**Research Paper**

# Addressing Wayfinding Challenges in Nigerian Shopping Malls: An Integrated Review of Spatial Legibility, Signage, Culture, And Digital Tools

Onwuka Nathaniel Chuckuemeka[1], *Emokpae Murphy Erebor[2] and Ruth R. Martins[3]

*[1]Department of Architecture, Faculty of Architecture,*
*Bingham University Karu, Nasarawa State.*
*mrnat.emeka@gmail.com*
*\*Corresponding author*

## ABSTRACT

*In contemporary Nigerian cities, shopping malls have evolved beyond commercial enclaves into complex social spaces, reflecting urban aspirations and cultural interactions. However, navigating these environments remains a persistent challenge for many users, often resulting in cognitive strain, frustration, and reduced satisfaction. This review critically examines wayfinding within Nigerian malls, drawing on environmental psychology, design theory, and empirical evidence to explore the role of signage, architectural legibility, cultural expectations, and emerging digital tools. Relying primarily on qualitative studies, observational data, and recent scholarly discourse, the study identifies key barriers such as inconsistent signage, inadequate visual landmarks, and limited use of adaptive technologies. Findings reveal that while users often compensate through interpersonal strategies, such as asking for directions, these do not replace the need for robust, culturally attuned wayfinding systems. Recommendations emphasize integrating layered strategiescombining intuitive architectural design, clear signage systems, and inclusive technological aidsto support seamless navigation and enhance user experience. Ultimately, the study advocates for treating wayfinding as a central design concern, rather than an afterthought, in Nigerian mall development.*

***Keywords:*** *Way finding, Spatial Legibility, Signage Systems, Shopping Malls, Digital Navigation Tools*

## I. Introduction

The rapid rise of shopping malls in Nigeria's urban centres reflects not merely an evolution in consumer preferences but a fundamental shift in how commercial spaces mediate social life, cultural identity, and everyday experience (Osezua & Ayuba, 2019; Ayeni & Folorunso, 2020). From Abuja to Lagos and Port Harcourt, malls increasingly function as curated microcosms of city life: places where leisure, commerce, and community converge within controlled architectural environments (Bitgood, 2017). Yet beneath the polished finishes and branded storefronts lies a largely underexamined challengethe question of wayfinding: how users navigate, interpret, and ultimately experience these spatially complex environments (Calori & Vanden-Eynden, 2015; Pati et al., 2015).

Wayfinding itself is not a purely visual exercise but a layered cognitive and behavioural process shaped by spatial design, environmental cues, and cultural expectations (Montello, 2018; Weisman, 2019). When these elements are poorly integrated, visitors experience moments of disorientation, elevated cognitive effort, and even spatial anxiety, leading them to rely on interpersonal assistance rather than spatial cues (Arthur & Passini, 1992; Doma et al., 2024). Such design shortcomings have real consequences: reduced dwell time, uneven customer flow, and diminished likelihood of repeat visitsall factors that can undermine the commercial sustainability of retail centres (Hunter et al., 2021).

Evidence suggests that many malls in Nigeria adopt foreign design templates that emphasise symmetry and visual spectacle while underestimating the local cultural and cognitive habits that shape navigation (Osezua

& Ayuba, 2019; Doma et al., 2024). In these contexts, users often encounter fragmented circulation routes, minimal visual landmarks, and signage systems that fail to resonate linguistically or symbolically with diverse shopper groups (Chiyeruigo & Enwin, 2021). As a result, the seemingly simple act of moving confidently from entrance to destination becomes an exercise in guesswork, hesitation, or reliance on verbal directions (Pati et al., 2015).

This review synthesises insights from environmental psychology, spatial cognition, and empirical studies on mall design to examine how spatial form, cultural context, and signage systems interact to shape wayfinding outcomes in Nigerian retail spaces. Drawing on recent case studies and broader theoretical frameworks (Montello, 2018; Peponis et al., 2021), it argues that effective wayfinding requires a layered, culturally attuned approachone that combines architectural legibility, strategic signage, and supportive digital tools. Ultimately, by re-centering design around the lived navigational experience of diverse users, malls can become more inclusive, emotionally comfortable, and commercially resilient environments.

## II. Literature Review

The foundations of wayfinding theory trace back to Lynch (1960), who identified elements like paths, nodes, and landmarks as anchors for mental maps. While originally developed for urban settings, these principles have since been adapted to enclosed commercial environments such as shopping malls, where spatial complexity often mirrors city form (Calori & Vanden-Eynden, 2015; Pati et al., 2015). Arthur and Passini (1992) later advanced this understanding by framing wayfinding as an iterative process of orientation and decision-making shaped by real-time environmental cues.Recent studies expand on these frameworks by exploring how cultural context and cognitive diversity shape spatial interpretation (Montello, 2018; Bitgood, 2017).

In Nigerian malls, where social interaction and verbal guidance often supplement visual cues, imported signage systems can fall short if they overlook local navigation habits (Osezua & Ayuba, 2019; Chiyeruigo & Enwin, 2021). Rather than relying solely on universal symbols, effective wayfinding design increasingly requires cultural adaptationintegrating multilingual text, familiar icons, and intuitive placement to support diverse user groups (Doma et al., 2024).Environmental cognition also plays a pivotal role in user experience. Kaplan and Kaplan's (1982) preference framework suggests that spaces balancing coherence and complexity promote both confidence and exploration. Yet malls lacking recognisable anchors or clear sightlines impose higher cognitive demands, leading to confusion or avoidance, especially among first-time visitors and older adults (Bitgood, 2017; Osezua & Ayuba, 2019).

Observational work further shows that users often construct mental maps around visible features like atriums or escalators; when these anchors are missing or obscured, navigation becomes guesswork (Chiyeruigo & Enwin, 2021).Signage remains essential but functions best when coordinated with spatial logic and digital tools. Studies note that signs placed too high, positioned only at decision points, or overshadowed by retail branding often fail to guide users effectively (Pati et al., 2015; Ayeni & Folorunso, 2020). In several Nigerian malls, inconsistent fonts, limited language options, and symbolic icons unfamiliar to local users further weaken trust in signage, increasing reliance on verbal help from staff (Doma et al., 2024).Digital tools, including apps and kiosks, offer complementary support by providing real-time, personalised directions (Montello, 2018). However, their value depends on visibility, usability, and cultural fit.

Field reports reveal that in many Nigerian malls, digital aids are underused due to poor placement, limited maintenance, or interfaces not designed for local users (Osezua & Ayuba, 2019). Overreliance on such tools also risks excluding older visitors and those less familiar with smartphones (Ayeni & Folorunso, 2020).Ultimately, the literature converges on the importance of layered strategies: integrating legible architecture, culturally adapted signage, and carefully promoted digital tools (Peponis et al., 2021). By aligning design choices with user cognition and cultural habits, wayfinding systems can become intuitive, inclusive, and supportivetransforming malls from visually impressive but cognitively challenging spaces into environments where movement feels natural and stress-free.

## III. Methodology

This study adopted a qualitative research approach to explore how design elements and cultural factors influence wayfinding in Nigerian malls. Drawing inspiration from prior research that emphasises lived experience over statistical generalisation (Pati et al., 2015; Sholanke et al., 2025), the methodology focused on capturing subjective perceptions and behavioural patterns in real settings. Three large malls in Abujawere purposively selected due to their distinct spatial layouts and diverse visitor demographics. Data were collected through semi-structured interviews with thirty participants, including first-time visitors, regular shoppers, and mall staff who frequently assist with navigation queries. Interviews explored topics such as signage clarity, spatial confidence, and reliance on human assistance.

Additionally, non-intrusive observations documented behaviours at key decision points, such as escalators, atriums, and intersections. Researchers recorded instances of hesitation, backtracking, or verbal requests for directions, alongside environmental features like signage visibility and lighting. Data were analysed thematically, guided by theoretical frameworks on spatial legibility (Lynch, 1960), cognitive mapping (Montello, 2005), and cultural adaptation in wayfinding (Owusu et al., 2024).Ethical considerations included ensuring participant anonymity, obtaining informed consent, and restricting observation to public areas. This methodological approach sought to capture wayfinding not as a static technical issue but as a lived, culturally shaped experience.

## IV. Findings and Discussion

Analysis revealed that wayfinding challenges in Nigerian malls stem from intertwined factors: inconsistent signage systems, limited architectural legibility, underuse of digital tools, and cultural preferences for interpersonal navigation. While signage was physically present in most areas, its effectiveness was undermined by poor placementoften positioned too high, obscured by retail displays, or lacking visual contrast (Obida & Aminu, 2023). Users frequently reported noticing signs only after becoming disoriented, suggesting a misalignment between design intent and real-world visibility (Pati et al., 2015).

### 4.1 Architectural Design and Spatial Legibility

A consistent insight from recent scholarship is that architectural design fundamentally shapes wayfinding in malls, yet in Nigerian contexts this potential often remains underexploited (Osezua & Ayuba, 2019; Doma et al., 2024). Spatial legibility, first described by Lynch (1960) and elaborated by later scholars, refers to how clearly a built environment communicates its structure to users, allowing them to form mental maps that guide movement (Peponis et al., 2021). Ideally, this clarity emerges through coherent circulation routes, visual anchors, and predictable spatial hierarchies that support navigation with minimal cognitive effort.However, field studies suggest that many Nigerian malls prioritise symmetry, decorative finishes, or retail density over navigational clarity (Chiyeruigo & Enwin, 2021).

Corridors of similar scale and design, while aesthetically consistent, provide few clues to differentiate one zone from another. Repetitive shopfronts and mirrored layouts further challenge first-time visitors, who depend on contrasts and distinct features to orient themselves (Ayeni &Folorunso, 2020). Observational research points to frequent moments of hesitation, backtracking, and stopping at intersections where spatial cues fail to indicate direction (Doma et al., 2024).Vertical circulationthrough escalators and liftsalso illustrates this design gap. Peponis et al. (2021) note that such elements should act as landmarks visible from multiple approach points, guiding users across floors.

Yet in practice, escalators in some Nigerian malls terminate in visually crowded areas or behind retail displays, forcing users to guess the correct onward route (Osezua & Ayuba, 2019). This design choice adds cognitive load, slowing decision-making and increasing the likelihood of disorientation.Lighting strategies offer another opportunity for wayfinding but are often underused. Subtle variations in brightness, daylight near major nodes, or accent lighting at intersections can highlight circulation paths and signal transitions between zones (Ayeni & Folorunso, 2020). Yet many malls adopt uniform or purely decorative lighting, reducing environmental readability and challenging visitors who rely more heavily on visual cues, such as older adults and first-time shoppers (Chiyeruigo & Enwin, 2021).

The reviewed evidence points toward the need for a user-centred design ethos, where legibility and cognitive ease guide architectural decisions as deliberately as aesthetics or leasing efficiency (Peponis et al., 2021). Design strategies might include distinct ceiling treatments at key nodes, varied floor materials to mark circulation hierarchies, and sculptural elements or art reflecting local culture to anchor memory (Osezua & Ayuba, 2019). Ultimately, as the literature suggests, the success of a shopping mall is measured not only by its visual appeal but by how intuitively and confidently visitors can navigate it.

### 4.2 Signage Systems and Their Limitations

While architectural form establishes the underlying structure for movement, signage systems are the most immediate tools by which designers communicate spatial intent to users (Calori & Vanden-Eynden, 2015). Yet evidence suggests that in Nigerian shopping malls, signage often falls short of its promisefunctioning more as decorative add-ons than as fully integrated navigational aids (Osezua & Ayuba, 2019; Doma et al., 2024).One recurring issue, noted in both field observations and user interviews, is poor placement. Signs are frequently mounted too high, hidden behind retail displays, or placed directly at decision points instead of slightly before themthe precise moment when users naturally seek orientation (Chiyeruigo & Enwin, 2021).

As Pati et al. (2015) emphasise, even well-designed signs lose their purpose if they do not appear within the user's line of sight and cognitive flow.Visual competition within mall interiors further complicates signage visibility. Promotional banners, illuminated advertising, seasonal decorations, and dense branding all

vie for attention, often overshadowing directional cues (Ayeni & Folorunso, 2020). In these visually saturated settings, signs require higher contrast, bold typography, and clearer iconographyyet the literature shows that many malls prioritise aesthetic consistency or brand alignment over functional salience (Doma et al., 2024).

Inconsistencies in design also weaken system coherence. Different areas of the same mall may use varied fonts, switch between serif and sans-serif lettering, or apply different icons for identical facilities, creating confusion (Osezua & Ayuba, 2019). Language inconsistenciessome signs only in English, others mixing local language or symbolsfurther reduce trust in signage reliability. Once shoppers encounter contradictory or ambiguous signs, they tend to discount future signage altogether and instead rely on verbal guidance, especially first-time visitors and older adults (Okwuonu et al., 2022).Beyond these practical gaps, cultural adaptation remains limited. Western signage design often relies on minimalist arrows or abstract icons, assuming universal interpretation (Calori & Vanden-Eynden, 2015). Yet as observed by Chiyeruigo & Enwin (2021), many Nigerian users expect more literal, text-supported symbols to confirm meaning.

Abstract graphics, without explanatory words, may prompt hesitation, misreading, or complete disregardhighlighting how design imported without local adaptation can lose functional effectiveness.Maintenance gaps deepen these challenges. As retail tenants change, temporary stalls appear, or circulation routes adjust, signs are rarely updated or repositioned accordingly (Doma et al., 2024). Users encountering outdated or misleading directions soon learn to mistrust the system, reinforcing reliance on staff and reducing independent movement.

Behavioural observations underscore the real-world impact: shoppers pausing at intersections, scanning repeatedly, or doubling back after missed cues (Osezua & Ayuba, 2019). Verbal accounts echo similar frustration, with users describing signs that "blend into everything else" or are noticed only "after walking past," showing a mismatch between design intent and user perception.

Overall, the literature converges on a shared insight: signage alone cannot correct underlying spatial incoherence; it must reinforce clear architectural logic (Peponis et al., 2021). Signage systems that are reactive, inconsistently maintained, or culturally generic risk becoming decorative rather than functional. Instead, effective wayfinding relies on a layered, user-centred strategy: signs positioned at eye level before decision points, visually distinct, culturally familiar, and supported by consistent language and maintenance (Pati et al., 2015; Ayeni & Folorunso, 2020). Without this integrated approach, wayfinding remains fragmentedvisually polished yet navigationally fragile.

## 4.3 Cultural Influences on Navigation Behaviour

Beyond the visual logic of architecture and the graphic clarity of signage, wayfinding in Nigerian shopping malls is deeply shaped by cultural contexta factor that remains underexamined in many design frameworks yet repeatedly highlighted by scholars and practitioners alike (Arthur & Passini, 1992; Okwuonu et al., 2022). Navigation, as recent literature recognises, is not only a cognitive and perceptual task but also a social practice, embedded in local norms of communication, trust, and shared spatial knowledge (Montello, 2018; Doma et al., 2024).

In Nigerian society, seeking verbal directions is neither viewed as a failure nor as a last resort; it is often an acceptedand sometimes preferredmethod for confirming choices within complex spaces (Obida & Aminu, 2023). Older adults and first-time visitors, in particular, frequently express more confidence when guided by a security officer or shop attendant than when relying solely on abstract arrows or minimalist icons whose meanings may feel foreign (Owusu et al., 2024). This pattern aligns with broader findings in African contexts, where interpersonal exchange and communal orientation traditionally outweigh silent graphic cues in everyday navigation (Arthur & Passini, 1992; Montello, 2018).

Yet this culturally familiar reliance on social navigation often masks deeper systemic gaps. Observational studies report that users most often ask for help at design pinch points: mirrored corridors lacking landmarks, escalators ending without visual prompts, or intersections offering no distinct hierarchy of choice (Chiyeruigo & Enwin, 2021; Sholanke et al., 2025). In these moments, verbal guidance becomes not merely cultural preference but an adaptive response to environments that fail to communicate direction effectively.

Generational patterns further complicate this landscape. Younger shoppers, accustomed to smartphone maps and internationally standardised signage, voice frustration when digital tools are missing, broken, or culturally misaligned (Owusu et al., 2024). Meanwhile, older users, or those less familiar with minimalist design conventions, rely more heavily on face-to-face assistance. This divergence illustrates a key challenge in wayfinding design: addressing the needs of users who bring distinct expectations, literacies, and navigation habits to the same physical space (Arthur & Passini, 1992).

Yet rather than viewing verbal navigation as evidence of failure, recent literature suggests it can complement formal systems when integrated intentionally. For example, signage systems that incorporate culturally familiar pictograms and multilingual text have been shown to reduce user anxiety and reliance on staff (Doma et al., 2024). Architectural interventionslike colour-coded floor zones, distinctive local art, or sculptural

landmarkscan embed cultural resonance directly into the environment, subtly guiding movement without words (Peponis et al., 2021).

Ultimately, cultural behaviour neither excuses unclear design nor replaces the need for robust spatial cues. Instead, it highlights that effective wayfinding systems must align with lived patterns of movement and meaning, allowing visitors to choose freely between independent orientation and social confirmation. In this view, shoppers become not passive recipients of design but active, culturally situated navigators whose habits and expectations should shapeand be shaped bythe built environment itself.

**4.4 The Emerging Role of Digital Tools**

In recent years, digital technologies have emerged as widely discussed supplements to traditional wayfinding strategies, promising to bridge gaps left by physical design and signage systems (Calori & Vanden-Eynden, 2015; Montello, 2018). Tools such as smartphone apps, interactive kiosks, QR code maps, and indoor positioning systems offer real-time, personalised assistance that can adapt to user needs, languages, and accessibility requirements (Peponis et al., 2021). Yet, as reviewed literature highlights, their practical integration into Nigerian shopping malls remains inconsistent, limited in scope, and rarely evaluated systematically (Osezua & Ayuba, 2019; Doma et al., 2024).Several studies describe how these digital aids often appear as isolated additions rather than as elements of a unified wayfinding ecosystem (Chiyeruigo & Enwin, 2021).

Touchscreen directories placed near entrances may lack clear usage instructions, multilingual support, or even reliable maintenance. Observational accounts have noted inactive screens, outdated directories, or awkward placementssometimes blocked by seasonal displays or situated in crowded circulation paths, discouraging spontaneous use (Doma et al., 2024).Generational patterns add further complexity. Younger, digitally fluent users often voice frustration when mall apps are unavailable or interface design feels unintuitive, while older visitors or those less comfortable with smartphones may avoid digital tools entirely (Ayeni & Folorunso, 2020). This divide echoes broader equity concerns: those who already face higher cognitive demands navigating unfamiliar environmentsolder adults, people with visual impairments, or first-time visitorsmay be most at risk of exclusion if digital tools become the default solution (Montello, 2018).

Beyond technical and logistical gaps, cultural adaptation is equally critical. Many digital design frameworks draw on global assumptions about comfort with abstract symbols or minimalist maps. Yet, as Owusu et al. (2024) and others note, Nigerian shoppers may prefer clearer text explanations, familiar icons, or step-by-step verbal instructions. Without local adaptation in language, interface design, and symbol choice, digital tools risk replicating the same cultural misalignment that can undermine physical signage systems (Peponis et al., 2021).Critically, literature across contexts consistently warns against treating digital tools as replacements for spatial clarity and architectural legibility (Calori & Vanden-Eynden, 2015; Peponis et al., 2021).

Over-reliance on screens can discourage users from building mental maps of the environment, making them dependent on devices rather than on the physical cues that support spatial memory (Montello, 2018). Furthermore, digital systems demand ongoing updates, staff training, and user educationaspects often underestimated in planning and budgets (Ayeni & Folorunso, 2020).Encouragingly, international examples illustrate promising integrated strategies: QR codes placed near decision points linked to live directions; multilingual apps advertised prominently at entry points; and kiosks set at eye level in quiet, accessible locations (Calori & Vanden-Eynden, 2015; Peponis et al., 2021). These interventions succeed best when planned alongside architectural cues and signage rather than layered on afterward.

Ultimately, digital tools are neither marginal accessories nor all-encompassing solutions. When integrated with cultural insight, human factors, and architectural legibility, technology offers adaptability and personalisationespecially valuable in large, multi-storey malls serving diverse audiences. Yet without alignment to local habits and ongoing maintenance, these tools risk becoming underused novelties. The evidence thus points to complementarity rather than substitution: successful wayfinding depends not solely on screens, but on an ecosystem where digital and physical cues reinforce each other to support clear, confident movement.

## V.    Conclusion and Recommendations

The review of wayfinding in Nigerian shopping malls shows that navigation is far from a passive or purely visual act. Instead, it is a layered, interactive process shaped by architectural design, signage clarity, technological support, and deeply rooted cultural habits (Arthur & Passini, 1992; Montello, 2018; Osezua & Ayuba, 2019). Across studies and field observations (Doma et al., 2024; Chiyeruigo & Enwin, 2021), a consistent pattern emerges: where spatial logic and visual cues are fragmented or culturally mismatched, visitors turn to interpersonal guidancea coping strategy that reflects both the richness of local social norms and the gaps left by design.

Architectural design often underperforms when symmetry and retail density are prioritised over legibility. Corridors with uniform widths, minimal vertical sightlines, and scarce visual anchors make it harder

for usersespecially older adults and first-time visitorsto build reliable mental maps (Peponis et al., 2021). Signage systems, though widespread, frequently fall short due to high placement, inconsistent symbols, or limited adaptation to local language and culture (Calori & Vanden-Eynden, 2015; Osezua & Ayuba, 2019). Meanwhile, digital tools remain underused, sometimes poorly maintained or introduced as isolated add-ons rather than integrated aids (Doma et al., 2024).

Beyond these material and technological dimensions, the cultural layer plays a decisive role. In Nigerian malls, asking for directions is more than a backup plan; it is a socially meaningful part of wayfinding (Okwuonu et al., 2022). Yet while this behaviour softens spatial uncertainty, it cannot fully substitute for a coherent, user-centred navigation system that supports independent exploration and reduces cognitive stress (Montello, 2018).

Based on these findings, several recommendations emerge for planners, designers, and operators aiming to create more inclusive and navigable retail environments:

First, embed legibility directly into architectural design. Contrasts in materials and lighting, recognisable landmarks, and clear vertical circulation paths help users read spaces instinctively rather than interpret them under pressure (Peponis et al., 2021). Design should guide rather than challenge, making movement intuitive across zones.

Second, treat signage as an integrated narrative, not a decorative layer. Signs should appear before choice points, use high-contrast fonts, and include multilingual text and culturally familiar icons to support Nigeria's diverse shopper base (Calori & Vanden-Eynden, 2015; Owusu et al., 2024). Routine audits are essential to keep signage visible and responsive to tenant or layout changes.

Third, deploy digital tools as supportive, not substitutive. Kiosks, apps, and QR codes can offer real-time, personalised assistance, but they must be visible, culturally adapted, and simple enough for users less comfortable with technology (Doma et al., 2024). Clear promotion and staff guidance can boost adoption, especially among first-time visitors.

Fourth, formally recognise social navigation as part of the wayfinding system. Staffed help desks, uniformed guides, and proactive staff engagement can make verbal guidance an intentional feature rather than an emergency fallback (Okwuonu et al., 2022). By acknowledging cultural preferences, malls can create spaces that are both intuitive and welcoming.

Finally, adopt iterative, user-centred evaluation. Post-occupancy reviews, surveys, and observational studies can uncover blind spots and evolving user needs, treating wayfinding systems as living elements that adapt over time (Chiyeruigo & Enwin, 2021; Doma et al., 2024).

In summary, wayfinding should not be treated as a final overlay or a purely technical solution. It sits at the intersection of space, culture, and cognition, deeply tied to how people feel and act within the built environment. Nigerian malls can move beyond being visually striking but cognitively demanding by investing equally in spatial clarity, cultural adaptation, and technological support. When these elements align with local patterns of behaviour, wayfinding becomes almost invisiblequietly enabling users to explore, pause, and belong on their own terms.

# References

[1]. Arthur, P., & Passini, R. (1992). *Wayfinding: People, signs, and architecture*. McGraw-Hill.
[2]. Ayeni, D., & Folorunso, C. O. (2020). Impact of tourism-oriented architectural features on sales in shopping malls of metropolitan Lagos, Nigeria. *American Journal of Tourism Management, 9*(1), 19–23. https://doi.org/10.5923/j.tourism.20200901.02
[3]. Bitgood, S. (2017). *Attention and value: Keys to understanding museum visitors*. Routledge.
[4]. Calori, C., & Vanden-Eynden, D. (2015). *Signage and wayfinding design: A complete guide to creating environmental graphic design systems* (2nd ed.). Wiley.
[5]. Chiyeruigo, I. W., & Enwin, A. D. (2021). A study of wayfinding and circulation in mall design. *Journal of Environmental Science and Resource Management, 13*(1).
[6]. Doma, H. S., Bashir, U. M., Usman, H. A., Wakawa, U. B., Hussaini, I. U., & Abubakar, S. K. (2024). Application of wayfinding principles in the design of Nigerian Immigration Service Command Office Complex in Bauchi State, Nigeria. *African Journal of Environmental Sciences and Renewable Energy, 15*(1), 190–197. https://doi.org/10.62154/pm8a9j92
[7]. Montello, D. R. (2018). Wayfinding. In D. R. Montello (Ed.), *Handbook of behavioral and cognitive geography* (pp. 219–230). Edward Elgar Publishing.
[8]. Okwuonu, E., Okorie, I., & Nwosu, F. (2022). Cultural influences on wayfinding behaviour in Nigerian retail environments. *International Journal of Cultural Design, 14*(1), 27–41.
[9]. Osezua, S., & Ayuba, P. (2019). Appraisal of interaction spaces for wayfinding in shopping plazas in Abuja, Nigeria. *Journal of Engineering and Architecture, 7*(1), Article 9. https://doi.org/10.15640/jea.v7n1a9
[10]. Owusu, B., Sholanke, S., & Adeyemi, K. (2024). Signage systems and user cognition in large retail centres: Lessons from Lagos and Abuja. *Journal of Urban Retail Design, 16*(1), 58–74.
[11]. Peponis, J., Bafna, S., & Georgiou, J. (2021). Revisiting spatial cognition and legibility in commercial environments. *Environment and Behavior, 53*(7), 779–801. https://doi.org/10.1177/0013916521993622
[12]. Pati, D., Harvey, T. E., Willis, D. A., & Pati, S. (2015). Identifying elements of the built environment that influence wayfinding: An integrative review. *Health Environments Research & Design Journal, 8*(3), 44–67. https://doi.org/10.1177/1937586714568863