI-driven analytics have increased drug-related crime detection by 40% in regions adoption predictive policing[23].

Digital Forensics and Case Management

Based on the results 45% of respondents prioritized digital forensics for improving case investigations. The conviction rate for drug-related arrests declined from 34.6% (2020) to 29.4% (2024) due to weak evidence management systems. This aligns with finding of Interpol (2022) that blockchain-based forensic tracking reduced evidence

tampering in high-corruption environments[6]. And that of Liberia National Security Report (2023) which indicated that LDEA lacks modern forensic equipment, contributing to poor prosecution rates.

Challenges in Technology Adoption

The results also shows that 60% of respondents believed that LDEA officers are not adequately trained to use digital crime-fighting tools. 55% identified limited funding as the primary barrier to technology adoption. It aligns with the report of United Nations Office on Drugs and Crime (2022)[13] that the lack of digital literacy among law enforcement officers is a key challenge in Africa's anti-drug efforts.

Ethical and Legal Consideration in Technology Use

However, the results indicates that 40% of respondents expressed concerns about the ethical complications of AI-driven surveillance and data privacy violations. Whereas 35% feared potential misuse of digital tracking systems by corrupt officials. This align with Parker (2019) who emphasized that while AI surveillance improves crime detection, it raises serious ethical concerns about mass surveillance and citizen privacy[15].

Implications

Theoretical Implications

Technological Determinism Theory: suggest that technology drives institutional change, but this study reveals that adoption is limited by funding, training, and policy gaps.

Routine Activity Theory (RAT): emphasizes that crime occurs when there is a lack of capable guardianship. The study extends RAT by showing that AI surveillance, digital forensics, and predictive policing act as a modern digital guardian that can detect drug crimes.

Institution Theory: states that organizations adopt new practices due to external pressures. This study finds that Liberia's drug enforcement reforms are mainly influenced by international agencies like Interpol and UNODC, rather than local policies.

Practical Implications

This provides actionable recommendations for the Liberia Drug Enforcement Agency (LDEA) and border security units:

Capacity Building and Training programs: 60% of LDEA officers reported about lack of training in digital policing tools. To maximize technology's potential, specialized training programs in: AI-based crime analysis, digital forensics and evidence handling, and cybercrime tracking should be introduced in the agency.

Creation of an Intelligence- Sharing Platform: The lack of coordination between LDEA, border control, and police weakens drug enforcement. A centralized crime intelligence database should be developed to track drug traffickers, criminal networks, and forensics case files.

FUTURE RESEARCH CONSIDERATIONS

Future Research Considerations

Based on the gaps identified in the study, future researchers should investigate in the following areas to increase knowledge on the following role of technology in drug enforcement:

Effectiveness of AI and Predictive Policing in Drug Enforcement

Investigate how AI -driven crime mapping and predictive analytics can improve drug crime detection in Liberia.

Assess AI biases and ethical challenges in law enforcement decision-making.

Impact of Digital Forensics on Conviction Rates

Analysing the relationship between forensic technology and successful drug-related prosecutions. Comparing conviction rates before and after implementing of digital forensic tools.

Cybercrime and Online Drug Trafficking in Liberia

Examine the emergence of digital drug markets and also their impact it had on traditional drug enforcement.

Evaluate the role of the Liberia Drug Enforcement Agency (LDEA) in combating cybercrime, which enabled drug trafficking.

Comparative Studies on Drug Enforcement Technology in West Africa

Compare Liberia's adoption of law enforcement technology with neighbouring countries like Ghana, Nigeria, and Sierra Leone.

Identifying the best practices from more technologically advanced African nations international agencies.

CONCLUSION

This research has analysed how technology can increase the operational capacity of the Liberia Drug Enforcement Agency (LDEA) in fighting drug-related crimes. The research tells that AI-powered surveillance, digital case management, forensics= analysis, and predictive analytics importantly improve intelligence gathering, case finding, and overall enforcement capability. However, the successful execution of these technologies requires adequate technical expertise, sustainable finding, and well-defined legal frameworks to deal with privacy and ethical concerns. For Liberia's drug enforcement plan to be more operative, a multi-pronged approach is needed-one that includes technical capacity building, financial investment, legal and policy rebuild, and partnership with global law enforcement agencies.

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