

An Appraisal of Universal Design Compliance of Museum Buildings in Southwest Nigeria

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Abstract

In recent years, museums in Nigeria have struggled to maintain economic viability and social relevance due to low patronage by visitors. Consequently, there is a growing need to explore how to achieve visitor-centered approach in the design, planning, and construction of museum buildings and facilities in this country. In the light of this, this study examined the extent to which the design, planning, and construction of museum buildings and facilities in Nigeria comply with the principles of universal design and promote users' satisfaction. A case study research design was adopted in appraising three museums in southwest Nigeria, based on three universal design principles of approachability, accessibility, and usability. The findings reveal that the three museums complied reasonably well when it comes to approachability but performed below average in accessibility and usability parameters. As a result, the existing museums and their facilities and services are not very accessible, and usable by all categories of persons in the society. This implies that for museums buildings and facilities in this country to effectively serve all segments of the society and achieve end-user satisfaction, there is a need for the adoption of universal design principles, particularly as they relate to accessibility and usability requirements while retrofitting the existing ones.

Keywords: Universal Design, Inclusive Design, User satisfaction; Museum Buildings; Retrofitting,

INTRODUCTION

Architects, planners, and engineers involved in the development and operation of public buildings have always been challenged by the need to satisfy the needs, expectations, and aspirations of the public without any form of segregation or access denial to any social group in the society. In response to this, the concepts of inclusive design, universal design, accessibility, and usability have been introduced to cater for the needs of every possible user of such buildings, facilities, and services within and around them [1]. These concepts are used to describe approach to design and construction that shows empathy for all social groups and does not believe in designing and constructing for an "average user" as there is really no average user. In public buildings like museums, issues like accessibility and social inclusion have become

topical because the very essence of a museum is to create a place where the public can assess museum objects for several purposes ranging from leisure, entertainment to education among others.

Historical facts show that early museums were merely places for storing artifacts until the Ashmolean Museum became the first museum to be given public access in 1683 [2]. For an institution like museum, whose existence is depends on the level of public patronage, the importance of inclusive design or accessible design cannot be overemphasized. In fact, several museums such as the Canadian Museum of Human Rights, the Worcester Art Museum, the Museum of Science and the British Museum, have made conscious efforts to create an inclusive learning environment for all their visitors and staff.

Studies have also shown that the adoption of universal design in museums has many benefits, such as the provision of a more comfortable learning experience for the disabled, increase in the number of visits and the level of social interactions [3, 4, 5]. It is also an established fact that museums serve as educational and cultural institutions and tourist attraction [6 and 7]. For this reason, museums should be accessible by every member of the public irrespective of sex, age, social status, and level of disability. The physical context of a museum or exhibition space contributes to the experience of the visitors and should be planned and constructed to satisfy them in terms of recreation, tourism, and learning with maximum convenience. It is also evident in the literature that the adoption of universal design in museums in the United States of America, Canada, and Europe has been on the increase in the past three decades [8 and 9]. This has been fueled by the growing emphasis on tourism development and the concern over human rights, and the strict requirements of their national building regulations, the compliance with the Smithsonian accessibility guidelines and other accessibility and universal design guidelines [9,10,11].

In Nigeria, Areo [12] noted that museums have been forced to find new methods of increasing the number of visitors in recent times. The need to increase the visitor counts arose from the need to attain an optimum and acceptable performance despite inadequate funds from the government and increasing cost of running museums as non-profit making institutions. This means that museums in Nigeria have to

begin to look beyond the traditional functions of acquisition, conservation, and storage [13], and start laying more emphasis on visitor-centered approaches to running their operations leading to improved end user satisfaction. As Ginsburgh and Mairesse [14] argued, this places enormous responsibilities on public museums to begin to identify, anticipate and satisfy the needs and expectations of all categories of visitors and remain relevant in ever-increasing competitive environment. This study argues that one of the strategies to be engaged in improving the relevance of museums in Nigeria is to make their environments and facilities accessible and usable by all categories of people in the society.

Although the National Building Code of 2006 has very minute provisions on accessibility to public and assembly buildings [15], there appears to be poor response to basic accessibility requirements in public buildings, including museums in Nigeria. In view of the dwindling fortunes of museums and the need to improve user satisfaction with museum buildings and facilities in Nigeria, it has become imperative for architects and engineers to engage in visitors'-oriented practices in the design, planning, construction, and operations of museums. Therefore, this study appraised three museums in southwest Nigeria, based on three universal design principles of approachability, accessibility, and usability. The key research question addressed in this study is: to what extent do museum buildings and facilities in southwest Nigeria comply with universal design principles?

This study is based on case studies of three museums: the Natural History Museum, Obafemi Awolowo University, Ile-Ife, Osun State; Badagry Heritage Museum, Badagry, Lagos State; and National Museum, Onikan, Lagos all in southwest Nigeria. It contributes to knowledge by providing empirical evidence of the level of compliance of museum buildings and facilities in the study area with universal design requirements. This is important in informing architects and engineers on the issues they must begin to address in improving the relevance of museums in the society. It is also expected that findings of this study will form the basis for benchmarking Nigerian museums with their counterparts in the world when it comes to compliance with universal design principles. The remaining part of this paper is structured into four parts. The first part is the review of related literature on museums and universal design. The second part is the research methods. The third part is the presentation and analysis of findings, followed by a brief discussion of the findings. The last part deals with the conclusions and recommendations.

LITERATURE REVIEW

Museums and their role in the Society

Historical facts on the origin of museums show that a museum is primarily the collected, preserved, and interpreted knowledge rather than the building itself. In fact, early museums were mostly collections of knowledge or curiosities

with less emphasis on the building itself [2]. This explains why there are several types of museums like open-air museums, eco-museums and virtual museums, none of which is housed in buildings [2]. This clearly shows that a museum is more than just a building but a collection of knowledge. The descriptions of a museum by Falk and Dierking [6] and Roppola [7] indicate how museums play an important role as educational institutions, recreation/leisure centers, and tourist centers. Museums, particularly larger museums in major cities, are important as tourism destinations as they help to create a sense of place, contribute to the overall self-image of a city, and the tourism industry [7]. Stead [16] also alluded that a purpose-built museum building is also, in a sense, part of the contents of that museum as it could serve as a museum object. Falk and Dierking [6] specifically explained that the physical context of a museum (the museum building and environment) has long been recognized as an important facet of the visitor experience; and building professionals like architects and engineers are largely responsible for the production of this physical context.

Regarding the definition of museum, the most widely used definition of a museum and the definition adopted in this work is the definition given by the International Council on Museums (ICOM). The ICOM defines museum as “*a non-profit making, permanent institution in the service of society and of its development, and open to the public, which acquires, conserves, researches, communicates and exhibits, for purposes of study, education and enjoyment, material evidence of people and their environment*” [17]. It is evident from the description of the defining characteristics of museums presented by ICOM, [17] and Ginsburgh and Mairesse [18] that the core responsibility of a museum is public service and exhibition of collections. This means that museums must strive to serve the public interest by providing them access to their collections and interpreting these collections effectively to all categories of visitors; and by so doing creating value in the society.

Principles of universal design

According to Mace [19], universal design is the design and production of products and environments that are usable by all people, to the greatest extent possible, without the need for adaptation or specialized design. This definition is very similar to that given by the Center for Excellence in Universal Design [20] which views ‘universal design as the design and composition of an environment so that it can be accessed, understood and used to the greatest extent possible by all people, regardless of their age, size, ability or disability. Steinfeld and Maisel [21] also defined universal design as the process of creating an environment that adequately serves a diverse population by improving its human performance, health, and social inclusion. These definitions buttress the importance of a user-centered approach to environmental design and the production of products that are user-friendly

and compatible with the needs, expectations, and expectations of all classes of end-users.

Connell *et al.* [22] and Copeland [23] identified the principles of universal design to include equitable use, flexibility in use, simple and intuitive use, and perceptible information, tolerance of error, low physical effort, size and space for approach and use. Copeland [23] described equitable use as entailing the design of a built environment that allows all its potential users to have a productive and satisfying use of the environment despite the diversity in their abilities. Flexibility in use requires that all users with a wide range of abilities perform tasks as conveniently as possible, while simple and intuitive use allows building users who are not familiar with the building to find it easy to use different features and access different areas of the building. This aspect of universal design allows users with different knowledge, language skill, or education to use buildings and products conveniently. There is also the perceptible information aspect, which requires the built environment to communicate information to its users easily despite their differences in sensory and intellectual abilities. Copeland [23] also made it clear that the tolerance of error of universal design aims at minimizing any accidents or possible hazards to the building users due to either their actions or inabilities by providing adequate allowance for inaccuracy or inefficiency in the design and construction of buildings and facilities. This is also related to low physical effort principle that allows users to access the features of an environment with convenience and minimal stress or fatigue. The last but not the least principle of universal design is the size and space for approach and use, which ensure that every user easily maneuver the environment and access spaces without any difficulty as a result of spatial constraint.

Universal design strategies in buildings

The definitions of universal design by Mace [19] and the Center for Excellence in Universal Design [20] as previously highlighted identified three important concepts in universal design to include access, usability, and communication. Any product or environment designed to achieve the highest performance attainable in these three areas can be sure to be universal. In the context of universal design of buildings and environments, access simply means approachability and accessibility. On the one hand, approachability refers to the accessible journey between the immediate surroundings of the building and the building itself and entails the provision of an accessible route from the street and car park through the public spaces of the building to the building entrances [24]. Accessibility on the other hand extends from the building's entry points to the spaces and facilities/services within the building where users, including people with disabilities would carry out required activities and functions [25 and 26]. According to Barrier Free NZ Trust [26], approachability to a building is achieved when there is an accessible route from the transport systems that deliver and pick-up people to the

public spaces around the building (this includes the walkways and car parks) and to the building access points like vertical connections to the building.

Usability refers to how well the building or environment is able to satisfy the needs and goals of its users. This means the ability of users to effectively and efficiently use the building and its facilities. Therefore, it seeks to provide environments and products that can be used by as many people as possible, including those with disabilities without the need for assistance. Usability manifest in the height and stiffness of door handles, height of switches, and height of handrails, sanitary facilities and the likes among others [23, 26, and 27].

Communication in buildings and environmental design refers to how perceptible information is to users of the built environment. Effective communication in public buildings can be very difficult to achieve considering the variations in the sensory abilities and the intellectual or cognitive abilities of the users. Way finding in buildings can be difficult for users with impaired sensory abilities if necessary information is not relayed in a perceptible manner. For example the use of tactile signs, contrasting floor finishes, audiovisuals communication, sign language and proper lighting will enable users with impaired sensory abilities perceive building information better [26].

Universal design in museums

Several requirements have been identified by the Smithsonian guideline for accessible exhibition design, "Exhibitions for All" by the National Museums of Scotland (NMS) and the Americans with Disability Act (ADA). These requirements are meant to guide designers and builders on how to achieve universal design in museum buildings and facilities, including all the spaces and functions that a museum building could contain, such as exhibition galleries, exhibit stands, lobbies and circulation, restaurants, libraries, parking, conveniences and others. The guidelines for achieving a universal museum are focused on the basic requirements of an accessible route; approachability and accessibility, universal usability and communication.

Approachability and accessibility in a museum are relevant to vertical and horizontal travels within the building and access routes to the building. Horizontal travels could be from the car park to the main entrance of buildings or between interior spaces on the same level. For people with mobility impairments, people with fatigue or aged people, making long travel distances at a stretch can be tiring. It is always considered better to reduce travel distances as much as possible and create resting areas where travel distances are too long. For example, the Smithsonian Accessibility Guidelines require that universally usable seats be provided within and between galleries where necessary. In addition, adequate spatial requirements are considered for pavements, corridors

and other paths to accommodate mobility aids like wheelchairs push trolleys, motorized scooters and others. Vertical travels between levels of the building or site are expected to be easy for people with different abilities or disabilities. It is also advocated that features like ramps, kerbs, stairs, and elevators be incorporated in an inclusive manner and that the design should meet spatial requirements, gradients for ramps, riser and thread dimensions for stairs and the appropriate surfacing and detailing [26]. Areas of concern in achieving an accessible route for approachability and accessibility in the museum include parking, footpaths, entrances, doors and corridors, kerb, ramps, stairs, lifts, places of assembly, public toilet, exhibition halls, and service points. Accessibility guides on how each of these areas in a museum building can be made accessible have been spelled out in the universal design requirements [10, 11; 26; 28; 29].

Regarding usability of museum buildings and facilities, it is recommended that the peculiar requirements for each disability be carefully considered and addressed. Consequently, the factors affecting usability could be spatial or based on the physical, sensory, or intellectual abilities of the users. For example people using mobility aids, white canes, or guide dogs would require more space to perform some functions within the museum like making horizontal and vertical travels, using the restroom, maneuvering corridors and others. Further, effective communication in museums allows every museum visitors to understand the environment, find his /her way around the building, perceive, and understand the information being displayed. Effective communication begins with enabling the museum visitors to find their way into and around the museum. This entails comprehensive exterior signage and way-finding system at every major point to assist visitors with varying disabilities to locate appropriate parking and accessible entrances. The street address of museum name should be clearly visible from the street or public laneway. For this reason, it is noted that while designing or specifying signage, the size of the lettering should be legible at typical viewing distances (e.g., from the road, approach route, parking area, etc.). According to the City of Toronto Accessibility Plan [29], signage should generally be in bold 'sans-serif' lettering (e.g., Helvetica) and placed on a highly contrasting background so that people with impaired vision can easily see it. They further explained that appropriate signage should be used to distinguish pedestrian, vehicular, and emergency routes on the site. In addition, one-way routes should be clearly marked with both paving markings and post-mounted signs; and consistency is very important so as not to confuse the museum visitors. This requires the adoption of "International Symbol of Accessibility" in identifying special amenities, such as accessible parking, accessible entrances, or accessible washrooms [29].

RESEARCH METHODS

As noted earlier on, the study was designed to address the research question of how selected museum buildings and facilities in southwest Nigeria comply with universal design principles. Consequently, the case study research approach was adopted in this study. According to Yin[30], case studies can be categorized as explanatory, exploratory, or descriptive and are the preferred research strategy when the "how" or "why" questions are being posed; the researcher has little control over the events; and the focus of the study is on contemporary as opposed to historical phenomena or issues. Stewart [31] also noted that case study research could be single or multiple sites, allowing researchers to explore issues, problems and concerns faced by the phenomena under investigation, and how these issues might be addressed. For these reasons, the current study is a multiple sites case study involving three main museums in southwest Nigeria. The museums investigated are the Natural History Museum, Obafemi Awolowo University, Ile-Ife, Osun State, Badagry Heritage Museum, Badagry, Lagos State; and the National Museum, Onikan, Lagos State. These museums were selected for this study because amongst the several museums approached for permission to carry out this research, the operators of these three museums were the only ones who accepted the invitation and subsequently granted the researchers permission and access to the museum buildings and facilities for the purpose of gathering empirical data for this research.

Being a descriptive case study, the data used were derived from both secondary and primary sources. The secondary sources of data were documentary analysis and archival records, websites of the selected museums and online tour guides. The provisions of the National Building Codes, Smithsonian Guidelines for Accessible Design and other accessibility guides were also analysed to identify the basic concepts and requirements for universal design. On the other hand, the primary data were derived using observations schedule and photographic materials during the visits to the three museums investigated.

In the process of collecting primary data for this research, the researchers paid visits to the three museums between December 2016 and February 2017. The basic primary data collected were related to the approachability features of the museums; the accessibility within the museum buildings and their surroundings; and the usability of the museum facilities and services. This means that the data collected were mainly qualitative in nature; hence, they were analysed using content analysis. The purpose of content analysis was to help the researchers juxtapose the approachability, accessibility and usability features of the three museums with the established standards of universal design principles as found in both theoretical and research literature.

FINDINGS AND ANALYSIS

Case Study 1: Natural History Museum, Obafemi Awolowo University, Ile-Ife, Osun State

The Natural History Museum located in Obafemi Awolowo University (O.A.U), Ile-Ife, was donated to the institution in fulfillment of the university management's desire in 1971 to have a repository for scientific materials in this university. Funds for the construction of the building were not readily available so the building took 30 years before Mr. A. P. Leventis completed it on 25 February 2011. The museum building houses spaces for offices, technical labs, library, various exhibitions, lecture rooms, director's office, and secretary's office and toilet facilities on two floors.

a. Approachability of the Museum

Assessment of the approachability of this museum reveals the following features. First, although there is a bus shuttle system that brings visitors from outside the university campus to entrance of the location of the museum and a car park near the museum building, however, there are no provisions in both the shuttle system and the car park for physically challenged visitors to the museum. Second, as shown in Figure 1, the entrance of the museum from the access road is through a flight of steps and the access to the car park is on the same level with the entrance of the museum (see Figure 2). However, there is a drainage channel between the car park and the main entrance of the museum, which among the other things makes it difficult for wheelchair users and dangerous for cane users or visitors using a mobility aid like a walking stick or crutches to access the museum. The implication of these is that only able-bodied people can actually gain access to this museum, which is inconsistent with one of the key objectives of universal design as previously discussed.



Figure 1: Pedestrian access from the Road.

Source: Authors' Fieldwork (2016).



Figure 2: Access from the Car Park

Source: Author's Fieldwork (2016).

b. Accessibility to spaces within the museum

Regarding the accessibility to spaces within the museum building, it was observed that the ground floor of the building does not have a change in floor level; this makes it easy for everyone to move around easily with a low risk of error. Hence, this aspect of the building appears to be in compliance with the principle of universal design. Again, the staircases are compliant with universal design requirements, only that they have no provisions for handrails at varying heights for the visitors (see Figure 3). However, there is neither any lift nor ramp for accessing the first floor of the museum. This means that wheelchair users that manage to find their way to the ground floor of the museum cannot go beyond this level, which is a major restriction to disabled visitors.



Figure 3: Vertical Circulation in the museum

Source: Authors' Fieldwork (2016).

Further, the lobbies within the museum are wide enough in line with universal design requirements but they do not have handrails to support visitors with mobility impairments and other physically challenged persons as recommended by the Smithsonian Accessibility Guidelines. It was also found that the museum was grossly deficient in the provision of facilities for blind visitors or cane users because no evidence of tactile signs and audio directions was found within and around the

museum. In addition, no accessible interactive kiosks were provided to help visitors find their way around the museum. Yet, provisions were not also made for the use of strollers or guide dogs within the museum, which is the case with modern museums in many developed and developing countries. In view of these, when it comes to accessibility with the museum, the level of compliance of this museum with the universal design requirement is relatively very low and below internationally accepted standards.

c. Usability within the Museum

Findings of this study also reveal that in terms of usability of the facilities and services in this museum, the exhibition galleries have sufficient space for circulation in compliance with the universal design requirement of exhibition spaces. Similarly, some of the exhibitions were displaced at heights accessible to wheel chair users and children. However, some of the artifacts were found in locations considered too high to be conveniently seen and appreciated by wheel chair users and children. Furthermore, the conveniences do not have accessible stalls or baby-changing facilities (see Figure 4); this makes usability difficult for people with physical disabilities, strollers, or children.



Figure 4: A typical example of toilet facility of the Museum.

Source: Authors' Fieldwork (2017).

Other areas of non-compliance with universal design principles identified include the lack of provision for communication in sign language and Braille and seating within or between the galleries. This means that visitors have to remain standing from the beginning of the museum visit until the end. This can be very inconveniencing and dangerous to people with physical disabilities. The exhibitions were also found not to have been designed and constructed in such a way that enables them to be appreciated by people with sensory disabilities like blindness or impaired hearing. Hence, the museum does not comply with the communication requirement of universal design as recommended by the City of Toronto Accessibility Plan [29]

Case Study 2: Badagry Heritage Museum, Badagry, Lagos State

The Badagry Heritage Museum is located along the Marina Road, Boekoh Quarters, Badagry, Lagos State. The British Colonial Masters constructed the structure and used it as administrative building in Nigeria over 150 years ago; and thus its architectural style reflects the western architecture of that era. The idea of converting the building to Badagry Heritage Museum was mooted by Asiwaju Bola Ahmed Tinubu, while he was the Executive Governor of Lagos State between 1999 and 2007[32]. The museum is a timber structure of two floors surrounded by columns and balconies. The Lagos State Ministry of Tourism, Arts and Culture currently manages the museum [33].

a. Approachability of the Badagry Heritage Museum, Badagry

Appraisal of the approachability of the Badagry Heritage Museum shows that the access road leading to this museum has no pedestrian walkway for visitors; and there was no defined bus stop close to the museum since commercial vehicles do not ply the road. However, for visitors that come with their own vehicles or cabs, there is no defined car park for both able-body and physically challenged people on the museum site. The absence of pedestrian walkways or paths on the site and the earth-finished surface of the site make it difficult for wheel chair users to move freely around the site. Moreover, the entrance of the museum is elevated, without ramps, and thus can only be accessed via steps. These constitute a barrier to wheel chair users, and could make it difficult and dangerous for a cane user or a visitor using a mobility aid like a walking stick or crutches.

b. Accessibility of spaces within the Badagry Heritage Museum

Regarding accessibility of spaces within this museum, it was observed that the ground floor of this museum has changes in level that are linked by steps only; and thus making it difficult for visitors with physical or sensory disabilities to move around easily. This also increases the risk of errors by the museum visitors. Furthermore, all the staircases in the museum were found not to be compliant with universal design requirements as they have open riser staircases and had no provisions for handrails at varying heights for visitors. As at the time of the research there were also neither lifts nor ramp to access the first floor of the museum; and hence wheelchair users that manage to find their way to the ground floor of the museum cannot go beyond this level. In addition to the absence of provision for blind visitors and people with cane users; stroller; tactile signs and audio directions, there are no accessible interactive kiosks that could help visitors find their way around the museum. However, the museum has a map of

the galleries and signage showing the direction of the circulation around the galleries. Of course, these are only useful to visitors who are not visually impaired.

c. Usability of the museum

Assessment of usability of the museum reveals that some of the exhibitions were displayed at heights not accessible to wheel chair users and children but some others are too high to be conveniently seen by wheel chair users and children. It was also found that the exhibition galleries have sufficient space for circulation in compliance with the universal design requirement of exhibition spaces, but they were poorly lit as shown in Figure 5. The exhibitions were also not designed to be used by people with sensory disabilities like blindness or hearing impairments. Similarly, the size of some labels and gallery texts were observed to be very small with no magnifying device provided (see Figure 6). Other areas of non-compliance with the principles of universal design identified include the lack of provision for communication in sign language and Braille; audiovisual communication; and seats within or between the galleries. The toilet facilities are detached from the museum building and do not have accessible stalls or baby changing facilities, which makes usability difficult for people with physical disabilities, strollers or children.



Figure 5: A Poorly Lighted Gallery in the Museum.

Source: Authors' Fieldwork (2017)



Figure 6: A typical font size and image quality used in the museum exhibitions.

Source: Author's Fieldwork (2017).

Case Study 3: National Museum, Onikan, Lagos

The National Museum, Onikan, Lagos, is located in the Central District of Lagos, along Onikan Station Road. It was founded by Archaeologist Kenneth Murray and opened to the public in 1957. It was built and later extended with a capital cost of about £100 000. The Federal Government of Nigeria currently operates the museum, which has over 20,000 objects ranging from artworks, antique furniture, archaeological findings, and paintings to sculptures. The main museum building is partly on two floors, while the rear part of the museum is on only one floor. Other support functions of the museum are housed in bungalows connected to the museum or even totally separated in the case of the museum kitchen and the toilets.

a. Approachability of the Museum

In terms of approachability of the National Museum, Onikan, Lagos, it was found that the access road to the museum has a pedestrian walkway and a bus stop opposite the museum for visitors. For visitors that come with their own vehicles or cabs, there is a car park at the left side of the museum and provision was made for visitors to make drop offs before heading to the car park. However, there is no provision for accessible bays in the car park. As shown in Figure 7, the entrance to the museum is elevated and can only be accessed using steps; this is a barrier to wheel chair users and could be difficult and dangerous for a cane user or a visitor using a mobility aid like a walking stick or crutches.

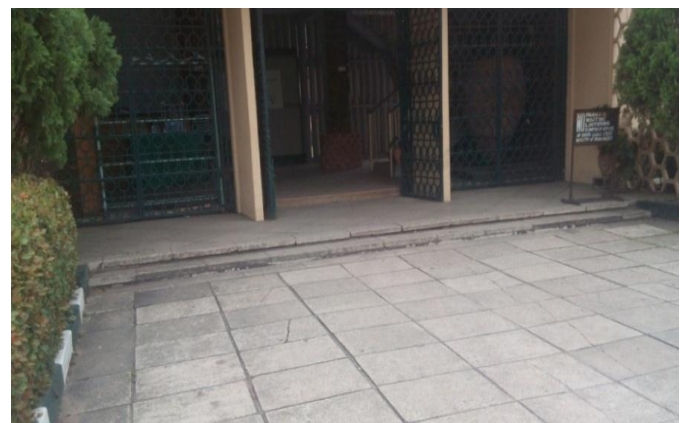


Figure 7: Access to the Museum Building.

Source: Authors' Fieldwork (2016).

b. Accessibility of spaces within the Museum

Regarding the museum's compliance with accessibility requirements of universal design, it was found that the ground floor of the museum building has change in levels linked by steps only. This makes it difficult for people with physical or sensory disabilities to move around easily and increases the risk of errors by the museum visitors. The staircase is also not

compliant with universal design requirements as it has open risers and does not have handrails at varying heights to cater for the height differences of the visitors (see Figure 8). In addition, there is neither any lift nor ramp for accessing the first floor of the museum; this means that wheelchair users that manage to find their way to the ground floor of the museum cannot go beyond this level. Interestingly, the corridors within the museum are wide enough in line with universal design requirement with the exception of the lobbies that have display stands. In addition, the corridors do not have handrails that can provide support to visitors with mobility impairments or other physical disabilities. This is compounded with the lack of provision for blind visitors or cane users; tactile signs and audio directions around the museum; interactive kiosks that could help visitors find their way around the museum are also absent and the lack of use of strollers within the museum.



Figure 9: Corridor to the Benin Gallery.

Source: Authors Fieldwork (2016)

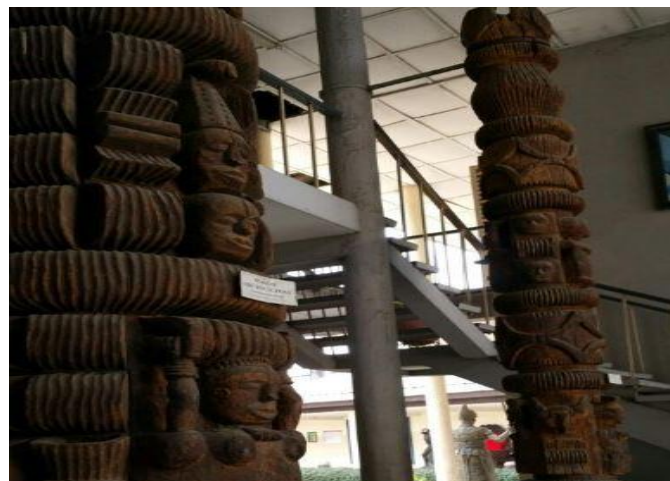


Figure 8: Vertical Circulation

Source: Authors' Fieldwork (2016).

c. Usability within the Museum

In terms of usability of the museum facilities, the findings show that, as is true with the other two museums investigated, some of the exhibitions in the National Museum, Onikan, Lagos, are displayed at a height accessible to wheelchair users and children, while some others are too high to be conveniently seen and appreciated by wheelchair users and children. The exhibition galleries have sufficient space for circulation in compliance with the universal design requirement of exhibition spaces with the exception of the exhibits along the corridor leading to the Benin Gallery (see Figure 9). The toilet facilities are also detached from the museum building and accessed through a series of steps; and lack accessible stalls or baby changing facilities, which makes usability difficult for people with physical disabilities, strollers or children.

In addition, although there is a television for audiovisual communication no provision for communication in sign language and Braille in this museum, as the only language used for communication within the museum is English. There is no provision for seating within or between the galleries, which can be very inconveniencing and dangerous for people with physical disabilities. The exhibitions were also found to be arranged in a manner that has little or no consideration for people with sensory disabilities like blindness or hearing impairments in mind.

DISCUSSION

This study appraised three major museums in southwest Nigeria based on three key requirements of universal design, namely, approachability; accessibility and usability as identified in the published literature [see 19, 20, and 24]. From the findings of the appraisal of these museums, it is evident that whereas two of the museums: the Natural History Museum, Obafemi Awolowo University, Ile-Ife, Osun State and the National Museum, Onikan, Lagos, show a level of compliance with the approachability requirements of universal design by having access roads that are usable by all categories of visitors. This is evident in the provision of pedestrian access for visitors, bus stop for visitors coming with public transport system and car parks for those who visit the museums with private vehicles and hired taxis. In contrast, the Badagry Heritage Museum in Badagry showed very low compliance with approachability requirements. This is because the access road to the museum has no pedestrian walkway, bus stop, and car park for visitors. This implies that on overall, the museums appraised in this research have complied moderately with the approachability requirements as identified in the previous literature [10, 11; 26; 28; 29].

In terms of accessibility, the result reveals that for all the three museums, access to the different levels of the building appears to be convenient for only able-bodied persons but not for those with one form of disabilities or the other and children.

This is because; access points to the building are through steps with no provisions for ramps to aid those on wheelchairs and the blind (see Figures 1 and 7). The same is the case in the buildings with more than one floor. It was also found that for disabled visitors who managed to gain access to the ground floors of the museum buildings, there are no lifts to take them to the next floors. This is because the vertical circulation elements in the buildings are mainly stairs (see Figures 7 and 8). Moreover, the stairs provided in the museums do not comply with universal design, as the handrails are placed at heights not accessible to children as seen in Figures 3 and 8. This means that the museums investigated complied very little with the accessibility requirement of universal design. In fact, the physically challenged people cannot access the museums investigated, while accessibility to physically challenged people is not beyond the ground floor of the museum. This is in contrast with the recommendations regarding the features of access and exit points of public buildings as previously highlighted [see 25 and 26].

Regarding the usability of the museums and their facilities, the literature reviewed indicates that universal usability aims at designing environments and products that can be used by both able-bodied and disabled persons without the need for assistance. Findings of this study reveal that facilities and services provided by the three museums investigated were not designed to benefit the disabled members of the society in terms of the usability of the services within the buildings. For example, none of the three museums investigated provided alternative means of communication like sign language, Braille or tactile signs and warnings to aid people with sensory disabilities. Similarly, the toilet facilities in all the museums do not meet the need of children and disabled persons, and seats were not provided in the exhibition lobbies for the elderly and persons who might need to take some rest while going through the exhibitions. All these are in contrast with the provisions by Connell *et al.* [22] and Copeland [23] and Smithsonian Accessibility guidelines.

CONCLUSION AND RECOMMENDATIONS

This case study is an appraisal of the compliance levels of three museums in southwest Nigeria with the universal design principles related to approachability, accessibility, and usability. Based on the findings, the following conclusions are made. First, the three museums investigated have complied moderately with approachability requirements of universal design principles. Second, in terms of accessibility, all the museums complied poorly with the accessibility requirements for persons with disabilities and children. Third, the facilities and services in the museums were designed with little or no considerations with the usability needs of the disabled persons, the elderly, and children.

The general implication of the findings of this study is that these museums are not really playing their roles in national

developments as identified in the literature [see 34 and 35]. This is because they are not approachable, accessible, and useable by all segments of the society. In view of this, the following recommendations are made. The first recommendation is that to address the inadequacies identified, the existing museum buildings and their surroundings in the study area should be retrofitted with features and building services that enhance their compliance level with the accessibility and usability requirements of universal design. Therefore, architects and building services engineers must play their professional roles in achieving this, and by so doing ensure that these museums become accessible and useable by all categories of people in the Nigerian society.

The second recommendation is that government should collaborate with the private sector in improving the quality of access roads to museums by making them accessible to pedestrian and vehicular traffic. This can be achieved by rehabilitating such roads with the introduction of pedestrian walkways, bicycle lanes and bus stop or bus lay bye very close to the location of the museums. In addition, new museum buildings and facilities should be designed and constructed in such a way that they comply fully with the approachability, accessibility, and usability requirements of universal design. This calls for legislative actions that would compel designers and developers of such facilities to comply with universal design requirements in line with global best practices.

The last recommendation is that the study recognizes the advancements in universal design, which have been made possible through information and communication technologies (ICTs); and thus, owners and operators of public museums in Nigeria are advised to take advantage of the current digital age in achieving an inclusive museum environment. In doing this, it is expected that the museums in Nigeria would expand their potential market, promote social inclusion, foster accessible tourism, and improve their social significance and economic viability.

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