

An Assessment of User Satisfaction with Security Strategies in Selected Bus Terminals in Lagos, Nigeria

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Abstract:

Public transportation systems, especially bus terminals, are critical for urban mobility but face significant security challenges due to high foot traffic and open access. This research aims to assess user satisfaction with security measures at four major bus terminals in Lagos, Nigeria. The study adopts a quantitative design, employing a purposive sampling method to select 400 users from a population of approximately 1,200 daily commuters. Out of these, 320 valid responses were obtained and analyzed using SPSS software. Analytical tools such as descriptive statistics and chi-square tests were utilized to explore the data. Key findings reveal that while there is a general awareness of security strategies, their perceived adequacy and availability vary. CCTV surveillance and physical security are widely recognized, yet measures like threat assessment are less familiar. Respondents rated CCTV surveillance as the most adequate, though all strategies positively impacted users' safety perceptions. Despite this, satisfaction levels indicate room for improvement. Recommendations include enhancing public awareness, continuous monitoring, and incorporating user feedback into security protocols. This multi-layered approach aims to foster a secure environment, boosting public confidence and efficient mobility. The study's insights are valuable for policymakers and security professionals in refining and implementing robust, user-centric security measures in public transportation systems.

Keywords: Access Control, Bus Terminals, Emergency Preparedness, Security Technology, Urban Transportation.

1. Introduction

PUBLIC transportation systems, particularly bus terminals, play a crucial role in facilitating the movement of people and ensuring efficient mobility within urban areas [1]. However, the high volume of foot traffic and the open nature of these facilities present significant security challenges [2]. Ensuring the safety and security of commuters, staff, and infrastructure is of paramount importance not only for maintaining operational efficiency but also for fostering a sense of trust and confidence among the public [2,3].

In densely populated cities like Lagos, Nigeria, the need for robust security measures in bus terminals is amplified [4]. As the commercial capital of the country, Lagos has experienced rapid urbanization and population growth, straining its transportation infrastructure. The city's bus terminals have become critical hubs, catering to the transportation needs of millions of commuters daily [4,5]. However, this increased demand and congestion have also made these terminals more vulnerable to various security threats.

Unfortunately, bus terminals in Lagos have become potential targets for criminal activities, ranging from petty theft and vandalism to more severe incidents like terrorist attacks or civil unrest [6]. The open and bustling nature of these facilities,

coupled with the large crowds, creates opportunities for criminal elements to exploit vulnerabilities and perpetrate unlawful activities [4,5,7]. Incidents such as pickpocketing, bag snatching, and even violent crimes can not only disrupt operations but also erode public confidence in the transportation system, deterring commuters from utilizing these services [7].

Moreover, the threat of terrorism and extremist activities cannot be overlooked in an urban center like Lagos. Bus terminals, with their high concentration of people and potential for mass casualties, could be targeted by terrorist organizations or individuals seeking to cause widespread panic and disruption. Such incidents can have far-reaching consequences, including loss of life, economic disruption, and a lasting impact on the city's reputation and sense of security [8].

Effective security strategies are crucial to mitigate these risks and create a secure environment for all stakeholders, including commuters, terminal staff, and the general public. By implementing robust measures and fostering a culture of vigilance, bus terminals can enhance public confidence, promote a sense of safety, and ensure the efficient movement of people within the city [9].

Ensuring the security of bus terminals requires a multi-layered approach that addresses various potential threats and

vulnerabilities. Common security measures implemented in these facilities encompass a range of strategies designed to safeguard the premises, personnel, and commuters.

Access control systems play a pivotal role in regulating the flow of individuals and vehicles within the terminal premises. Electronic key card systems, which grant access only to authorized personnel carrying valid credentials, significantly enhance security by preventing unauthorized entry [10,11]. These systems can be further augmented with biometric authentication measures, such as fingerprint or iris scanners, which utilize unique biological traits to verify identities. Traditional security personnel checks, involving visual identification and verification procedures, can complement these technological measures, providing an additional layer of security and ensuring a comprehensive approach to access control [12].

Establishing a secure perimeter is equally vital for deterring potential intruders and minimizing the risk of unauthorized access [13]. Sturdy physical barriers, such as fencing, bollards, and structural elements, clearly demarcate the boundaries of the facility and create a visible and challenging obstacle for potential trespassers [14]. These barriers, combined with appropriate signage and lighting, make it more difficult for unauthorized individuals to breach the perimeter, significantly reducing the likelihood of criminal activities within the premises [13,15].

Surveillance systems, particularly modern, high-resolution Closed-Circuit Television (CCTV) cameras strategically positioned throughout the facility, provide comprehensive coverage and real-time monitoring capabilities [16]. This enables security personnel to detect potential threats promptly and respond accordingly, while also serving as a deterrent to unlawful activities [17]. Advanced CCTV systems with features like motion detection and remote monitoring further enhance security by alerting authorities to suspicious movements and enabling real-time monitoring from centralized locations, ensuring effective surveillance even in remote areas of the terminal [18].

In addition to preventive measures, effective emergency preparedness protocols are essential for ensuring a prompt and coordinated response [19] to various emergency scenarios, such as fires, natural disasters, or security incidents. Well-defined protocols, combined with regular staff training and periodic drills, help reinforce procedures and familiarize personnel with their roles and responsibilities during emergencies [20]. Effective communication systems, evacuation plans, and coordination strategies with emergency services facilitate efficient information dissemination and enable a coordinated response, minimizing potential loss of life and property damage [21].

In the digital age, enhancing cybersecurity measures is crucial for protecting infrastructure systems, including access control and surveillance systems, from cyber threats [22]. Robust encryption protocols and continuous monitoring safeguard sensitive data and critical systems from unauthorized access and potential breaches [23,24]. Advanced authentication measures, such as multi-factor authentication and regular

updates to security protocols, further strengthen the security posture against emerging cyber threats [25].

Recognizing the significance of this issue, this research aims to assess user satisfaction with the current security strategies implemented in selected bus terminals in Lagos, Nigeria. The primary objectives of the study are: (1) to evaluate the effectiveness of existing security measures from the perspective of commuters and terminal staff, (2) to identify gaps or areas for improvement in the security strategies, and (3) to propose recommendations for enhancing security protocols and measures based on user feedback and best practices.

The potential contributions of this research are multifaceted. Firstly, it will provide valuable insights into the perceptions and experiences of users, which are essential for informed decision-making and policy formulation. Secondly, by identifying areas for improvement, the study can guide the implementation of more robust and user-centric security strategies, thereby enhancing the overall safety and security of bus terminals. Furthermore, the research findings may serve as a reference for other urban centers facing similar challenges, contributing to the broader discourse on transportation security and public safety.

By conducting an assessment of user satisfaction with security strategies, this study aims to bridge the gap between theoretical approaches and practical implementation, ensuring that the needs and concerns of commuters and terminal staff are adequately addressed. Ultimately, the research seeks to foster a safer and more secure transportation environment, promoting public confidence and facilitating the efficient movement of people within Lagos and beyond.

To achieve these objectives, this study employs a quantitative research design, utilizing a structured questionnaire as the primary data collection instrument. The research focuses on four major bus terminals in Lagos, Nigeria: Ikeja Transport Terminal, Yaba Bus Terminal, Oshodi Bus Terminal, and God is Good Motors Terminal. A total of 400 questionnaires were distributed among users across these terminals, with 320 valid responses collected. The questionnaire assessed users' perceptions of various security strategies, including CCTV surveillance, physical security, cybersecurity, public awareness, parking security, and threat assessment. Data analysis was conducted using descriptive statistics and the Relative Importance Index (RII) technique to evaluate and rank respondents' perspectives on the security strategies. This methodological approach allows for a comprehensive assessment of user satisfaction with current security measures and provides a foundation for identifying areas of improvement in bus terminal security protocols.

I. MATERIALS AND METHODS

The study employed a quantitative research design and utilized a structured questionnaire as the primary data collection instrument. The questionnaire aimed to capture users' perceptions, experiences, and satisfaction levels regarding the security strategies implemented at four major bus terminals in Lagos, Nigeria: Ikeja Transport Terminal, Yaba Bus Terminal, Oshodi Bus Terminal, and God is Good Motors Terminal. These terminals were selected based on their high commuter

traffic volume and significance as transportation hubs within the city.

A total of 400 questionnaires were distributed among users across the four terminals, with 80 at Ikeja Transport Terminal, 60 at Yaba Bus Terminal, 110 at Oshodi Bus Terminal, and 150 at God is Good Motors Terminal. The respondents were selected using a convenience sampling technique, targeting individuals present at the terminals during the data collection period, which spanned from November 2023 to January 2024. The questionnaire consisted of three main sections: demographic information, knowledge, availability, and adequacy of security strategies, and the impact of security strategies. It utilized a five-point Likert scale (1 = Very dissatisfied, 2 = Dissatisfied, 3 = Not Sure, 4 = Satisfied, 5 = Very Satisfied) to capture respondents' opinions on the availability, adequacy, and impact of various security measures, including CCTV surveillance, physical security, cybersecurity, public awareness, parking security, and threat assessment.

The collected data underwent rigorous coding and analysis using the Statistical Package for Social Sciences (SPSS) software. Descriptive statistics were employed to summarize the demographic characteristics, while the Relative Importance Index (RII) technique was utilized to analyze and rank respondents' perspectives on the security strategies. Appropriate ethical measures were taken, including maintaining respondents' anonymity, confidentiality, and obtaining necessary approvals, to ensure the ethical conduct of the research.

II. RESULTS

A. Demographic Characteristics

Table I shows the response rate across the selected bus terminals. A total of 400 questionnaires were distributed, and 320 were successfully retrieved, indicating an overall retrieval success rate of 80%. The highest response rate was from God is Good Motors Terminal (GIGM) (40.31%), followed by Oshodi Bus Terminal (28.13%), Ikeja Transport Terminal (19.06%), and Yaba Bus Terminal (12.5%).

TABLE I
RESPONSE RATE ACROSS THE SELECTED BUS TERMINALS

S/N	Name of bus terminal	No. Administered	No. Retrieved	Percentage
1	Ikeja transport terminal	80	61	19.06%
2	Yaba bus terminal	60	40	12.5%
3	Oshodi bus terminal	110	90	28.13%
4	GIGM bus terminal	150	129	40.31%
	Total	400	320	100%

SOURCE: AUTHOR'S FIELDWORK

Table II provides a comparison of users' characteristics across the four selected bus terminals, including gender, age, marital status, educational level, and the specific bus terminal visited.

TABLE II
COMPARISON OF USERS' CHARACTERISTICS ACROSS THE FOUR SELECTED BUS TERMINALS

Sex	Frequency	Percentage	Valid Percentage	Cummulative Percentage
Male	200	62.5%	62.5%	62.5%
Female	120	37.5%	37.5%	100%
Total	320	100%	100%	
Age	Frequency	Percentage	Valid Percentage	Cummulative Percentage
Below 18 Years	0	0%	0%	0%
18-27	136	43.6%	43.6%	43.6%
28-37	120	38.5%	38.5%	82.1%
Above 38 Years	56	17.9%	17.9%	100%
Total	320	100%	100%	
Marital Status	Frequency	Percentage	Valid Percentage	Cummulative Percentage
Single	200	62.5%	62.5%	62.5%
Engaged	32	10%	10%	72.5%
Married	76	23.75%	23.75%	96.25%
Divorced	12	3.75%	3.75%	100%
Widowed	0	0%	0%	100%
Separated	0	0%	0%	100%
Total	320	100%	100%	
Highest Education Level	Frequency	Percentage	Valid Percentage	Cummulative Percentage
No Education	0	0%	0%	0%
Primary	0	0%	0%	0%
Secondary	12	3.75%	3.75%	3.75%
OND/HN D/NCE/B. Sc/A'Level	224	70%	70%	73.75%
MSc	80	25%	25%	98.75%
PhD	4	1.25%	1.25%	100%
Total	320	100%	100%	
Bus Terminal Visited	Frequency	Percentage	Valid Percentage	Cummulative Percentage
Ikeja Transport Terminal	61	19.06%	19.06%	19.06%
Yaba Bus Terminal	40	12.5%	12.5%	31.56%
Oshodi Bus Terminal	90	28.13%	28.13%	59.69%
God Is Good Motors	129	40.31%	40.31%	100%
Total	320	100%	100%	

SOURCE: AUTHOR'S FIELDWORK

The demographic data reveals several key findings. A majority of respondents, 62.5%, were male, while 37.5% were female. The age distribution indicates that the largest group of respondents, 43.6%, were aged between 18-27 years, followed by 38.5% in the 28-37 years range, and 17.9% were above 38 years. In terms of marital status, most respondents were single (62.5%), with the remainder being married (23.75%), engaged

(10%), or divorced (3.75%). Educational attainment among the respondents showed that 70% had qualifications such as OND, HND, NCE, B.Sc, or A'Level, while 25% had an MSc, and 1.25% had a PhD.

B. Availability of Elements of Security Strategies

The survey sought to ascertain the respondents' knowledge level regarding security strategies and the specific elements of security strategies they were familiar with. The results revealed that a significant majority, 79.2% of the respondents, acknowledged having knowledge of what security strategies entail. However, 14.3% indicated uncertainty, responding "Not sure," while 6.5% stated they did not possess knowledge about security strategies. Concerning the elements of security strategies, the data showed varying levels of familiarity among the 400 respondents. The most widely recognized element was CCTV surveillance, with 300 respondents indicating they had heard of it. Physical security followed closely, with 216 respondents being aware of it. Cyber Security and Parking Security were familiar to 192 and 204 respondents, respectively. Public Awareness as a security strategy element was known to 176 respondents, while Threat Assessment was recognized by 76 respondents. Additionally, 28 respondents indicated awareness of other security strategy elements not explicitly mentioned in the survey. Figure 1 provides an illustrative representation of this data.

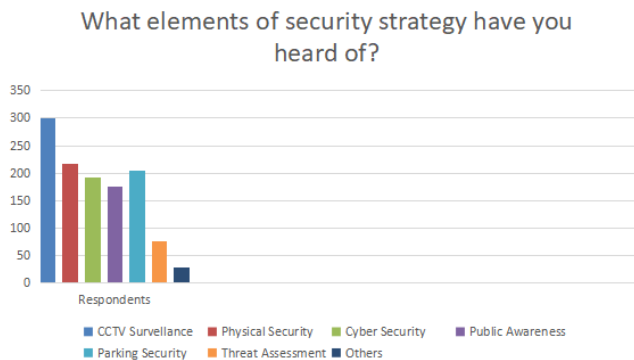


Fig. 1. Respondents' Awareness of Various Security Strategies and Their Elements

C. Availability of Elements of Security Strategies

TABLE III
RESPONDENTS' PERSPECTIVES ON THE AVAILABILITY OF VARIOUS SECURITY STRATEGIES

S/N	Availability Of Security Strategies	Relative Importance Index	Rating
1	CCTV Surveillance	0.74583	High-Medium
2	Physical Security	0.8	High
3	Cyber Security	0.64583	High-Medium
4	Public Awareness	0.8	High
5	Parking Security	0.75833	High-Medium
6	Threat Assessment	0.67083	High-Medium

SOURCE: AUTHOR'S ANALYSIS

The analysis of respondents' perspectives on the availability of various security strategies, conducted using the Relative Importance Index (RII), shown in Table 3 yielded insightful findings. Physical Security and Public Awareness strategies emerged as the most readily available, both garnering the

highest RII of 0.8, indicating a "High" rating for availability. Strategies such as CCTV Surveillance, Parking Security, and Threat Assessment were rated as "High-Medium" in terms of availability, with RII values of 0.74583, 0.75833, and 0.67083, respectively. Cyber Security strategy also received a "High-Medium" rating for availability, with an RII of 0.64583. These findings suggest that respondents perceived Physical Security and Public Awareness measures to be highly prevalent and accessible within the context of the selected bus terminals. Concurrently, they acknowledged the presence, albeit to a slightly lesser extent, of CCTV Surveillance, Parking Security, Threat Assessment, and Cyber Security strategies.

D. Adequacy of Elements of Security Strategies

TABLE IV
RESPONDENTS' PERSPECTIVES ON THE ADEQUACY OF VARIOUS SECURITY STRATEGIES

S/N	Adequacy of Security Strategies	Relative Importance Index	Rating
1	CCTV Surveillance	0.6026	High-Medium
2	Physical Security	0.5949	Medium
3	Cyber Security	0.5472	Medium
4	Public Awareness	0.5539	Medium
5	Parking Security	0.5205	Medium
6	Threat Assessment	0.5256	Medium

SOURCE: AUTHOR'S ANALYSIS

The analysis of respondents' perceptions regarding the adequacy of various security strategies, conducted using the Relative Importance Index (RII) shown in Table 4, yielded noteworthy insights. All security strategies were rated as either "Medium" or "High-Medium" in terms of adequacy. CCTV Surveillance strategy emerged as the most adequate, garnering the highest RII of 0.6026, indicating a "High-Medium" rating. Conversely, Physical Security (RII = 0.5949), Cyber Security (RII = 0.5472), Public Awareness (RII = 0.5539), Parking Security (RII = 0.5205), and Threat Assessment (RII = 0.5256) strategies were rated as "Medium" in terms of adequacy. These findings suggest that while respondents acknowledged the presence of various security strategies, their perceptions of the adequacy of these measures varied. CCTV Surveillance was deemed relatively more adequate compared to the other strategies, which were perceived as moderately adequate in ensuring the security and safety of users within the selected bus terminals.

E. Impact of Security Strategies on Users' Safety

TABLE V
RESPONDENTS' PERSPECTIVES ON THE IMPACT OF VARIOUS SECURITY STRATEGIES ON USERS' SAFETY

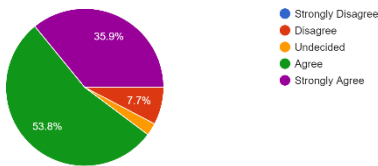
S/N	Impact of Security Strategies on Users' Safety	Relative Importance Index	Rating
1	CCTV Surveillance	0.7846	High-Medium
2	Physical Security	0.7590	High-Medium
3	Cyber Security	0.7439	High-Medium
4	Public Awareness	0.7429	High-Medium
5	Parking Security	0.7974	High-Medium
6	Threat Assessment	0.7692	High-Medium

SOURCE: AUTHOR'S ANALYSIS

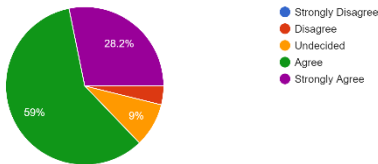
The study assessed the impact of various security strategies on users' safety shown in Table 5, by employing the Relative Importance Index (RII). The analysis revealed that all six security strategies examined – CCTV Surveillance, Physical Security, Cybersecurity, Public Awareness, Parking Security, and Threat Assessment – were rated as "High-Medium" in terms of their impact on users' safety. The RII values for these strategies ranged from 0.7429 to 0.7974, indicating a significant positive impact on users' perceptions of safety within the selected bus terminals. These findings highlight the crucial role that a comprehensive suite of security measures plays in fostering a sense of security and well-being among users. The respondents acknowledged the substantial influence of these strategies in enhancing their overall safety and peace of mind while utilizing the transportation facilities.

F. Impact of Security Strategies on Users' Wellbeing & Satisfaction Level with Security Measures in the Visited Bus Terminals

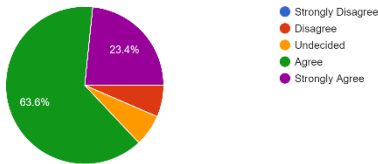
Easy access to amenities (restrooms, food outlets) contributes to my overall wellbeing while using the terminal
78 responses



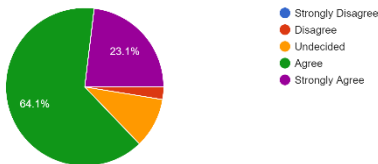
Security strategies influence my sense of comfort and relaxation within bus terminals
78 responses



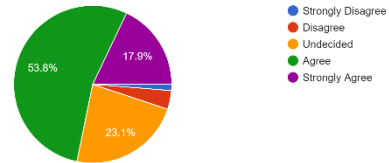
There are changes in my stress level or mental state when security strategies are present or absent in bus terminals
77 responses



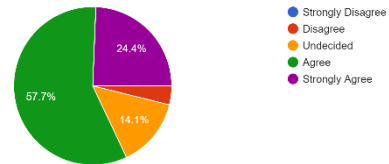
The presence of security strategies positively affects my experience in bus terminals
78 responses



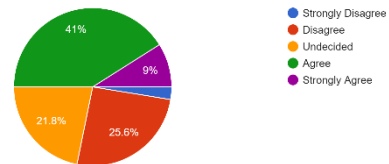
Incorporating green spaces or natural elements within bus terminals positively influences my well-being
78 responses



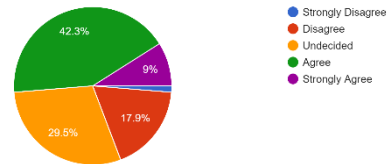
The overall design and layout of the bus terminal impacts my mental state or mood
78 responses



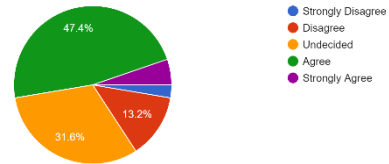
I feel very safe with my electronic devices when using the terminal
78 responses



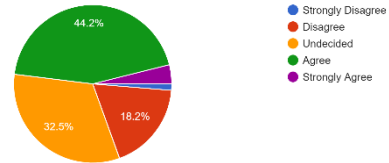
I always like to travel through this terminal
78 responses



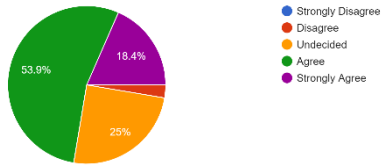
The security strategies implemented here are very good
76 responses



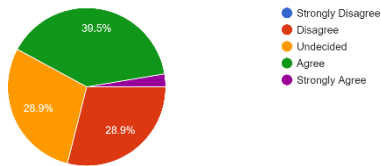
The surveillance cameras and security devices are very noticeable
77 responses



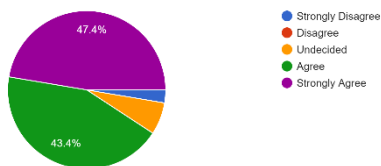
Involving the local community can enhance security in these spaces



The security personnels are well stationed in this terminal



There should be a platform for reporting security concerns or suspicious activities



There has never been a security incident in this terminal
78 responses

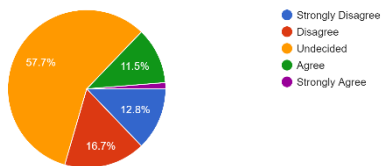


Fig. 2. Chat 1-14, Impact of Security Strategies on Users' Wellbeing & Satisfaction Level with Security Measures in the Visited Bus Terminals
SOURCE: AUTHOR'S ANALYSIS

The study employed a series of pie charts, collectively referred to as Figure 2, Parts 1 to 14, to provide visual representations of the impact of security strategies on users' well-being and their overall satisfaction level with the security measures implemented at the visited bus terminals. These graphical illustrations offer a clear and concise depiction of the respondents' perceptions, allowing for an intuitive understanding of the data. The pie charts effectively convey the distribution of responses, highlighting the varying degrees of impact and satisfaction levels associated with each security strategy. By presenting the information in a visual format, the study facilitates a more accessible interpretation of the complex data, enabling readers to grasp the nuances and patterns that emerged from the analysis. These visual aids play a crucial role in communicating the findings effectively, complementing the textual and numerical data presented throughout the research.

III. DISCUSSIONS

The study's findings provide valuable insights into user

perceptions and satisfaction levels regarding the security strategies implemented across selected bus terminals in Lagos, Nigeria. The demographic characteristics reveal a diverse sample encompassing respondents of varying ages, educational levels, and marital statuses, allowing for a comprehensive representation of different user groups.

The results indicate that a substantial majority (79.2%) of respondents acknowledged having knowledge about security strategies, suggesting a general awareness of the measures in place. However, the varying levels of familiarity with specific security strategy elements highlight the need for enhanced public awareness and education efforts. While CCTV surveillance and physical security measures were widely recognized, strategies such as threat assessment received comparatively lower recognition (Figure 1). Raising awareness about the diverse range of security strategies employed can foster a greater sense of security and cooperation among users [26].

The analysis of the availability of security strategies revealed that physical security and public awareness measures were rated as highly available (RII = 0.8) (Table 3). This finding aligns with the open and accessible nature of bus terminals, where visible security personnel and public awareness campaigns are more prevalent. Conversely, strategies like cybersecurity (RII = 0.64583) and threat assessment (RII = 0.67083) were perceived as moderately available, potentially due to their more covert or specialized implementation [27].

Respondents' perceptions of the adequacy of security strategies varied, with CCTV surveillance emerging as the most adequate (RII = 0.6026) (Table 4). This suggests that the visible presence of surveillance cameras instills a sense of confidence in users [28]. However, other strategies, such as physical security, cybersecurity, public awareness, parking security, and threat assessment, were rated as moderately adequate. These findings highlight the need for continuous improvement and reinforcement of security measures to meet users' expectations and ensure a comprehensive approach to safety and security [29].

The study's findings demonstrate that all examined security strategies had a substantial positive impact on users' perceptions of safety (Table 5). Strategies like parking security (RII = 0.7974) and CCTV surveillance (RII = 0.7846) were particularly influential in fostering a sense of security among users. The visual representations in Figure 2 further illustrate the distribution of responses, underscoring the importance of a multi-layered approach to security that addresses various potential threats and vulnerabilities [30].

While the results indicate positive impacts of security strategies on user safety and well-being, the satisfaction levels with the specific security measures implemented at the visited bus terminals varied (Figure 2, Parts 1-14). This discrepancy between perceived impact and satisfaction levels suggests room for improvement in the implementation and execution of security strategies [31]. Continuous monitoring, user feedback, and adjustments to security protocols and infrastructure are crucial to enhancing overall user satisfaction and fostering a sense of security within the transportation system [32].

IV. CONCLUSION AND RECOMMENDATIONS

This comprehensive assessment of user satisfaction with security strategies in Lagos bus terminals has unveiled a complex tapestry of perceptions, highlighting both strengths and areas ripe for improvement. The six security pillars examined - CCTV surveillance, physical security, cybersecurity, public awareness, parking security, and threat assessment - each play a crucial role in the intricate dance of urban transportation safety.

CCTV surveillance emerged as the beacon of security in the eyes of respondents, its watchful electronic gaze providing a sense of comfort and vigilance. Yet, deeper analysis uncovered a landscape of varying awareness and satisfaction. The less visible guardians of safety - threat assessment and cybersecurity - lurked in the shadows of public consciousness, their critical roles often overlooked or underappreciated.

This disparity in perception is not merely an academic curiosity; it represents a clarion call for action. The research has illuminated the path forward, offering a roadmap for policymakers and security professionals to navigate the complex terrain of public transportation security. By shining a light on these hidden corners, the study provides tools to craft more balanced, comprehensive, and effective security strategies.

The impact of this study reverberates beyond the bustling terminals of Lagos. It not only captures a snapshot of current security effectiveness through the lens of user experience but also identifies critical gaps that, if addressed, could transform the safety landscape of urban transportation. The methodological framework stands as a beacon for other cities grappling with similar challenges, offering a tested approach to assess and enhance their own security measures.

V. RECOMMENDATIONS

At this crossroads of insight and opportunity, several key recommendations emerge, each a stepping stone towards a safer, more secure future:

Firstly, a crusade of public awareness must be embarked upon. Knowledge is power, and by empowering users with a comprehensive understanding of all security strategies - from the visible CCTV cameras to the invisible cyber protections - a more vigilant and cooperative community can be created.

Simultaneously, the adequacy of security measures must be addressed. The findings call for a renewed focus on physical security, cybersecurity, and threat assessment. This is not merely about investing in new technologies or infrastructure; it's about cultivating a holistic security ecosystem that seamlessly blends the virtual and physical realms.

To truly elevate the security posture, the pulse of users must be listened to. Regular feedback mechanisms should be woven into the fabric of operations, allowing for continuous monitoring and refinement of approaches. This dynamic, responsive system will ensure that security strategies evolve in tandem with emerging threats and user needs.

Collaboration must be the watchword moving forward. By bringing together transportation authorities, security experts, and user representatives, a symphony of diverse perspectives can be created, each contributing to a more robust and nuanced security strategy.

As these recommendations are implemented, a delicate balance between technology and human elements must be struck. While CCTV systems stand as sentinels, the irreplaceable value of human intuition and interaction in creating a truly secure environment must not be neglected.

Lastly, preparation for the unexpected is crucial. Comprehensive emergency preparedness protocols, regularly practiced and refined, will ensure that when challenges arise, they can be met with confidence and coordination.

By embracing these recommendations, Lagos has the opportunity to transform its bus terminals into beacons of safety and efficiency. This is not merely about improving a transportation system; it's about nurturing public confidence, fueling economic growth, and enhancing the very fabric of urban life.

In conclusion, the far-reaching implications of this research must be recognized. The insights and recommendations uncovered are not confined to the borders of Lagos or even Nigeria. They offer a valuable blueprint for rapidly growing urban centers across Africa and beyond, grappling with the universal challenge of balancing accessibility with security in public spaces.

This study is more than a collection of data points and recommendations. It is a call to action, a roadmap to a future where bus terminals stand not as potential targets, but as pillars of urban resilience. By heeding these insights and implementing these recommendations, Lagos can lead the way in crafting a new paradigm of transportation security - one that is robust, responsive, and deeply attuned to the needs of its users. In doing so, the safety of daily commutes is not only enhanced, but a contribution is made to the creation of smarter, more secure, and more livable cities for generations to come.

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REFERENCES

- [1] C. Wan, Z. Yang, D. Zhang, X. Yan, and S. Fan, "Resilience in transportation systems: a systematic review and future directions," *Transport Reviews*, vol. 38, no. 4, pp. 479–498, Oct. 2017, doi: 10.1080/01441647.2017.1383532.
- [2] S. Kaewunruen, J. M. Sussman, and A. Matsumoto, "Grand challenges in transportation and transit systems," *Frontiers in Built Environment*, vol. 2, Feb. 2016, doi: 10.3389/fbuil.2016.00004.
- [3] A. Sumalee and H. W. Ho, "Smarter and more connected: Future intelligent transportation system," *IATSS Research*, vol. 42, no. 2, pp. 67–71, Jul. 2018, doi: 10.1016/j.iatssr.2018.05.005.
- [4] E. Mogaji, "Impact of COVID-19 on transportation in Lagos, Nigeria," *Transportation Research Interdisciplinary Perspectives*, vol. 6, p. 100154, Jul. 2020, doi: 10.1016/j.trip.2020.100154.
- [5] J. Edema, "Poor Public Transport Infrastructure in Lagos Nigeria, How Sustainable Improvement could enhance well-being of the people and provide environmental benefits.," 2019. [Online]. Available: <https://www.theseus.fi/handle/10024/208647>
- [6] J. O. Onatere, C. Nwagboso, and P. Georgakis, "Performance indicators for urban transport development in Nigeria," *WIT*

- Transactions on the Built Environment, May 2014, doi: 10.2495/ut140461.
- [7] P. C. Onokala and C. J. Olajide, "Problems and challenges facing the Nigerian transportation system which affect their contribution to the economic development of the country in the 21st century," *Transportation Research Procedia*, vol. 48, pp. 2945–2962, Jan. 2020, doi: 10.1016/j.trpro.2020.08.189.
- [8] M. E. Nwafor & O. V. Onya "Road transportation service in Nigeria: Problems and prospects.," *Dvance Journal of Economics and Marketing Research*, vol. 4, no. 3, 2019.
- [9] O. A. Bilabial, "Commuters perception and preferences on the bus rapid transit in Lagos state.," *Transcampus Journal*, vol. 14, no. 2, p. 99, 2016. [Online]. Available: <https://d1wqtxts1xzle7.cloudfront.net/>
- [10] D. Oladimeji, K. Gupta, N. A. Kose, K. Gundogan, L. Ge, and F. Liang, "Smart Transportation: An Overview of technologies and applications," *Sensors*, vol. 23, no. 8, p. 3880, Apr. 2023, doi: 10.3390/s23083880.
- [11] "Crime prevention through environmental design," in Elsevier eBooks, 2013. doi: 10.1016/c2012-0-03280-2.
- [12] Y. Liu, Y. Yuan, J. Shen, and W. Gao, "Emergency response facility location in transportation networks: A literature review," *Journal of Traffic and Transportation Engineering/Journal of Traffic and Transportation Engineering*, vol. 8, no. 2, pp. 153–169, Apr. 2021, doi: 10.1016/j.jtte.2021.03.001.
- [13] R. O. Phillips, O. H. Hagen, and S. H. Berge, "Bus stop design and traffic safety: An explorative analysis," *Accident Analysis and Prevention*, vol. 153, p. 105917, Apr. 2021, doi: 10.1016/j.aap.2020.105917.
- [14] "Effective physical security," in Elsevier eBooks, 2013. doi: 10.1016/c2011-0-05381-4.
- [15] M. C. Nnatuanya, "CRIME PREVENTION THROUGH ENVIRONMENTAL DESIGN (CPTED) IN THE DESIGN OF AN AIRPORT BUILDING UMUERI, ANAMBRA STATE, NIGERIA," 2019. [Online]. Available: <http://eprints.covenantuniversity.edu.ng/13411/>
- [16] R. F. Abenoza, V. Ceccato, Y. O. Susilo, and O. Cats, "Individual, travel, and bus stop characteristics influencing travelers' safety perceptions," *Transportation Research Record*, vol. 2672, no. 8, pp. 19–28, Apr. 2018, doi: 10.1177/0361198118758677.
- [17] M. P. J. Ashby, "The value of CCTV surveillance cameras as an Investigative tool: An Empirical analysis," *European Journal on Criminal Policy and Research*, vol. 23, no. 3, pp. 441–459, Apr. 2017, doi: 10.1007/s10610-017-9341-6.
- [18] T. Zhang, A. Chowdhery, P. Bahl, K. Jamieson, and S. Banerjee, "The Design and Implementation of a Wireless Video Surveillance System," In *Proceedings of the 21st Annual International Conference on Mobile Computing and Networking*, pp. 426–438, Sep. 2015, doi: 10.1145/2789168.2790123.
- [19] S. An, N. Cui, X. Li, and Y. Ouyang, "Location planning for transit-based evacuation under the risk of service disruptions," *Transportation Research. Part B: Methodological/Transportation Research. Part B, Methodological*, vol. 54, pp. 1–16, Aug. 2013, doi: 10.1016/j.trb.2013.03.002.
- [20] R. Damaševičius, N. Bacanin, and S. Misra, "From sensors to safety: Internet of Emergency Services (IOES) for emergency response and disaster management," *Journal of Sensor and Actuator Networks*, vol. 12, no. 3, p. 41, May 2023, doi: 10.3390/jsan12030041.
- [21] A. Cox, F. Prager, and A. Rose, "Transportation security and the role of resilience: A foundation for operational metrics," *Transport Policy*, vol. 18, no. 2, pp. 307–317, Mar. 2011, doi: 10.1016/j.tranpol.2010.09.004.
- [22] M. Benyahya, A. Collen, S. Kechagia, and N. A. Nijdam, "Automated city shuttles: Mapping the key challenges in cybersecurity, privacy and standards to future developments," *Computers & Security*, vol. 122, p. 102904, Nov. 2022, doi: 10.1016/j.cose.2022.102904.
- [23] S. Rass, S. Schauer, S. König, and Q. Zhu, *Cyber-Security in critical infrastructures*. 2020. doi: 10.1007/978-3-030-46908-5.
- [24] B. Chen et al., "Security Analysis of Urban Railway Systems: The need for a Cyber-Physical Perspective," in *Lecture notes in computer science*, 2015, pp. 277–290. doi: 10.1007/978-3-319-24249-1_24.
- [25] B. Zheng, W. Li, P. Deng, L. Gérard, Q. Zhu, and N. Shankar, "Design and verification for transportation system security," In *Proceedings of the 52nd Annual Design Automation Conference*, pp. 1–6, Jun. 2015, doi: 10.1145/2744769.2747920.