

Circulation Systems and Accessibility of Malls in Lagos, Nigeria: An Inclusive Design Application in Terms of Accessibility

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Abstract— Inclusive design, also known as Universal design, is the ability of a place to be usable by all classes of people, regardless of their ability, age and circumstance. Circulation systems in shopping malls are an essential part of the built environment. This research sought to evaluate the circulation system in existing shopping malls in Lagos with a view to identifying the inadequacies in accessibility and produce improved accessibility conditions for designing a shopping mall. The objective of this research is to examine the level of accessibility of existing shopping malls by evaluating the circulation systems and entrances in shopping malls in the study area. The research used a mixed-method research approach, which includes quantitative and qualitative methods. Qualitative data were grouped in themes, and the descriptive approach was used to analyze them, while quantitative data were analyzed using the Statistical package for social science (SPSS). The result of the observation showed that application of inclusive design at the malls in Lagos had some inadequacies, especially in the area of the corridors and aisles, entrances without alternative elements and footpaths. It is suggested that the deliberate use of the inclusive design approach be employed in design of shopping malls.

Keywords- *Accessibility, Accessibility standards, Circulation system, Inclusive design, Shopping mall.*

I. INTRODUCTION

In architecture, circulation refers to the movement and interaction of individuals with a building environment. Circulation is vital in public buildings. They are designed and strategically positioned for the optimum flow of people through a building and for convenient interaction with the circulation elements such as staircases, corridors, elevators, parking lots, and so on. Accessible route describes a route taken by pedestrians that is accessible. With little exception, the accessible routes connect the available areas of the building to the public right of way, public transportation stops with buildings that have accessible entrances to elements and places that are accessible both on the site and within the structure, including each story and mezzanine (Janis, 2019).

Users of public buildings are known and accepted to be individuals who live in the same community. Designers have responsibilities for making accessible designs while considering the universal, pragmatic, and aesthetic aspects of the plan. (Wilkoff, 1994).

Architect Victor Gruen established shopping mall ideas (Gruen, 1973). He had in mind a combination of different uses of the city, ranging from commercial to social in a whole unique building. Still, over the years, the non-commercial functions have been scrapped by shopping mall owners to make the malls much bigger

than the way they used to be (Jorge, Ester, 2017). The aim was to make more profit while ignoring some other vital issues, especially the ones related to circulation.

Equipped appropriately designed environment with circulation elements are supposed to enable all users' positive experiences. Although, as generally observed, some public spaces such as shopping malls, most times, do not provide adequate accessibility of people for the comfort of the users of these buildings. The quality of our interactions with the building and its environment can be better supported if we see the mall as well-being and positive engagement place. However, this positive engagement level is not evident for persons with disabilities (Poldma et al, 2014). The universal approach adopted in the design of the built environment allows full access to persons into the interior and exterior of these public spaces regardless of age or ability. Every user of the open space must enjoy social participation. Social participation is defined as the capacity to pick and move around uninhibitedly in one's surrounding and to perform any activity, including utilizing lodging, work, transportation, and social scenes (Ward, Mitchell, & Price, 2007). However, more often than usual, building environments may deny access while allowing access to others.

Therefore, this study is aimed at solving the accessibility problem by evaluating the circulation system in existing shopping malls to identify inadequacies in building accessibility and then proffer better design solutions to improve accessibility conditions in the built environment. This research will bring to awareness the necessity of accessibility in public buildings and further add to the body of knowledge.

II. PROBLEMS, AIM, AND OBJECTIVES

Due to the poor circulation concerning accessibility of public spaces, the building of a shopping mall which is as a result of the built environment's development is without consciously putting into consideration some essential needs of the prospective users, as it is seen our environment today (Poldma et al, 2014). The account of the potential users' crucial needs is necessary to ensure adequate circulation in buildings. The best achievement of proper circulation is when the built environment developers adopt the Accessibility Standards to assess building areas by the circulation elements.

This research seeks to study, evaluate the circulation system in existing shopping malls in Lagos to identify inadequacies in building's accessibility and produce improved accessibility conditions for designing a shopping mall.

This research aims to examine the level of accessibility of existing shopping malls by evaluating the circulation systems and entrances in shopping malls in the study area.

III. UNDERSTANDING ACCESSIBILITY

Accessibility in this study means eradicating many obstacles/barriers as possible that can pose as a challenge for individuals with disabilities, and creating access to spaces. Facilities that aid accessibility are required to develop solutions to problems some people encounter.

Accessibility is most times caused by the designer. A more accessible and usable environment for everyone can be created instead of creating challenges for some people.

For a clear understanding of accessibility, it started in the 1950s, where it was known to be the barrier-free movement which majorly involves the environment and its physical barriers. There are several approaches introduced with a common goal of improving accessibility in the living space. Although it is commonly termed 'Inclusive Design' in our present day, it is also known as 'Barrier-Free Design,' 'Universal Design,' 'User-Centred Design,' 'Design for all,' and 'Sensitive Design.'

IV. INCLUSIVE DESIGN

An Inclusive community is one in which all users, whatever their capacities, can complete their everyday exercises efficiently, adequately and securely without being confined by the helpless designs, lousy maintenance and management of the built environment (Hanson, 2012, p.13). The point of 'inclusive design' is to develop products and ecosystems by the multiplicity of people. By doing that, inclusive design can be serviceable to everyone without making changes (Hanson, 2012, p.12). As said by (Alderson 2010), user comfort without being selective is the principal objective of inclusive design. The table below shows the principles of Inclusive Design.

[1] *Principles of Inclusive Design*

TABLE I. PRINCIPLES OF INCLUSIVE DESIGN (CENTRE FOR UNIVERSAL DESIGN, 1995; HANSON, 2012, P.14)

Principle	Description
Equitable	The product is useful and marketable to people with a range of abilities
Flexible	It can accommodate a wide range of individual needs and preferences
Intuitive	The product is easy to use
Effective	It works in most situations and for most people
Tolerant	The product can cope with user-errors
Efficient	It does not stress or tire the user
Appropriate	It is ergonomically designed to be acceptable to the majority of users

[2] *Application of Inclusive Design in other Public buildings*

A research by (Sholanke, Adeboye, Oluwatayo & Alagbe, 2016) aimed to evaluate the universal design compliance in the main entrances of selected public buildings in Covenant University. In the research, parking, pedestrian footpath, entrance porch, steps and ramps, floor finishes and entrance doors were seven important features that are said to disturb the free movement of users from a public building's main entrance. The study further noted that all the case studies still had issues with full implementation of the universal design. The research resulted in being consistent with the findings of various studies that the built environment is inaccessible to the physically impaired.

Also, research done by (Yusita, Sherly de Yong, Diana, 2012) was aimed at evaluating the entrance and circulation facilities of malls in Surabaya. The study concluded that universal design application in the Physical entrance and circulation facilities at the malls in the study area still had many issues; mostly in terms of the entrance design and entries threshold.

(Sholanke, et al, 2019) findings in his research showed that the provisions made for accessibility in the schools effectively meet their needs. However, some of the students believed that ramps provided were inadequate, thus not effective for accessibility. Also, some other students found that corridors, external floor surface areas, main entrances, were inadequate for accessibility.

Research by (Ibem, Oni, Umoren & Ejiga, 2017) aimed to appraise the level of compliance in three museums in the southwest region of Nigeria using principles of universal design in terms of approachability, accessibility, and usability. Their findings concluded with the following: Firstly, in terms of approachability, the three museums complied moderately. Secondly, relating to accessibility, poor compliance with accessibility requirements for children and disabled people was recorded in every museum. Thirdly, the usability needs of the physically impaired, children and elderly ones were not considered in the design of

facilities and services of the museums. On a general note, the museums are not approachable, accessible, and useable by all segments of the society, therefore not playing their roles in national developments.

Various studies have shown that the built environment is still considered as a non-user-friendly environment, which does not correspond with the aim of an inclusive environment.

V. ACCESSIBILITY STANDARDS: CIRCULATION SYSTEM IN A SHOPPING MALL

Many developing countries use the guidelines and regulations formed by the developed countries because they are more detailed and include more instructions. Amongst the reputable guidelines and rules, there are four (4) most known, which are; American Disability Act (ADA), World Health Organization (WHO), Uniform Federal Accessibility Standards (UFAS) Retrofit Guide, and The European Disability Forum (EDF). These are accessibility standards structured in various sizes and capacities of individuals. Evaluation of the level of horizontal and vertical circulation in spaces are in terms of criteria that include components of these spaces.

[3] *Horinzontal Circulation*

Elements like corridors, verandas, and porches are part of horizontal circulation elements. The horizontal circulation elements help achieve uninterrupted circulation in buildings and provide smooth movements in between levels of the building. Horizontal circulation is defined according to Beirne (2003) as regions of walkways on individual floors of a structure that aid access to other spaces include the highlights like hallways, entryways, terraces, patios, entryways, entrance lobbies, and overhangs (Elottol, 2011: 226). This study will examine the following horizontal circulation elements; Car park area, Footpaths, Central entrances, Entrance foyer, Corridors. The grouping of these elements is according to their dimensions and types.

[4] *Vertical Circulation*

Vertical Circulation aids the vertical movement between floors within a building, which expects to make available unobstructed access to everyone equally. Vertical circulation, as defined by Beirne (2003), says, regions of strolling and automated devices introduced in individual floors of a structure that vertically aid movement to other space including flights of stairs, ramps, lifts and escalators" (Elottol, 2011: 226). This study will examine the following Vertical circulation elements; Stairs and steps, Ramps, Elevators, Escalators.

Based on other studies, circulation can be grouped as "interior circulation" and "exterior circulation." The exterior circulation is evaluated by urban planners and landscape architects, while interior designers and architects assess the other. Circulation within the interior spaces and relation between the Interior-exterior areas in terms of circulation will be the focus of this study. Therefore, the circulation elements were evaluated from the exterior part to the interior of the building.

The accessibility standard employed for the observation guide is obtained from different structured accessibility standards. The best fit for a shopping mall was selected to have a befitting result. All the buildings evaluated using the below accessibility standards acceptable and the required circulation for shopping malls.

TABLE II. OBSERVATION GUIDE CONTAINING THE ACCESSIBILITY STANDARDS USED FOR EVALUATION

S/N	Aspect	Required standards
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1	Car park area	<ul style="list-style-type: none"> • Designated accessible car parking • Size of parking spaces • Convenient access from the parking spaces onto the footpath • Closeness to the central entrance or any exit point • Parking sign
2	Footpath	<ul style="list-style-type: none"> • Width :1500mm (min) for 1 wheelchair users - (1800mm) (min) for 2 wheelchair users
3	Ramps	<ul style="list-style-type: none"> • Minimum gradient of 1:20 • Minimum width of 1800mm • Maximum length of 9000mm • Maximum height of 450mm • Landing width of 2400mm x 2400mm • Intermediate landing of 2400mm
4	External steps	<ul style="list-style-type: none"> • Riser of 150mm-180mm • Width of 1200mm • Provision of railings
5	Entrances	<ul style="list-style-type: none"> • Clear, visible and prominent • Entrance porch of 2400mm x 2400mm • Provision of the entrance canopy • Provision of ramps where there are steps
6	Entrance doors	<ul style="list-style-type: none"> • Minimum width of 1000mm • Clear space on both sides of the door
7	Entrance foyer	<ul style="list-style-type: none"> • Prominent circulation routes • Comfortable seating arrangement • Clear signage • Width: 1200mm (min) • Approach from outside: 1200mmx1200mm (min) • Door width: 750mm (min) • Clear space for interior access: 1500mmx1500mm for 2 wheelchair users
8	Interior doors	<ul style="list-style-type: none"> • Minimum door width of 850mm • In-ward opening doors • Consistent direction of opening • Clear space on both sides of the door
9	Corridors/ Aisle	<ul style="list-style-type: none"> • Minimum width of 1500mm • Recess of wall-mounted signage • Handrails where the corridor is more than 20m • Seating where the corridor is more than 20m • Turning space: 1600mm (min)
10	Elevators, Lifts and Escalator	<ul style="list-style-type: none"> • Sign showing the use of a lift or other vertical circulation measures is at the entrance of the building • Whatever circulation method is used, alternative stair should be provided • An unobstructed manoeuvring space of 1500mm x 1500mm in front of any circulation measure • Landing and call buttons located between 900mm x 1100mm from the landing • A handrail be provided on at least one side of the equipment

In addition to the observation guide, questionnaires were provided to respondents on a Likert scale to get a perspective view from them. The table below shows the questions asked.

TABLE III. LEVEL OF SATISFACTION OF THE USERS ON THE CIRCULATION SYSTEM

Circulation system	Variable
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Car Park	Do you struggle with parking when visiting the shopping mall?
Footpath	Are you obstructed by cars due to the undefined footpath?
Ramps and steps	Are you able to make use of the ramps and steps without stress?
Entrance foyer	Do you feel choiced when you enter into the mall's entrance foyer?
Stair/elevators	Do you find it hard navigating from the entrance foyer to the stairs or elevators?
Stairs/elevators	Do you have to squeeze through a mass of people when using the stairs and elevators?
Interior doors	Do you have to squeeze through a mass of people when going through the stores?
Corridor/aisles	Do you feel brushed at the backside while standing on the corridor/ aisle?
Aisles	Do you struggle with payment at the counter due to inadequate space provided?
Total review	Will you still visit the mall even after all these difficulties faced?

VI. METHODOLOGY

The research used a mixed-method study, which includes Literature surveys, questionnaires, and observations on site. Methods for this study's data analysis include document analysis and observation schedule, which are to collect qualitative data. In contrast, the collection of quantitative data was done using a structured questionnaire, carefully developed for the study. Selected shopping malls in Nigerian cities were viewed and evaluated relative to circulation through the use of accessibility standards. The author examined the building using an observation guide, which has been developed by the author. Level of accessibility of circulation element and areas, like car parks, corridors, entrances, doors, ramps, stairs, elevators, and escalators, entrance foyers, were observed by takings photographs and measuring. Qualitative data were grouped in themes, and the descriptive approach was used to analyze them, while quantitative data were analyzed using the Statistical package for social science (SPSS). The results were interpreted and presented using a descriptive approach with tables, charts, texts, histograms, and photographs.

VII. FINDINGS AND RESULT

Lagos state has the most populated city in Nigeria; adequate adherence to inclusive design is essential. Here are brief descriptions of the Lagos state malls in the study. Ikeja City Mall located in 179/194, Obafemi Awolowo way, Alausa, Ikeja, Lagos State, Nigeria. The retail development is an ultra-modern in a dual economic state with a wide selection of national and international tenants. The mall was owned and developed by Broll property service limited. It commenced construction in May 2010 and opened to the public on 14 December 2011. Grand square mall located at Plot Y, Mobolaji Johnson avenue Lagos state, Nigeria. Grand Square is a specialist in electronics, small and large household appliances, home accessories, and electrical equipment, with a large dedicated area offering a wide range of products. They are also well known for their excellent bakery section, where you can hurry to pick the bread while it is hot! Addas mall located opposite Cadbury Plc, 8/10 Hakeem Balogun St, Agidingbi, Ikeja, Lagos. The multi-billion-naira Mall owned by Bolanle, the wife of the immediate past governor of Lagos state Akinwunmi Ambode. Addas mall is a beautiful and all-glass six-story building situated on two plots of land.

The Maryland mall located at 350 360 Ikorodu Road Ikeja, 100211, Lagos. It is popularly called the 'Big Black Box' due to its outer, is a mall which is poised to give a shopping experience of international standards. This mall is the first Mall in Nigeria to have an underground park, and its location also witnesses a traffic flow of not less than 5000 cars hourly. Leisure Mall/ Adeniran Ogunsanya Mall (AOS) is located on 84, Adeniran Ogusanya street, in Surulere, Lagos. It is claimed and overseen by Top Services Limited. The development of the shopping centre started in 2008 and finished in 2010. The shopping centre as of now traverses 15,000 sqm and houses more than 154 shops. Leisure Mall visited by up to 35,000 individuals month to month. Jendol supermarket is one of Jendol's superstores in Lagos, located at Km 241 Lagos Abeokuta Expressway, U-turn bus stop, Abule Egba, Lagos State. It sells household products, fruits and vegetables, hair care products, and a long-range of products at an affordable price.

TABLE IV. EVALUATION OF THE CIRCULATION SYSTEM IN THE EXTERIOR SPACES. (HORIZONTAL CIRCULATION)

	Ikeja City Mall	Grand square mall	Addas mall	Maryland mall	Leisure mall	Jendol supermarket
Car park	A	A/I	A	A	I	A
Footpath	A/I	-	I	A	A	-
Ramps	A	I	A	A	A	-
External steps	A	A	A	-	A	-
Entrances	A	A	A	A		I

The result shows that 4/6 (66.7%) of the malls have adequate car parking spaces with good circulation except for Grand square, having one of its car parks too small with poor circulation and leisure mall with inadequate parking space. Ikeja city mall portrays both adequate and insufficient footpaths, in contrast to Maryland and Leisure mall that have suitable trails while there is none existence of paths in others. The majority of the malls have accessible ramps. Grand square was missing a ramp at the main entrances, which makes it inaccessible. External steps well provided, and 4/6(66.7%) of the malls are accessible without barriers. On a general note, Maryland, ICM, and Addas Mall and Leisure mall have the most accessible horizontal circulation.

TABLE V. EVALUATION OF THE CIRCULATION SYSTEM IN THE INTERIOR SPACES. (HORIZONTAL & VERTICAL)

	Ikeja City Mall	Grand square mall	Addas mall	Maryland mall	Leisure mall	Jendol supermarket
Entrance door	A	A	A	A	A	A
Entrance foyer	A	A	A	-	-	-
Interior doors	A	A	A	A	A	A
Corridors/aisle	A/I	A/I	A/I	A/I	A/I	A
Stairs/Elevator/Escalator	A	A/I	A	A	A	-

NOTE: Accessible elements represented as (A) Inaccessible elements represented as (I) Both Accessible / Inaccessible elements represented as (A/I) None available elements represented as (-)

The evaluation shows a 100% accessibility of the entrance and interior doors in the malls, also the entrance foyers are appropriately designed to aid accessibility. The corridors were according to the standard as well as the aisles. However, as observed, aisles at the counters seemed tight for the users as there was no free passageway behind the queue. Majority of the stores, except Grandsquare mall, had alternative vertical elements at proximity which were very accessible. Jendol supermarket had no vertical circulation element because it was a single volume building.

Likewise, the result gotten from the questionnaire shows that A cumulative of 44.2% of the respondents disagree. At the same time, 40% of the respondents agree that they struggle with parking when visiting the mall, then 15.8% of the respondents are neutral. A sum of 36.7% of the respondents disagree, at the same time, 40% of the respondents agree that they are obstructed by cars due to the undefined footpath, then 23.3% of the respondents are neutral. A total of 24.2% of the respondents disagree, while 56.7% of the respondents agree that they can make use of the ramps and steps without stress. Then 19.1% of the respondents are neutral. 59.1% of the respondents disagree, while 11.7% of the respondents agree that they feel chocked when they enter into the mall's entrance foyer, then 29.2% of the respondents are neutral about it. A total of 65% of the respondents disagree that they find it hard navigating from the entrance foyer to the stairs or elevators. In comparison, an aggregate of 16.7% agrees, then 18.3% of the respondents are neutral about it. A collective of 70% of the respondents disagree while 15% of the respondents agree that they have to squeeze through a mass of people when using the stairs and elevators, then 15% of the respondents are neutral about it. An aggregate of 85% of the respondents disagree that they have to squeeze through a mass of people when going through the stores, then 15% of the respondents are neutral about it. A cumulative of 65% of the respondents disagree while 15% of the respondents agree that they feel brushed at the backside while standing on the corridor/ aisle, then 20% of the respondents are neutral about it. A total of 45% of the respondents disagree while 10% of the respondents agree that they struggle with payment at the counter due to inadequate space provided, then 45% of the respondents are neutral about it. A collective of 95% of the respondents agree that they will still visit the mall even after all these difficulties faced, then 5% of the respondents are neutral about it.

VIII. DISCUSSION

From the result gotten it shows that the car park area provided at these malls serve the users averagely. As seen, majority of the car parking area in these malls were not overly provided so though there is a free space for vehicular movement; the car park area could still be inadequate when the mall is at its peak period. It seems as though obstruction from cars cannot be avoided because of the transition point from the car park area to the footpaths. However, some of these malls lacked footpaths which makes the situation even less comfortable.

The result shows that more than half the number of users find the ramps and steps easy to use. This can be accredited to the proper placement of these elements in the majority of the malls. However, some of these malls did not have ramps which do not make the entrance accessible.

The entrance foyers in these shopping malls were designed to accommodate many people at a time. However, not all the malls had one. As an alternative, the malls without entrance foyer had wide entrances that could accommodate many people at a time. Most of the malls did not have signages placed at the entrance foyer; however, the escalators can be seen once inside the mall, then the elevator and stairs are at proximity with each other. For the malls that did not have the vertical circulation elements visible at the entrance had signages within the building, directing and showing the elements. However, some of these

elements were not so visible and not easy to locate at the first visit. Many of the users were comfortable with vertical circulation elements.

As observed, many people make use of the elevator more than the stairs and the elevator. For some of the malls, the elevator was majorly used by the staff to carry goods while the major element used was the escalator which was wide and can accommodate many people at a time.

The corridors and aisles in these malls are all according to standards, wide to accommodate the free flow of movement. However, been brushed at the backside seems to be inevitable even when the aisles and corridors are massive as some do not watch where they are heading or are just nasty. As earlier said, the corridors and aisles are according to the standard. However, the aisle in front of the counter in departmental stores seem crowded and tight no matter how wide they were. In different stores, the aisle possibly tight for movement is those in front of the counter due to the usual traffic there. On a general note, many agreed to revisit the malls, notwithstanding the trouble faced in the mall. Well, that can be understandable because many of the stores are conducive for them and also because none of these respondents was disabled or physically impaired.

IX. CONCLUSION AND RECOMMENDATIONS

The conclusion from the research with the inclusive design application concerning the circulation system is based on the following:

The application of the inclusive design at the malls in Lagos still have some problems, especially in the area of the corridors and aisles, entrances without alternative elements and footpaths.

The mall with the least inclusive design application is Jendol supermarket.

Solution for these inadequacies that can be provided is the deliberate use of the inclusive design approach, which is according to the accessibility standards in terms of dimensions. Also, the provision of physical elements with inclusive design application and special consideration of aisles in front of the counters; they should be designed in away from the general aisles and in aa way that it does not obstruct the movement around the space.

As for recommendations for further similar research, there should be continuous research on inclusive design applications in public buildings, studying the circulation system in parts for a more detailed analysis of the accessibility of the building. Some of these public spaces are Art galleries, Airports, Bus stations, Libraries, Hospitals, recreational areas etc. in Lagos State. This research is done, as a whole as the advantage of making these public buildings inclusively design, which will result in a user-friendly environment/city.

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