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Assessment of Universal Design Compliance in Selected Shopping Malls in Abuja, Nigeria

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ABSTRACT
Shopping malls are important public spaces that combine retail, dining, entertainment and social activities, yet their physical configuration often creates barriers for users with diverse mobility, sensory and cognitive abilities. Universal Design (UD) provides ways of addressing these barriers by integrating accessibility and usability into architectural design. Therefore, this study examines the utilisation of seven Universal Design principles in three selected shopping malls in Abuja, Nigeria. The study employed a multiple-case study design, combining architectural observation with quantitative scoring. The three malls were purposively selected to provide cases for the comparative assessment of Universal Design compliance. An observation checklist comprising four architectural criteria for each of the seven Universal Design principles was developed, producing a proposed Universal Design Compliance Index (UDCI) with a maximum score of 84 points. The assessment was based on structured observational ratings of architectural features and provisions rather than user-experience evaluation. The seven principles assessed included equitable use, flexibility in use, simple and intuitive use, perceptible information, tolerance for error, low physical effort, and size and space for approach and use. The UDCI assessment revealed that Ceddi Plaza recorded 48/84 (57.14%), Silverbird Entertainment Centre 36/84 (42.86%), and Jabi Lake Mall 63/84 (75.00%). These findings suggest that newer shopping malls do not necessarily demonstrate more comprehensive universal accessibility and that deficiencies may persist even where physical access provisions are strong. Although the proposed UDCI provides a framework for comparative assessment, its scoring has not been subjected to inter-rater validation and should not be interpreted as a validated tool. The study concludes by recommending architectural design strategies to inform the design of future shopping malls in Abuja.

Keywords: Universal Design, Accessibility, Inclusion, Shopping Malls, Architectural Design

INTRODUCTION

The design of public environments influences who can participate independently and equitably in social and economic life (Heyik et al., 2024; Qi et al., 2024). Shopping malls are important because they combine retail, food services, entertainment, offices, parking and circulation spaces within a single environment (Olawale et al., 2026). Therefore, accessibility in a shopping mall extends beyond providing a ramp at an entrance. It requires an integrated spatial system through which users can enter, move, understand, interact with facilities and exit safely regardless of differences in mobility, sensory ability, age or physical stature (Aigbe et al., 2024) Previous studies has demonstrated the importance of considering the relationship between the built environment, spatial provisions and users' needs (Auwalu & Oluigbo, 2016).

Universal Design (UD) emerged as a response to environments that separated or excluded people with disabilities (Olodeoku et al., 2024). Rather than treating accessibility as an intervention for a minority group, UD seeks to create environments usable by a diverse range of people without the need for adaptation or specialised design. According to Connell et al. (1997), the seven principles of Universal Design, developed through the Centre for Universal Design at North Carolina State University, serve as a vital framework for evaluating existing environments and guiding new design. The principles address equitable use, flexibility in use, simple and intuitive use, perceptible information, tolerance for error, low physical effort, and size and space for approach and use.

The relevance of these principles is essential in the built environment of shopping malls. Shopping malls require high pedestrian flows, multiple entrances, complex circulation systems, vertical movement, food courts, toilets, retail counters, parking areas and extensive wayfinding requirements (Akeredolu et al., 2025; Ngia & Enwin, 2024). A deficiency in one component can compromise the user's experience of the entire facility. An accessible entrance is considered as user non-compliance if the internal circulation path requires a wheelchair user to take a different route from other users, or if lifts lack perceptible information for users with visual or hearing impairments.

The Nigeria's disability policy has also continuously emphasized the significance of of non-discriminatory measures for accessibility in buildings. The Disability Act, known as the Discrimination against Persons with Disabilities (Prohibition) Act, 2018, seek to eliminate discrimination against PWDs and ensure their full integration into the built environment (Udefuna et al., 2026). Over the years, accessibility regulations and institutional initiatives have further strengthened the policy conditions. However, studies identify deficiencies in the accessibility of Nigerian public and commercial buildings (Ajobiewe et al., 2019; Aniekan, 2021). These concerns also relate to broader challenges of the

integration of inclusive design into Nigeria's built environment (Auwalu & Bello, 2023).

The problem is therefore not simply the absence of an accessibility policy. It relates to the transformations of accessibility measures into design strategies. Recent studies have identified shortcomings in shopping malls, which include inaccessible parking, slippery surfaces, inadequate handrails, unsafe stair configurations and insufficient facilities for diverse users (Mshelia et al., 2025; Oluigbo et al., 2026). Sholanke and Adisa (2025) assessed accessibility features in Nigeria's shopping malls using an observation-based approach and identified several areas requiring improvement. Similarly, Adewale et al. (2022), in their assessment of shopping malls in southwestern Nigeria, identified insufficient provision for perceptible information, demonstrating that accessibility deficiencies extend beyond physical access to include the ability of users to understand and navigate the built environment. Although these studies establish the importance of Universal Design assessment in Nigerian shopping malls, there remains a need for a comparative approach that evaluates the seven principles simultaneously using consistent architectural criteria and a common scoring framework. Therefore, this study aims to assess and compare the compliance of three (3) selected shopping malls in Abuja, Nigeria, with the seven principles of Universal Design using a structured assessment framework, and to propose architectural design strategies for improving accessibility and inclusiveness in shopping malls.

Literature Review

Universal Design and Accessibility

Universal Design is often associated with creation of environments that can be used by people with diverse abilities without requiring specialised adaptation (Aigbe et al., 2024). The Centre for Universal Design's seven principles were developed to provide designers with a concise framework for evaluating usability and guiding design decisions (Connell et al., 1997). Similar concerns have been identified in Nigerian public buildings, where accessibility provisions are often provided as isolated features rather than integrated into the overall spatial and circulation system (Makinde et al., 2026). The principles are applicable to architectural built environments because they address both physical and informational dimensions of accessibility (Selanon & Chuangchai, 2024). The framework does not simply ask if a particular facility exists; it considers whether users can reach, understand and use that facility independently and comfortably. Story (1998) earlier established the value of the principles as design and evaluation criteria. His work revealed that such principles can be used in existing and proposed facilities, making it suitable for a comparative case-study. For shopping malls, these principles can be transformed into architectural variables as presented in Table 1.

Table 1: Universal Design Principles and Architectural Variables for Assessment

	Universal Design Principle	Architectural Variables
i.	Equitable Use	Step-free access; two-height counters; equitable access to facilities
ii.	Flexibility in Use	Choice of routes; adaptable seating; accessible self-service facilities
iii.	Simple and Intuitive Use	Logical spatial organisation; clear wayfinding; unobstructed circulation
iv.	Perceptible Information	Tactile indicators; braille; audible information; legible signage
v.	Tolerance for Error	Slip-resistant surfaces; safe edges; protected level changes; emergency provisions
vi.	Low Physical Effort	Low-effort doors; accessible lifts; gentle ramps; rest opportunities
vii.	Size and Space for Approach and Use	Adequate circulation width; wheelchair manoeuvring; accessible toilets and parking

Universal Design in Shopping Mall Environments

Shopping malls in Nigeria present accessibility challenges due to their interconnected functional systems (Obakin & Amosa, 2026; Olawale et al., 2026). Entrances establish the first point of access, while ramps, stairs, escalators and lifts determine vertical mobility (Hosseini et al., 2024). Internal circulation requires sufficient space for movement and manoeuvring, while signage and other information systems enable users to understand the environment (Ngia & Enwin, 2024).

Perceptible Information is also crucial because a mall may be physically accessible but remain difficult to navigate for people with visual, auditory or cognitive limitations. Adewale et al. (2022), in their study of shopping malls in southwestern Nigeria, found insufficient provision of perceptible information and highlighted the need for better implementation of this Universal Design principle. This finding is important because it demonstrates that accessibility should not be assessed solely through physical provisions such as ramps, entrances and circulation spaces. Information systems are equally important in supporting movement and effective use of public facilities.

Similarly, recent research by Sholanke and Adisa (2025) found deficiencies in several accessibility features in selected shopping malls. Their findings included inadequate accessible parking, slippery surfaces, absence of lower handrails in some situations, open risers and inadequate facilities for some users. Their study demonstrates the continuing relevance of accessibility assessment within Nigeria's retail environments. Compared with Adewale et al. (2022), whose findings highlighted deficiencies in perceptible information, Sholanke and Adisa (2025) examined a wider range of physical accessibility provisions. These studies indicate that accessibility challenges in shopping malls are multidimensional and require assessment beyond isolated architectural features.

The present study builds upon these studies but adopts a different analytical structure. Rather than examining accessibility features mainly through descriptive compliance, it employs observable architectural criteria using all seven UD principles and calculates a common index for each case. This approach provides a basis for comparing the relative performance of the selected malls and identifying the principles and architectural provisions that require greater attention. However, the assessment represents a structured observation of architectural provisions and should not be interpreted as direct measurements of users' experiences or independent validation of universal usability.

Universal Design and the Nigeria's Regulatory Framework

Nigeria's disability legislation provides an important institutional basis for accessible design. The Discrimination Against Persons with Disabilities (Prohibition) Act, 2018 established legal provisions for protecting the rights of persons with disabilities and promoting accessibility within the built environment (Federal Republic of Nigeria, 2018).

The Act therefore provides an important legal foundation for improving access and inclusion in public buildings and facilities.

The National Commission for Persons with Disabilities subsequently developed accessibility regulations to provide more detailed guidance on the implementation of accessibility requirements. However, recent research has identified limitations in the extent to which existing building regulations provide detailed Universal Design requirements. Sholanke and Adisa (2025) found that although accessibility provisions are incorporated into the National Building Code, several requirements lack sufficient detail or technical specifications to support comprehensive accessibility.

This distinction between policy recognition and architectural implementation is vital. A building may satisfy a minimum regulatory requirement while still failing to provide an environment that is equitable, intuitive, perceptible and comfortable for diverse users. Universal Design therefore provides a useful framework for moving from minimum accessibility provision towards broader usability.

Research Gap and Contribution

The literature establishes three relevant points. First, Universal Design provides an established framework for inclusive environments. Second, previous studies have indicated persistent accessibility gaps in commercial and shopping environments. Third, recent studies have already examined selected Nigerian shopping malls using Universal Design principles and accessibility assessment approaches.

However, the reviewed studies also indicate a need for comparative evaluation of Universal Design provisions. While Adewale et al. (2022) highlighted deficiencies in perceptible information and Sholanke and Adisa (2025) identified shortcomings in numerous physical accessibility features, the present study seeks to bring the seven principles into a common architectural scoring framework. Therefore, the contribution of this study should not be examined solely in terms of investigating Universal Design in Nigeria's shopping malls. Instead, its contribution lies in the integration of four elements to bridge the gap between evaluation and design:

i. All seven Universal Design principles are assessed simultaneously;
ii. Each principle is operationalised through four observable architectural criteria;
iii. The criteria are combined into a unified 84-point Universal Design Compliance Index;
iv. The findings formed the empirical basis for recommending architectural design measures for future shopping mall development.

MATERIALS AND METHODS

Research Design

The study employed a multiple-case study design using structured observation and quantitative scoring. This approach enabled the assessment of three shopping malls with different construction dates, spatial characteristics and functional configurations. Structured observation provided the empirical basis for identifying and documenting architectural accessibility features, while quantitative scoring enabled the systematic comparison of Universal Design performance across the cases. The study consisted of three (3) key stages:

i. Development of the Universal Design assessment framework;
ii. Structured observation and scoring of the three shopping malls; and
iii. Case study comparison and transformation of gaps into design strategies.

The study was observational and descriptive in nature, focusing on the assessment of existing architectural provisions in publicly accessible areas of the selected shopping malls. It did not involve user-experience or evaluation of the experiences of persons with disabilities. Therefore, the findings represent structured observational assessments of architectural features rather than measurements of users' perceived accessibility.

Case Study Selection

Three shopping malls were purposively selected in Abuja, namely: Ceddi Plaza, Silverbird Entertainment Centre and Jabi Lake Mall as described in Table 2. The cases represent different development periods and spatial configurations.

Table 2: Characteristics of the Three Case-Study Malls

Characteristic	Ceddi Plaza	Silverbird Entertainment Centre	Jabi Lake Mall
Year opened	2005	2010	2015
Location	Central Abuja	Central Abuja	Jabi District
Approximate size	10,000 m²	15,000 m²	30,000 m²
Major facilities	Retail, offices, fast food	Cinema, restaurants, retail	Retail, dining, cinema, supermarket
Vertical configuration	6 floors, and basement	4 floors, basement, and mezzanine	3 floors

The three case studies were selected to provide variation in building age and vertical complexity. Ceddi Plaza represents an older generation of Abuja retail development, Silverbird represents an intermediate development period, while Jabi Lake Mall represents a more recent generation of large-scale retail development.

The selection was purposive, based on the availability of different development periods, variations in spatial and vertical configurations, and suitability for comparative architectural assessment. It aimed to provide cases with differing physical and functional characteristics through which variations in Universal Design provisions could be examined. The selection was comparative rather than statistically representative, with the aim of identifying differences and patterns among the cases rather than generalising the findings to all shopping malls in Abuja.

Data Collection

Data were collected through structured site observation of publicly accessible areas of the three malls. A checklist was used to document the presence, partial provision or absence of architectural features associated with the seven Universal Design principles. Photographic documentation was used where appropriate to support observations and record relevant architectural conditions.

Case study visits were undertaken to assess the publicly accessible areas of each shopping mall. The assessment considered relevant architectural provisions at entrances, circulation spaces, vertical movement facilities, retail and

service counters, toilets, parking areas and wayfinding locations, where applicable. Observations were recorded against individual checklist items using the assigned 0–3 scoring scale. Photographs were used to document observable architectural features and support the assessment of individual criteria.

Secondary information was used to establish the conceptual and regulatory basis of the assessment, including studies on Universal Design, Nigerian accessibility policy and previous studies on shopping mall accessibility.

Universal Design Observation Framework

Each of the seven Universal Design principles was operationalised through four observable architectural criteria. Each criterion was assigned a score based on the observed level of provision, using a structured scoring approach to enable systematic assessment and comparison across the selected case-study malls. The scoring system comprised 3 = fully present/provided, 2 = partially present/provided, 1 = minimally present/provided, and 0 = absent/not provided.

To improve consistency in the interpretation of the scoring system, the following operational definitions were adopted as presented in Table 3:

Table 3: Operational Definitions of the Universal Design Scoring Scale

Score	Category	Operational Definition
0	Absent	The architectural feature or provision was not observed in the assessed shopping mall.
1	Minimal provision	The feature was present only to a very limited extent, was isolated, or exhibited substantial limitations that restricted its intended accessibility function.
2	Partial provision	The feature was provided but with some e limitations in its availability, continuity, configuration or functionality.
3	Full provision	The feature was visibly provided in the assessed location and appeared to perform its intended accessibility function with no obvious limitation during observation

For example, in assessing equitable use, a step-free entrance that was absent would receive zero, while a provision available only at a limited entrance or with significant restrictions could receive one or two, depending on the extent of provision. A clearly available and unobstructed step-free entrance would receive three. Similarly, for perceptible information, the absence of relevant signage or information would receive zero, limited or incomplete provision would receive one or two, while clearly available and legible information would receive three.

These scores represent the observed extent of architectural provision and do not establish compliance with statutory requirements or guarantee usability for all categories of users. For each Universal Design principle, the four criteria generated a maximum score of 12 points. Across the seven principles, the maximum possible score was therefore:

7 principles × 4 criteria × 3 points = 84 points

The resulting measure was defined as the Universal Design Compliance Index (UDCI). The UDCI was calculating using the formula:

$$\text{UDCI (\%)} = (\text{Observed score} / 84) \times 100$$

For individual Universal Design principles, the percentage score was calculated as:

$$\text{Principle score (\%)} = (\text{Observed principal score} / 12) \times 100$$

In these equations, the observed score represents the total points obtained by a shopping mall across the 28 assessment criteria, while the observed principle score represents the total points obtained across the four criteria associated with an individual Universal Design principle. The values 84 and 12 represent the maximum attainable scores for the overall index and individual principles.

Equal weighting was adopted for the seven principles and their corresponding architectural criteria to provide a consistent approach for comparing the three shopping malls. Their equal weighting scores ensured that each principle contributed equally to the overall index. The UDCI is therefore an assessment index developed for this study. Its percentage scores indicate the extent of observed provision against the selected assessment criteria. The percentages were interpreted using the four categories presented in Table 4.

Table 4: Interpretation of Universal Design Compliance Index (UDCI) Scores:

	UDCI range (%)	Interpretation
i.	$0 \leq \text{UDCI} \leq 25$	Very Low
ii.	$25 < \text{UDCI} \leq 50$	Low
iii.	$50 < \text{UDCI} \leq 75$	Moderate
iv.	$75 < \text{UDCI} \leq 100$	High

The four interpretation ranges were adopted as descriptive categories to facilitate the comparison of percentage scores. The intervals divide the 0–100% scale into four continuous ranges, ensuring that fractional values are accommodated without gaps.

To improve reproducibility, the complete 28-item checklist, including the assessment criteria and individual scores recorded for each shopping mall, is provided in Supplementary Table A1.

Analytical Framework

The conceptual relationship between the seven Universal Design principles, architectural variables, the UDCI and the design requirements is presented in Figure 1.

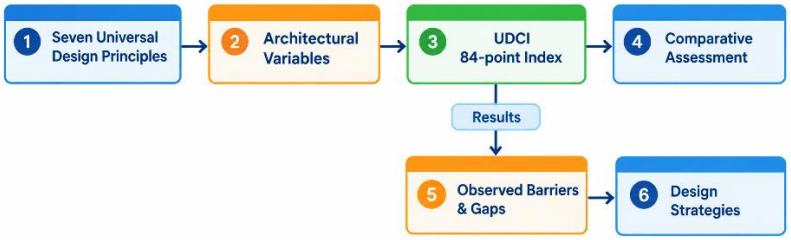


Figure 1: Conceptual framework linking Universal Design principles, architectural variables, UDCI assessment and design implications

The framework begins with the seven Universal Design principles, transform them into observable architectural variables, interpret observations into the 84-point UDCI and then uses the comparative findings to identify design gaps and requirements.

The framework establishes a relationship between the conceptual principles, the architectural evidence collected during the case study observations, the comparative scoring procedure and the resulting design recommendations. It therefore provides a systematic basis for connecting the assessment of existing shopping malls with the identification of architectural measures to improve inclusive design.

Data Analysis

The completed observation scores were organised into a cross-case synthesis. Scores were calculated for each Universal Design principle and for the UDCI. The analysis focused on:

i. Differences in UDCI;
ii. Differences among the seven principles;
iii. Recurring accessibility deficiencies;
iv. Implications for future shopping mall design.

The analysis was descriptive and comparative, using the calculated scores and documented architectural observations to identify similarities, differences and recurring deficiencies across the three cases. No inferential statistical tests were undertaken because the assessment was designed to compare three purposively selected case studies.

RESULTS AND DISCUSSION

Universal Design Performance

The comparative results presented in in Table 5 show clear differences in the Universal Design performance among the three shopping malls. Jabi Lake Mall achieved the highest Universal Design Compliance Index (UDCI) score of 63/84 (75.00%), followed by Ceddi Plaza at 48/84 (57.14%), while Silverbird Entertainment Centre recorded the lowest score of 36/84 (42.86%). Based on the predefined classification thresholds, Jabi Lake Mall and Ceddi Plaza fall within the Moderate category, whereas Silverbird Entertainment Centre falls within the Low category.

Table 5: Comparative Universal Design Compliance Index

	Case Study	Score	UDCI	Interpretation
i.	Ceddi Plaza	48/84	57.14%	Moderate
ii.	Silverbird Entertainment Centre	36/84	42.86%	Low
iii.	Jabi Lake Mall	63/84	75.00%	Moderate

None of the three malls reached the High UDCI category (76–100%). Although Jabi Lake Mall approached this threshold, its overall score indicates that important aspects of Universal Design remain incompletely addressed. The results therefore suggest that the presence of individual accessibility provisions does not necessarily translate into comprehensive Universal Design performance. Rather, effective Universal Design requires coordinated provision across physical access, usability, information, safety, and spatial requirements (Selanon & Chuangchai, 2024).

Principle-by-Principle Comparison

The principle-level results in Table 6 and Figure 2 provide a more detailed explanation of the differences in overall UDCI performance. Jabi Lake Mall recorded the highest score for all seven Universal Design principles, while Silverbird Entertainment Centre recorded the lowest score for five principles. Ceddi Plaza generally occupied an intermediate position.

Table 6: Seven-Principle UDCI Comparison

	Universal Design Principle	Ceddi Plaza	Silverbird Centre	Jabi Lake Mall
i.	Equitable Use	58.3%	41.7%	66.7%
ii.	Flexibility in Use	50.0%	41.7%	75.0%
iii.	Simple & Intuitive Use	75.0%	58.3%	91.7%
iv.	Perceptible Information	25.0%	25.0%	33.3%
v.	Tolerance for Error	58.3%	50.0%	83.3%
vi.	Low Physical Effort	58.3%	33.3%	83.3%
vii.	Size & Space for Approach and Use	75.0%	50.0%	91.7%

The results also demonstrate that overall accessibility cannot be inferred from the presence of isolated facilities such as ramps, lifts, or accessible toilets. Universal Design encompasses several dimensions of usability, including equitable access, flexibility, intuitive use, perceptible information, safety, physical effort, and adequate space for approach and use (Story, 1998). Therefore, a facility may

provide adequate physical access while still presenting limitations in other dimensions of user experience.

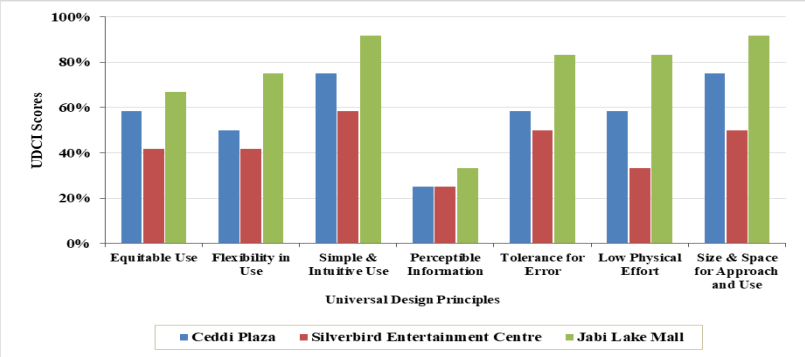


Figure 2: Comparative UDCI scores across the seven Universal Design principles for the three selected shopping malls in Abuja, Nigeria

Equitable Use

The Equitable Use scores were 58.3% for Ceddi Plaza, 41.7% for Silverbird Entertainment Centre and 66.7% for Jabi Lake Mall (Table 6; Figure 2). Jabi Lake Mall therefore demonstrated the strongest performance among the three cases, although its 66.7% score indicates that equitable use was not fully achieved. The photographic evidence illustrates differences in entrance accessibility, showing restricted access conditions at Ceddi Plaza and Silverbird Centre compared with step-free access at Jabi Lake Mall (Figure 3).



Figure 3: Equitable use: (a) restricted access at Ceddi Plaza; (b) restricted access at Silverbird Centre; and (c) step-free access at Jabi Lake Mall

These findings suggest that equitable access should be addressed as an integrated building-system requirement. Entrances, service counters, queues and major facilities should provide comparable means of access and use rather than requiring users with disabilities to depend on separate or less convenient routes.

Flexibility in Use

Flexibility in Use recorded scores of 50.0% for Ceddi Plaza, 41.7% for Silverbird Entertainment Centre and 75.0% for Jabi Lake Mall (Table 6; Figure 2). Jabi Lake Mall therefore demonstrated comparatively greater flexibility in accommodating different patterns of movement and use. The case-study evidence illustrates differences in retail and circulation arrangements, such as the staircase and escalator provisions observed across the malls (Figure 4). These photographs provide examples of the circulation but do not, in isolation, establish the overall flexibility score.



Figure 4: Flexibility in use: (a) flexible retail space at Ceddi Plaza; (b) staircase circulation at Silverbird Centre; and (c) escalator access at Jabi Lake Mall

Simple and Intuitive Use

Simple and Intuitive Use was one of the strongest-performing principles across the three cases, with scores of 75.0% for Ceddi Plaza, 58.3% for Silverbird Entertainment Centre and 91.7% for Jabi Lake Mall (Table 6; Figure 2). The 91.7% score for Jabi Lake Mall was among the highest principle-level scores recorded in the assessment. The case-study evidence shows clear layouts at Ceddi Plaza, unobstructed corridors at Silverbird Centre and open sightlines at Jabi Lake Mall (Figure 5).



(a) (b) (c)

Figure 5: Simple and intuitive use: (a) clear layout at Ceddi Plaza; (b) unobstructed corridors at Silverbird Centre; and (c) open sightlines at Jabi Lake Mall

These results suggest that spatial organisation, circulation clarity and wayfinding contribute to usability. A logically organised environment with clear visual relationships and consistent circulation can reduce the effort required to understand and navigate a complex building.

Perceptible Information

Perceptible Information was the weakest-performing principle across all three malls, with scores of 25.0% for Ceddi Plaza, 25.0% for Silverbird Entertainment Centre and 33.3% for Jabi Lake Mall (Table 6; Figure 2). The low scores indicate a cross-case weakness in information accessibility, especially in relation to Braille, audible information and multisensory communication. The case-study photographs presented in Figure 6 further illustrate the information conditions observed across the three malls.



(a) (b) (c)

Figure 6: Perceptible information: (a) Ceddi Plaza; (b) Silverbird Centre; and (c) Jabi Lake Mall

This finding is consistent with Adewale, Jegede and Sogbetun (2022), who identified insufficient perceptible information in shopping malls in southwest Nigeria. Both studies point to limitations in the provision of information that can be accessed through different sensory channels. Notably, Jabi Lake Mall's relatively high UDCI did not translate into comparable performance in perceptible information. Its score of only 33.3% indicates that stronger performance in other dimensions of Universal Design does not necessarily ensure accessibility of the information environment.

Therefore, for inclusive design, accessibility must include information systems. Tactile indicators, braille, high-contrast signage, pictograms and audible announcements should be integrated from the beginning rather than added after construction.

Tolerance for Error

Tolerance for Error recorded scores of 58.3% for Ceddi Plaza, 50.0% for Silverbird Entertainment Centre and 83.3% for Jabi Lake Mall (Table 6; Figure 2). Jabi Lake Mall consequently demonstrated comparatively stronger provision for reducing hazards and limiting the consequences of user error. The photographic evidence shows protective balustrades at Ceddi Plaza, a guardrail at Silverbird Centre and a glass balustrade at Jabi Lake Mall (Figure 7).



(a) (b) (c)

Figure 7: Tolerance for error: (a) protective balustrade at Ceddi Plaza; (b) guardrail at Silverbird Centre; and (c) glass balustrade at Jabi Lake Mall

These features are relevant in shopping malls, where high pedestrian volumes, level changes, stairs, escalators and potentially congested circulation can increase exposure to hazards. However, the photographs illustrate selected safety features and should be interpreted alongside the other assessment criteria. The lower scores recorded for Ceddi Plaza and Silverbird Entertainment Centre indicate opportunities for strengthening surface safety, edge

protection, level-change treatment and related safety provision.

Low Physical Effort

Low Physical Effort recorded scores of 58.3% for Ceddi Plaza, 33.3% for Silverbird Entertainment Centre and 83.3% for Jabi Lake Mall (Table 6; Figure 2). The substantial difference between Silverbird Entertainment Centre and Jabi Lake Mall indicates variation in the observed provision of building components intended to support comfortable and independent use. The case-study photographs show seating provision at Ceddi Plaza, comparatively limited seating at Silverbird Centre and seating integrated along circulation routes at Jabi Lake Mall (Figure 8).



(a) (b) (c)

Figure 8: Low physical effort: (a) seating at Ceddi Plaza; (b) inadequate seating areas at Silverbird Centre; and (c) seating along routes at Jabi Lake Mall

These observations illustrate the importance of rest opportunities in reducing the physical effort required to use a building. However, seating provision alone does not establish overall performance under this principle, which also considers door operation, vertical circulation and other building components. The findings therefore support an integrated approach in which accessibility is considered throughout the circulation system rather than satisfied by providing an accessible route in isolation.

The findings therefore support an integrated approach in which accessibility is considered throughout the circulation system rather than satisfied by providing an accessible route in isolation.

Size and Space for Approach and Use

Size and Space for Approach and Use recorded scores of 75.0% for Ceddi Plaza, 50.0% for Silverbird Entertainment Centre and 91.7% for Jabi Lake Mall (Table 6; Figure 2). Jabi Lake Mall and Ceddi Plaza performed comparatively well in terms of spatial capacity, while Silverbird Entertainment Centre recorded a substantially lower score. The case-study evidence also shows adequate circulation at Ceddi Plaza, obstructing columns at Silverbird Centre and a comparatively large manoeuvring area at Jabi Lake Mall (Figure 9). ‘



(a) (b) (c)

Figure 9: Size and space for approach and use: (a) adequate circulation at Ceddi Plaza; (b) obstrcuting columns at Silverbird Centre; and (c) large manoeuvring area at Jabi Lake Mall

These results suggest that adequate circulation, manoeuvring and approach spaces provide an important physical foundation for inclusive use. However, the substantially lower scores for Perceptible Information demonstrate that spatial adequacy alone does not constitute integrated and inclusive Design.

Cross-Case Interpretation

The cross-case comparison reveals three principal patterns (Figure 10). First, Jabi Lake Mall recorded the highest overall UDCI at 75.00% and also achieved the highest score for each of the seven Universal Design principles. Its strongest performances were in Simple and Intuitive Use and Size and Space for Approach and Use, both at 91.7%, followed by Tolerance for Error and Low Physical Effort at 83.3%. Second, Ceddi Plaza recorded an overall UDCI of 57.14% and performed relatively well in Simple and Intuitive Use and Size and Space for Approach and Use, both at 75.0%. Despite its intermediate overall performance, its stronger scores in selected principles demonstrate that Universal Design performance is not uniform across dimensions. Third, Silverbird Entertainment Centre recorded the lowest overall UDCI at 42.86%, with low scores for Perceptible Information (25.0%) and Low Physical Effort (33.3%).

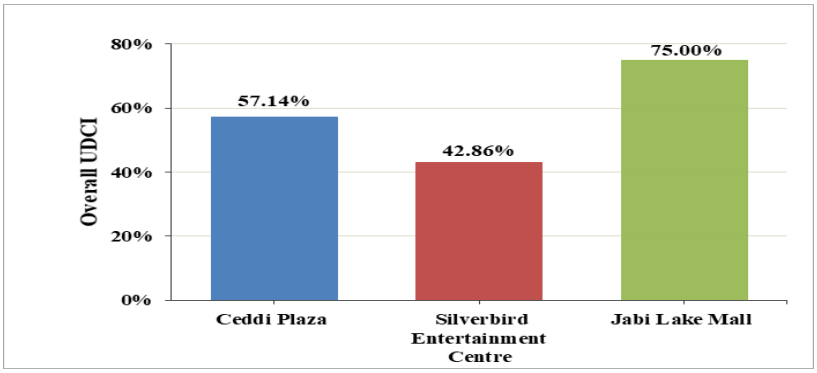


Figure 10: Comparative overall Universal Design Compliance Index (UDCI) across the three selected shopping malls in Abuja, Nigeria

The results suggest that Universal Design is multidimensional and that weaknesses in specific principles can constrain overall performance. The findings also suggest that building age alone is insufficient to explain the observed differences. Ceddi Plaza, despite being the oldest case, achieved relatively strong scores in Simple and Intuitive Use and Size and Space for Approach and Use, while Jabi Lake Mall, despite achieving the highest overall UDCI, retained a substantial weakness in Perceptible Information.

The Persistent Weakness of Perceptible Information

The most consistent cross-case finding is the weak performance of Perceptible Information. Scores of 25.0%, 25.0% and 33.3% were recorded for Ceddi Plaza, Silverbird Entertainment Centre and Jabi Lake Mall, respectively. Perceptible Information was therefore the lowest-performing principle in all three cases.

This finding demonstrates a clear disparity between physical accessibility and information accessibility. Users may be able to enter and move through a shopping mall while still experiencing barriers to independent navigation when tactile indicators, braille, high-contrast signage, pictograms or audible information are inadequate.

The consistency of this weakness across all three malls suggests that information accessibility represents a common design gap within the selected cases rather than an isolated deficiency in one building. This finding is consistent with Adewale et al. (2022), whose study also identified insufficient perceptible information in shopping malls in southwest Nigeria. The similarity between the findings points to the need for greater attention to multisensory information provision in shopping mall design. However, the findings from the present study should not be generalised to all shopping malls in Nigeria without further investigation.

For architectural design, the results support a shift from an accessibility approach focusing on ramps, lifts, parking and accessible toilets towards a more comprehensive Universal Design strategy with perceptible information incorporated into the design of the built environment. Future shopping mall design briefs should therefore identify perceptible information as a vital accessibility requirement from the initial planning and design stages, allowing tactile, visual and auditory communication systems to be integrated with circulation and wayfinding rather than added retrospectively.

Implications for Future Shopping Mall Design

The comparative findings provide the empirical basis for transforming the identified Universal Design gaps into architectural strategies for future shopping mall development. The results demonstrate that accessibility should not be addressed through isolated features or post-design modifications but should be embedded within the architectural brief, spatial planning and circulation strategy from the earliest stages of design.

Equitable Use

Future shopping malls should provide equitable access to entrances, services and facilities for users with different abilities. Entrances should incorporate automatic or power-assisted doors where appropriate, while service counters and queue areas should be designed to accommodate users with different mobility requirements. Major facilities should be accessible through convenient routes rather than through secondary or segregated paths.

Flexibility in Use

Flexibility in use should be addressed by providing users with alternative and convenient ways of moving through and interacting with the building. Stairs, escalators and lifts should therefore be integrated into a coherent primary circulation system rather than positioning accessible routes away from principal movement paths. Seating and self-service facilities should accommodate different users and mobility devices.

Simple and Intuitive Use

Future shopping malls should incorporate consistent floor organisation, identifiable circulation nodes, clear sightlines and logically connected routes to major destinations. Pictographic signage, consistent terminology and recognisable symbols should be used throughout the development to reinforce wayfinding. These measures reduce the cognitive effort required to navigate complex retail environments and improve independent use.

Perceptible Information

Future designs should integrate tactile indicators, braille information, high-contrast signage, clear pictograms and audible announcements into the overall information and wayfinding system. Emergency information should be communicated through appropriate visual and auditory channels to support users with different sensory abilities. These measures should be incorporated during the initial design stages rather than as remedial interventions.

Tolerance for Error

The principle of Tolerance for Error requires the building to minimise hazards and reduce the consequences of accidental actions. Future shopping malls should incorporate slip-resistant flooring, protected level changes and appropriately designed edges and guardrails in areas where falls or collisions may occur. Hazard warnings should be clearly

visible, while emergency audio facilities should be strategically located and readily accessible.

Low Physical Effort

Future malls should minimise the physical effort required to enter, move through and use the building. This can be achieved through low-effort/ power-assisted doors, appropriately designed ramps and accessible lift controls. Handrails should be easy to grip and positioned to support users along ramps and other circulation routes. Rest opportunities should also be provided along longer travel paths. The circulation system should be designed to minimise unnecessary travel distances and avoid requiring users with mobility limitations to take longer or more physically demanding routes.

Size and Space for Approach and Use

Future shopping malls should provide sufficient space for wheelchair approach, turning, circulation and transfer at entrances, counters, lifts, toilets and other frequently used facilities. Accessible parking should provide adequate space for vehicle access and transfer. Where specific dimensional requirements are adopted, these should be incorporated consistently into the building layout and coordinated with the applicable accessibility standards rather than treated as isolated provisions.

The findings suggest that the architectural variables associated with the seven Universal Design principles are interdependent and should therefore be considered collectively. The consistent weakness in perceptible information across the three case studies demonstrates that good physical circulation alone does not constitute comprehensive accessibility. Thus, Universal Design measures should be incorporated directly into the architectural brief, site and space planning, and schematic design stages of future shopping mall projects rather than being treated as post-design modifications or remedial interventions.

CONCLUSION

This study evaluated Universal Design (UD) performance in three shopping malls in Abuja, Nigeria, using a multiple-case approach and a Universal Design Compliance Index (UDCI). The UDCI integrates the seven UD principles, four observable criteria per principle, and a maximum score of 84 points, enabling the comparison of accessibility performance across cases. The findings revealed substantial variation in overall UD performance. Jabi Lake Mall achieved the highest score at 63/84 (75.00%), followed by Ceddi Plaza at 48/84 (57.14%) and Silverbird Entertainment Centre at 36/84 (42.86%). Jabi Lake Mall performed particularly well in Simple and Intuitive Use and Size and Space for Approach and Use (91.7% each), whereas Perceptible Information was consistently the weakest principle across all three malls (25.0–33.3%). This suggests that spatial accessibility does not necessarily translate into informational accessibility, highlighting the importance of addressing sensory and communication barriers alongside physical access. The findings further indicate that building age alone does not determine UD performance. Although the newer Jabi Lake Mall achieved the highest overall score, its weakness in Perceptible Information demonstrates that contemporary design does not imply accessibility compliance. The study contributes a structured seven-principle, 84-point UDCI framework for comparative architectural assessment. However, the index has not yet been validated, and the assessment was observational, limited to three selected shopping malls, and did not involve direct assessment with people with disabilities. Therefore, the findings should not be interpreted as representative of all shopping malls in Abuja. Future studies should validate the UDCI, incorporate evaluations involving people with diverse mobility, sensory and cognitive needs, and establish inter-rater reliability through independent assessments.

REFERENCES

Adewale, B. A., Jegede, F. O., & Sogbetun, O. T. (2022). Evaluation of the effectiveness of perceptible principle of Universal Design in shopping malls in Southwest Nigeria. *IOP Conference Series: Earth and Environmental Science, 1054*(1), 012020. https://doi.org/10.1088/1755-1315/1054/1/012020

Aigbe, J. I., Maina, J. J., & Sagada, M. L. (2024). Exploring spatial configuration for effective way-finding in the design of shopping malls in Abuja–Nigeria. *Architecture and Planning Journal, 30*(1), 1–21. https://doi.org/10.54729/2789-8547.1248

Ajobiewe, T. O., Adeleye, O. I., & Shaibu, S. (2019). *Access to public buildings by the physically challenged in Ibadan metropolis*. *31st Annual Conference of the National Association of Special Education Teacher*s, Osogbo, Osun State, Nigeria.

Akeredolu, P., Jayeoba, S., & Badedale, L. S. (2025). Evaluating the effectiveness of space allocation in controlling traffic and circulation in shopping mall designs. *African Journal of Environment and Sustainable Development, 3*(3), 102–113. https://doi.org/10.5281/zenodo.17078598

Aniekan, E. D. (2021). Assessment of accessibility and disability planning in Nigerian construction industry. *ASRIC Journal on Engineering Sciences, 1*, 32–39.

Auwalu, F. K., & Bello, M. (2023). Exploring the contemporary challenges of urbanization and the role of sustainable urban development: A study of Lagos City, Nigeria. *Journal of Contemporary Urban Affairs, 7*(1), 175–188. https://doi.org/10.25034/ijcua.2023.v7n1-12

Auwalu, F. K., & Oluigbo, S. N. (2016). Built environment for rehabilitation: Case studies of selected juvenile rehabilitation centres in Nigeria. *Journal of Design and Built Environment, 16*(2), 15–29. https://doi.org/10.22452/jdbe.vol16no2.3

Connell, B. R., Jones, M., Mace, R., Mueller, J., Mullick, A., Ostroff, E., Sanford, J., Steinfeld, E., Story, M., & Vanderheiden, G. (1997). *The principles of Universal Design* (Version 2.0). The Center for Universal Design, North Carolina State University.

Federal Republic of Nigeria. (2018). *Discrimination against Persons with Disabilities (Prohibition) Act, 2018*.

Heyik, M. A., Castellanos-Escobar, M. C., Romero-Martínez, J. M., & Çalışkan, Z. (2024). Exploring citizens' perspectives on participatory design and planning: A comparative study across three capital cities. *Urban Governance, 4*(2), 101–112. https://doi.org/10.1016/j.ugj.2024.03.003

Hosseini, Z., Yeganeh, M., & Jalali, S. (2024). Exploring the impact of vertical access elements on visual richness and

space quality within shopping mall atriums. *Buildings, 14*(9), Article 2724. https://doi.org/10.3390/buildings14092724

Makinde, O., Gbiri, O. A., & Makinde, O. T. (2026). Evaluation of spatial layout and accessibility performance of selected High Court buildings in Southwest Nigeria. *FUDMA Journal of Sciences, 10*(18), 196–212. https://doi.org/10.33003/fjs-2026-1018-5915

Mshelia, L. B., Idakwoji, W. A., & Audu, J. (2025). An assessment of the level of integration of inclusive design principles in a neighbourhood shopping mall in Abuja, Nigeria. *IIARD International Journal of Geography & Environmental Management, 11*(8), 77–90. https://doi.org/10.56201/ijgem.vol.11.no8.2025.pg77.90

Ngia, N. P., & Enwin, A. D. (2024). Enhancing wayfinding and circulation in shopping mall design. *International Journal of Research Publication and Reviews, 5*(8), 2744–2749.

Obakin, O. A., & Amosa, M. A. (2026). Assessment of circulation systems and accessibility in shopping malls towards the design of sustainable malls in Nigeria. *African Journal of Applied Research & Sustainable Development, 4*(2), 162–169. https://doi.org/10.54117/8tvt2709

Olawale, S. F., Morakinyo, K. O., Adedayo, O. F., Alonge, T. S., Adebambo, O. I., Farodoye, S. O., & Mustapha, A. (2026). Assessment of the functional nature of contemporary city malls in Nigeria. *Journal of Science Research and Reviews, 3*(3), 61–72. https://doi.org/10.70882/josrar.2026.v3i3.214

Olawale, S. F., Morakinyo, K. O., Adedayo, O. F., Alonge, T. S., Adebambo, O. I., Farodoye, S. O., & Mustapha, A. (2026). Assessment of the functional nature of contemporary city malls in Nigeria. *Journal of Science Research and Reviews, 3*(3), 61–72. https://doi.org/10.70882/josrar.2026.v3i3.214

Olodeoku, M., Alokun, A., Alagbe, O., Egwabor, J., & Buseri, J. (2024). Exploring Universal Design principles in the built environment: An empirical review. *African Journal of Environmental Sciences and Renewable Energy, 16*(1), 84–98. https://doi.org/10.62154/ajesre.2024.016.010352

Oluigbo, C. U., Okonta, E. D., Osamor, S. N., & Ndubuisi, C. B. (2026). User accessibility in shopping malls: Towards compliance and inclusive design. *ABC2: Journal of Architecture, Building, Construction, and Cities, 2026*(3), 35–59. https://doi.org/10.66408/abc2.2026.36

Qi, J., Mazumdar, S., & Vasconcelos, A. C. (2024). Understanding the relationship between urban public space and social cohesion: A systematic review. *International Journal of Community Well-Being, 7*(2), 155–212. https://doi.org/10.1007/s42413-024-00204-5

Selanon, P., & Chuangchai, W. (2024). Improving accessibility to urban greenspaces for people with disabilities: A modified Universal Design approach. *Journal of Planning Literature, 39*(1), 79–83. https://doi.org/10.1177/08854122231212662

Sholanke, A. B., & Adisa, O. S. (2025). Compliance of accessibility features of selected shopping malls with Universal Design strategies in Nigeria. *Civil Engineering and Architecture, 13*(4), 3144–3159. https://doi.org/10.13189/cea.2025.130422

Story, M. F. (1998). Maximizing usability: The principles of Universal Design. *Assistive Technology, 10*(1), 4–12. https://doi.org/10.1080/10400435.1998.10131955

Udefuna, P. N., Yerima, H., & Nandi, L. A. (2026). *Bridging accessibility barriers for Nigerians with disabilities: A look at the Disability Act and urgent need for legislative action*. https://ir.nilds.gov.ng/handle/123456789/3472

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