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Centre for Nigerian Architecture – Lighting and Ventilation, Iganmu, Lagos

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ABSTRACT

Center for Nigerian architecture is a museum dedicated to educating visitors about architecture of Nigeria in general or with a focus on a specific architectural style. They are often chartered with the principle of advancing public education on how design can positively impact the human environment. This thesis explores and exposes on what an architectural museum is and aim to do with the understanding that knowledge of architecture varies between architects and the public (users). The museum will create an archive of iconic buildings in Nigeria from different ages and geographical areas. Focusing on lighting as an important factor in museum or gallery design, to create visual experience; modulate and accentuate the visual landscape of works of architecture. Lighting enhances the impact of the models and other works on display alongside ventilation, providing fresh air for visitors and employees, discharging emissions (e.g. carbon dioxide, water vapor, vapors from the furniture) while simultaneously preventing dust infiltration and regulating the humidity. Combination of natural ventilation inform of green architecture alongside HVAC system being infused to achieve the desired indoor environment. Connection of spaces in relations to the number of user per time determines both the circulation style and the dimension adopted. The architectural museum is designed as an inclusive public place for people from all backgrounds to gather and discuss architecture, making it a research and exploratory center of knowledge for architects and better understanding of trends of architecture in the country. Other spaces of interest are designed alongside, spaces like children library, art room, restaurant, shops, conference room and modeling room to create a difference from the conventional museum design.

Keywords – Architectural museum, Circulation, Display, Lighting, Ventilation

CHAPTER ONE

1.0 INTRODUCTION

1.1 BACKGROUND TO THE STUDY

Architecture is peculiar to the environment of study, history of which can be used to categorize the ages and styles. Nigeria architecture was historically influenced by environmental conditions as well as social and cultural factors. Jonathan (2016) grouped Nigerian Architecture into five periods namely Nigerian Ancient Architecture (NAA), Nigerian Traditional Architecture (NTA), Nigerian Colonial Architecture (NCA), Nigerian Modern Architecture (NMA), Nigerian Architecture Today (NAT).

The Nigerian Ancient Architecture (NAA) stands for Ancient era characterized by the prehistoric Nigerian civilization of Nok, the SO of Chad Basin, Prehistoric Yoruba and Igbo. The available information on these Nigerian Ancient Civilizations is from oral traditions and archeological data, some of which are dated back to 1000B.C. This is closely followed by the Nigerian Traditional Architecture (NTA) which stands for the Antiquity periods characterized by the historical native kingdoms and empires with basic distinction made between the North and the South, and this is best pronounced by Traditional Architecture and Traditional Style (Prucnal-Ogunsote, 2015). This then ushered in the Nigerian Colonial Architecture (NCA) that was categorized by the Brazilian and Colonial architectural styles which were introduced by following the British conquest of Lagos. The town grew to become a city with a combination of various people: the indigenous residents of Isale Eko, African returnees from Brazil Trinidad, Cuba who had crossed the Atlantic twice, European merchants and British colonists, and lastly creoles. This style was characterized by the introduction of stuccoes bungalows or storey buildings with arch windows and doorways influenced by the architecture found in Brazil. Between 1860 and 1870, the advent of colonialism led to the construction of structures to host public events and the bureaucracy. The earliest form of Colonial architecture present in Lagos was the mission houses housing missionaries that were built from timber and pre-fabricated materials imported from England. A planned effort by the governments in Lagos and the regions to introduce tall and modern buildings began to emerge in the years after the end of World War II (1950s and 1960s). At the same time, European architects working in West Africa began to think of innovative ways to create modern designs that takes into consideration the tropical climate. This classification is very similar to Pruscal-Ogunsote's (2001) as both of

them concur on traditional architectural style. Pruscal-Ogunsote (2001) also classified Nigerian architecture into historical, traditional and modern styles. The historical style is represented by the European, Brazilian and North African trends. The traditional architecture manifests in 'cone upon cylinder' (thatch roof placed on mud wall). And the modern style includes the international style, the new West African style and the post- modern movement. She noted a very weak link between the historical style cum traditional architecture and their contemporary counterparts in Nigeria. However, Jonathan (2016) splits Pruscal-Ogunsote's 'historical style into ancient and colonial versions. Similarly, he separated contemporary from modern Nigerian architecture. These blends which when mastered by the people would, according to Langley (1976) became the foundations for vernacular architecture being an architecture specific to a country and a people. The traditional architecture covers different ethnics' architecture and their styles of building were highly influenced by their culture, materials availability and climate. These was governed by the first stage of penetration of foreigners in the middle ages as Islamic/Arab cultural penetration from the North and the Europeans penetrations from the South by way of slave trading and much later by Christianity thereby ending the foundation of the original undiluted native kingdom civilizations. The quest to bring together the architecture of the different ages for educational and recreational purpose gave birth to the architectural museum.

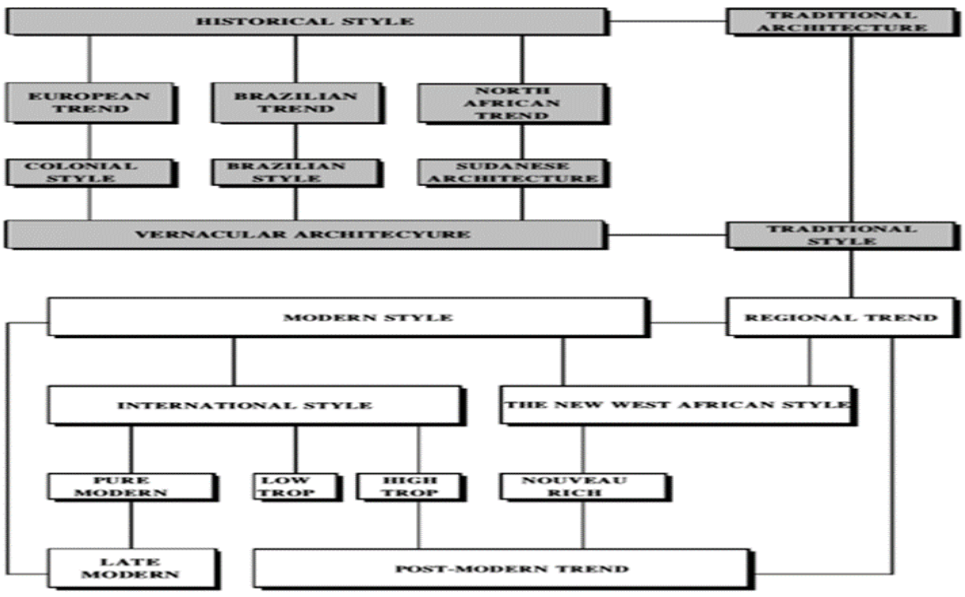

Figure 1 Evolution of Nigeria Architecture

Center for Nigerian architecture is henceforth meant to exhibits the architecture marvels of the past, accomplishment of the present and the vision for the future. The experience will involve weaving of all the three phases of time, a time-line to dive into (past, present and future) which will be translated into architecture. Architectural museum is dedicated to both historic and contemporary work; journeys from certainty to uncertainty which will further get translated into the architecture of exhibition spaces, site planning and the building form. However, today museums are known to be pursuing both informative and recreational roles (Bitgood, el.at 2002), they are being conceptualized in terms of the way they communicate and their relationships to the public (Reussner, el .al 2003).

As for displays and exhibitions, architecture museum displays exhibitions relating the history of architecture of a certain region, such as German Architecture Museum (diachronic) or architectural ages. The resources and holdings of drawings, prints, photographs, and architectural archives offer specialists a wealth of primary and secondary materials for advanced research in the history, theory, and practice of architecture. As a museum, the CCA (Centre Canadien d'Architecture/Canadian Centre for Architecture) interprets its collection for the public through exhibitions and publications that reveal the richness and significance of architectural culture and stimulate awareness of contemporary issues in architecture.

CHAPTER TWO

LITERATURE REVIEW

2.0 INTRODUCTION

The literature study shall comprise of definition and descriptions, history, types and criteria for categorization, basic functions, problems identified with, lessons learned through reviewed literature and conceptual to design.

2.1 DEFINITION AND DESCRIPTION

2.1.1 MUSEUM

"The simple should go there to learn, the wise to remember." (John Ruskin). As an institution, museum is defined formally as "an establishment, open to the public and administered in the public interest, for the purpose of conserving and preserving, studying, interpreting, assembling, and exhibiting to the public for its instruction and enjoyment objects and specimens of educational and cultural value, including artistic, scientific (whether animate or inanimate), historical and technological material" (American Association of Museums, 1994). There is no institution that can trigger memories more professionally and intensely than a museum.

Museum is given different definitions depending on the perspective from which it is observed. Museum is defined as a non-profit, permanent institution in the service of society and its development. A building open to the public which acquires, conserves, researches, communicates and exhibits the tangible and intangible heritage of humanity and its environment for the purposes of education, study and enjoyment (ICOM, 2016). Museum preserves the past, define the present and educate for the future. Museum is also seen as an organization in the service of society and its development, open to the public, which researches, communicates and exhibits things and ideas, for the purposes of education, study and enjoyment. (Mark Walhimer, 2011).

There's a debate about whether the cultural sector should reflect the world or proactively change the world. Of course, it's not easy to do the latter, but cultural organisations have ability and a responsibility to communicate, and to help people understand a new, more sustainable

narrative. Museums can add weight to an issue. Museums are also in the unique position of being able to help us understand and prepare for the future by looking at the past. Visiting a museum 'feeds the soul' of visitors and inspires creativity. In addition, museums are not simply places to which visitors go to look at exhibits; they are a co-created experience, like attending a football match. The combination of being able to both inspire people and enable social interaction means museums are extremely well placed to utilize crowdsourcing. (Christopher Barnatt, 2014). 'There is nothing permanent except change. In July 2013, the UK Museums Association (MA) published its vision document, Museums Change Lives. Amongst its proposed actions for increasing the social impact of museums, are calls to 'reflect', 'listen', 'involve', 'research', 'innovate', 'celebrate', 'seek out and connect with suitable partners', and 'encourage wider participation'.

2.1.2 SIGNIFICANCE OF MUSEUMS

The importance of a museum is more than educational, cultural or merely housing collections of curious objects. They play unique and significant parts to human existence. Among its significant are:-

a) They are places of instruction for the general public about the legacy of the past, the common narrative memory and history of peoples.
b) The expenditure of the world is stored up there as no thoughtful person should leave its door without gaining something from a visit.
c) It is a picture book of the history of man and for study as it enlarge one's comprehension of what man has done and what man can do.
d) The universe of man like the universe of nature extends its boundary daily before our eyes and it is in our museum that the story is displaced for the visitors to come.
e) Museums stimulate curiosity, the gratification of which increases knowledge.
f) The collections are of enormous values as they exhibit the technological and cultural evolutional patterns and human's interaction with the environment as we can understand from the techniques of production, decoration and composition of the collections and the spatial distribution of the acquired resources.
g) Museums provide recreational intellectual and aesthetic enjoyment.

h) The education survey of a museum is not merely passive but active.
i) Museum provides opportunities for visual instructions which are more impressive and lasting than oral instruction.
j) At its deepest level a museum is a collective memory bank of human achievement through a collection of objects.
k) Either virtual or physical, museum consist of many layers that generate knowledge. It is opposed to schools or universities as it does not have a set curriculum, do not require attendance, do not have a continuous system for evaluation and are usually open to a very wide range of age groups.
l) They offer a fun experience to the people, unlike in schools where a student is at a constant strain to cram in and learn new things.
m) They have social and economic symbols that spark a great deal of interest to the public given that it is established in a highly urbanized area where trade and commerce is at its zenith.

Robert Gretton (1966) further iterated more significant of museum as a place to stimulate wonder and imagination, to pause and answer questions. A place that offers manifold exciting and enriching experiences of mind and spirit. It helps us to understand ourselves and our time and to shape die patterns of our future by explaining our past and die natural world around us. It opens horizons and challenges the constructive imagination.

2.1.3 CENTER FOR NIGERIAN ARCHITECTURE

Architecture is the art and science of designing buildings and other physical structures. A wider definition often includes the design of the total built environment from the macro level of town planning, urban design and landscape architecture to the micro level of construction details. It is the process and the product of planning, designing, and constructing buildings or any other structures. Architectural works, in the material form of buildings, are often perceived as cultural symbols and as works of art awing on the widened scope of analytical possibilities represented by contemporary sociological analyses of architecture and the built environment.

An architecture museum is a museum dedicated to educating visitors about architecture in general or with a focus on a specific architectural style. They are often chartered with the

principle of advancing public education on how design can positively impact the human environment. It is meant to connect the society to architecture on a level that bridges the gap between the understanding of the architecture between the architects and their victims (referred to anyone getting affected by any piece of architecture). Architectural museum is closely related to the urban context, together with its functional spaces, and meant to survive the dialogue with architecture, its users, museum visitors and museum staff. The goal of center of Nigerian architecture is to promote the production of 'new documents' by means of the active involvement of architects, architectural students, historians, theorists and critics. So does architectural exhibition, as it does not only makes architectural documents visible and understandable, it also treats them as museological objects identified, collected and preserved, but also creates and completes them to construct an archive for the promotion of architectural knowledge. In other words, architectural knowledge will be obtained by the actual making of documents and documentation. This critical act is conceived as a process, rather than an end product. John Locke, an English philosopher, used the term tabula rasa to shaped thoughts on Modern Architecture as refreshing design principles and rejecting historical mind, this is the main purpose of an architectural museum.

Architectural needs of museums are not universal, but peculiar to each institution. To speak of these needs in general terms, and attempt to formulate recommendations applicable in common to the wants of all, would therefore be both presumptuous and illogical. Museum illustrates the evolution of architecture and an accelerated transformation of trends in architecture, which can run either in parallel or in counteractive directions, but most frequently, in complete opposition to each other.

Exhibits and reserves are the two main groupings of museum material for which housing plans are required. The spatial requirements of different types of museums vary according to the subjects and themes of display and the related activities and programs they envisage based on or/and related to them. By interacting with a display, each visitor reaches different outcomes. By sharing these with others, the learners expand each other's learning experience. The more you enlarge your individual archive, the better memory you have to associate the knowledge garnered from the museum.

The Museum of Traditional Nigerian Architecture (MOTNA), located adjacent to the National Museum Jos, Jos Nigeria can be described as an example of an architectural museum on a small scale. It features life-size replicas of a variety of Nigerian buildings and architectural landmarks, from the walls of Kano and the mosque at Zaria to a Tiv village. In addition, articles of interest from colonial times relating to the railway network and tin mining are on display.

2.2 HISTORY OF BUILDING TYPOLOGY

2.2.1 HISTORY OF MUSEUM

Museums have a long and varied history, springing from what may be an innate human desire to collect and interpret and having discernible origins in large collections built up by individuals and groups before the modern era. They were initially established in structures constructed for other purposes such as residential, social and religious places such as palaces, forts, churches etc. This is because of the reason that museums came into existence out of enthusiasm to collect and display objects by the eminent citizens of the community let they be nobles, gentry, elite, enlightened, explorers, prosperous merchants or traders; by various means and by spiritual leaders or heads of different sects, faiths, beliefs or pantheons who used to receive them through gifts and votive offerings made by the devotees or followers to religious places. Some of the present world famous museums are a testimony to that fact. The word museum has classical origins. In its Greek form, MOUSEION, it meant “SEAT OF THE MUSES” and designated a philosophical institution or a place of contemplation (Woodhead and Stansfield, 1994). The use of the Latin derivation, museum, appears to have been restricted in Roman times mainly to places of philosophical discussion. Thus, the great Museum at Alexandria, founded by Ptolemy I Soter early in the 3rd century BCE, with its college of scholars and its famous library, was more a prototype university than an institution to preserve and interpret material aspects of one’s heritage. The word museum was revived in 15th-century Europe to describe the collection of Lorenzo de’ Medici in Florence, but the term conveyed the concept of comprehensiveness rather than denoting a building. After the destruction of Alexandrian Museum nothing was known for long of any attempt at establishing an institution like it anywhere else. The oldest surviving museum on a sound basis is the Ashmolean Oxford. Apart from this the great and typical museum was established in the year 1753. Much later the Fitz William Museum of Art and Archaeology was established at Cambridge and it is now a

department of the Cambridge University. In Europe towards the latter part of 16th century and beginning of 17th century, the collection of amusement led to the actual beginnings of some of the great museums of today. Museum therefore is not a modern innovation.

Though they do not follow the definitions already cited above, Plato's Academy in the fourth century BC and Aristotle's Lyceum are considered as forerunners to modern museums (Ripley, 1970). Both were places of higher learning, where scholars conducted and published research, held lectures and taught students. The Library of Alexandria established by Ptolemy the First in 332 BC also met many of the same criteria, and has in the past been termed "by far the most important museum of antiquity" (Murray, 1904). Apart from their considerable document and book archives, however, these early institutions did not have at their core a collection in the sense of McLean's (2014). Museums were a product of the Renaissance, a product of an aristocratic and hierarchical society which believed that art and scholarship were for a closed circle (1977).

Amongst historians, the British Museum is viewed as the world‘s oldest. It has one of the largest and most significant collections. In 1753, the English scholar Sir Hans Sloane bequeathed his comprehensive collection of antiquities, fossils, stones and coins to the State. The parliament decided to make the collection accessible to the public and to gradually expand it. And the British Museum came to being. The Egyptian Museum in Cairo is considered the world‘s largest and mother of all museums. In 1835, the Egyptian government founded the Service des antiquities de l‘Egypte to prevent further looting of archaeological treasures by both native and foreign treasure hunters. Thus, emerged the first collection of Egyptian works of art collected by the Egyptian government.

2.2.2 CENTER FOR ARCHITECTURE

Architectural materials have been collected since at least the early thirteenth century. (Phyllis Lambert, 2000). The Centre Canadien d'Architecture/Canadian Centre for Architecture CCA was founded in 1979 as a study center and museum devoted to the art of architecture past and present of the social and natural environment having in a public concern that, architectural research has a profound cultural influence, and that scholars have a social responsibility of the

highest order. In this, the CCA provides one among several contemporary models of a museum of architecture, quite distinct from either the museum of art or the academic research center, although both institutions inform its overlapping agendas. Indeed, the terms "study center" and "museum" attach selectivity to the collection. As a study center, acquisitions are directed to works that have advanced thought about the nature of the built world and that will therefore engage significant research. The resources of the library and the holdings of drawings, prints, photographs, and architectural archives offer specialists a wealth of primary and secondary material for advanced research in the history, theory, and practice of architecture. The Centre Canadien d'Architecture/Canadian Centre for Architecture (CCA) opened in 1989. Looking forward to the next decade, Adolf K. Placzek was prescient in underscoring the interconnectedness of an architecture museum's collection in a broader institutional. As a museum, the CCA interprets its collection for the public through exhibitions and publications that reveal the richness and significance of architectural culture and stimulate awareness of contemporary issues in architecture. The membership has since grown to nearly 100 members, including museums, archives, and collections housed in larger institutions such as libraries.

M. Senthil (2001) states that though museums are of different types which are majorly based on collection for displays, they could further be categorized based on owners or operators namely:-

- ✓ Federal Government
- ✓ State Government
- ✓ University
- ✓ Non-governmental organization
- ✓ Private individuals

Center for Nigerian architecture can hence be categorized under art museum as it displays visual art objects as photography, illustrations, drawing and models. This categorization is unique to the display because it centers round architecture and not general art as the case may be. Architecture which is the science and art of building also has a part in science representation.

2.3 BASIC FUNCTIONS, SPACES RELATIONSHIP COMMON IN MUSEUM

In the design of museum of any type, the general function cut across bar as museums came into existence out of enthusiasm to collect and display objects, the type of museum hence go along with type of materials that is displayed. Some of the present world famous museums are a testimony to that fact (Coleman, 1950). In all museums, design lighting, display, ventilation and circulations are key considerations to a good and functional design with the spaces categorized into public, semi-public and the private areas.

2.3.1 LIGHTING IN MUSEUM

Light defines a space within a building's design. The role of light is an essential part of creating an atmosphere prime for discovery, while also preserving artifacts (Hunt, Elizabeth. 2009). It is vital for spatial impression and enjoyment of art. Good representation of objects is crippling without illumination. So, lighting system is the most essential installation for display of museum collections. "The main aim of museum lighting is to highlight the object or to signify a part thereof (Singh, A. P, 1987). It enables visitors to see objects, experience new sights and react to the surrounding environment. Light controls the behavior of people, casts darkness and brightness to spaces so as to reveal rhythmic changes in the physical shape of building and also affects the psychology of people by giving a sentimental side to architecture" (Kim C. S, 2014). Lighting also draws attention to tripping hazards and reduces the risk of accidents.

Only in the right lighting can museum staff work effectively (Good Lighting for Museums, Galleries and Exhibitions). While the visitors move around, the light delivers various spatial expressions to them by the change of the light, and it helps them to experience the aesthetic and artistic values of the building. The light helps the visitors to experience the building in the sentimental and psychological manners by organizing spaces with the shadow (Kim C. S, 2014). Lighting plays a vital role in guiding visitors through their museum or gallery experience; the moment a visitor sees the exterior façade, the journey has begun. From creating anticipation on arrival to communicating drama or contemplation within the exhibition space, lighting has a key role to play, It can be used to alter the mood of the exhibition space, draw the eye to stunning artwork and sculptures and subtle play of light and dark can be used to guide the visitor's journey from entrance to exit (Feilo Sylvania, 2015).

The property of the light to illuminate the indoor space of building can be different in accordance with the environmental context of the region that building is located. Such locality of building is the key aspect in making design strategies on how to induce the light to indoor space of building, how to maintain the brightness, and how to make indoor space comfortable. (Kim, C.S. 2014). So, the light enables occupants of building feel cozy and makes indoor space more refined. The design and configuration of exhibition room lighting depends on many planning parameters. Foremost among these is the architecture of the building with which the lighting is required to harmonize. Other factor includes room proportions, interior design, color scheme, available daylight and the nature of the exhibition. The way the ambience is shaped by light and shadow is a matter of fundamental importance. This can be a very difficult balancing act between meeting preservation needs and forming interactive experiences to achieve the goal of the museum. Lighting plays a significant role in developing interaction between humans and museum displays in one defined space as they cannot be properly appreciated without the right type of lighting to accentuate it. Hence, lighting is used to actualize the goal of a museum user by creating an interactive experience for the guests, as well as preserve the condition of displays. Lighting gives different feelings to the same physical space as time changes, and such altered feelings affect the sentiment of people. The space itself is in three-dimensional system. However, the light enables people to experience it in four-dimensional system by embracing the dimension of time when it is joined with the light (Kim, C.S. 2014).

Two types of lighting are typically identified, which are natural and artificial. As much as light being an essential part of creating an atmosphere prime for discovery, preservation of displays are also of paramount importance. Balancing the two requires a lot of understanding of the type of lighting to be used per display and the artifact material in display. A good connection makes the museum to fulfill its purpose as a place to discover, explore and learn. Illumination Engineering Society of North America (IESNA) provide parameters and standards for lighting design in a museum to ensure safety, preserve artifacts, and create an interactive experience for guests of all ages.

Besides protecting the display collections, provision of a safety and comfortable environment for human also has been identified as one of museum primary purpose. To attracts more tourist to visit museum, a healthy, well ventilated interior space within the museum building has been

identified as one of the important element that must been considered and also provide a good working environment among museum staffs. Here, good Indoor Air Quality is an important factor to provide a healthy environment in the museum building. Indoor contaminants due to bad ventilation can cause discomfort and health symptoms to tourist. Whether natural ventilation alone or combinations with artificial is enough for a museum, depends on the number of visitors. However, the use of natural ventilation depends on wind pressure and orientation of the structure which requires openings in the right places with sufficient cross-sections to ensure the required air exchange. Since these are generally not available in the building envelopes like museums due to fire and burglar protection reasons, the natural ventilation will be supported in individual cases by HVAC systems. The application of mechanical ventilation system supposedly provides a healthy and better indoor environment for both collection care and human comfort without affecting one of them.

Types of lighting:-

- ✓ Natural lighting
- ✓ Artificial lighting

NATURAL LIGHTING: -"Natural Light can be used to great effect to dramatize and enliven the design of any building (De Chiara, 690, 2007). Putting daylight into a space provides a connection to the outside world and the fact that it is dynamic helps the visitor to interpret the architecture of the space, feeling more comfortable within it (Feilo Sylvania, 2015). It can be used profitably by the installation of different types of windows in the museum buildings. Side lighting, corner lighting, ribbon lighting, high level side lighting and sky light are the different types of natural lighting. Daylight fluctuates and is often fused in interactive spaces due to cloud cover, season, the time of day and a building's position being factors directly impacting lighting design and how humans experience the space. While daylight adds to the overall ambiance of the space, it can have negative impact on artifacts. Thus, daylight and preservation of artifacts usually conflict and must sometimes compromise for a museum design's sake (Hunt, Elizabeth. 2009).

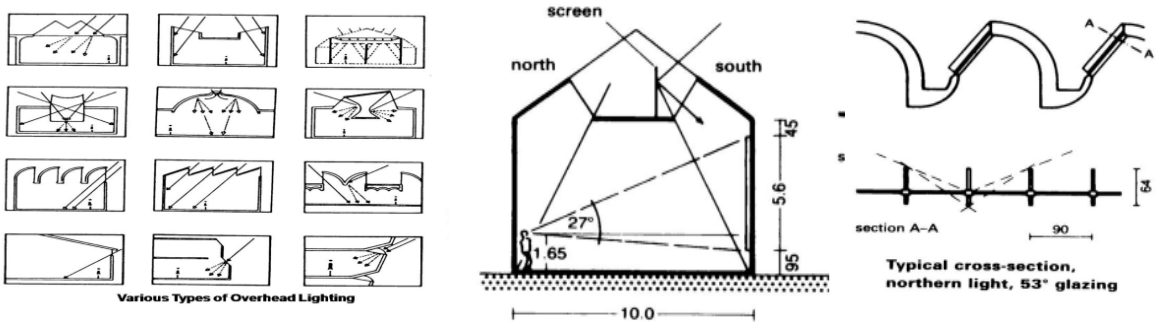

Figure 2 Various types of natural lightings

ARTIFICIAL LIGHTING: - Light, produced by fluorescent tubes and incandescent tungsten filament lamps are known as artificial light. Artificial lighting is focused on two ways namely direct and indirect lighting. For image exhibition, direct lighting is more preferred than the indirect room lighting. Spot light, false skylight, louvered light, trough light, cove light, polarized light are notable as the source of artificial lighting. Several types of artificial light sources are used in interior applications to provide light for visibility, tasks, accent and decoration. Typical interior artificial light sources include incandescent, fluorescent, HID, fiber optics, cold cathode and LEDs. Incandescent lamps are generally used for ambient and accent lighting with track luminaires. In museums, incandescent, fibers optic and HID are the most common light sources. Any efficient and effective lighting design, especially within historic buildings and museums, requires knowledge of light and it's connected physical, optical, colorimetric, photometric, and radiometric aspects in addition to the related energy and environmental sustainability implications. The impact of LEDs for lighting design based on light quality, conservation, and maintenance of works of art is of almost importance. According to IESNA standards for museums, compact fluorescents, tungsten Halogen, HID and PARs are the most common for general lighting.

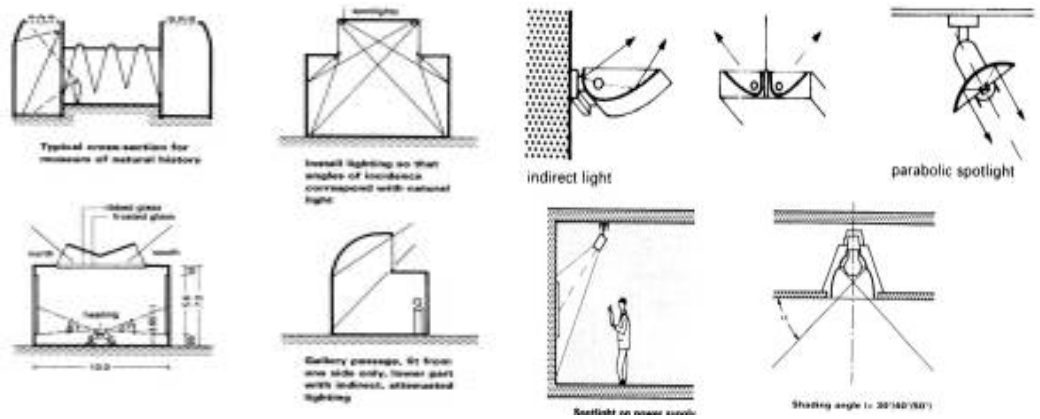

Figure 3 Various types of artificial lightings

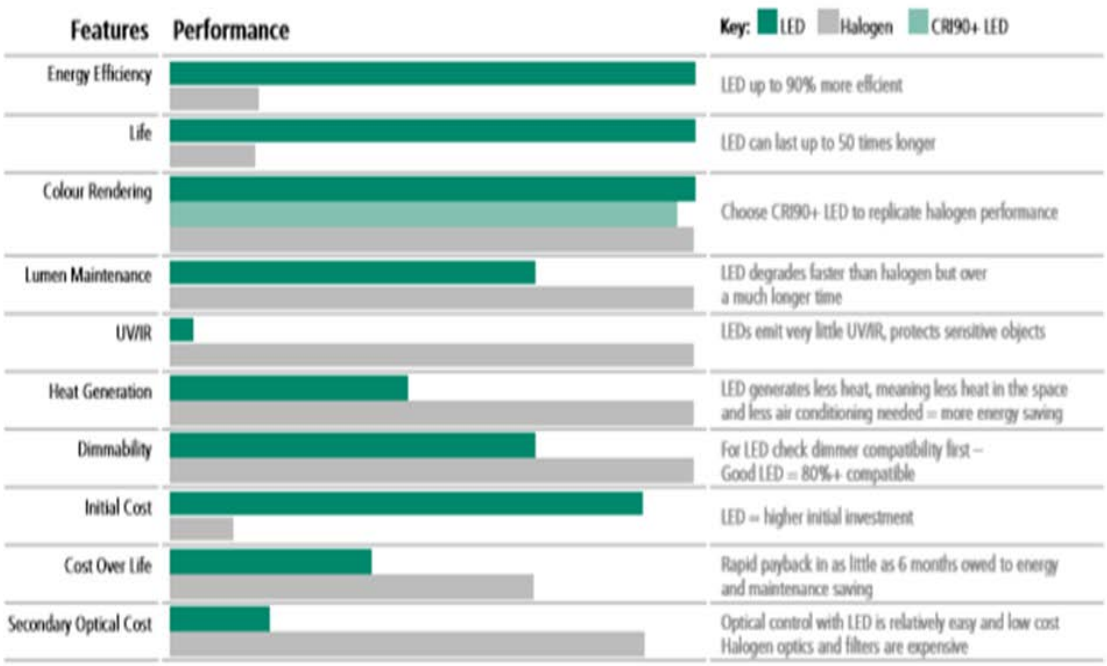

Figure 4 Comparism of Different Lighting Types

2.3.2 VENTILATION IN MUSEUM

Ventilation is the intentional introduction of outdoor air into a space and is mainly used to control indoor air quality by diluting and displacing indoor pollutants; it can be used for purposes of thermal comfort or dehumidification. Air quality is an important factor in the preservation of cultural heritage, especially in museum environment. Temperature and humidity are identified as one of important factors that determine whether the air quality inside

the building is good or poor. In museum, imbalance of temperature and humidity could bring potential risk towards people and collection materials because it could also produce indoor gaseous pollution inside the museum building (Camuffo, 2001). Systematic air quality assessment is a requirement in most heritage conservation plans. The aim of room air conditioning in museums is preservation, the preservation of priceless works of art.

Ventilation systems in any building falls into 3 main categories, either the space is fully natural ventilated, combination of natural and mechanical ventilation or fully mechanically ventilated (Sulaiman, 2011).

NATURAL VENTILATION

Natural ventilation is a vital and extensively used alternative to mechanical ventilation in terms of cost and operational simplicity. People can open or close the windows thus allowing the outdoor air to flow through the space and create a positive thermal sensation. For passively cooled buildings, natural ventilation is the main technique for achieving indoor thermal comfort and the only means for satisfying IAQ requirements (Dounis, 1996). Moreover, provided that the outdoor-air quality is acceptable, natural ventilation, unlike mechanical ventilation, is not a pollution source. A major problem, however, with controlling natural ventilation is the continuously varying environmental condition. Outdoor pollutants can enter a building, especially a naturally ventilated building and pose a risk to collections. In particular, variations of wind velocity might cause continuous changes of the controlled parameter, for example the window opening area. It was found that, the size of windows, the number of windows and the positioning of windows have major impact on IAQ (Sribanurekha et.al. 2010). Natural ventilated buildings have indoor concentrations of pollutants that are nearly equal to the outdoor levels.

Ventilation System	Air Change Rates (ACH)		
	Common Value (ACH)	Assumption of ACH in Museum's Gallery (hr^{-1})	
Natural	10	Natural	10
Mechanical	12 – 15	Split Unit	15
		Fans	12
Mixed - Mode	Depends	Depends on mechanical usage	

Figure 5 Ventilation systems

MECHANICAL VENTILATION

In mechanical ventilation generally, many of heritage buildings loss its passive climate features due to the installing of air conditioning systems, which mean that they will be tightly sealed and heavily modified (Mohd Yusof, M. A. 2014). Adapting mechanical systems to heritage buildings are not an easy task as there is a need for careful planning to be conducted during the early stages of designing the mechanical systems, so that only suitable and appropriate systems are installed (Park, S. C. 2004). As museums are equipped with HVAC systems, it is necessary to provide proper interventions and measures with the aim of monitoring and controlling indoor physical parameters (Costanzo, S.at. el. 2007). However, building with HVAC systems that have gas-phase filtration minimize the infiltration of pollutants, reducing the indoor level to as low as 5% of the outdoor concentration (Grzywacz C.M. 2006).

2.3.3 CIRCULATION IN MUSEUM

The term 'circulation' refers to the movement of people through, around and between buildings and other parts of the built environment (Arthur and Passini, 1992). It is also the space in which people move and have to make decisions to find their way, in other words, the circulation space is the path. Good circulation requires an adequate orientation for proper wayfinding. Wayfinding is mentioned in relation to orientation. Charpman and Grant (2002) describe it as a behavior, as successful wayfinding involves knowing where you are, your destination, knowing and following the best route (or at least a serviceable route) to your destination, being able to recognize your destination upon arrival, and reversing the process to find your way back out. An effective wayfinding system is important so that visitors can move through the museum in an efficient manner and not easily fatigued and concentrate on enjoying their experience rather than spending unnecessary time finding their way. Lack of orientation information causes people to feel disoriented which leads them to an inability to situate themselves within the environment and incapability of having or developing a plan in order to reach their destination. As the result, when people become disoriented, they become deprived of the information where they are and how to get where they need to go, they feel stressed, frustrated, and fatigued both mentally and physically (Passini 1984; Charpman and Grant, 2002). According to the study

which Falk, Koran, Dierking, and Dreblow (1985) conducted, the need of visitors to be guided by wayfinding signs was obvious and concluded that importance of orientation appears in first minutes of a given visit.

Although we may not be conscious of this "our bodies and our movement are in constant dialogue with our building". In essence, how we experience the three dimensionality of a building (perceptual function) is basically through movement of our bodies through time, sequence and space (Linda Hsu, 2004). Museum circulation and galleries provide an environment for social encounters, introducing an aspect of museum visits as collective social experiences. Forming an integral part of any environment organization (Robillard, 1982). Circulation system is informative in the sense that the more understandable a circulation system is, the more understandable the spatial organization of the setting and its architecture are (Arthur and Passini, 1992). There are consistent patterns people use to move through public space with landmarks having the strongest influence on visitor circulation. Inertia influences circulation path (Arthur and Passini, 1992). The manner in which museum architecture and the layout of the exhibitions constrain visitor circulation may determine visitors' patterns of interaction with display objects.

Figure 6 Circulation types

Interaction between spaces and displays follows a path which determines how best tourist enjoys the use of the museum (Ipek Kaynar, 2000). Circulation within a museum space establishes the sequence of its sensed realization as a space is judged by the flow of impression. "The visitor should be led into the museum and through it naturally and easily without feeling that they are in a maze and without being interrupted. There should be continuous controlled circulation, at least each main division of the museum so that [the materials] in each of these

divisions to be seen in an orderly and intelligent sequence. Form and size of [paths] must accommodate the movement of people… Thus, the arrangement and itinerary will be clear not only to anyone looking at the ground plan of the museum, but also to anyone walking through the rooms (Robillard, 1982). Hence, the way in which circulation constraints are structured is the central question of museum design. Circulation behavior is defined in the literature as overall movement patterns of visitors that are the combination of traffic flow and exploratory locomotion (Bitgood, 2002; Klein, 1993; Robillard, 1982). It is therefore discovered that visibility establishes a cordial link between physical design and visitor's movement patterns in a museum. As a general planning "rule of thumb," Circulation Area comprises roughly 25 to 40% of the total Usable Area. Planning for this allotment will better ensure that the programmed Usable Area will represent the space needed to accommodate the future workplace, in most fairly efficient buildings. A visitor's contact and engagement with objects in the museum occur along the path why visitors tend to have a more satisfying experience and acquire more knowledge when they are given information about where to go, what to expect, how long it might take to visit, where to find rest rooms, etc. The manner in which architectural museum and the layout of the exhibitions constrain visitor circulation may determine visitors' patterns of interaction with displayed objects (Ipek Kaynar, 2000).

2.3.4 DISPLAY IN MUSEUM

Display is proper presentation, unique and special method for communicating artifacts to the public (Bhattacharya, Chaya. 1980). The arrangement of objects in space, sculptured by light is the strength of display. Proper display and dissemination are of primary importance to those who come to visit a museum. They are propagated in the inside of museum as well as outside for the need of effective education among the people. The utility of an exhibit, the period when it belongs to, the provenance of the object and object's importance in human culture are the basic factors for implementation of effective display which museum personnel depend on (Bhattacharya, Chaya. 1980). Display must be arranged after considering the need of target audience and designed to fulfill their interest and curiosity. Throughout the visitors' exploration of museum space, the architectural design plays a critical role in facilitating visitors' encounters with the displays, because the museum experience cannot be separated from its physicality (Sirefman, 1999).

Usual types of exhibition include permanent, temporary and travelling or mobile exhibition. Attractive presentation needs the display units, like showcases, diorama, pedestal, charts, visual aids, etc. Generally, display related to icon needs various types of pedestals, showcases, direct and indirect lights and audio-visuals, like T.V. set, slide projectors

Any type of display has the following benefits:-

(1) It can stimulate a huge number of different classes of population for their academic enhancement.

(2) It unveils the real identity of objects.

(3) Museum users are enabling to utilize the display of objects at their own level of knowledge.

2.4 PROBLEMS IDENTIFIED

No matter the type of museum in question, they are all identified with common problems. Most museums are losing relevance as they are not functional in definition and technology trend as expected. Museums are barometers of social and cultural change but most museums find themselves in a dynamically shifting realm where time honored methods are becoming outdated and ineffective. For them to survive and thrive, museums must adjust to meet the needs of their audiences while not losing sight of their missions.

Museum audiences are increasing in number, diversity, and in their expectations. The wide availability of in-depth information and media has created a generation of museum visitors that craves sophisticated new experiences and ideas which has to be properly serviced to encourage more patronage. They increasingly face the challenge of maintaining scholarly and professional standards while also being compelling and entertaining enough to compete with their audience's other numerous leisure time options. This calls for need to continually review operations, standards and staffs if need be to service the audience.

The globalization of culture and the immediacy of social media and electronic communications have significantly advanced far more than the way most museums present their subject matter for their audiences. The need for evolving exhibition techniques will allow museums to adapt to present multiple viewpoints, educate and challenge visitors as never before which in turn will make a lasting effect. The use of ancient lighting which doesn't allow for proper view still characterized most local museums and tend to make visitors visit less interesting. In museums where both artificial and natural lighting are combined for lighting, they don't infuse perfectly

into one another. Ventilation is a high challenge in museum because of the number of visitors that visits at a particular time with air pollution as a particular problem in historical buildings such as museums, because they were not originally built to exhibit and protect art objects in a sustainable way.

2.5 COMMON AND UNIQUE SOLUTIONS TO PROBLEMS IDENTIFIED

Center for Nigerian architecture have to move with technology trends by paying more attention on social changes that are occurring all over the world, which also have implications for cultural heritage management. “Just as today’s societies are incredibly diverse and complex, museums are no longer the monolithic institutions of the past. Instead, many are focusing their efforts more narrowly, telling particular stories with larger meanings. Often, these stories reflect issues and people that have been marginalized by mainstream society, First Nations, immigrants, and chronic illness. This approach can also lead to an activism that embraces community issues and inspirations, in an effort to provide value and meaning” (Janes & Conaty, 2005). Moreover, in 1999 Weil argued that museums need to change their vision from being about something to being for somebody, strengthening the role of museum responsiveness (Lang, Reeve & Woollard, 2006; Ocello, 2011). The curative style of museum has little impact in the present and should be reviewed. New strategies to involve people should not neglect the innovation of communication contents. To become relevant organizations, it is essential that museums develop new content to match different levels of understanding (Montella, 2009; Cerquetti, 2014). “An audience-centric approach is considered a vehicle to achieve museum sustainability (Villeneuve, 2013; Di Pietro et al, 2014) and audience development is a relevant democratic mandate for museums in contemporary society”. The impact of using LEDs for lighting design based on light quality, conservation, and maintenance of works of art should be compared to a traditional halogen lamp, with research having it that damage of LEDs is not always directly related to their correlated color temperature (CCT);the swatches faded more slowly under LED with the highest CCT compared to how they do under a halogen lamp and thus, the use of CCT as an effective predictor of material degradation is not consistent with LEDs when considering fading induced only by the Blue Wool Standard. Most recent literature regarding the optimal and energy sustainable lighting design for museums has also demonstrated that cognitive psychology and

new technologies such as eye tracking for assessing, interpreting, and measuring eye movements, respectively, can be used in museums.

The use of natural or artificial ventilation in a museum must be planned alongside from the onset bearing in mind that, museum building, either historic museum building or modern museum building, must achieve balanced of indoor environment conditions in order to provide a better indoor air quality for collection care and human comfort. A healthy interior space will attract more tourists to visit museum and also provide a good working environment among museum staffs. The application of only mechanical ventilation system supposedly provides a healthy and better indoor environment for both collection care and human comfort without affect one of them.

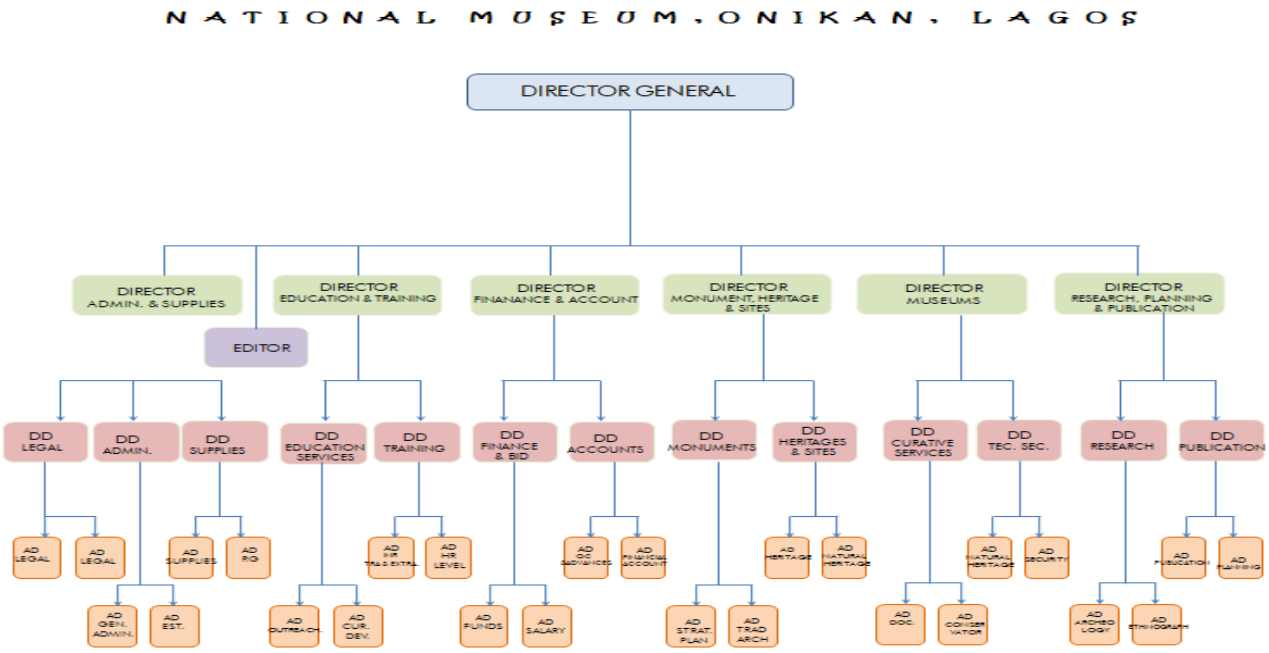

Figure 7:-National Museum Organogram

The museum has statistics of its visits with the peak averagely between the month of March and April every year. This is possible because of the high in flock of students that visit for excursion.

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NATIONAL MUSEUM, LAGOS
VISITORS STATISTICS FOR 2015

MONTHS	PUPILS/ STUDENTS	NIGERIAN ADULTS	FOREIGNERS	TOTAL
JANUARY	874	277	105	1,256
FEBRUARY	4,801	550	20	5,371
MARCH	9,652	1,224	15	10,891
APRIL	790	326	68	1,184
MAY	3,841	357	30	4,228
JUNE	4,708	618	20	5,346
JULY	1,981	492	79	2,552
AUGUST	1,294	585	89	1,968
SEPTEMBER	417	481	63	961
OCTOBER	1,388	339	50	1,777
NOVEMBER	2,996	627	79	3,699
DECEMBER	2,850	600	41	3,491
TOTAL	33,592	6,476	636	42,724

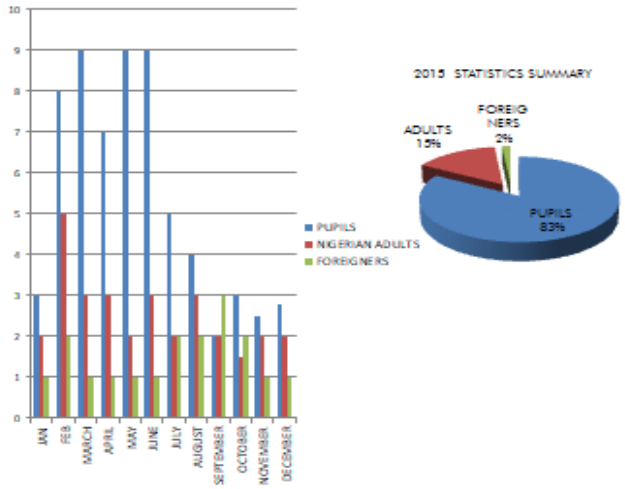

Table 1 Visitors statistics for 2015, National Museum Onikan, Lagos

NATIONAL MUSEUM, LAGOS
VISITORS STATISTICS FOR 2016

MONTHS	PUPILS/ STUDENTS	NIGERIAN ADULTS	FOREIGNERS	TOTAL
JANUARY	1,219	462	64	1,745
FEBRUARY	3,737	561	61	4,559
MARCH	8,588	1,463	87	10,138
APRIL	2,644	401	87	13,143
MAY	4,587	704	80	5,371
JUNE	4,673	704	83	5,460
JULY	1,617	600	75	2,589
AUGUST	1,775	657	157	2,292
SEPTEMBER	1,037	539	85	2,358
OCTOBER	1,734	539	85	2,358
NOVEMBER	3,151	570	104	3,825
DECEMBER	2,051	833	115	2,999
TOTAL	37,013	8,149	1,197	46,359

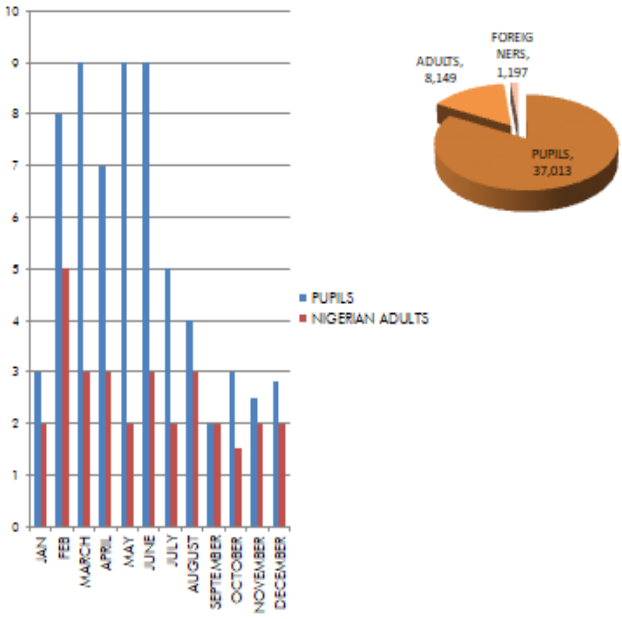

Table 2 Visitors statistics for 2016, National Museum Onikan, Lagos

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NATIONAL MUSEUM, LAGOS
VISITORS STATISTICS FOR 2017

MONTHS	PUPILS/ STUDENTS	NIGERIAN ADULTS	FOREIGNERS	TOTAL
JANUARY	489	459	67	1,015
FEBRUARY	4,648	782	93	5,523
MARCH	9,811	1,106	69	10,986
APRIL	1,449	539	104	10,986
MAY	1,649	461	96	2,206
JUNE	3,526	754	57	4,347
JULY	2,057	510	58	2,625
AUGUST	969	561	58	1,588
SEPTEMBER	780	426	63	1,269
OCTOBER	2,756	507	89	3,352
NOVEMBER	3,260	667	180	4,107
DECEMBER	2,036	554	125	2,715
TOTAL	33,430	7,326	1,070	41,826

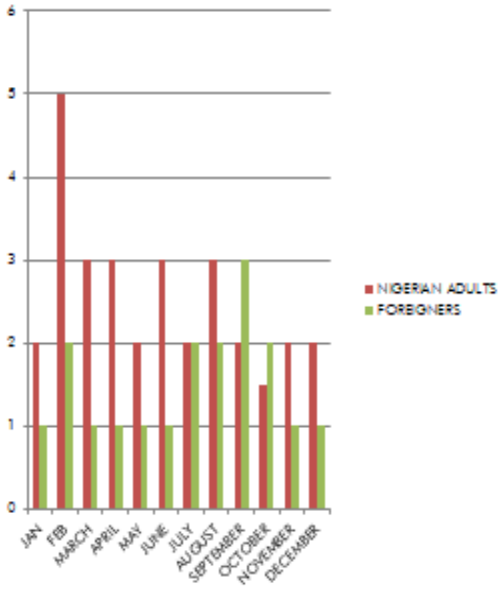
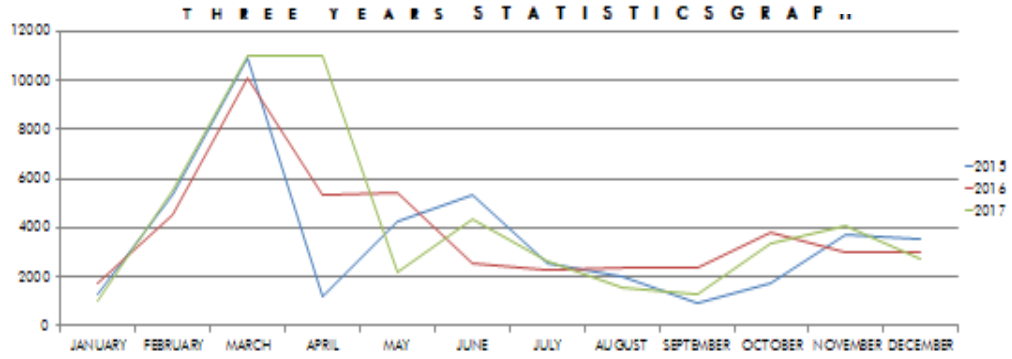
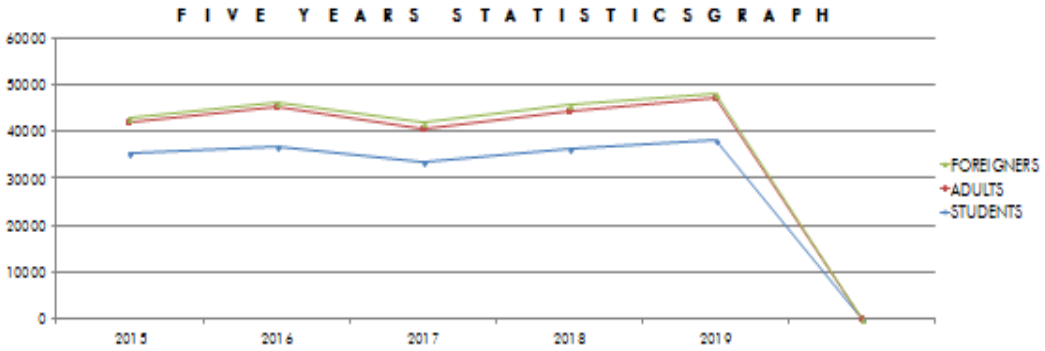


Table 3 Visitors statistics for 2017, National Museum Onikan, Lagos





The design solution explored was a combination of different design criteria. This is to come up with a unique design that meets the design considerations. The functionality design value was the main brain as there is no need for a building if it does not meet its functional requirements. This was achieved in the circulation and connectivity of spaces, zoning to display, lighting and ventilation. Though an iconic building as it should be, the use of its geometric shape made it goes along the simplicity design criteria while exhibiting an uncommon aesthetics that describes the emergence of the shape.

The combination of lattice and frame structure for structural members helps in bringing post modernism design into time design value. These alongside the sustainability knowledge infused made the building a total whole.

DESIGN CONSIDERATIONS

The two main design considerations are lighting and ventilation. The use of natural of both was considered alongside the conventional types.

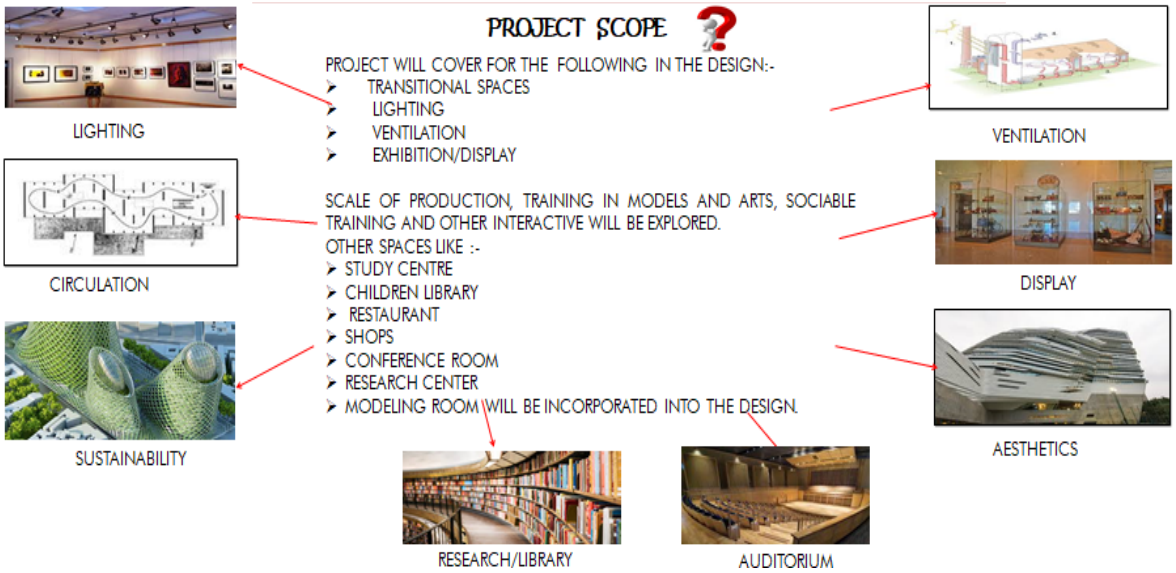


Figure 10 Design Considerations

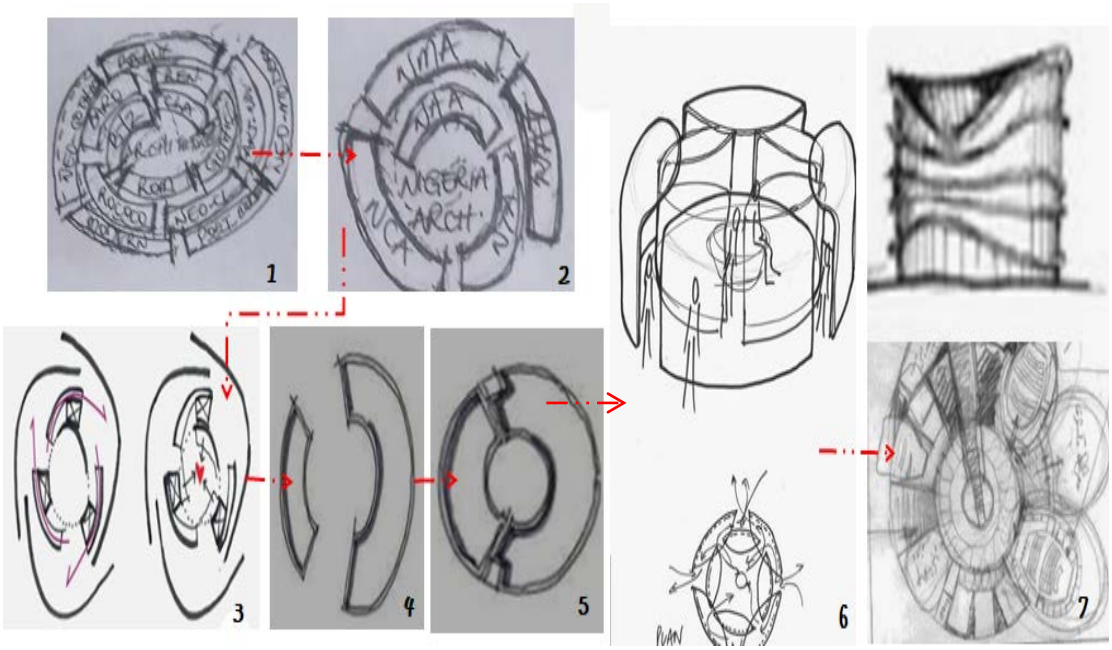
The design was approached from both functionality and sustainability points. This became necessary because of the uniqueness of the society in which the building is designed. The global warming and the peculiarity of our world demand designs that are both sustainable and smart as to reduce the emission of harmful substances into the air.

The design is therefore a green building as it green roofs contribute to the sustainability of the building. It in turns reduces the need for air conditioning in summer and provides insulation in the winter. The green roof's plants remove air particulates, produce oxygen and provide shade. It also reduces and slows storm water runoff in urban environments. Because rooftops and streets in cities are hard surfaces, the volume and velocity of storm water runoff increases tremendously and is a major source of flooding and pollution worldwide with the peculiarity of Lagos State, this is another way of reducing flooding and increases agricultural space.

CONCEPTUAL DEVELOPMENT

The introduction of part or a whole architecture from the past gave a clue of the cyclic concept. Starting from Nigeria Ancient Architecture to the Nigerian Architecture of today, there exists a bit of a trend that is infused in a modernized way but which can be traced to a trend in the past. Though Nigeria Architecture is not as advanced as it should be, the uniqueness when combined with other renowned grouping still has an in the past.

Starting from the Stone Age which influenced the Egyptian Architecture, Egypt influenced the Greeks, Greeks influenced the Romans, and Romans influenced the timeless elements of today’s architecture, all have a way they have metamorphosed over the ages to the neo-modernism and parametricism architecture. This found the basis for the cyclic shape as concept as they interwove and revolves round the ages influencing one another.



Picture 11 Conceptual Development

DESIGN DEVELOPMENT

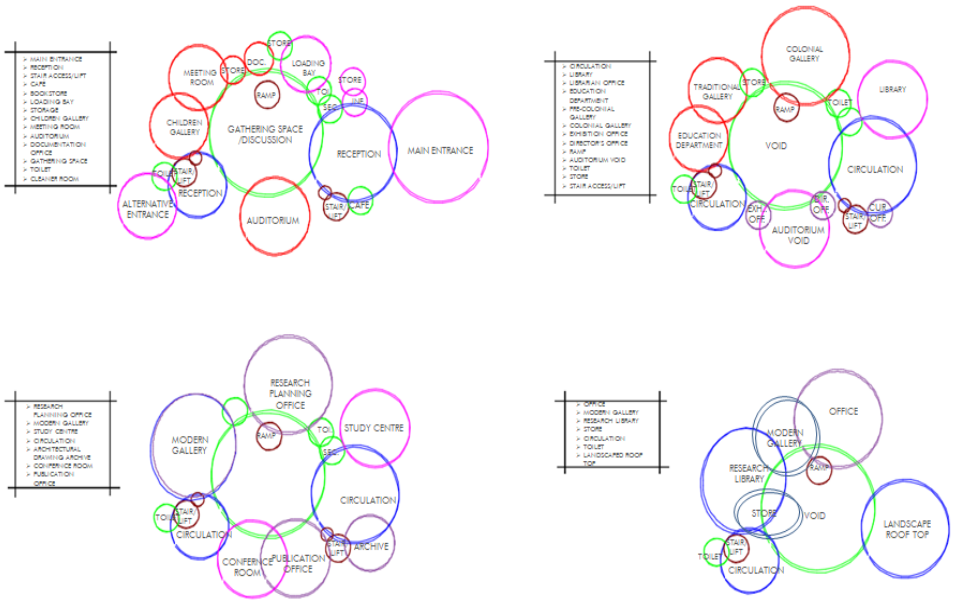
The development of the design was done through processes starting from the site zoning, building zoning and schedules of spaces.

5.4.2a SITE ZONING

The zoning was also done based on levels with the ground floor being the public zone housing all the basic spaces that that is open to the public. The higher the floor the less

public it become with the fourth floor being the most private housing the research library. Each floor in the building defines the architecture of an era and this move to the current era that we are currently.

5.4.2b SPACE REQUIREMENT AND BUBBLE DIAGRAM



5.4.2c SCHEDULE OF SPACES

GROUND FLOOR		
S/NO	SPACES	SQM
1	Main Entrance	
2	Reception	153m2
3	Café	45m2
4	Bookshop	58m2
5	Mechanical Room	16m2
6	Staircase Access	44m2
7	Lift	15m2
8	Security Post	17m2

9	Control Room	13m2
10	Information/Visitor Services	38m2
11	Main Toilet	37m2
12	Female Toilet	31m2
13	Circulation	586m2
14	Lobby	109m2
15	Loading/Delivery Bay	52m2
16	Auditorium	578m2
17	Storage	65m2
18	Filling/Documentation Office	65m2
19	Cleaner Store	14m2
20	Changing Room	15m2
21	Meeting Room	193m2
22	Children Library/Gallery	103m2
23	Alternative Entrance	36m2
24	Atrium	166m2
25	Sunken Gallery Sitting	44m2
26	Alternative Reception	55m2
FIRST FLOOR		

S/NO	SPACES	SQM
1	Curator office	43m2
2	Secretary	17m2

3	Library	96m2
4	Librarian office	17m2
5	Mechanical Room	16m2
6	Staircase Access	44m2
7	Lift	15m2
8	Security Post	17m2
9	Director's office	40m2
10	Exhibition office	39m2
11	Main Toilet	37m2
12	Female Toilet	31m2
13	Circulation	497m2
14	Lobby	176m2
15	Education department	103m2
16	Pre-colonial gallery	192m2
17	Colonial gallery	189m2
SECOND FLOOR		
S/NO	SPACES	SQM
1	Research and planning office	85m2
2	Modern architecture	121m2
3	Modern Architecture	298m2
4	Architecture drawing archive	80m2
5	E-drawing office	16m2

6	Staircase Access	44m2
7	Lift	15m2
8	Publication office	90m2
9	Director's office	18m2
10	Conference room	133m2
THIRD FLOOR		
S/NO	SPACES	SQM
1	Research library	192m2
2	Modern architecture	121m2
3	Storage	103m2
4	Staircase Access	44m2
5	Lift	15m2

Table 11 Schedule of Spaces

The external display area is carved out for the display of big models compared to the miniature models that are stored within the museum building. The space is also used for other architectural exhibition that may be organized by Architects Registration Council of Nigeria (ARCON) or Nigeria Institute of Architecture (NIA). Schools of Architecture can also make use of the space. Other bodies that are involved in design and construction may also be allowed as they deem fit.

5.5 CONCLUSION

The need for a center of Nigerian architecture that is sustainable, energy friendly and an inclusive public place for people from all backgrounds to gather and discuss architecture will change the face of architecture in the country. A better knowledge of

our indigenous way of living and design from the ancient to the traditional, pre-colonial architecture both in material feel, traditional wooden staircase and cathedrals among others will give a better understanding of where architecture of the country is coming from. This then gives a better enlightenment on how to play with designs to suite our current needs. Better understanding of the climatic peculiarity of our weather will better inform students of architecture to design based on the environment and stop the importation of internet designs. This hence place the iconic building as a research and exploratory center of knowledge for architects in practice and students of architecture that will love to explore and research more on architecture to have access to quality materials in terms of historical, archeological, virtual, models and hardcopies materials in conducting their research works.

5.6 RECOMMENDATION

I will strongly recommend the need to look into the possibility of making this design a reality as it will stand as an iconic building, the first center of Nigerian architecture in the country.

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