

Evaluation of Universal Design Compliance at the Main Entrance of Selected Public Buildings in Covenant University, Ota, Ogun State, Nigeria

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Abstract— Provision of easy access to public facilities and environments for everyone is crucial in the development of a sustainable community. However, it is observed nationwide that public buildings and environments are not easily accessible to people with disabilities largely due to a combination of design inadequacies. It is against this backdrop that this study evaluated the compliance of the main entrance of selected public buildings in Covenant University in Ota, Ogun State, Nigeria to universal design, with a view to improve access for people with mobility impaired disabilities. The study adopted a mixed method research approach and collected data using observation guide. Data were analyzed by content analysis and presented by descriptive approaching tables and percentages. Result showed that majority of the main entrances of the public buildings evaluated were not fully universal design compliant, thus making accessibility for people with disabilities difficult. The study recommends that the university should make appropriate efforts to ensure non-discrimination on the basis of disability in providing access to facilities, buildings and environment as the institution matches towards achieving her vision of becoming one of the top ten Universities by 2022. The outcome of the study will be useful to researchers, policy makers and building industry professionals on issues relating to universal design concept in the built environment.

Keywords— *Accessibility; People With Disabilities; Public Buildings; Universal Design; Nigeria.*

I. INTRODUCTION

The provision of adequate accessibility features for everyone to effectively use public facilities and environments is crucial in the development of a sustainable community. However it has been observed that in many communities public facilities, services and environments are not easily accessible to people with disabilities. Studies have revealed that people with disabilities are usually marginalized through inaccessible facilities, services and physical infrastructures [1], [2], [3], [4] and [5]. Such anomaly is what has brought about disability laws in many countries, aimed at integrating people with disabilities back into the main stream of social, political and economic life.

Apart from disability laws, accessibility design standards and concepts have also been developed over the years to help provide equal opportunities for people with disabilities alongside people without disabilities. Notably among these concepts is Universal Design (UD), “a concept from the field of Architecture” [6] that seeks to produce products, buildings and environments that are accessible and usable by everyone on equal terms. Universal design is an approach to make products and the built environment usable by the broadest group of users’ possible. It is an all-inclusive design concept anchored by seven principles developed by The Center for Universal Design in North Carolina State University in the United States of America. These principles include: equitable use; flexibility in use; simple and intuitive use; perceptible information; tolerance for error; low physical effort; and size and space for approach use [7], [8] and [9]. [10] posited that universal design principles can be used to evaluate buildings for clarity and ease of movement to safety during times of emergencies. He added that it is a useful tool for evaluating and designing buildings to better support the emergency evacuation needs of individuals with disabilities. [11] posited that the principles could be regarded as one component of a quality-assurance process of functionality, from the start of the project to the final result.

Covenant University in Ota, Ogun State, Nigeria is one of the leading higher institutions in Nigeria. According to the latest Webometrics ranking web of universities in the World of January 2016, Covenant University is ranked as the Best Private University and Second Best University in Nigeria [12]. One of the University’s goals is to be one of the top ten universities in the world by the year 2022. In attaining this goal, it is imperative that the university’s buildings, facilities and environment are of world class standard. This implies that its facilities and built environment should be of international standard, easily accessible and effectively usable by everyone on equal terms, in line with the globally accepted principle of universal design.

It is against this backdrop that this study evaluated the compliance of the main entrance of some purposively selected

public buildings in Covenant University to the universal design principles. This is done with a view to improve access in the institution, in order to properly situate the university's buildings in the best position to align with her vision of being one of the top ten higher institutions in the world by 2022. The scope of this study is limited to the main entrance of the following purposively selected public buildings: Senate; College of Science and Technology; Library; Chapel; and Cafeteria-2.

II. LITERATURE REVIEW

The term "universal design" was first used by a USA designer and architect, Ronald L. Mace in the mid-1980's to describe the concept of designing all products, buildings and the environment to be aesthetic and usable to the greatest extent possible by everyone, regardless of their age, ability or status in life. Mace was a wheelchair user who challenged the conventional way of designing products and the built environment for the average user group and laid the foundation for an all-inclusive approach that targets everyone.

The emergence of universal design in architecture and design fields did not occur in isolation. [13]reported that the concept had its beginnings in demographic, legislative, economic, and social changes among older adults and people with disabilities throughout the 20th century. [14]also noted that universal design emerged from slightly earlier barrier-free concepts, the broader accessibility movement, adaptive and assistive technology and also seeks to blend aesthetics into these core considerations.

The Center for Excellence in Universal Design defined 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" [15]. The aim of universal design is to develop theory, principles and solutions to enable everybody to use the same physical solutions to the greatest extent possible, whether they are buildings, outdoor areas, means of communication or household goods. Its objectives include: to integrate core principles of universal design to improve livability and quality of life for everyone; to reduce physical and attitudinal barriers between people with and without disabilities; to make provisions that will enable people with disabilities to participate fully in social life on equal terms with people without disabilities; and to make simple every part of our daily activities by providing a usable community to everyone by producing buildings, products and environments that are inherently accessible to children, older people, people without disabilities, people with disabilities and people with special needs. The concept targets all people of all ages, sizes and abilities.

The planning through the implementation of ergonomics while at the same time considering the unique requirements of the various people living with disabilities such as children and the elderly, is also referred to as universal design [16] and [17]. The authors argued that universal design is a useful tool for evaluating and designing buildings to better support the emergency evacuation needs of individuals with disabilities. [17]submitted that the understanding of the average males and females' human forms in the relationship with their built environment is known as ergonomics. Particularly, it is viewed

as the number of open space required for people to perfectly achieve their responsibilities. Traditionally, the philosophies of ergonomics were built by the military with the aim of manufacturing better and efficient weapons. These philosophies were crafted for able bodied people. Though, when these philosophies were implemented to industrial commodities, they appeared to be perfect for the minority [16].

The definition of universal design by The Center for Universal Design in North Carolina State University is accompanied by a set of principles widely acknowledged as the seven (7) principles of universal design. These principles are: 1. *Equitable use* (the design is useful and marketable to people with diverse abilities); 2. *Flexibility in use* (the design accommodates a wide range of individual preferences and abilities); 3. *Simple and intuitive use* (use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level); 4. *Perceptible information*(the design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities); 5. *Tolerance for error* (the design minimizes hazards and the adverse consequences of accidental or unintended actions); 6. *Low physical effort* (the design can be used efficiently and comfortably and with a minimum of fatigue); and 7. *Size and space for approach and use*(appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility) [7], [8], [9].

Based on the definition of universal design and its seven principles, The Center for Universal Design also sets up five instructive points relevant for architecture and the design process. These points include: the building should be of equitable use and accessible for everybody; the building and its design should be easy to understand and to use by all people; the design of the building should demand low physical effort, and be used efficiently and with a minimum of fatigue; the whole building or project should be designed for use by all people, regardless of users' body size, posture or mobility; and the building's use of materials and the indoor climate should not lead to uncomfortable conditions.

The principles of universal design can feed into the planning, design and construction processes to support quality of life. The principles are useful for guiding and influencing the design process, influence and acknowledge the signaling of more usable products and environments, and to evaluate existing Architecture. The principles are broader than those of accessible and barrier-free designs.

III. METHODOLOGY

A case study research method was adopted in collecting data from five (5) purposively selected institutional buildings in Covenant University in Ota, Ogun State, Nigeria for the research. The selected buildings were appraised based on their degree of compliance to the seven principles of universal design. Result was reported using descriptive statistics with the aid of tables and percentages.

IV. FINDINGS AND DISCUSSIONS

Accessible buildings and environments guidelines require that adequate provisions be made for people with disabilities to gain easy access to use buildings right from the site boundary and car parks. To this end, car parking spaces and pedestrian walkways leading to the main entrance of the selected public buildings for this study were also evaluated. Other accessibility features influencing mobility at the main entrance of the public buildings identified and evaluated by this study include: entrance porch, entrance steps, entrance ramps, floor finishes and entrance doors.

Tables I to VII show a breakdown of how the seven accessibility features identified comply with the Seven Principles of Universal Design. In each of the Tables, "Yes" indicates compliance of the accessibility features with the Universal Design Principles the table represents, "No" signifies none compliance and "-" indicates accessibility features not provided for.

TABLE I. MAIN ENTRANCE ACCESSIBILITY FEATURES DEGREE OF COMPLIANCE WITH UNIVERSAL DESIGN PRINCIPLE ONE – EQUITABLE USE

No	Accessibility Features	Senate	CST	Library	Chapel	Cafeteria-2
1.	Parking	No	No	No	No	No
2.	Pedestrian Walkway	-	No	No	No	No
3.	Entrance Porch	Yes	Yes	Yes	Yes	Yes
4.	Entrance steps	Yes	Yes	Yes	Yes	Yes
5.	Entrance Ramps	No	-	No	-	-
6.	Floor Finishes	Yes	Yes	Yes	Yes	Yes
7.	Entrance Doors	Yes	Yes	Yes	Yes	Yes
	% of Compliance to UD Principle One	4/7 57%	4/7 57%	4/7 57%	4/7 57%	4/7 57%

Table I indicates that all the buildings' main entrance accessibility features have an above average compliance rate of 57% with UD Principle One, as each of the buildings having five out of the seven features complying with UD Principle One.

TABLE II. MAIN ENTRANCE ACCESSIBILITY FEATURES DEGREE OF COMPLIANCE WITH UNIVERSAL DESIGN PRINCIPLE TWO – FLEXIBILITY IN USE

No	Accessibility Features	Senate	CST	Library	Chapel	Cafeteria-2
1.	Parking	No	No	No	No	No
2.	Pedestrian Walkway	-	No	No	No	No
3.	Entrance Porch	Yes	Yes	Yes	Yes	Yes
4.	Entrance steps	Yes	Yes	No	No	Yes
5.	Entrance Ramps	No	-	Yes	-	-
6.	Floor Finishes	No	Yes	Yes	No	Yes
7.	Entrance Doors	Yes	Yes	Yes	Yes	No
	% of Compliance to UD Principle Two	3/7 43%	4/7 57%	4/7 57%	2/7 29%	3/7 43%

Table II indicates that the Senate, Chapel and Library

buildings' main entrance accessibility features compliance rate to UD Principle Two are below average. The Chapel building has the least compliance rate of 29% with only two out of the seven features complying with UD Principle Two. The Senate and Cafeteria-2 buildings both have three out of the seven features complying with UD Principle Two, which represents 43% compliance rate. The CST and Library buildings with four out of the seven features complying with UD Principle Two have the highest compliance rate of 57% each, which is above average.

TABLE III. MAIN ENTRANCE ACCESSIBILITY FEATURES DEGREE OF COMPLIANCE WITH UNIVERSAL DESIGN PRINCIPLE THREE – SIMPLE AND INTUITIVE USE

No	Accessibility Features	Senate	CST	Library	Chapel	Cafeteria-2
1.	Parking	Yes	Yes	Yes	Yes	Yes
2.	Pedestrian Walkway	-	Yes	Yes	Yes	Yes
3.	Entrance Porch	Yes	Yes	Yes	Yes	Yes
4.	Entrance steps	Yes	Yes	Yes	Yes	Yes
5.	Entrance Ramps	Yes	-	Yes	-	-
6.	Floor Finishes	Yes	Yes	Yes	Yes	Yes
7.	Entrance Doors	Yes	Yes	Yes	Yes	Yes
	% of Compliance to UD Principle Three	6/7 86%	6/7 86%	7/7 100%	6/7 86%	6/7 86%

Table III indicates that the compliance rates of the main entrance accessibility features of all the buildings with UD Principle Three are high. The Library has the highest compliance rate of 100% with all its seven features complying with UD Principle Three. While all the other buildings have six of the seven features complying with UD Principle Three, representing 86% compliance rate.

TABLE IV. MAIN ENTRANCE ACCESSIBILITY FEATURES DEGREE OF COMPLIANCE WITH UNIVERSAL DESIGN PRINCIPLE FOUR – PERCEPTIBLE INFORMATION

No	Accessibility Features	Senate	CST	Library	Chapel	Cafeteria-2
1.	Parking	Yes	Yes	Yes	Yes	Yes
2.	Pedestrian Walkway	-	Yes	Yes	Yes	Yes
3.	Entrance Porch	Yes	Yes	Yes	Yes	Yes
4.	Entrance steps	Yes	Yes	Yes	Yes	Yes
5.	Entrance Ramps	Yes	-	Yes	-	-
6.	Floor Finishes	Yes	Yes	Yes	Yes	Yes
7.	Entrance Doors	Yes	Yes	Yes	Yes	Yes
	% of Compliance to UD Principle Four	6/7 86%	6/7 86%	7/7 100%	6/7 86%	6/7 86%

Table IV above indicates that the compliance rates of the main entrance accessibility features of all the buildings with UD Principle Four are also high. Again, the Library has the

highest compliance rate of 100% with all its seven features complying with UD Principle Four, while all the other buildings have six out of the seven features complying with UD Principle Four, representing 86% compliance rate.

TABLE V. MAIN ENTRANCE ACCESSIBILITY FEATURES DEGREE OF COMPLIANCE WITH UNIVERSAL DESIGN PRINCIPLE FIVE – TOLERANCE FOR ERROR

No	Accessibility Features	Senate	CST	Library	Chapel	Cafeteria-2
1.	Parking	Yes	Yes	Yes	Yes	Yes
2.	Pedestrian Walkway	-	No	Yes	Yes	Yes
3.	Entrance Porch	Yes	Yes	Yes	Yes	Yes
4.	Entrance steps	Yes	Yes	No	No	Yes
5.	Entrance Ramps	No	-	Yes	-	-
6.	Floor Finishes	No	Yes	No	Yes	Yes
7.	Entrance Doors	Yes	Yes	Yes	Yes	No
	% of Compliance to UD Principle 5	4/7 57%	5/7 71%	5/7 71%	5/7 71%	5/7 71%

Table V above indicates that all the buildings main entrance accessibility features compliance rate to UD Principle Five is above average. Apart from the Senate building that has four out of the seven features complying with UD Principle Five, representing 57% compliance rate, all the other buildings have five out of the seven features complying with UD Principle Five, representing 71% compliance rate.

TABLE VI. MAIN ENTRANCE ACCESSIBILITY FEATURES DEGREE OF COMPLIANCE WITH UNIVERSAL DESIGN PRINCIPLE SIX – LOW PHYSICAL EFFORT

No	Accessibility Features	Senate	CST	Library	Chapel	Cafeteria-2
1.	Parking	Yes	Yes	Yes	Yes	Yes
2.	Pedestrian Walkway	-	Yes	Yes	Yes	Yes
3.	Entrance Porch	Yes	Yes	Yes	Yes	Yes
4.	Entrance steps	Yes	Yes	Yes	Yes	Yes
5.	Entrance Ramps	Yes	-	Yes	-	-
6.	Floor Finishes	Yes	Yes	Yes	Yes	Yes
7.	Entrance Doors	Yes	Yes	Yes	Yes	No
	% of Compliance to UD Principle Six	6/7 86%	6/7 86%	7/7 100%	6/7 86%	5/7 71%

Table VI above indicates that the compliance rates of the main entrance accessibility features of all the buildings to UD Principle Six are also high. Again, the Library has the highest compliance rate of 100% with all its seven features complying with UD Principle Six. The Senate, CST and Chapel buildings have 86% compliance rate each, with six out of the seven features complying with UD Principle Six, while Cafeteria-2 has the least compliance rate of 71%, with five out of the seven features complying with UD Principle Six.

TABLE VII. MAIN ENTRANCE ACCESSIBILITY FEATURES DEGREE OF COMPLIANCE WITH UNIVERSAL DESIGN PRINCIPLE SEVEN – SIZE AND SPACE FOR APPROACH AND USE

No	Accessibility Features	Senate	CST	Library	Chapel	Cafeteria-2
1.	Parking	Yes	Yes	Yes	Yes	Yes
2.	Pedestrian Walkway	-	Yes	Yes	Yes	Yes
3.	Entrance Porch	Yes	Yes	Yes	Yes	Yes
4.	Entrance steps	Yes	Yes	Yes	Yes	Yes
5.	Entrance Ramps	No	-	Yes	-	-
6.	Floor Finishes	Yes	Yes	Yes	Yes	Yes
7.	Entrance Doors	Yes	Yes	Yes	Yes	Yes
	% of Compliance to UD Principle Seven	5/7 71%	6/7 86%	7/7 100%	6/7 86%	6/7 86%

Table VII indicates that the compliance rates of the main entrance accessibility features of all the buildings to UD Principle Seven are also high. Again, the Library has the highest compliance rate of 100% with all its seven features complying with UD Principle Seven. The CST, Chapel and Cafeteria-2 buildings have 86% compliance rate each, with six out of the seven features complying with UD Principle Seven, while the Senate building has the least compliance rate of 71%, with five out of the seven features complying with UD Principle Seven.

V. CONCLUSION AND RECOMMENDATIONS

This study identifies seven important accessibility features that affect users' mobility from the main entrance of a public building. The features include: parking; pedestrian walkways; entrance porch; steps; ramps; floor finishes; and entrance doors. The study also revealed that none of the case study buildings' main entrances is fully universally designed. The result of the research is consistent with other studies that have found that the built environment is generally inaccessible to the physically challenged. This negates the focal point of universal design, which is to produce buildings and the environment that are accessible and usable to everyone on equal terms.

The study recommends that the University should begin to make efforts to ensure nondiscrimination on the basis of disability in providing access to use facilities, buildings and environment in the institution. Efforts should be made to renovate accessibility features in the university to make them all-inclusive in nature. Among the important findings from this study is that appropriately introducing dropped kerbs, ramps, handrails, non-slippery floor finishes and beveled door thresholds where necessary, will be a starting point towards fully implementing the concept of universal design in the built environment of the university.

Other recommendations include conducting training workshops for projects supervision/monitoring teams and workers on universal design, formulating guidelines to implementing universal design principles and criteria in all future projects of the university and ensure strict compliance to the guidelines. Relevant departments of the university should also incorporate universal design in their curriculums. This will help to ensure that future designers and builders of

the built environment are trained and grounded in the universal design concept. To build a sustainable learning environment, it is imperative that all hands should be on deck to ensure that facilities, buildings and environment are produced with features that make them easily accessible for use by everyone on equal terms, in line with the universal design concept.

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