British Journal of Multidisciplinary and Advanced Studies 5(5),1-27, 2024

Civil Engineering and Building Construction

Print ISSN: 2517-276X

Online ISSN: 2517-2778

Website: https://bjmas.org/index.php/bjmas/index

Published by the European Centre for Research Training and Development UK

Optimizing Cultural Tourism Through Effective Lighting Design

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doi: https://doi.org/10.37745/bjmas.2022.04181 Published September 20, 2024

Citation: Ayobami F.E.and Ayeni, D. A. (2024) Optimizing Cultural Tourism Through Effective Lighting Design, *British Journal of Multidisciplinary and Advanced Studies*, 5(5),1-27

Abstract: *Overtime, interest has risen in museum research, with researchers finding answer to issues such as visitors experience, visitors' interest, visitors need, motivations and desire to revisit. Lighting in museum is one of many crucial factors in museum finishing, that could motivate, promote or discourage more visit by tourists. The intensity of the spatial lighting could be excessive, or not sufficient. The understanding of lighting being sourced primarily from daylighting, and supported with artificial lighting, especially to serve as energy sources for the rainy seasons and the night hours in many parts of the world is a vital design criterion especially in Nigeria. Museum design over time has held on to the philosophy of putting out completely the natural light in museum design, or relegating it to common spaces in the museum such as circulation areas. Research has shown that the essence of natural lighting to the human psychology is very important, for effective productivity within spaces, which includes the museum, which double function today as a learning space too. This research is a step further in emphasizing this importance, and addressing the problem of balance between natural and artificial lighting within the museum exhibition space, to protect artifacts on display and promote maximum productivity amongst tourist and space users of a museum, thereby enhancing cultural tourism. For the purpose of this research, qualitative method of data collection is employed, using case study as the primary source for data collection, aside interview, and literatures for secondary data. Findings show that natural lighting in a museum can be controlled and adequately regulated using strategies such as building orientation with openings in the north and south axis of the site, strategic openings which promote in-direct contact with artifacts on display, treated glazing such as the anti-solar glass, and use of filters on glasses to keep the harmful UV ray out of the indoor space, and use of recesses and shading devices. The, research will enhance museum experience, through lighting within the museum space, and recommends proper control strategies for natural lighting, to enhance visitor's performance, protect the artifacts on display, and enhance cultural tourism.*

KEY WORDS: culture, history, lighting, tourism.

British Journal of Multidisciplinary and Advanced Studies 5(5),1-27, 2024

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Print ISSN: 2517-276X

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INTRODUCTION

A museum is a space coined out of the larger environment, to protect valuables such as knowledge, artifacts and items of relevance to people and places, and a reliable source for primary data about places and people. Sogbesan, (2022) further understands it to be a place where knowledge of people and culture is promoted and stored to tell history. Stapp (1990) in his review, identifies a museum as tool for reshaping and enlarging visitors understanding about the uniqueness of past culture. (Marie & Chassagnol, 2022) in their review see museum as foundation, to many literary or fictional narrative. It has evolved from the act of display in many family dwellings, and has now become a space of its own.

In Nigeria, the first museum according to records is called Esie. It was founded in the year 1945, by the colonial government in Kwara state (Simon, 2022). Museums could be designed for art, history or scientific purposes, depending on the contents of the built space. In Nigeria, most national museum, tells of the historical culture and lifestyle of a kingdom or state in which it is situated (Spero & Adeoye, 2022). Africa generally is peculiar for its unique traditions and ways of life, differing from country to country, and from people to people, whose tales can be well spelt out by display, in the museum. This knowledge is better explained by the museum educators, who explains more on what and how those artefacts or contents came to be, and their relevance (Rika et al, 2011; Akova et al, 2017). According to Apeh, (2018), cultural tourism visit by tourist, is done with the mindset of getting true information and details about a subject matter.

Overtime interest has risen in museum research, with researchers finding answer to issues such as visitors experience, visitors' interest, visitors need, motivations and desire to revisit (Akova & Tezgel, 2017; Preko et al, 2020). Shao et al (2019) in a research, spoke of enhancing museum visits through shopping, while Bauer et al, (2019) says it can be futher enhanced by the use of internet advertisment. A review by Sheng & Chen, (2012) concludes that visitors experience should be characterized by fun and easiness, as the major priority for every tourist. Lorena et al, (2023) in a more resent review, analysied the power of virtual exhibition as a cogent strategy for enhancing revisit and promoting fun and ease for visitors, in our current dispensation. In the process of exploration, learning, and fun seeking, a few design factors enhance or foster discomfort in the course of museum tourism experience, one of such is the issue of lighting.

Lighting in museum is one of many crucial factors in museum finishing, that could motivate, promote or discourage more visit by tourist. The intensity of the spatial lighting could be excessive, or not sufficient (Piana & Merli, 2020). In general knowledge, lighting in a space is sourced either through natural or artificial means. In Nigeria, lighting is sourced majorly from daylighting, and supported with artificial lighting, especially to serve as energy sources for the rainy seasons and the night hours (Aderonmu et al, 2019).

Natural Lighting is essential in every space, for enhancement of mental and physiological health among space users, and helps to promote effective productivity in various built environments (Rana, 2018). Influence of social relationships, economic performance and user's satisfaction,

have been rated to improve with the presence of natural light in a built space (Sevkiye et al,2017). Reviewed literature on historical buildings such as museums, points to the importance of natural lighting, in conceiving artistic content and enhancing visual comfort for visitors of a space (Marzouk, et al,2021). The museum, being a very important space, considering its function of protecting and preserving heritage content, has a need for natural lighting, to enhance its content display and promote communication and visual satisfaction within the built structure (Aderonmu et al, 2019).

Natural Lighting in museums has been criticized, and reviews by researchers tell of the difficulty experienced, and the impact resulting from lack of inadequate control of penetrating radiations from the sun, into the space. According to Çevik, (2019) such unregulated radiation leads to glare, art damage, chemical change, irreversible fading, drying, cracks in artifacts and reduction in visual comfort of visitors (Piana & Merli, 2020). All of which affects the purpose of a museum, which is to preserve or conserve and educate people about places and their cultural heritage, to be kept for prosperity. This also affects the passion of future tourist visits to that space, defining their comfort and possibility of frequent visit.

Energy-efficient design strategies play a pivotal role in addressing the growing energy crisis and combating climate change. Energy in Nigeria is challenged with inconsistent supply (Ohajianya et al, 2014), which has influenced most of its design. Most architectural designs encourage the use of wall openings to introduce natural lighting and improve the psychological state of space users (Dodo, et al., 2013). The use of openings, can encourage as much as 60% energy saving, in a building (Jaysawal et al, 2022). Although exhibition rooms are known to function over the years majorly with artificial lighting source, a sustainable museum design for southwest Nigeria, would require balance between natural and artificial lighting, to enhance its design efficiency (Aderonmu et al, 2019).

The aim of this research is to enhance cultural tourism through lighting efficient strategies for Ado-Ekiti, Nigeria. And will be achieved, by: Evaluate the culture of Ado-Ekiti; evaluate design efficient strategies that enhance building performance; and appraise the impact of natural lighting in enhancing cultural tourism.

LITERATURE REVIEW

Cultural Heritage in South West Nigeria.

Cultural heritage is an important aspect of existence that humanity can't do without. Side-lining it, is choosing rather to forget where and how every unique culture emerged. Diverse places have varying peculiarities and differences that are identifiable by culture in various geographical locations of the world, having distinctive cultural characteristics applicable to different people (Onyima , 2016). Giving up on preserving cultural heritage is comparable to mankind thrashing vital data that would provide opportunities of evaluation and study, which is a crucial factor in promoting development especially in the 21st century. The world has since by the passing of years

undergone many transformations to become modernized or civilized, especially with advancement in technology on the rise. Cultures, that is, a way of life from the past, has fast been transformed and is today modernized due to westernization, in today's world.

Nigeria as a nation rich in cultural resources, and has numerous cultural diversity which according to Oladumiye et al, (2013) is to be adequately documented. Her culture is divided majorly into three the north (Hausa), the east (Igbo), the west and south (Yoruba). The southwestern part of Nigeria comprises the Yoruba indigenous speaking people that is, Ekiti, Lagos, Ondo, Ogun, Oyo and Osun state. Dare, (2010) argues that many of such vital cultural values have been displaced due to western colonization, civilization, and poor record keepings (Nussbanum,2003).

The process of passing on heritage is essential to record keeping, promoting knowledge and it is priceless to many geographical locations as a proof of its existence (Ezenagu,2020). Heritage according to Silverman, (2007) defines territories and identity of people and places, either to unite or separate them. In a more personal light, Bakare, (2019) sees culture as a pattern that influences human behavior, influencing how people view life and relate to others and situations that surround them. This is termed intangible heritage, which further includes people's way of life such as language, music, dance, values, philosophy of life etc., while cultural artifacts that can be touched and seen are regarded as tangibles such as ancient architecture (Jolaoso et al, 2017), for example, cowrie for money, carvings, dresses etc., which are often kept with the king (Onyima,2016).

Cultural heritage as means of handing living traditions to future generations, can be seen through the beautiful culture of the south western part of Nigeria. Through many tangible and intangible heritage such as the Yoruba folktales anchored by the elderly, under the orange tree, a means of educating children and young once on the various cultural values and heritage to be kept, through storytelling and proverbs (Alade,2015). Yoruba music heritage, another means of communicating and teaching deep heart felt lessons. According to Bakare, (2019), Oludare (2014) and Alade, (2015), it is a way Yoruba cultural heritage has been preserved for years and are regarded as intangible heritage. Yoruba Architecture is a major tangible heritage, among others like sculptures and art works. It is a kind of art that also keeps what the past used to look like from many years back. The southwestern architecture in Nigeria has distinctive ornamentations and ways for which they were designed, with special openings, spatial arrangement, artworks, courtyards etc. Retaining more evidently the very cultural heritage of her people for years (Jolaoso, 2017 and Akande, 2020).

Ekiti State is a south western state in Nigeria with coordinates 7°40'N 5°15'E, bounded by Kwara to the north, Kogi in the north-east, Ondo in the south and Osun to the west (Wikipedia). It's a place founded on a hill, i.e. 'Okiti'. Okiti meaning hill as reformed brought about the name Ekiti. Which the state has been called till date. It has about 127 towns, such as Ado, Ijero, Ikere, Okeako, Irele, Omuo-oke, Efon-Alaaye, Okemesi, etc. all arranged in a nucleus urban pattern, connected by road networks (Arenibafo, 2017; Babatola, 2015). Ado-Ekiti the capital of Ekiti state was founded by Awamaro the first Ewi (king) of Ado-Ekiti, who migrated from Ile Ife, and overthrew

the previous king of Ulesun and occupant of the presently named Ado-Ekiti as at his arrival to that premises. Ado-Ekiti history has it that the subordinate of the old Elesun (king) of Ulesun people had subordinate of which few were relieved of their titles, while a few were retained such as the Odofin (second in command to the king), Asao, Elegemo (chief priest and custodian of iwemo Ogun idol). Ado-Ekiti has the record to have increased as a product of victory from slave wars in the 1870s to 1880s; it has existed for more than 200 years. Its settlement arrangement was such that began from the smallest unit called Ebi (family), and to the largest called Ilu i.e. Town, which is arranged around the Ewi palace, which usually is the CBD and is in two main settlement categories i.e. the main town where the Ewi resides, and subordinate slave towns which have been conquered by the main town according to Babatola (2015), presently the Ado-Ewi, Odo-Ado, and Oke-Ila.

The culture of Ado-Ekiti, though not much, has got a lot to be preserved. Its peculiar dressing (Fakunle, 2022), dancing (Drewal, 2000), language, occupations, war history and equipment, and festivities (Udiroko, Iwemo Ogun, Ogun festival, and Ade festival) and the peculiarity of celebration, marriage ceremony, coronation ceremony, (Adams, 2018) craft (pottery, cloth making), mineral/economic resources and many more, are valuable knowledge to be kept for posterity. Major part of its culture or traditions revolves around the king I.e. the Ewi. Ekiti has this belief that their kings are divine and sacred. The kings are usually appointed by the 'Afobaje' i.e. the chief who appoints the king. They are appointed from the lineage of the past kings, and are taken through traditional ceremonies that fortify them, making them the most powerful in the kingdom. They are for the people a personification of justice.

Ekiti states most tangible artifacts could be regarded as the Ewi's palace of Ado, Ikole and Otun. Which can be classified as tangible heritage, while it's intangible culture, which seems to be majorly what Ado-Ekiti has left, and shouldn't be wiped out, by reason of death of older generations who might have access to these records. In the 19th century, Ado-Ekiti had become famous producers of textile, shoes, pottery and farming of cash crops such as cocoa and timber, also yams, cassava, corn, rice fruits usually sold at her local markets (Falola,2023). Women in Ado-Ekiti as of many other southwestern states in Nigeria, were a major influence for economic progress and socialization. Women bore responsibilities such as processing raw farm products, weaving mats, pottery making and trading etc. The fact of colonialism and development promoting the loss of this heritage is a concern for Ado-Ekiti, as most of her valuable heritage seems lost, and many more are likely to be lost if measures to preserve them aren't adopted according to Oloidi, (2014).

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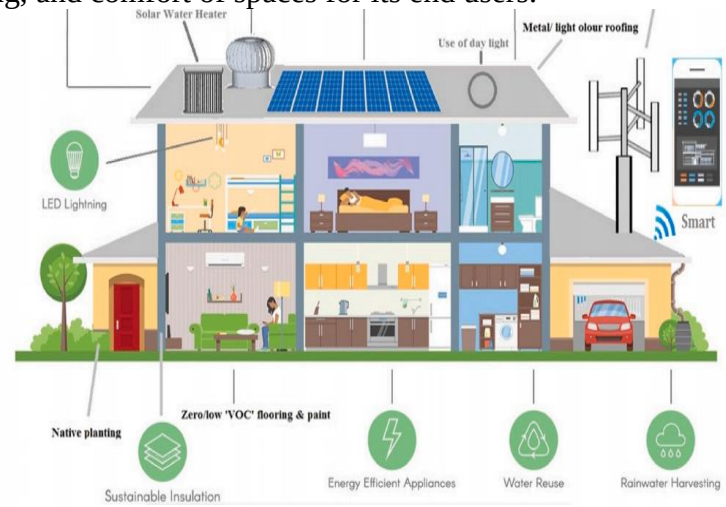
Published by the European Centre for Research Training and Development UK

Images showing Ado-Ekiti Udiroko festival the towns in it.
Source: Oloidi, 2014 and Oduntan, 2022

Design Efficient Strategies for Museums

In today's rapidly evolving world, the pursuit of sustainable development has become a paramount concern for architects, engineers, and designers alike (Murtagh et al, 2016). With the escalating global energy demand and the pressing need to mitigate climate change, energy-efficient strategies in design have emerged as crucial elements in creating sustainable built environments (Xing et al, 2016). Energy efficient design is an essential aspect for architects to focus on in design, to ensure maintenance of building, and comfort of spaces for its end users.



A typical energy efficient building. Source: Jaysawal et al, 2022

By integrating these technologies into the design process, architects and engineers can significantly reduce the reliance on fossil fuels and minimize greenhouse gas emissions (Owusu, Sarkodie, & Dubey, 2016). Green buildings as a strategy to reduce greenhouse emissions and control thermal comfort within spaces has been researched more frequently today.

Print ISSN: 2517-276X
Online ISSN: 2517-2778
Website: https://bjmas.org/index.php/bjmas/index
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Energy-efficient design strategies play a pivotal role in addressing the growing energy crisis and combating climate change (Xing et al, 2016). As buildings account for a significant portion of global energy consumption, optimizing their energy efficiency becomes imperative. By employing energy-efficient design principles, such as passive solar design, effective insulation, and efficient lighting systems, architects and designers can substantially reduce the energy consumption of buildings. A study by (Jaysawal et al, 2022) highlights the positive impact of energy-efficient design in achieving energy savings of up to 60% in residential buildings. This demonstrates the immense potential for energy efficiency to contribute to the global reduction of greenhouse gas emissions. Energy efficiency in design means a building is self-sufficient and can function with or without any artificial source of aid. Energy efficient strategies for buildings are numerous and may differ with designs having special exceptions, but every building work on these three most basic strategies especially in a museum i.e. Thermal comfort, Ventilation and natural lighting regulation (Mueller,2012). To promote and encourage energy-efficient strategies in design, it is crucial to incorporate these principles into building codes, regulations, and standards. Governments, policymakers, and industry professionals must collaborate to establish and enforce energy efficiency requirements for new construction and renovation projects (Ochedi et al, 2022).

Museums play a vital role in preserving and showcasing our cultural heritage, scientific achievements, and artistic endeavors. As architectural professionals, it is crucial to design efficient strategies for museums to enhance visitor experiences, optimize space utilization, and ensure the preservation of artifacts. A literature by Apeh, (2018) defines a museum, to be a space for displaying artistic and educational materials. Visitors have been noted to go touring in museums for the primary purpose of feeling nature, and understanding culture of places. For a successful design, a few professional strategies involved in designing are considered for efficient museums. Site analysis and planning, comes before designing any project, thorough site analysis is essential. This involves studying the surrounding environment, including the topography, climate, access points, and nearby landmarks. It helps architects understand the site's opportunities and challenges, enabling them to make informed design decisions (Tamminga, 2001). Zoning of site for design, is the division of a layout into different functional zones. These zones for a museum can include exhibition spaces, storage areas, administrative offices, visitor amenities, and circulation routes. Efficient zoning ensures smooth movement within the museum and maximizes visitor engagement. Museums are majorly zoned into public and private spaces. Circulation refers and movement of visitors within the museum for an architect, is designed for efficiency. Circulation routes that allow for a logical flow and prevent congestion (Schorch, 2013). Factors such as visitor capacities, sightlines, and accessibility requirements must be considered to create an optimal circulation system.

Passive design strategies minimize the museum's reliance on artificial heating, cooling, and lighting systems. Features such as proper insulation, natural ventilation, daylight harvesting, and solar shading can significantly reduce energy consumption and environmental impact, by integrated renewable energy systems, such as solar panels or geothermal heating and cooling, into

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the museum's design (Ochoa et al, 2008). Utilizing sustainable energy sources decreases reliance on traditional power grids and promotes a greener approach to energy consumption (Figueiro, 2022). Although not much of water consumption regulations is considered as sustainable for a museum, but it's also a valuable resource, and museums should aim to minimize water consumption (Nguyen, 2018). Architects can incorporate efficient plumbing fixtures, such as rainwater harvesting systems, and greywater recycling to reduce water usage within the museum.

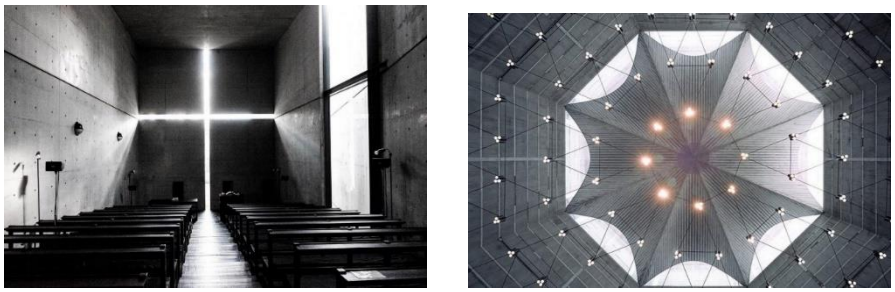
The integration of technology allows museums to enhance visitor experiences. Architects can design spaces that accommodate interactive displays, multimedia installations, virtual reality experiences, and augmented reality applications, creating an immersive environment for visitors. Advanced lighting control systems can help preserve delicate artifacts by adjusting light levels and minimizing UV radiation exposure (Fathy et al, 2020). Architects consider integrating these systems into the museum's design, to protect the exhibits while ensuring a visually appealing ambiance. Museums generate vast amounts of data related to visitor statistics, collection management, and conservation efforts. Plans for dedicated server rooms, network infrastructure, and data management systems to facilitate efficient storage and analysis of this information are essential. Efficient museum design not only enhances the visitor experience but also ensures the preservation and protection of valuable artifacts for future generations (Ezenagu, 2020). By carefully zoning the museum layout, designing efficient circulation routes, and creating flexible spaces, architects can optimize the use of available space and accommodate diverse collections and exhibitions.

Architects' consideration of accessibility and inclusivity when designing museum spaces, by incorporating universal design principles ensures that all visitors, regardless of their physical abilities, can enjoy and engage with the exhibits. Another important aspect to consider is the engagement and interaction between the museum and the surrounding community. Designing strategies that facilitate community involvement, such as public spaces, outdoor exhibits, and educational programs, can create a sense of ownership and foster a strong connection between the museum and its visitors. Collaboration with exhibition designers, lighting specialists, audiovisual experts, and other professionals is crucial to ensure a holistic and cohesive approach to museum design (Cevik, 2019). By working together, these professionals can create immersive and engaging environments that effectively communicate the museum's narrative and enhance the visitor's understanding and appreciation of the exhibits. Sustainable operations are also a consideration in museum design. Architects can incorporate energy-efficient HVAC systems, lighting controls, and smart building technologies to reduce energy consumption (Liu, et al, 2021).

According to (Aderonmu et al, 2019) Lighting is a vital element in museum design, as it influences the perception and appreciation of exhibits. Architects must carefully consider the balance between natural and artificial lighting, taking into account the sensitivity of certain artifacts to light exposure. Proper lighting design can enhance the visual impact of exhibits, highlight important details, and create a desired ambiance within the museum spaces (Alwetaishi, 2016; Figueiro, 2022). Finally integrating sustainable practices into the design of museums is essential for creating

efficient and environmentally responsible spaces. By prioritizing energy efficiency, water conservation, the use of eco-friendly materials, waste management, integration with the surrounding environment, and public education, architects can design museums that minimize their ecological impact and serve as models for sustainable design. These strategies not only contribute to the overall efficiency of the museum but also promote a culture of sustainability and environmental consciousness among visitors and the broader community. comfort cannot be overemphasized, because the space would be very uncomfortable, and may lead to cases of abandonment.

Impact of Natural Lighting in Design.



Natural lighting through side windows, domes. Sourced: https://www.pinterest.com/pin/627055948124589034/

Natural lighting refers to the illumination provided by sunlight during daylight hours. It is an essential element of the environment that impacts various aspects of human health, energy consumption, and ecosystem functionality. Light is the natural sensation that enables visibility. Like land, it is a free gift of nature. The sun being a primary source of light on earth, has its existence according to history dating back to the beginning of creation. Natural lighting has a profound impact on human health and well-being. Exposure to natural light has been linked to numerous benefits. In the human body, the eye is the only part so designed to capture these sensations, to enable sight and Vision for the whole body. Other parts of the body like the skin through research are identified to benefit from the radiation. The human body is greatly influenced by natural lighting, research by Webb, (2006), and NIH, (2022) talks about circadian rhythms. Study and findings explain circadian rhythms, to be a result of patterns of a day, such as waking at day break, when the sun is risen, and sleeping at dusk, when the sun is set.

British Journal of Multidisciplinary and Advanced Studies 5(5),1-27, 2024

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Published by the European Centre for Research Training and Development UK

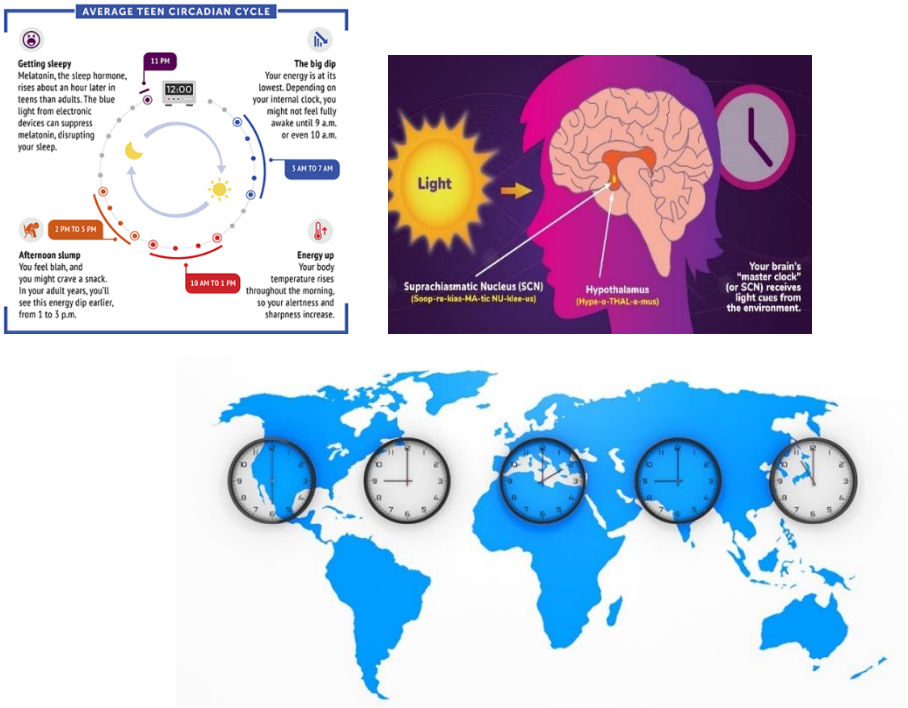

Image showing difference in time zones for different continent, and the influence of light to the circadian rhythms to the human psychology. Source: https://nigms.nih.gov

For the built environment, lighting is critical for many reasons. Natural lighting plays a vital role in reducing energy consumption and increasing energy efficiency in buildings. By maximizing the use of natural light, artificial lighting needs can be minimized, leading to significant energy savings and reduced carbon emissions. Research tells us of its benefit for visibility and energy consumption management (Aderonmu,2019; Fathy,2020; Fontoynot,2013; Mueller,2012). Figueiro, (2022) argues that there's more benefit to natural lighting in the built environment, for which more research should be carried out, some of which he stated to be aesthetics, health and wellbeing, measuring light in the built space, application of light in buildings, etc. Natural Lighting as a measure to address health and wellbeing of patients, according to Conellan et al, (2013), her findings resolved that by many ways lighting through Architecture has successfully helped mental health outcomes. Health facilities without interaction of patients with natural lighting, have proven to be damaging to the biological and psychological health of patients, by altering the circadian rhythm (Caballero-Arce et al,2012). In a nutshell, as essential to health and wellness, so is natural lighting to users in every space structure, such as residence, offices, schools etc., but proper regulatory measures are to be adopted (An et al,2016).

Lighting in architecture is very important, as it influences many aspects of design. From conception of a design to completion of a project, lighting is involved and cannot be compromised. In design, natural lighting for proposed spaces is a crucial consideration that determines the sizes

of openings, position of openings and shapes of openings, to provide adequate and sufficient natural light into the building envelope (Idowu,2018). Lighting though sourced naturally or through artificial sources, must be well regulated and controlled. This is essential to promote a comfortable and visually pleasing space in a built design. Konstantzos, (2020) informed through review that human performance is influenced by special illumination, their perception of what a space is all about, is also a result of lighting arrangements (E-Architecture, 2022), which helps inform space users of their surroundings, leaving in their pictorial mind, an unforgettable experience. Furthermore, lighting plays a critical responsibility in helping people perceive a space and understand its architecture. Thereby furthering the focus of users to texture, colors, and forms of spaces (TPC,2017). In Architecture, lights contribute immensely to functionality, helping to keep space users directed, influencing their mood, behavior, perception, etc. Natural lighting availability during the day before sun set, can be converted into energy to provide artificial lighting for the night in a structural envelope. This helps to save cost of illumination, and is a reliable source of generating energy. A review by E-Architects, (2022) tells of the vantage through natural lighting, i.e. to promote calmness, and gives allowance for easy expression etc. among users of a space.

Much research has been carried out on the issues of lighting, on glare, visual comfort, and more. For a museum design, reviews have emphasized the importance of lighting especially that sourced naturally i.e. natural lighting (NL). Natural lighting (NL) also called day lighting (DL), can be defined as providing internal lighting with the primary goal of comfort and functionality of spaces. Servkiye, (2017) tells the reasons for which daylighting in a museum space requires more focus, to avoid damages and to meet users' requirements. According to Marzouk et al, (2022) Natural Lighting is defined as the capacity to improve perception of massive artistic content, amend psychological state of occupants (Marzouk et al,2020), enhance the beauty of interior finishes, by increasing visibility, that emphasizes texture, scale, patterns, rhythms, emphasis, etc. in the built environment (Çevik,2019). Lighting in a museum influences how visitors relate to knowledge shared, and it influences visitor's perception during visit. Beyond this has been the issue of damage caused by natural light (NL), when museum content is exposed excessively to its radiations. According to Ceron, (2019) review, regulating daylighting is difficult, due to its high content of UV radiations that can't easily be stopped. Museums with concepts for natural light integration often help a designer to determine styles, positions and sizes of openings (Aderonmu,2019), having an understanding for control and regulation of radiation penetrating into the space through these openings.

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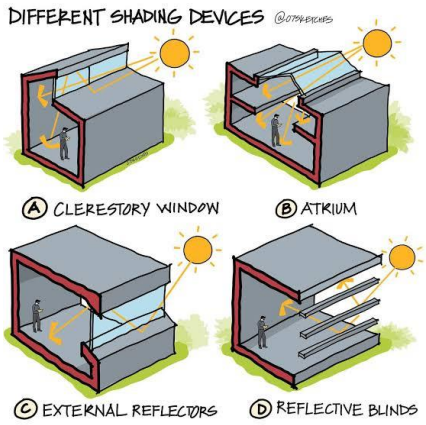

Different ways of introducing natural light into the built space. Source: https://web.facebook.com

Spaces in a museum vary in functions, and require different levels of natural lighting exposure. Kim, (2010) argues that over time, there has been importance attached to control of illumination, in promoting the uniqueness of artworks displayed in a museum. While Fathy, (2020) is concerned that not much focus and research has been channeled to ensure comfort of visitors in the exhibition space. Because exhibits are much more vulnerable to lighting radiations, consideration has been paid to the artifacts and ensuring their longevity, than has been accorded to the visitors visual, behavioral and physiological comfort. Research has shown that variation in spatial illumination, light setting, color temperature, etc. through daylight, has effectively increased visit and interest of museum explorers (Fathy,2020). With a sight adjustment in research lence to visitors' perception, preference and study of people, visiting experience in museums through lighting is better addressed and improved (YU et al,2023).

Incorporating daylighting strategies according to Fontoynot, (2013) can be such that it looks like a sculptural piece for beautifying the interior space, like an artificial lighting chandelier. Nevertheless, such innovation is to be assessed and evaluated extensively, to ensure its performance. Mueller, (2012) views good natural space lighting as having good color results and balanced daylight distribution in a space. According to Szokolay, (2004) lighting at its least velocity is not less than 300,000km/sec, and about 100klk which is a lot of direct intensity for an enveloped space. And because different artifacts respond to light differently, some spaces may have limited exposure (Ceron,2019). The passing of light through objects like prisms, helps to split a monochromatic light into various colors, which is primarily Blue, Green, and Red. The ultraviolet radiation and high lighting sensitivity level has been said by reviews, to be calculable for the damaging influence of direct sun rays on artifacts' surface and visual discomfort of space visitors with long time contact or exposure (Webb,2006; Kaya et al, 2017; Helmenstine,2019; Fathy et al,2020). Furthermore, research shows that sidelights, providing sculpture with shaded layers, and skylight giving even distribution of radiation within a space (Marzouk et al,2020;

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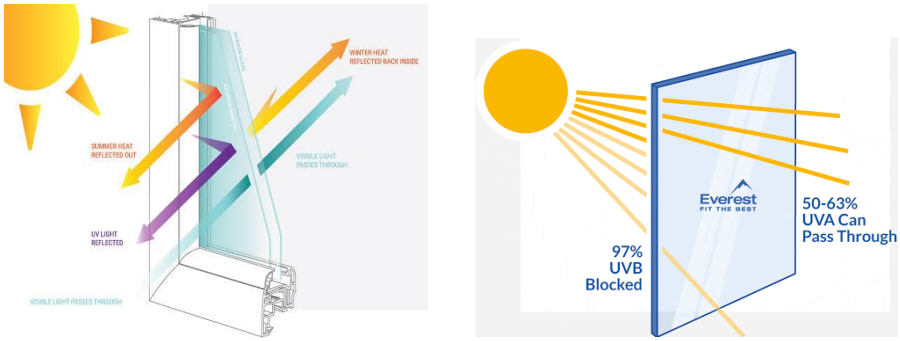
Marzouk et al,2022; Shirzadnia,2023; Çevik,2019; Szokolay,2004), are the best strategies of transmitting natural lighting into a museum space. Both strategies give room for free entrance of natural light radiations, which uncontrolled are evidently dangerous to exhibit and visitors of the museum. This lighting strategies are practically implemented in museum spaces through domes, clerestory, windows, atriums, light tubes, and anti-solar glass etc. (Aderonmu et al, 2019).

In architecture, a clerestory refers to a distinct feature found in the upper section of a building's wall, specifically in the form of a series of windows or openings. This architectural element serves both functional and aesthetic purposes, providing an abundance of natural light and enhancing the overall visual appeal of a structure. An atrium is a magnificent architectural feature that serves as a focal point within a building. With its open space, soaring ceilings, and often surrounded by multiple levels, an atrium creates a sense of grandeur and openness. It acts as a central gathering area, connecting various parts of the building and facilitating the flow of people and natural light. The primary purpose of anti-solar glass is to enhance energy efficiency and improve thermal comfort within a space. By reducing solar heat gain, it helps to keep interiors cooler during hot summers, reducing the need for excessive air conditioning and saving energy. Prismatic glass is a kind of glass that functions well in controlling UV radiation (Lorenz, 2001). In addition to its heat-reflecting properties, anti-solar glass also blocks a significant amount of UV radiation. This protects the interior of a building from the damaging effects of sunlight, such as fading of furniture, flooring, artifacts, and artwork, as well as potential harm to human health



Images showing sun radiations and anti-solar glass reactions. Source: Venosa, 2019; Haynes, 2020.

Regulatory measures for regulating radio effect in spaces according to reviews are first Window location, resulting from positioning and building orientation (Aderonmu, 2019), i.e. locating openings on areas other than the west and east where the sunrises and sunsets in a proposed site. Secondly regulating apertures based on sizes, shape and number of openings (Marzouk, 2022). Thirdly, glazing are the major elements used for apertures in buildings, they could either be transparent or translucent such as the prismatic glass, and inclusion of filters finishings have proven effective, alongside the use of frost glazings for top light, arranged in layers (Çevik, 2019) etc. Direct use of side or top glazing without a means of reducing sun radiation would still make

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Online ISSN: 2517-2778
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them inefficient, therefore treatment such as anti-glare windows, filters and adaptation of recesses and shading devices in design are productive measures for control solution.

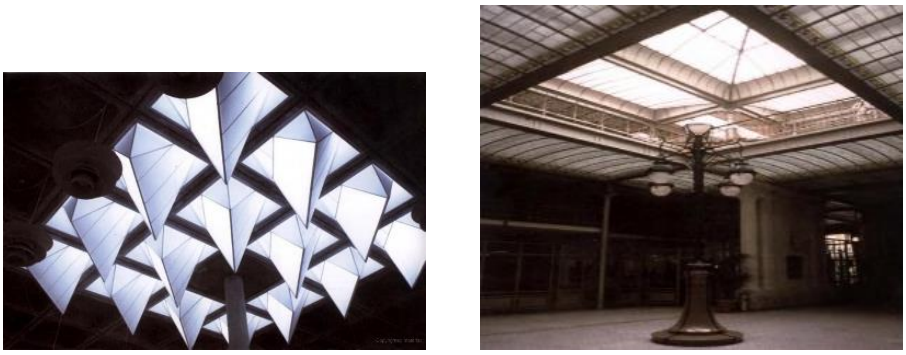

Image showing regulated filters in the built space. Source: online.

Summary of Literature

Since cultural heritage is an important aspect of existence that humanity cannot do without, the review above states the essence of cultural tourism and its essentiality to future development, as it helps to connect the past and present, providing posterity with handful knowledge of what use to be, in comparison with what is at present and what is to evolve.

Ado-Ekiti has a state in Nigeria, has history that is rooted in its origin and royalty. Ado-Ekiti was established by the first king (Ewi Awamaro) who conquered the previous land occupant i.e. Ulesun people. The kingdom of Ado-Ekiti experienced more expansion, as more domains where conquered in wars, and more surrounding kingdoms were slaves to the Ewi. Although Ado-Ekiti people are no different from the other southwestern homogeneous Yoruba speaking people of Nigeria, they have some peculiarity that makes them distinct, such has their language, their love for pounded yam and egusi soup, festivities, such as Udiroko, Iwemo Ogun, Beri Ogun and the ADE festival. All of which are celebrated in nine days interval from each other. Udiroko festival, is a famous celebration in Ado-Ekiti, that brings many foreigners and indigenes home, and also represents the beginning of a new year for Ado indigenes.

The palace has peculiar rules that must be abided to by all anywhere in Ado, and most especially in the palace, such as not crossing the leg, hands on the chin, giving birth in the palace, carrying a child on once shoulder, using of walking stick or umbrella etc. all this and more are regarded as taboos in the Ewi's palace. Another history is the Ekiti Parapo war which was fought to ease the treat of being subdued by Ibadan. All southwestern state came together to achieve freedom.

In Nigeria, most national museum, tells of the historical culture and lifestyle of a kingdom or state in which it is situated. Its content is usually terracotta, bronze, stones, metal works, wood carvings, clothes worn in the past, symbols of royal properties, calabash, hunting and war guns, weaving machines etc. to tell the story of what life in the past was like. Many of this artifact are precious

and valuable to be kept, lighting exposure on this artifact has the possibility of damaging or reducing the longevity of the artifacts in display, as stated by researchers, it is also a crucial factor in museum finishing, that could motivate, promote or discourage more visit by tourist. The intensity of the spatial lighting could be excessive, or not sufficient. Therefore, a need to treat the lighting, i.e. majorly natural or artificial lighting source, to ensure a comfortable lit exhibition and safety of the exhibition content.

Science has proven that productivity of space users within a built space, is greatly enhanced with natural lighting interaction. This results from the reactions produced in the human body during the day. The circadian cycle speaks of the internal clock in every human, which helps to enhance productivity during the day time and rest at night. This fact of an internal clock enables the human brain to release chemicals such as serotonin and melatonin, to keep track of time and seek maximum productivity in the day. This informs the essence of encouraging natural lighting in built spaces and in designs, which includes the museum as well. In recent times, the museum not only serves as a place to protect artifacts for posterity, but also serves as a learning environment for students, researchers and knowledge seekers. Natural lighting in a built environment, has been said to encourage and enhances the psychological behavior and mental productivity of users, in any kind of space. For the museum, natural lighting intensity in an exhibition, is based on considerations such as safety of displayed artifacts, and users' comfort.

Natural lighting comprises of ultraviolet rays (UV), which is very harmful both to artifacts and space users of a museum. Ultraviolet rays are of three categories i.e. UVA, UVB, UVC. All this radiation come from the sun, and are not all active or dangerous. The UVC doesn't go beyond the ozone layer, while the UVB is a harmless ray from the sun, that penetrates in through the ozone layer along with the UVA, which is harmful to the human body, health and space content. The UVA can be controlled through shading devices, which could be vertical, horizontal, or use of recesses in design, anti-solar glazing, building orientation, and positioning of windows in the north-south direction of a site, also the use of filters on the glazing, anti-solar glass, width and depth of openings. Natural lighting, can further be maximized as a renewable energy source for artificial lighting in a museum, using photovoltaic (PV) solar panels.

METHODOLOGY

For the purpose of this research, an in-depth analysis of three local existing museums in Nigeria, and two foreign case studies, a total of five existing museums, to provide a better understanding of how museum architecture has been treated, the spatial (function and flow), and natural lighting system of this museum. My case studies incudes OAU museum, Osun state, National Museum Ife, Osun state, Owo museum, Ondo state, Institute for the study of ancient culture, University of Chicago and Nancy and Rich Kinder Museum, USA. The data collected from the case study sites, both locally and from foreign designs, were analyzed using pros and cons of the designs in study, focusing on the spatial flow, natural lighting and control, artificial lighting and consistency, signage, circulation and relaxation, universal design.

British Journal of Multidisciplinary and Advanced Studies 5(5),1-27, 2024

Civil Engineering and Building Construction

Print ISSN: 2517-276X

Online ISSN: 2517-2778

Website: https://bjmas.org/index.php/bjmas/index

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Case study as a tool of data collection is essential for the peculiarity of this research, because it avails the researcher the opportunity to learn from other existing designs and to identify avoidable flaws, to enhance future development in design (Priya, 2020). Case study method further assists the researcher in obtaining genuine on-site information on the subject of study and ensures that an accurate illustration is provided. This method allows for physical, genuine on-site and practical information, to identify problems, and applying solutions observed and seen in reviews. For a broader view and learning perspective, this case study is sourced, both locally and internationally. That is, both primary and secondary case study tools are adopted for the success of this research.Other data resources for this research, are sourced primarily through qualitative interview, and literature reviews. Qualitative interviews are essential as it give room for the interviewed to speak without restrictions (Jones, 2020), and such responses according to (Rouder, Saucier, Kinder, & Jans, 2021) are regarded true and most accurate. Its result and analysis is of high value when the researcher is able to gather much information during interview and properly report data gotten (Roberts, 2020). While literature review according to (Lim, Kumar, & Ali, 2022) is a known essential for every written research, standing on existing findings and knowledge on a particular area of study, and providing new knowledge and insight to other areas that need t be covered by future research (Bahishti, 2021). This source of data, both primary (qualitative interview), and secondary (literature review) data sources, provides this research with authentic historical information of Ado-Ekiti people and the uniqueness her culture.

FINDINGS AND DISCUSSION

The below shows the summary of the case study carried out below on the five different existing museums, showing the Pros =1 and Cons=0.

STUDY AREAS	Natural lighting and control	Artificial lighting and consistency	Spatial flow and security	Use of signage	Universal design and easeful circulation	Relaxation spot and waiting area	Aesthetics and Finishes
OAU museum, Osun state	1	0	1	0	0	0	1
National Museum Ife, Osun state	1	1	1	1	0	0	0
Owo museum	0	1	1	1	1	0	0
Institute for the study of ancient culture, University of Chicago	1	1	0	1	1	1	1
Nancy and Rich Kinder Museum	1	1	1	1	1	1	1

Source: Researcher's field study (2023). Showing summary of findings from case study.

British Journal of Multidisciplinary and Advanced Studies 5(5),1-27, 2024

Civil Engineering and Building Construction

Print ISSN: 2517-276X

Online ISSN: 2517-2778

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Table 1.0 shows the result of case studies carried out, the Pros and Cons in each design, and what to be included in future museum designs for tourism efficiency. For OAU museum its design is deficient in artificial lighting consistency, which disrupt the flow of learning in the exhibition space, especially in areas with no access to natural lighting. No use of signage for easy circulation during visits, the design doesn't accommodate visitors with disabilities, and there's no provision for relaxation such as a café or restaurant. The design embraces balance in artificial and natural lighting, and is aesthetically pleasing, and has an easy flow within spaces. IFE museum design is deficient not been designed to accommodate visitors with disabilities, there's no provision for relaxation such as a café or restaurant, and its circulation area is little. The design embraces balance in artificial and natural lighting, easy space flow and signage for directives during visit. Owo museum design is deficient in provision for relaxation such as a café or restaurant, poor balance of natural lighting alongside artificial lighting, and poor aesthetics and finishings. The design embraces an easy space flow, and use of signage. Institute for the study of ancient culture, University of Chicago is deficient due to having many accesses leading into the museum arena, which poses a great risk of insecurity majorly to the museum content. The design embraces balance in artificial and natural lighting, and is a universal design. Nancy and Rich Kinder museum design is aesthetically pleasing, and has an easy flow, embracing balance between natural and artificial lighting. The design provides ample circulation area for visitors to explore the museum, and relaxation space such as the café for relaxation and waiting.

All considered in the case studies, are essential for a sustainable design. Such as Natural lighting, which according to Ertas & Sirel (2022) enhances visitors' perception of a space, shape or exhibit finishing and also promote a self-efficient building. Zhao (2020) In a research, emphasized the advantage of balance in lighting (natural and artificial) in an exhibition space, to enhance the psychology and perception of visitors. Furthermore, the cruciality of universality in design can't be over emphasized, to promote designs that are inclusive and accessible to all categories, especially the physically challenged museum visitors (Morns & Berger, 2024). Museum design without control of in-flow and security, will be exposed to theft. Atkinson, et al (2020) in a research explains the importance of security in a museum, and the need to have designs with security in view, thereby encouraging museums security practices as a day to day focus. This is possible through security cameras, and restrictions around exhibitions displayed (Runhovda, 2021).

4.1 An Interview with Chief Ogunmodimu, Secretary to The Ewi (King of Ado-Ekiti).

A. Is Ekiti state any different from other homogenous Yoruba western states in Nigeria?
   Ans: *It is not totally different, as they all have many things in common. Most of which are similarities in custom.*
B. What customs are peculiar to Ado-Ekiti?
   Ans: *That would be our etiquette, morals and standards. Here respect for elders, greetings, children helping parents with domestic work like fetching water, sweeping, washing the dish, while the woman prepares the meal for the family, and goes to market to buy or sell. The men are usually farmers, hunters or palm wine tappers. Aside this are the taboos of*

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Online ISSN: 2517-2778
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the palace and people of Ado. Such as not using a walking stick or an umbrella in the palace, no child is to be born in the palace, not even heirs of the king, no one must carry a child on his or her shoulders anywhere in Ado. It's a taboo. All these taboos have an exception of the king, which is called the Ewi of Ado-Ekiti. This and many more are rules binding the palace and the people Ado-Ekiti.

C. Are there tourism destinations/ places of attraction in Ado-Ekiti?
Ans: *Ado-Ekiti is divided into three major quarters, which are Oke-Ewi, Oke-Ila and Odo-Ado. In Odo-Ado, there is a hill called Oke-Ilota, where Ilota worshipers go for worship, and tourist too, go there to see its fountain. Also, there is Oke-Igeti, where the Ifa oracle started. Pilgrimage is usually done to this site by powerful priest from Ibadan, Akure, and other Yoruba speaking states. Also, the Udiroko festival.*

D. What festivals do Ado-Ekiti people celebrate Annually?
Ans: *Ado-Ekiti celebrates four annual festivals, which begins with the Udiroko Festival, where all indigene of Ado from far and near, come to pay homage to the king, then within an interval of nine days, Iwemo-Ogun festival is done, with the youngest prince taken to the shrine for necessary rights to be made for him, to make him fit as a successor in future. After a space of nine days interval, the ADE festival is done in all quarters, one after the other, all in nine days interval. Then finally the Ogun festival (festival for the god of iron), which then crowns it all and brings the festivity to an end.*

E. What is the story behind the absence of Ado-Ekiti in the Ekiti Parapo war?
Ans: *Ado-Ekiti couldn't join in the war back then as a result of the existing internal war it had with the Edo-Benin, who at that time had conquered Ikere-Ekiti, and dethroned her king who was before called the Olukere of Ikere-Ekiti, replacing him with a solder of Edo-Benin now called Ogoga of Ikere, till date. So, Ado-Ekiti warriors had to stay back to protect her people and other surrounding towns in Ekiti to avoid been taking over by the Edo-Benin warriors.*

F. What is the likely content for a museum, if designed in Ado-Ekiti?
Ans: Items such as pottery works such as pots, plates Amo (water pots), Odu (ancient coffins used by the rich in the past), accessories and ancient art works. Things like keke e ran wu (weaving machine used in the past to make textiles) of that day, raw wool converters, Atupa (ancient Yoruba lamps made clay pots, and egbon owu, as the wool, fueled with palm oil, and regulated with pieces of a broken pot). More items include the war instruments, hunting equipment, palm wine taping equipment, farming tools, and much more.

Policy Implication of The Findings

The Government should help by paying more attention, and channeling more efforts and funds into preserving our cultural heritage. This is possible if the government of every state, through displays of tangible artifact e.g., sculptures, paintings, carvings, metal works, and much more, which helps to leave a lasting image, and better understand of the past culture and what use to be

before western civilization, are kept and well preserved, with properly controlled finishing such as lighting, security and much more.

Secondly the Government should help with providing consistent artificial lighting, this is essential to keep the temperature of the built space regulated, through air conditioning (AC).

Thirdly the Government would help promote and enhance heritage tourism, by establishing policies that promotes maintenance around and within the museum. Maintenance is a very crucial strategy for sustainability, which will keep this great investment ever relevant, inviting and financially profitable to the state and nation at large.

Recommendation

In order to foster a psychologically enhanced environment through natural lighting in the museum exhibition space, and yet protect the artifact in display, the following recommendations are made:

More research should be carried out on more effective ways of promoting balance in natural lighting which enhance user's performance and psychology in spaces, with the need for regulation of radiation for artifact durability. Secondly, further research would help museum designers have more research-based assurance to encourage natural lighting, in exhibition spaces, without posing harm to both display and users.

Secondly museum design by architects, should be seen from a perspective of not just a storage or display space, but also a space for learning. Thereby enhancing museum designs that both contribute to the improvement of space users, and safety of displayed exhibitions.

CONCLUSION

Museum is a public building where people from diverse parts of the world, and at any time of the year, can come and get educated about the cultural values and norms of a people or places. Provision of such spaces helps to bridge a gap between the past and the present. The purpose of locating the museum in Ado-Ekiti was to promote and increase the appreciation of history and culture, providing a readily accessible place to learn about Ado-Ekiti and Ekiti people 365 days of every year. The key to the development of this is to have a clear understanding of what needs to be achieved. Museum is a building that is important for creating cultural interactions between artifact and visitors, as it is a place where people of various class, age, status, religion and tribe visits. One among many others ways to achieving this interaction is providing a balance in lighting system, that would help visitors enjoy their visit better, and make their experience worthwhile, and worth returning. Finally, the cultural interaction in the museum, influences cultural learning, exchange of thoughts and feelings, enhance personal pleasure and growth, and the development of positive attitudes to the environment. With proper lighting, interaction and learning is smooth and productive. Therefore, its logical to say that well-regulated natural lighting within a museum is an important means of enhancing cultural tourism through architecture.

Print ISSN: 2517-276X

Online ISSN: 2517-2778

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