



The Role of Circulation on User Experience in Bus Terminals for Urban Renewal in Lagos State

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ABSTRACT

Efficient circulation within bus terminals plays a critical role in shaping user experience and supporting urban renewal in Lagos State. This study examines how circulation patterns influence user movement, navigation, and satisfaction in selected bus terminals. Data were collected through structured questionnaires administered to 196 terminal users and direct observations of pedestrian, vehicular, and boarding activities. Findings indicate that male users dominate terminal usage, while passengers aged 46 and above are frequent users, highlighting the need for mobility-sensitive design. Results show mixed clarity of walkways, inadequate signage, overcrowded waiting areas, and congestion during peak hours, contributing to low overall satisfaction. Users recognize the importance of improving circulation through better pathways, signage, reduced congestion, and organized boarding processes. The study concludes that enhancing terminal circulation can significantly improve user experience and support urban renewal initiatives.

Keywords: Bus terminals, circulation, user experience, urban renewal, Lagos State, pedestrian flow, signage, congestion

INTRODUCTION

Background of study

Urban public transportation systems play a vital role in supporting mobility, economic activities, and social interactions in rapidly growing metropolitan areas (McSharry & Paul, 2021). Transport terminals function as critical nodes within these systems because they facilitate the movement of large numbers of passengers and provide connections between different routes and transport services (Rusanen & Wiest, 2024). The physical organization of terminal spaces significantly influences how passengers move through the facility and how they perceive their travel experience (Abdelkhalek et al., 2023). Circulation, which refers to the movement routes that guide pedestrian and vehicular flow within a built environment, is therefore an important design element in transportation facilities (Onechojo et al., 2024). Well-designed circulation systems improve accessibility, reduce congestion, and allow users to navigate spaces more efficiently within complex buildings (Liu et al., 2024). Research on public facilities shows that spatial layouts that clearly define circulation paths contribute significantly to user comfort, orientation, and overall satisfaction (Abdelkhalek et al., 2023).

Bus terminals require particularly efficient circulation systems because they accommodate multiple user groups, including passengers, transport operators, and service providers within the same environment (Mardikawati et al., 2025). Effective terminal layouts must therefore coordinate pedestrian movement, boarding activities, and vehicular operations in a way that minimizes conflicts and delays (Syahriza et al., 2025). Studies on bus terminal facilities indicate that well-organized circulation networks enhance operational efficiency and improve passenger experience within transportation environments (Reza et al., 2025). The importance of efficient public transport infrastructure is especially evident in rapidly urbanizing cities such as Lagos, where population growth has led to increasing travel demand (McSharry & Paul, 2021). Public bus systems remain one of the most widely used modes of transportation in the city, serving a large proportion of daily commuters (Adebiyi et al., 2022). As passenger demand increases, the spatial organization and circulation systems of bus terminals become increasingly important in ensuring efficient passenger flow and maintaining service quality (Sogbe et al., 2024). Urban renewal initiatives in many cities have also highlighted the importance of improving transport infrastructure as a strategy for enhancing urban functionality and environmental quality (Adeel et al., 2021). Well-designed terminals can contribute to these goals by providing organized movement systems, improving accessibility, and creating more comfortable public spaces for commuters (Suleiman et al., 2023). The spatial layout and environmental quality of terminals have also been shown to influence passenger satisfaction and patronage of public transportation services (Adetayo et al., 2023). Furthermore, efficient circulation systems within

transportation facilities can help reduce congestion, improve safety, and enhance the overall usability of the environment (Tonade & Orkpeh, 2025). These spatial improvements can also contribute to broader sustainability goals by encouraging greater use of public transport and reducing reliance on private vehicles (Ajayi et al., 2023). Understanding how circulation design affects user experience is therefore essential for developing bus terminal environments that are both functional and supportive of urban development (Yasin & Yuliani, 2024).

Problem Statement

Bus terminals are designed to facilitate the movement of passengers between different transport routes, yet many terminals experience operational challenges due to inefficient spatial organization (Syahriza et al., 2025). Poorly planned circulation systems often result in congestion, conflicting movement patterns, and difficulty in navigating terminal spaces (Mardikawati et al., 2025). These conditions can reduce passenger comfort, create safety concerns, and negatively affect the overall functionality of transport facilities (Reza et al., 2025). In Lagos State, the growing demand for bus transportation has placed significant pressure on existing terminal facilities and their ability to handle increasing passenger volumes (McSharry & Paul, 2021). Several studies have reported that overcrowding and disorganized passenger flow are common challenges affecting the quality of bus terminal environments in the state (Salisu et al., 2024). Such conditions can lead to dissatisfaction among users and reduce the efficiency of the public transport system (Sogbe et al., 2024). Improving the spatial organization and circulation systems within bus terminals is therefore necessary to enhance passenger experience and support more efficient urban mobility (Suleiman et al., 2023). Addressing these circulation challenges can also contribute to broader urban renewal efforts by improving the functionality and quality of transportation infrastructure in Lagos State (Adeel et al., 2021).

Research Gap

Existing studies on public transport systems have largely focused on service quality, operational performance, and passenger satisfaction rather than the spatial design of terminal environments (Adebiyi et al., 2022). Some research has examined passenger perceptions of bus terminal facilities, emphasizing the availability of services and amenities rather than the influence of circulation patterns on user experience (Reza et al., 2025). Studies in architectural and spatial research have demonstrated that circulation systems significantly influence user comfort, accessibility, and navigation within complex buildings (Abdelkhalek et al., 2023). However, much of this research has been conducted in building types such as hospitals, retail environments, and exhibition spaces rather than transportation terminals (Onechojo et al., 2024). Although recent studies have highlighted the need for improved terminal layouts to enhance passenger movement and comfort, many of these investigations have been conducted outside Nigeria and within different urban contexts (Mardikawati et al., 2025). Consequently, there is limited context-specific research examining how circulation design within bus terminals influences user experience in Lagos State (Sani et al., 2025).

Aim

To examine the role of circulation in shaping user experience in bus terminals and its implications for urban renewal in Lagos State.

Objectives

1. To identify the existing circulation patterns within selected bus terminals in Lagos State.
2. To examine how circulation design influences user movement and navigation within bus terminals.
3. To evaluate users perception and experience of circulation spaces in bus terminals.
4. To propose design strategies that can improve circulation efficiency and enhance user experience in bus terminals for urban renewal in Lagos State.

LITERATURE REVIEW

Circulation in architectural design refers to the organized system of movement that allows people to navigate through spaces and access different functional areas within a facility (Abdelkhalek et al., 2023). In buildings that accommodate large numbers of users, circulation systems are essential for ensuring efficient movement, spatial clarity, and user comfort (Onechojo et al., 2024). Research has shown that clearly defined circulation routes help reduce congestion and improve the overall usability of complex environments (Liu et al., 2024). Effective circulation planning therefore plays a key role in shaping how users interact with and experience public spaces (Abdelkhalek et al., 2023). In transportation facilities such

as bus terminals, circulation systems are particularly important because these spaces function as transition points where passengers move between vehicles, waiting areas, and surrounding urban environments (Rusanen & Wiest, 2024). Efficient spatial layouts can significantly improve passenger flow, minimize delays, and enhance operational performance within terminals (Mardikawati et al., 2025). Conversely, poorly organized circulation often leads to overcrowding, confusion in wayfinding, and conflicts between pedestrian and vehicular movement (Syahriza et al., 2025). Studies evaluating bus terminal facilities have also shown that passengers' perception of comfort and convenience is strongly influenced by the ease with which they can move within the terminal environment (Reza et al., 2025). User experience has become an important factor in the evaluation of transportation infrastructure because passengers' perceptions of comfort, accessibility, and convenience influence their willingness to use public transport systems (Csiszarik-Kocsir & Varga, 2023). Research on public transport services indicates that environmental quality, spatial organization, and service conditions collectively shape passenger satisfaction and patronage (Adetayo et al., 2023).

When transport facilities provide organized movement systems and comfortable spaces, users are more likely to perceive the service as reliable and efficient (Sogbe et al., 2024). In rapidly growing cities such as Lagos, the demand for public transportation continues to increase due to population growth and expanding economic activities (McSharry & Paul, 2021). Bus transport systems remain one of the most widely used mobility options in the city, making bus terminals critical infrastructure for urban mobility (Adebiyi et al., 2022). However, increasing passenger volumes often place pressure on existing terminal facilities, leading to congestion and reduced service quality (Salisu et al., 2024). Improving the spatial organization and circulation systems of terminals has therefore been identified as an important strategy for enhancing transport efficiency and supporting urban development (Sani et al., 2025). Well-designed transport infrastructure can also contribute to urban renewal by improving accessibility, enhancing environmental quality, and supporting sustainable mobility systems within cities (Adeel et al., 2021). Efficient circulation systems within terminals can help reduce congestion, improve safety, and enhance the overall functionality of public transport facilities (Tonade & Orkpeh, 2025). Integrating effective circulation design into bus terminal planning is therefore essential for improving user experience while supporting broader urban development goals (Ajayi et al., 2023).

Case Study

Oshodi Transport Interchange

The Oshodi Transport Interchange is one of the largest and most important public transport terminals in Lagos State. The facility was developed as part of the state government's effort to reorganize transport activities and reduce congestion within the Oshodi area. The interchange accommodates multiple bus services and provides structured boarding areas, waiting spaces, and pedestrian circulation routes designed to manage the high number of passengers using the terminal daily. The development of the terminal reflects efforts to improve the quality and efficiency of public transportation infrastructure within the city (Adebiyi et al., 2022). The design of the terminal incorporates dedicated circulation zones that separate pedestrian movement from vehicular operations in order to improve safety and efficiency. Organized walkways and access points guide passengers from entrance areas to ticketing and boarding zones, helping to reduce confusion and congestion within the terminal environment. Efficient circulation systems within transport terminals are important for improving passenger flow and reducing delays during boarding and alighting processes (Mardikawati et al., 2025). Despite these improvements, the high volume of daily commuters continues to place pressure on the terminal's circulation spaces. During peak periods, passengers often experience crowding in waiting areas and movement corridors due to the large number of users accessing the facility simultaneously. Studies have shown that passenger satisfaction within transport terminals is strongly influenced by the ease of movement and the availability of adequate circulation space (Reza et al., 2025). Improving the management and design of circulation systems therefore remains important for enhancing the overall user experience within the Oshodi Transport Interchange.

Ojota Bus Terminal

Ojota Bus Terminal is another important transport facility within Lagos State, serving passengers traveling to different parts of the city and neighboring regions. The terminal functions as a key node within the urban transport network, connecting several bus routes and accommodating a large number of commuters on a daily basis. Public transport facilities such as this play an important role in supporting urban mobility and facilitating the movement of people across metropolitan areas (McSharry & Paul, 2021). The circulation system within the Ojota terminal consists of access roads, pedestrian pathways, and

boarding zones that allow passengers to move between waiting areas and transport vehicles. The spatial arrangement of these elements influences how efficiently passengers navigate the terminal environment. Proper planning of circulation spaces is necessary to reduce conflicts between pedestrian and vehicular movement within transportation facilities (Syahriza et al., 2025). However, the terminal often experiences congestion due to the high number of passengers using the facility and the limited spatial capacity available for movement. Overcrowding in circulation areas sometimes makes it difficult for passengers to access boarding points and navigate the terminal easily. Research on public transport environments indicates that poorly organized circulation systems can negatively affect user comfort and satisfaction (Sogbe et al., 2024). Improving circulation planning within terminals such as Ojota can therefore enhance user experience while supporting more efficient transport operations within the city.

Study Area

This study focuses on bus terminals located within Lagos, a major metropolitan city in Nigeria known for its high population density and intense urban mobility. The city serves as the country's economic hub and experiences significant daily movement of people across different districts and surrounding regions. The rapid growth in population and urban activities has increased the demand for efficient public transportation systems within the city (McSharry & Paul, 2021). Bus transport remains one of the most widely used forms of mobility in Lagos because it provides accessible and affordable transportation for a large number of commuters (Adebiyi et al., 2022). Bus terminals across the state function as important transport nodes where passengers board, alight, and transfer between different routes. These terminals handle large passenger volumes daily, making the organization of circulation systems critical for efficient movement within the facility (Salisu et al., 2024). The spatial design and environmental quality of terminals also influence passenger comfort, accessibility, and overall perception of public transport services (Adetayo et al., 2023). Improving the design and circulation efficiency of bus terminals is therefore important for enhancing urban mobility and supporting broader urban development initiatives within Lagos (Adeel et al., 2021).

Study population and size

The study population consists of users of selected bus terminals in Lagos State, including passengers, transport operators, and terminal staff who interact with the circulation spaces within the facilities. These groups provide relevant information on how movement patterns and spatial organization influence user experience within the terminals. The total sample size is determined with Cochran's formula yielding a total of 196 respondents. The respondents are drawn from users present at the selected bus terminals during the period of data collection in order to obtain diverse perspectives on circulation efficiency and user experience.

Data Collection Methods

Data for the study is collected using a structured questionnaire and direct observation. The questionnaire is administered to users of the selected bus terminals to obtain information on their experience, perception, and movement within the terminal spaces. The questionnaire includes questions related to circulation efficiency, ease of movement, accessibility, congestion, and general comfort within the terminal environment. Direct observation is also used to examine the physical layout and circulation patterns within the terminals. During the observation process, attention is given to pedestrian movement, access routes, waiting areas, and the interaction between vehicular and pedestrian circulation. This method helps to provide a clearer understanding of how spatial organization affects user movement within the terminals.

Data analysis

The data collected for the study is analyzed using both descriptive and inferential statistical methods. Questionnaire responses are organized, coded, and entered into a spreadsheet. Frequencies, percentages, and mean scores are used to summarize responses and identify patterns related to circulation efficiency, ease of movement, accessibility, congestion, and user comfort within the bus terminals. The results are presented using tables and charts to clearly illustrate user perceptions and experiences. Inferential statistical analysis is also applied to examine relationships and differences between variables. Tests such as chi-square analysis is used to determine whether factors like user type, time of travel, or terminal location significantly influence perceptions of circulation efficiency and overall user experience. Observational data is analyzed qualitatively to examine pedestrian movement, access routes, waiting areas,

and interactions between pedestrians and vehicles. Observations are compared with questionnaire findings to provide a comprehensive understanding of how circulation patterns impact user experience and terminal functionality.

RESULTS AND DISCUSSION

Descriptive Statistics of Responses

Demographic Information

Gender Distribution: The gender distribution indicates that male respondents accounted for 64.8%, while female respondents represented 35.2% of the total population. This suggests that male users dominate the bus terminal environment within the study area.

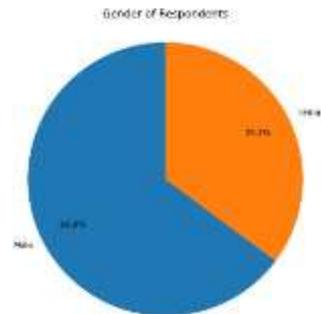


Figure 1: pie chart showing gender distribution
Source: Author's Analysis from Microsoft Excel

Age Distribution of Respondents: The age distribution shows that bus terminals in Lagos State are used by people across different age categories. Respondents aged 46 years and above constituted the highest percentage at 28.1%, followed by those aged 26–35 years at 25.5% and 36–45 years at 24.0%, while respondents aged 18–25 years accounted for 22.4%. This suggests that circulation spaces must be designed to support individuals with varying mobility needs, particularly older users who may require clearer pathways, adequate waiting areas, and improved accessibility features.

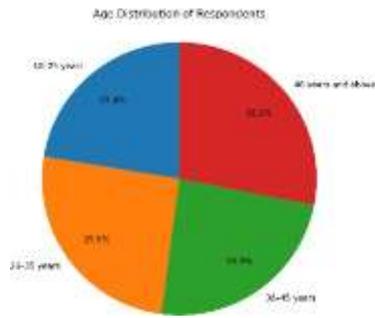


Figure 2: pie chart showing age distribution
Source: Author's Analysis from Microsoft Excel

Occupation of Respondents: The occupational distribution shows that students constituted the largest group at 29.6%, followed by workers or employees at 25.0%, self-employed individuals at 23.0%, and others at 22.4%. This indicates that bus terminals serve users with diverse travel purposes, including education, employment, and business activities.

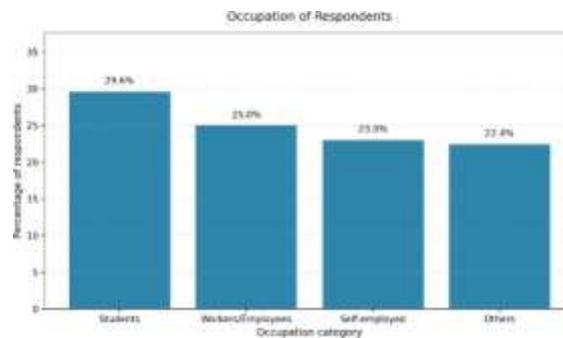


Figure 3: bar chart showing occupation of respondents
Source: Author's Analysis from Microsoft Excel

Objective 1: To Identify the Existing Circulation Patterns within Selected Bus Terminals in Lagos State

Frequency of Terminal Usage: The findings reveal varying levels of terminal usage among respondents. Occasional users accounted for 30.6%, representing the highest proportion of terminal users. This was followed by daily users at 25.5%, users who visit 2–3 times a week at 22.4%, and once-a-week users at 21.4%. The results indicate that bus terminals experience both regular and intermittent usage patterns.

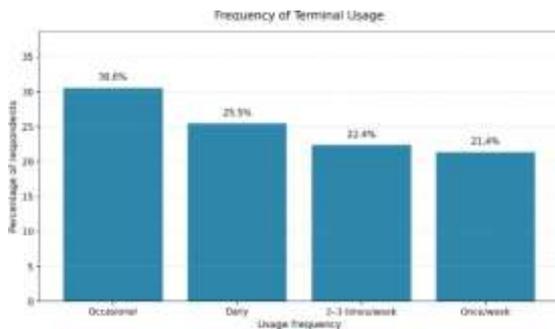


Figure 4: bar chart showing frequency of terminal usage
Source: Author's Analysis from Microsoft Excel

Clarity of Walkways and Circulation Paths: The findings on the clarity of walkways indicate mixed user experiences. 29.1% of respondents stated that walkways are very clear, while 25.5% considered them clear. However, 26.5% reported that walkways are unclear, and 18.9% described them as very unclear. These findings suggest that although some terminals provide well-defined circulation routes, others lack clear spatial organization and guidance, which may hinder smooth pedestrian movement within the terminal.

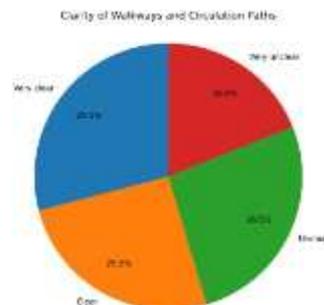


Figure 5: pie chart showing Clarity of walkways and circulation paths
Source: Author's Analysis from Microsoft Excel

Objective 2: To Examine How Circulation Design Influences User Movement and Navigation within Bus Terminals

Quality of Signage and Directional Information: The assessment of signage and directional systems shows varied responses among users. 29.1% rated signage as good, while 23.0% rated it as excellent, indicating that a portion of respondents find the way finding system effective. However, 26.5% rated signage as very poor, and 21.4% rated it as poor. These results suggest that ineffective signage in some terminals may contribute to navigation difficulties, thereby affecting the efficiency of user movement within the terminal environment.

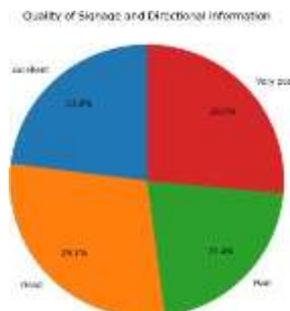


Figure 6: pie chart showing Quality of Signage and Directional Information

Source: Author's Analysis from Microsoft Excel

Smoothness of Movement within the Terminal: User responses regarding movement within the terminal reveal that 31.1% described movement as smooth, while 27.0% perceived it as very smooth. Conversely, 21.4% reported that movement is very congested, and 20.4% described it as congested. This indicates that although certain terminals provide relatively efficient circulation spaces, congestion remains a notable challenge in many terminals, particularly during periods of high passenger activity.

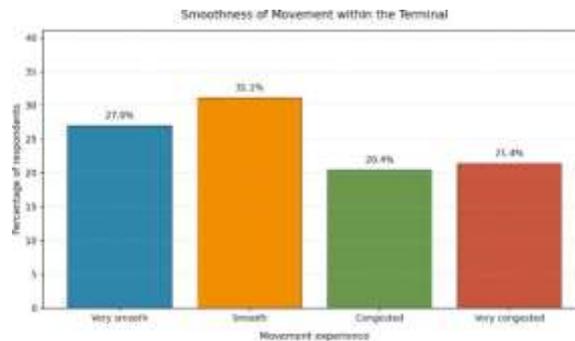


Figure 7: bar chart showing Smoothness of Movement within the Terminal

Source: Author's Analysis from Microsoft Excel

Objective 3: To Evaluate Users' Perception and Experience of Circulation Spaces in Bus Terminals

Overall User Satisfaction: The results regarding overall satisfaction indicate relatively low satisfaction with circulation spaces. 28.1% reported being very dissatisfied, while 25.5% indicated dissatisfaction. In contrast, 25.5% expressed satisfaction, and 20.9% reported being very satisfied. The dominance of dissatisfaction suggests that existing circulation design in many terminals does not adequately meet user expectations in terms of movement efficiency, comfort, and organization.

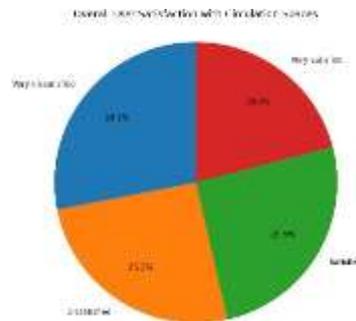


Figure 8: pie chart showing Overall User Satisfaction
Source: Author's Analysis from Microsoft Excel

Objective 4: To Propose Design Strategies that Can Improve Circulation Efficiency and Enhance User Experience in Bus Terminals

Perceived Importance of Circulation Improvements: Responses regarding the importance of improving circulation spaces show varying perceptions among respondents. 31.6% considered improvements less important, while 25.0% stated that improvements are not important. However, 21.9% regarded improvements as very important, and 21.4% considered them important. Although opinions differ, a substantial proportion of users still recognize the need for improvements in circulation design to enhance terminal functionality.

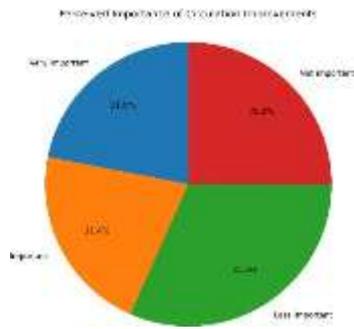


Figure 9: pie chart showing Perceived Importance of Circulation Improvements
Source: Author's Analysis from Microsoft Excel

Inferential Statistics

Chi-square Tests analysis: A chi-square analysis was conducted to examine the relationship between user type and perception of circulation efficiency within the selected bus terminals. The results show that perceptions vary across different user groups. For instance, about 53.6% of respondents reported dissatisfaction with circulation spaces, while 46.4% expressed satisfaction. Frequent users such as students and workers showed higher levels of dissatisfaction compared to other users, indicating that regular terminal use increases exposure to congestion, delays, and navigation challenges. These findings suggest that improving circulation design could enhance user satisfaction and movement efficiency within bus terminals.

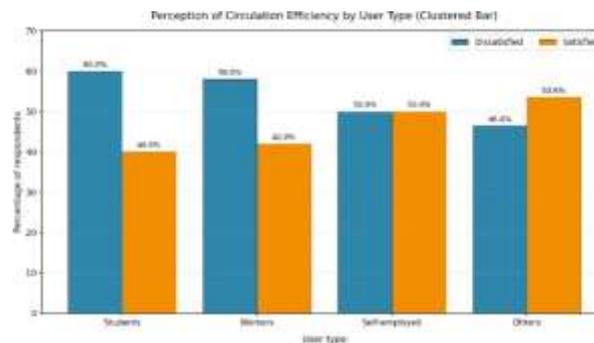


Figure 10: clustered bar chart showing perception of circulation efficiency by user type
Improvements Source: Author's Analysis from Microsoft Excel

Analysis of Observational Findings

Table 1: Showing Circulation Patterns In Selected Bus Terminals In Lagos State

Circulation Element	Observation Findings	Implication for Circulation Efficiency
Pedestrian Movement	Passengers move in multiple directions, often crossing bus lanes.	Causes congestion and potential pedestrian–vehicle conflicts.
Access Routes	Main entrances crowded, some users enter through informal side openings.	Reduces efficiency and increases congestion at entry points.
Waiting Areas	Waiting areas overcrowded; passengers stand along walkways.	Obstructs movement and lowers circulation efficiency.
Pedestrian–Vehicle Interaction	Little separation between pedestrians and moving buses.	Increases safety risks and slows movement.
Boarding Areas	Passengers cluster around buses, queues are rare.	Leads to congestion and delays in circulation.

Table 2: Showing Comparison Of Observation And Questionnaire Findings

Circulation Element	Observational Findings	Questionnaire Findings	Interpretation
Pedestrian Movement	Pedestrians frequently walk through vehicle paths to lack of designated walkways	Many respondents reported difficulty in boarding and navigating circulation spaces	Lack of proper pedestrian pathways contributes to movement conflicts and inefficiency
Boarding Areas	Passengers cluster around buses during boarding	Majority of respondents reported boarding as difficult or very difficult	Poorly organized boarding areas cause congestion and delays
Waiting Areas	Limited seating and shelter observed;	Respondents reported inconvenience in accessing waiting areas	Insufficient waiting spaces affect comfort

	passengers occupy circulation paths		and circulation efficiency
Signage and Wayfinding	Inadequate or poorly placed directional signage observed	Users rated signage as poor or very poor in several terminals	Lack of effective signage affects navigation and user experience
Congestion	Congestion observed during peak hours around entry points and boarding areas	Respondents reported delays and congested movement	Circulation infrastructure is insufficient for peak passenger volumes

Summary of Findings

The study highlights critical aspects of circulation patterns and their influence on user experience within Lagos State bus terminals. Walkways and circulation paths present mixed perceptions among users, with only 29.1% reporting very clear routes and 25.5% describing them as clear, while a significant proportion (45.4%) find them unclear or very unclear. This inconsistency suggests that many terminals lack well-defined pathways, which can hinder smooth pedestrian flow and increase congestion. Signage and directional information also show varied effectiveness, with 26.5% rating signage as very poor and 21.4% as poor, indicating that wayfinding systems in several terminals are inadequate, which affects users' ability to navigate efficiently. Observational analysis confirms these issues, revealing pedestrian-vehicle interactions in undesignated areas, overcrowded waiting zones, and clustering around boarding areas, all contributing to delays and reduced circulation efficiency. While some respondents (31.1%) report smooth movement, 41.8% describe movement as congested or very congested, particularly during peak hours, reflecting the mismatch between terminal capacity and passenger demand. Overall user satisfaction is low, with 53.6% expressing dissatisfaction with circulation spaces. Users consistently highlight the need for improved spatial organization, including clearer walkways, structured boarding areas, better signage, and reduced congestion. These findings collectively emphasize the significant role of circulation design in enhancing user comfort, safety, and operational efficiency within bus terminals, underscoring the importance of targeted design interventions to improve the overall travel experience and support urban renewal initiatives.

Conclusion

The study establishes that circulation patterns within Lagos State bus terminals significantly impact user movement, navigation, and overall experience. Inefficient walkways, inadequate signage, overcrowded waiting areas, and poor boarding organization hinder smooth pedestrian flow and increase safety risks. Frequent users, such as students and workers, experience greater challenges due to repeated exposure to congestion and delays. Despite mixed opinions on the importance of circulation improvements, a notable proportion of users acknowledge the need for enhanced spatial design to optimize movement and comfort. The research highlights the necessity for terminal layouts that integrate well-defined pedestrian pathways, accessible waiting zones, clear signage, and structured boarding processes. Addressing these circulation challenges is crucial for improving user satisfaction and supporting urban renewal initiatives through more functional and user-friendly public transport infrastructure.

Recommendations

To enhance circulation efficiency and user experience, bus terminal designers and urban planners should implement several key strategies. First, clear and well-marked pedestrian walkways must be established to separate foot traffic from vehicle lanes, reducing congestion and safety hazards. Signage and wayfinding systems should be strategically placed and standardized to facilitate navigation for all users, including first-time and older passengers. Boarding and alighting areas should be reorganized to prevent clustering, employing structured queues and designated zones. Waiting areas require adequate seating and shelter to minimize obstructions in circulation paths. Additionally, periodic monitoring and assessment of terminal flow patterns should guide continuous improvements. By adopting these measures, Lagos State

can create bus terminals that support smoother movement, enhance user comfort, and contribute to sustainable urban renewal.

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