

Landscape Elements as A Means of Navigation Within the University Community: A Case Study of The University of Lagos, Akoka

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Abstract—Navigation within university campuses is essential for efficient movement and user experience, especially in large and complex environments. Landscape elements such as pathways, vegetation, landmarks, and open spaces can serve as natural guides that support spatial orientation and movement. However, most studies on campus navigation focus primarily on signage and architectural structures, with limited attention to the role of landscape design. This study examines landscape elements as a means of navigation within the university community, using University of Lagos, Akoka Campus, as a case study. The aim is to evaluate how landscape features contribute to navigation and campus legibility. The objectives include identifying existing landscape elements that aid movement, assessing users' experiences of these elements, and proposing improvements. A mixed-method approach will be adopted, involving site observation, and questionnaires administered to students and staff. The collected data will be analyzed using descriptive methods to evaluate the effectiveness of landscape elements as navigation tools within the campus environment.

Index Terms—Campus planning, Environmental legibility, Landscape design, Spatial cognition, University campuses, Wayfinding.

I. INTRODUCTION

University campuses function as complex micro-urban systems where navigation ease significantly affects user experience, accessibility, and institutional efficiency. Wayfinding, the ability to navigate through space without feeling lost, encompasses self-localization, route planning, continuous monitoring, and destination recognition (Kwon et al., 2025). When navigation fails, users experience stress, anxiety, and

frustration that impede their primary activities (Picazo et al., 2020; Baş et al., 2024). Traditional wayfinding strategies rely heavily on signage and maps. However, research demonstrates that landscape elements: pathways, vegetation, landmarks, nodes, edges, shape spatial cognition and influence movement intuitively and continuously (Mahmoudi & Khalili, 2020; Al-Sharaa et al., 2022). Lynch's foundational work on environmental legibility identified five elements: paths, edges, districts, nodes, landmarks; that contribute to mental images of environments, providing a framework for understanding how landscape structure supports navigation (Yesiltepe et al., 2021; Cheirchanteri, 2021).

In Nigerian universities, students and visitors face significant navigation challenges. Studies show that 70% of campus users find navigation difficult, with locating classrooms cited as most problematic (Picazo et al., 2020). The University of Lagos (UNILAG), established in 1962, presents a complex, historically evolved campus spanning approximately 802 acres with diverse zones, buildings, and open spaces. Despite its significance, no systematic study has examined how landscape elements support navigation at UNILAG.

This study evaluates how landscape elements function as navigation tools within the University of Lagos community. It addresses the gap in literature focusing on architectural form and signage rather than campus landscape structure, and contributes to campus planning discourse by repositioning landscape design as strategic for spatial legibility.

II. LITERATURE REVIEW

2.1 Wayfinding and Environmental Legibility

Wayfinding is finding an intended destination through interaction between individual ability and environmental cues (Al-Sharaa et al., 2022). It involves decision-making, decision execution, and information-processing stages. Successful wayfinding systems allow users to determine location, destination, and develop navigation plans (Kwon et al., 2025).

Environmental legibility describes how easily spatial environments can be understood mentally (Yesiltepe et al., 2021). Legible environments support cognitive mapping: the mental representation of spatial information acquired through experience (Al-srogy et al., 2024). Lynch's five legibility elements provide the foundational framework:

Paths are channels through which people travel including walkways and circulation routes. They provide the framework organizing other elements. Complex configurations decrease wayfinding performance, and highest spatial integration occurs at

walkway intersections, indicating these serve as navigation anchors (Al-srogy et al., 2024; Baş et al., 2024). Edges are boundaries; walls, fence lines, transitions between zones. They define perimeters and guide movement. Entrances and exits; edge transitions: are most preferred physical features for wayfinding (Al-Sharaa et al., 2022).

Districts are regions with common characteristics: academic cores, residential areas. Distinctive character aids identification (Yesiltepe et al., 2021). Nodes are strategic points: junctions, gathering places, decision points. Users exhibit hesitation at nodes, pausing to consider routes, and signage is most influential at decision points (Kwon et al., 2025; Al-srogy et al., 2024; Baş et al., 2024). Landmarks are reference points: distinctive trees, sculptures, focal buildings. Landmark salience depends on visual characteristics (color, size, shape), structural characteristics (location at decision points), and cognitive characteristics (cultural or historical meaning) (Yesiltepe et al., 2021; Mahmoudi & Khalili, 2020; Cheirchanteri, 2021).

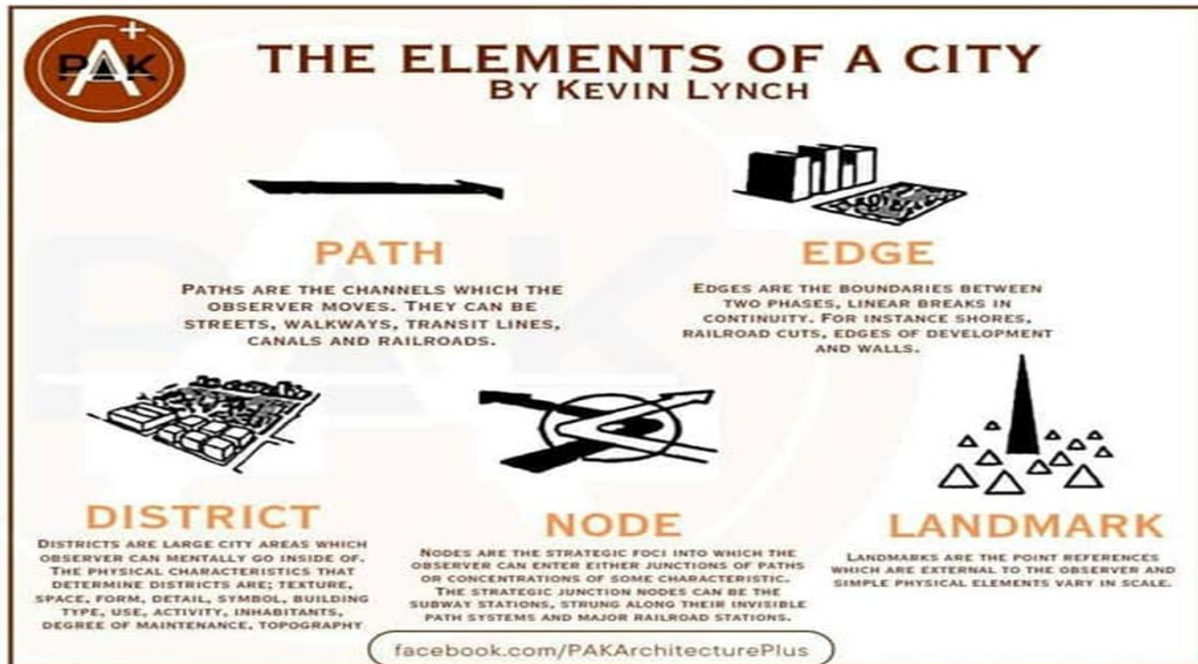


Fig 2.1: Kevin Lynch's 5 Elements of Urban Design

2.2 Landscape Elements as Navigational Cues

Pathways are fundamental to wayfinding. Clear, well-defined pathways significantly aid movement and reduce navigation errors (Kwon et al., 2025). The hierarchical organization of pathways contributes to

legibility by providing users with clear distinctions between primary and secondary routes (Al-srogy et al., 2024). Landmarks are easily identifiable elements that serve as reference points. Research shows that landmarks at decision points with turns are more

effective and better remembered (Yesiltepe et al., 2021). Landmark effectiveness depends on visual salience (color, size, shape), structural salience (location), and cognitive salience (meaning) (Mahmoudi & Khalili, 2020). Vegetation contributes to spatial definition and legibility. Color is useful for wayfinding and spatial orientation, and color affects wayfinding performance (Mahmoudi & Khalili, 2020; Alansari, 2022). Studies show that 70% of participants find color coding helpful, with almost half able to recall correct color corridors. Vegetation defines pathway edges, frames landmark views, creates spatial enclosure, and signals district transitions through consistent planting patterns (Al-Sharaa et al., 2022). Open spaces and nodes serve as reference points during movement. Major junctions and intersections help users make navigation decisions, with 70% of users confirming their role as critical decision points (Kwon et al., 2025; Al-srogy et al., 2024). Edges define boundaries between zones. Poor edge definition is a critical weakness in campus legibility, with users unable to easily detect transitions between academic, residential, and administrative areas (Al-Sharaa et al., 2022; Yesiltepe et al., 2021).

2.3 Theoretical Frameworks

This study integrates three complementary frameworks. Lynch's legibility theory provides vocabulary for analyzing landscape elements (Yesiltepe et al., 2021; Cheirchanteri, 2021). Passini's spatial problem-solving theory emphasizes environmental information for decision-making (Al-Sharaa et al., 2022). Rooke's tri-partite framework prioritizes physical features (landscape elements) over coded information (signage) and social practices for wayfinding. Physical features are most preferred, followed by coded information and social practices (Al-Sharaa et al., 2022). Additionally, the Social Ecological Model (SEM) provides a comprehensive framework encompassing individual domain (demographics, spatial knowledge), social domain (communication, interaction), physical environment domain (accessibility, layout, aesthetics), and institutional domain (policy, design) (Al-Sharaa et al., 2022).

2.4 Wayfinding and Stress

Navigation difficulty correlates with stress. Navigation issues are associated with exhaustion, high

blood pressure, headaches, and significant positive correlations exist between stress and difficulty, stress and confusion, stress and sign-seeking, and stress and navigation time (Kwon et al., 2025). In educational settings, time pressure amplifies navigational stress. Seventy-one percent of users experience moderate to extreme stress when navigating unfamiliar locations (Kwon et al., 2025; Baş et al., 2024). Effective landscape-based navigation reduces stress by creating legible environments requiring less conscious effort (Al-Sharaa et al., 2022).

2.5 Research Gap

Existing wayfinding research focuses on architectural form and signage, with limited attention to landscape configuration as navigational framework (Mahmoudi & Khalili, 2020; Yesiltepe et al., 2021). Nigerian campus-scale studies are scarce, and the University of Lagos: despite its significance, has received no systematic wayfinding study. This research addresses these gaps.

III. METHODOLOGY

3.1 Research Design

This study employs a mixed-method design integrating qualitative and quantitative approaches, appropriate for wayfinding research as it enables triangulation and provides both objective spatial data and subjective user perspectives (Kwon et al., 2025; Al-srogy et al., 2024). The design incorporates site observation, and questionnaire survey. This approach follows established methodological frameworks where 65% of wayfinding studies utilize surveys and questionnaires (Al-srogy et al., 2024).

3.2 Study Area

The University of Lagos, Akoka Campus, established 1962, spans approximately 802 acres in Yaba, Lagos. Selected for its historical evolution, spatial complexity, diverse user population (40,000+ students), accessibility, and absence of prior research. The study area includes the main academic core, student residential areas, major circulation routes, key open spaces, major nodes, and significant landmarks. This selection aligns with established wayfinding research settings in university environments (Picazo et al., 2020; Kwon et al., 2025; Baş et al., 2024).



Fig 3.1: Satellite view of UNILAG campus showing main buildings



Fig 3.2: Satellite view of UNILAG campus

3.3 Population, Sampling, and Data Collection

Target population comprises all campus users: students, staff, and visitors. Following established precedents in wayfinding research, a target sample of 400 respondents is appropriate for campus-scale studies (Al-srogy et al., 2024). Stratified random

sampling ensures representation: students (100, 67%), staff (35, 23%), visitors (15, 10%). Respondents selected randomly across different times and locations to ensure diversity (Picazo et al., 2020).

Site observation: Systematic walking of major routes, identifying and documenting pathways, landmarks, nodes, edges, districts, and signage using field notes and checklists. Observations conducted at different times and days to capture variation in user behavior and environmental conditions (Kwon et al., 2025; Baş et al., 2024).

Questionnaire survey: Structured instrument adapted from established wayfinding research comprising five sections aligned with Al-srogy et al.'s (2024) methodological categories:

Section A: Background Information: status, length of campus use, frequency of navigation, faculty association (individual domain)

Section B: Orientation and Navigation Experience: initial navigation ease, current difficulty, primary navigation strategies, frequency of getting lost, impact on punctuality (free recall method)

Section C: Landscape Elements and Navigation: five-point Likert-scale items measuring perceptions of pathways, landmarks, vegetation, open spaces, junctions, edges, and overall campus legibility (cued recall method)

Section D: Navigation Challenges and Preferences: identification of confusing areas, causes of confusion, useful landmarks, improvement suggestions, relationship between landscape and signage

Section E: Stress and Navigation: assessment of navigation-related stress levels (following Kwon et al., 2025)

The questionnaire was pilot-tested with 15 respondents and refined based on feedback, following established protocols (Picazo et al., 2020).

3.4 Data Analysis

Quantitative analysis: Descriptive statistics (frequencies, percentages, means, standard deviations) using SPSS. Relative Agreement Index (RAI) = $\frac{\Sigma ASac}{\Sigma PASmax}$ to rank landscape element importance, following established wayfinding research methods (Al-srogy et al., 2024). Inferential statistics: Chi-square tests for categorical associations, ANOVA for group comparisons, Pearson correlations for variable relationships (significance $p < 0.05$) (Kwon et al., 2025).

Qualitative analysis: Thematic analysis of observation notes, open-ended responses, interview transcripts, photographs. Coding according to Lynch's elements and established frameworks, pattern identification, integration with quantitative findings (Yesiltepe et al., 2021; Kwon et al., 2025).

Spatial analysis: Connectivity analysis of movement routes, node analysis of decision points, landmark distribution mapping, legibility mapping, confusion mapping of user-reported difficult areas (Al-Sharaa et al., 2022).

3.5 Ethical Considerations

All questionnaire respondents and interview participants will be informed about the purpose of the study, the voluntary nature of participation, and their right to withdraw at any time without consequence. Consent will be implied through completion and return of anonymous questionnaires. Respondents' identities will remain confidential through anonymous questionnaires. The study poses minimal risk to participants as questionnaire items are non-sensitive and relate only to spatial experiences. All data will be stored securely and accessed only by the research team for academic purposes, following established ethical protocols in wayfinding research (Kwon et al., 2025; Picazo et al., 2020).

3.6 Limitations

Several limitations should be considered. First, the study's focus on a single institution limits generalizability to other Nigerian universities with different spatial configurations and landscape characteristics. Second, self-reported data from questionnaires may be subject to recall bias and individual interpretation differences, though triangulation with observational data helps mitigate this. Third, data collection occurs at a single point in time, potentially missing seasonal variations in vegetation and lighting conditions that could affect navigation (Kwon et al., 2025).

Fourth, advanced spatial analysis techniques such as Space Syntax and Visibility Graph Analysis are not employed due to resource constraints, limiting objective quantification of spatial configuration (Al-Sharaa et al., 2022). Fifth, the sample, while stratified, may not fully represent all campus user categories,

particularly evening users and weekend visitors. These limitations are acknowledged and considered in interpreting findings.

IV. KEY FINDINGS

1) Response rate and sample characteristics

All 400 questionnaires were completed and returned, yielding a 100% response rate achieved through face-to-face administration and immediate collection.

The sample comprised 284 students (71%), 48 academic staff (12%), 40 non-academic staff (10%), and 28 visitors (7%). Regarding length of campus use, 13% had used the campus for less than 6 months, 16% for 6 months to 1 year, 28% for 1-3 years, 24% for 3-5 years, and 19% for more than 5 years. Frequency of navigation showed that 47% navigated daily, 26% several times a week, 12% weekly, 9% occasionally, and 6% rarely. Respondents represented all major faculties including Arts (11%), Science (12%), Social Sciences (13%), Engineering (10%), Environmental Sciences (9%), Law (8%), Business Administration (12%), Education (9%), Medical/Health Sciences (7%), Administration (6%), and others (3%).

2) Orientation and navigation experience

Regarding initial navigation experience, only 26% of respondents found navigation easy or very easy upon first visiting the campus, while 52% found it difficult or very difficult. The Relative Agreement Index of 0.476 indicates moderate legibility, confirming significant initial wayfinding challenges for new users. Concerning current navigation difficulty, only 32% of respondents report rarely or never experiencing difficulty, while 68% experience difficulty sometimes, often, or always. Notably, 31% experience difficulty often or always, indicating serious ongoing wayfinding problems for nearly one-third of campus users. This suggests that familiarity does not fully resolve navigation challenges and that some areas remain persistently confusing.

Regarding primary navigation strategies, asking people for directions is the most relied-upon strategy (23%), followed by landmarks (18%) and familiarity/memory (17%). Signage ranks fourth at 16%, followed by mobile phone maps (14%) and pathway layout (12%). This finding supports Rooke's tri-partite framework, which prioritizes physical features and social practices over coded information.

Cross-tabulation revealed that visitors rely more heavily on asking people (32%) and signage (25%), while staff rely more on familiarity (23%) and landmarks (21%). Concerning frequency of getting lost, only 28% of respondents rarely or never experience confusion, while 72% experience confusion sometimes, often, or very often, with 33% experiencing it often or very often. Chi-square analysis revealed a significant association between user status and frequency of getting lost ($\chi^2 = 34.27$, $df = 8$, $p < 0.001$), with visitors reporting the highest rates of confusion (46%), followed by students (35%), while staff reported lower rates (18%).

Regarding impact on punctuality, 63% of respondents have been late to appointments sometimes, often, or very often due to navigation difficulties, with 31% reporting this occurs often or very often. Pearson correlation revealed a significant positive relationship between frequency of getting lost and lateness due to navigation ($r = 0.68$, $p < 0.001$), confirming that navigation difficulty directly impacts punctuality.

3) Landscape elements and navigation

Regarding pathways, 80% of respondents agree or strongly agree that clearly defined pathways help them move easily around campus. The RAI of 0.812 indicates very high importance, ranking pathways as the most critical landscape element for navigation.

Concerning landmarks, 80% of respondents agree or strongly agree that landmarks help them identify their location. The RAI of 0.794 indicates high importance, ranking landmarks as the second most important landscape element. Regarding vegetation, 56% of respondents agree or strongly agree that vegetation arrangement helps them orient themselves, while 23% disagree or strongly disagree. The RAI of 0.630 indicates high importance, though with notable variation in perception suggesting inconsistent vegetation design. Concerning open spaces, 70% of respondents agree or strongly agree that open spaces and gathering areas serve as reference points during movement. The RAI of 0.736 indicates high importance, confirming their role as nodes in the campus cognitive map.

Regarding junctions and intersections, 70% of respondents agree or strongly agree that major junctions help them make navigation decisions. The

RAI of 0.718 indicates high importance, highlighting nodes as critical locations for wayfinding support. Concerning edges and zone transitions, only 33% agree they can easily detect when moving from one zone to another, while 44% disagree or strongly disagree. The RAI of 0.520 indicates moderate importance, revealing poor edge definition as a significant weakness in campus legibility. Regarding overall campus legibility, only 27% agree the campus layout is easy to understand, while 51% disagree or strongly disagree. The RAI of 0.516 indicates moderate legibility, confirming that the University of Lagos campus presents significant legibility challenges requiring landscape-based navigation improvements.

Junctions/Nodes	0.718	High
Vegetation	0.630	High
Edges/Transitions	0.520	Moderate
Overall Legibility	0.516	Moderate

4) Navigation challenges and preferences
 Regarding confusing areas, the main academic area was identified as most confusing by 53% of respondents, followed by Jaja Hostel area (39%), Moremi Hall area (37%), staff quarters (31%), Medical/Health Sciences area (27%), sports complex (23%), Senate Building area (22%), library area (19%), and Lagoon Front area (16%). Concerning causes of confusion, poor or inadequate signage was cited by 69% of respondents, similar-looking buildings by 62%, insufficient maps or directories by 51%, complex pathway networks by 49%, lack of distinctive landmarks by 46%, poor lighting by 39%, and overgrown vegetation by 33%.

Summary of landscape element importance:

Element	RAI	Importance Level
Pathways	0.812	Very High
Landmarks	0.794	High
Open Spaces	0.736	High



Fig 4.1: Satellite View of UNILAG Main Academic Area



Fig 4.2: Satellite view of Jaja Hall



Fig 4.3: Satellite view of Moremi Hall

Regarding useful landmarks, the Senate Building was identified as most useful by 74% of respondents, followed by the Main Library (63%), Lagoon Front (42%), Main Gate (39%), Moremi Hall (36%), Jaja Hall (33%), University Health Centre (27%), Sports Complex (24%), distinguished trees (22%), and sculptures or monuments (16%).

Concerning landscape improvements, the most requested enhancements were more maps integrated

into landscape (62%), improved lighting along pathways (59%), clearer pathway definition and maintenance (57%), more distinctive landmarks (53%), distinctive landscaping for different faculties (49%), better vegetation maintenance to improve visibility (46%), better zone definition through planting patterns (43%), strategic planting of distinctive trees (42%), and creation of more open spaces as reference points (36%).

Regarding the relationship between landscape and signage, 74% of respondents believe well-designed landscape elements can reduce dependence on signage significantly (36%) or to some extent (38%), while only 14% expressed doubt. This strongly supports the study's premise that landscape can function as an effective navigation tool.

Concerning navigation-related stress, 71% of respondents experience moderate to extreme stress when trying to find unfamiliar locations on campus, with 34% reporting moderate stress, 26% very stressful, and 11% extremely stressful. This confirms the psychological impact of poor wayfinding.

V. CONCLUSION

5.1 Summary of key findings

This study investigated how landscape elements function as navigation tools within the University of Lagos, Akoka Campus. The key findings are summarized below.

Regarding Users' Spatial Experiences: Only 26% of respondents found navigation easy upon first visiting the campus, while 52% found it difficult. Even with familiarity, 68% continue to experience navigation difficulty sometimes, often, or always. Asking people for directions is the most relied-upon navigation strategy (23%), followed by landmarks (18%) and familiarity (17%), while signage ranks fourth at only 16%. Significantly, 63% report lateness due to navigation difficulties and 71% experience moderate to extreme stress when navigating unfamiliar locations.

Regarding Key Landscape Elements: Pathways rank highest (RAI=0.812), with 80% agreeing they aid movement. Landmarks follow closely (RAI=0.794), with 80% agreeing they help identify location. Open spaces (RAI=0.736) and junctions (RAI=0.718) are also highly important. Edge definition (RAI=0.520) is the weakest element, with only 33% able to detect transitions between campus zones.

Regarding Campus Legibility: Overall legibility is perceived as poor (RAI=0.516). Just 27% agree the campus layout is easy to understand. The main academic area is most confusing (53%), followed by Jaja Hostel (39%) and Moremi Hall (37%). Primary

causes of confusion are poor signage (69%), similar-looking buildings (62%), insufficient maps (51%), and complex pathway networks (49%). The Senate Building (74%) and Main Library (63%) serve as the most useful landmarks.

Regarding Landscape-Based Strategies: Users strongly support landscape improvements, including more maps (62%), improved lighting (59%), clearer pathways (57%), more distinctive landmarks (53%), and distinctive faculty landscaping (49%). Crucially, 74% believe well-designed landscape elements can reduce dependence on signage.

5.2 Conclusion

First, landscape elements are fundamental to navigation at the University of Lagos. Pathways, landmarks, open spaces, and junctions are active components of the wayfinding system that users rely upon daily. However, the current campus landscape is not intentionally designed to support navigation, resulting in underutilized potential and persistent user confusion.

Second, the University of Lagos campus has poor legibility. The low overall legibility rating and high proportion of users finding navigation difficult indicate fundamental problems in spatial configuration. The campus lacks clear hierarchy, distinctive zones, and coherent edge definition, making it difficult for users to form accurate cognitive maps.

Third, edge definition is the weakest landscape element. Users cannot easily distinguish between academic, residential, and administrative areas, nor perceive when they cross from one zone to another. This lack of spatial differentiation compounds navigation difficulty.

Fourth, signage alone is insufficient for effective campus navigation. Despite being the most cited cause of confusion, signage ranks only fourth as a relied-upon strategy. The finding that 74% believe landscape can reduce signage dependence confirms that a holistic approach integrating landscape design with information systems is necessary.

Fifth, navigation difficulty has significant psychological and functional impacts. With 71% experiencing moderate to extreme stress and 63% reporting lateness, wayfinding affects well-being, academic performance, and institutional efficiency.

Sixth, the University of Lagos community strongly supports landscape-based navigation improvements, indicating that users are aware of landscape's potential and would welcome intentional navigation-focused design.

In conclusion, this study provides empirical evidence that landscape elements are essential but underutilized navigation tools at the University of Lagos. The campus currently has poor legibility, with pathways and landmarks serving as most important while edge definition is critically weak. Users experience significant navigation difficulty with measurable consequences, and they strongly support landscape-based improvements. Investing in landscape legibility is not merely an aesthetic consideration but a functional necessity that affects thousands of users daily.

5.3 Recommendations

Enhance Pathway Legibility: Primary pathways should be clearly distinguished from secondary routes through width, paving materials, and planting. Major desire lines should be formalized. Pathway intersections should be designed as clear nodes with improved visibility.

Develop a Comprehensive Landmark System: The Senate Building and Main Library should be reinforced as primary reference points. Additional landmarks should be strategically located at key nodes, including distinctive trees, sculptures, and water features.

Strengthen Edge Definition and Zone Differentiation: Each campus zone should have distinctive landscape character through consistent planting and paving. Transition points should be marked with gateway features or changes in paving to help users perceive movement between zones.

Improve Vegetation Management: Overgrown vegetation blocking sightlines should be regularly pruned. Distinctive tree species at key locations can

create living landmarks. Consistent planting patterns along primary routes can reinforce pathway alignment.

Integrate Maps with Landscape Features: Maps should be located at all major nodes, integrated into landscape design, and oriented to match the user's perspective. Digital QR codes could link to mobile navigation apps.

Improve Pathway Lighting: Improved lighting along primary routes will enhance navigation during evening hours and highlight key landmarks and nodes.

Develop Faculty-Based Landscape Identity: Each faculty area should develop distinctive landscape character through consistent planting and paving to help users identify different academic zones.

Create Open Spaces as Reference Points: Key open spaces should be designed as memorable nodes with clear spatial definition, seating, and distinctive landscape treatment.

Develop a Campus Landscape Master Plan: The University should develop a comprehensive landscape master plan that explicitly addresses navigation and legibility as design objectives, based on Lynch's framework and incorporating this study's findings.

Establish Design Guidelines: Specific guidelines should be developed for all new construction and landscape renovation projects, requiring consideration of navigation impacts on pathway hierarchy, landmark placement, edge definition, and vegetation management.

Allocate Budget for Navigation Improvements: Dedicated budget should be allocated for implementing landscape-based navigation improvements, recognizing that these investments enhance user experience, reduce stress, and improve institutional efficiency.

Prioritize the Main Academic Area: Given that 53% of respondents find this area most confusing, priority intervention is needed. This should include improved pathway definition, distinctive faculty landscaping, better signage integrated with landscape, and creation of small open spaces as reference points.

Address Hostel Areas: With 39% finding Jaja Hostel confusing and 37% finding Moremi Hall confusing, improvements should include better edge definition between hostel and academic zones, improved lighting, and clearer pathway hierarchy.

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