

# Users Perception of Lighting in Selected Arts and Craft Exhibition Centres in Nigeria

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**ABSTRACT:** Lighting is a very crucial aspect of human daily existence. It is necessary to perform daily activities in interior and exterior spaces. Natural and artificial lighting are needed to work hand in hand in order to achieve a balance in spaces. In exhibition spaces, lighting is a big consideration in order to view the pieces which are being exhibited. Lighting also gives users a certain feeling and could also affect their mood. The study examined the effect of lighting on exhibition spaces of Arts and Craft Exhibition Centres in Nigeria from users' perspective. The sampling frame consists of Four cases (Signature Beyond Art Gallery, Nimbus Art Gallery, Nike Art Gallery, and National Museum Benin) were randomly selected from 50 Top/Standard Art Galleries with estimated 650 daily users in the study context with the aid of Google and other search engines. Questionnaires were distributed to understand what the users think of the lighting conditions in the exhibition spaces. The sample size for the questionnaire distribution was 50 visitors which was obtained from information gained from galleries, of the number of

people who visited the buildings on a regular basis daily. The results of the questionnaires revealed that the artificial lighting were more effective in the exhibition spaces than the natural lighting. This was said to be as a result of the control that could be achieved with artificial lighting. This is not meant to be the case as more information on how to control natural lighting in spaces have been discovered and was observed in this study. Also, the result from the users revealed that the lighting, Proper Placement of art works, and the spaces worked hand in hand to enhance the exhibition. This implied that without proper lighting of interior spaces, exhibition would be impossible.

**KEYWORDS:**artificial lighting; arts and craft; exhibition spaces; natural lighting

## I. INTRODUCTION

Light is an electromagnetic radiation which falls between a wavelength of 380mm to 750mm (forming part of the visible spectrum) and this makes it possible for humans to see or have vision [1]. Lighting has always been an important

aspect of man's existence since the beginning of time as the sun itself is a source of lighting and aids our visual senses. It also plays a great role in the understanding of architecture by everyone providing a means for people to appreciate the aesthetics of buildings and could also bring an emotional connection between buildings and humans [2]. Some research questions were raised to which the study seeks to find answers. They are as follows. What are characteristics of lighting, what are the attributes of lighting in Exhibition spaces, and how can users Perception of Lighting in Selected Exhibition spaces in Nigeria be evaluated? Consequently, the objectives of the study are to:

examine characteristics of lighting, highlight attributes of lighting in Exhibition spaces, and evaluate users Perception of Lighting in Arts Exhibition spaces in Nigeria.

## II. LITERATURE

Arts and craft form a very important aspect of most Nigerian cultures, tribes and traditions, resulting in an amazing cultural heritage which is an admired fact about Nigeria. The Nigerian people have always been famous for producing arts and craft works with their hands. The works of the craftsmen had always been admired so much it attracted the eyes of the Colonial Masters [3]. They made an impression on the British invaders making them decide to extradite a lot of the works to the western world [4].

Arts and craft centres are public buildings used for exhibition, showcasing different forms of art (paintings, sculptures, plays etc.), selling of art and development of craft. They can also be seen as a form of museums. An exhibition is usually a program to showcase a number of art, products or different forms of skill [5]. Types of exhibition spaces includes, oral exhibitions, multimedia exhibitions, art exhibition, trade exhibition, consumer exhibition and museums [6].

Lighting is a very key factor for exhibition spaces of arts and craft centres as it is needed to aid the process of exhibiting any form of activity which goes on in the spaces. These spaces need enough light both natural and artificial in order to give the customers satisfaction and an appealing environment to enjoy the exhibitions or performances. In exhibition spaces especially, lighting can be a very complex issue.

As a result of lighting playing a very crucial role in spaces, several studies have been conducted on lighting in spaces in general and

exhibition spaces as well. The studies include those of; [7, 8, 9, 6, 5]. Although, none of the studies painted a clearer picture which placed the idea of lighting in exhibition spaces focusing on the users perspective. Some studies focused on topics such as degradation of pieces, the properties of lighting, thermal comfort, natural lighting or artificial lighting.

The study aimed at investigating the users' perception [10] of lighting in exhibition spaces in order to develop a paper which gives a better understanding of the users' perspective. The objectives of this paper includes; assessing factors which contribute to lighting in spaces and gaining the users of lighting in exhibition spaces.

Generally, this paper gives major insight on lighting in exhibition spaces shedding more light on the thoughts of the users. This paper proffers solutions when dealing with lighting and exhibition spaces. The study will be useful to professionals who are in the built environment, creative and enthusiasts such as; architects, interior designers, artists, craftsmen, researchers and educators giving them better insight on perception of users with regards lighting in exhibition spaces.

## III. METHODOLOGY

The research used qualitative research methodology. The case study method was used for the study. There were six steps which were undertaken in order to conduct this project. Firstly, the problem of the research was identified and an aim was established in the introduction. Secondly, two objectives were coined in order to achieve the set aim of the project.

Thirdly, since the paper is majorly a case study research paper, data was gained through primary sources. The case studies were randomly selected in Nigeria [11,12] from 50 Top/Standard Art Galleries sorted by means of Google and other search engines based on multi-stage selection. Using various websites the 50 facilities in different locations such as Lagos State, F.C.T. Abuja, Edo State, Kogi State, Plateau State, among others in Nigeria, from which 10 were randomly selected without replacement. From the 10, four (4) cases were finally randomly selected- three (3) of which were in Lagos and one (1) in Benin City, Edo State. Literature was also gained with Google Scholar search engine using open access journals and keywords such as; natural lighting, artificial lighting, exhibition spaces and arts and craft. Also users' perception [10] was adopted for getting the information on the study.

Fourthly, the literature documents and the answers from the questionnaire were examined assessed and information which was needed to accomplish the papers aims were extracted. Utilization of textual analysis was the fifth step. This information was arranged with special themes. The information which was collected was grouped under themes. The final step was presenting the results in a concise manner highlighting a summary of findings were documented in order to have drawn a conclusion. The fieldwork was conducted in 2020.

The sample size for Questionnaires administration was calculated based on standard formulae with alpha levels of .05 and an acceptable margin of error of .03 for continuous variables, since the main variables are of 10-point Likert scale. The 10-point Likert scale was adopted because even though it is wide, it can easily be collapsed into seven-, six-, five-, four-, three-, or two- for results reporting or descriptive purposes.

The first calculated sample size  $N_1$  with standard formula  $N_1 = t^2 \times s^2 / d^2$ , in which,

$t$  = value of selected alpha level of .025 in each tail = 1.96

(the alpha level of .05 shows the level of risk the researchers are willing to take that the true margin of error may exceed the acceptable)

$s$  = estimate of standard deviation in the population

$s^2$  = estimate of variance deviation for ten-point scale divided by nine (number of standard

deviations in the range) =  $10/9 = 1.111$

$d$  = acceptable margin of error for mean being estimated [number of points on primary scale

$(10) \times$  acceptable margin of error  $(.03) = 10 \times .03 = .3$

Thus,  $N_1 = t^2 \times s^2 / d^2 = (1.96)^2 \times (1.111)^2 / (.3)^2 = 52.69 \approx 53$

Since the calculated  $N_1$  is 53, which is greater than five per cent of the study population (650 daily users) in Table 1, the sample size correction formula was applied as shown.

$N_2 = N_1 / [1 + S_1 / \text{population}] = 53 / [1 + 53/650] = 49.00 \approx 49$

Consequently, the calculated sample size is 49. But since the expected number of users is 50, it is

adopted as the actual sample size for questionnaire administration (Table 1).

#### IV. RESULTS

##### 1 Characteristics of lighting

There are two classes of lighting, Artificial and Natural.

Natural lighting: This is also known as daylighting or passive design is a technique or means of admitting natural light into a room by maximizing the free resource to get a necessary balance of illumination in that room. It is also the control of the amount of natural light or continuous sunlight and spread of skylight into a structure or space to aid the decrease of artificial lighting, reduce energy consumption and promote economy [13]. Daylight, in other words is a resource that saves energy and produces an appealing visual atmosphere for users of a space [14]. The source of natural light is majorly the sun but can include other things like the moon, fireflies etc.

Some factors that affect natural lighting from [15] perspective includes size of aperture or openings location of aperture, access to sunlight, geometry of the room, location of point of interest in relation to apertures, visible transmittance of glazing, reflectance of room surfaces, exterior surface reflectance, daylight enhancement or reduction and [16] stated some other factors which are, appropriateness of daylighting for a space, ability to take direct sunlight, heat gain control, connection to nature and views and architecture and daylight maximization.

Benefits of natural lighting includes sustainable benefits, psychological benefits [1], reduction of electrical loading, saving of energy [1], reduction of cooling loads [1], reduction of solar heat gain [17], colour vibrance [18], reduces stress and discomfort [19], improvement of mood and well-being, cost benefits [1], satisfaction, reduces need to fix anything when properly designed, daylight is abundant [20], used for energy generation, it is free and health benefits [21].

Natural lighting also has a few disadvantages including which include things like; glare [16], solar heat gain [17], reduced energy efficiency, initial investment/capital [1], medical side effects [18] and availability.

**Table. Study Population, Sampling Frame and Sample Size**

		Sampling Frame	Sampling Frame	Sample Size	Sample Size
	Art Galleries	First Stage	Second Stage	Calculated	Actual
	50Top/ Standard Art Galleries	10 Selected	Four (4) Selected with estimated daily users (i) Nike Art Gallery..... 25 (ii) Nimbus Art Gallery .....5 (iii) Signature Beyond Art Gallery...10 (iv) National Museum Benin....10	24 5 10 10	25 5 10 10
Estimated Daily Users' Population	650		50	49	50

Artificial lighting: Artificial lighting is simply lighting not obtained by natural means. This light is generated from a source by electricity or other sources of energy. Artificial lighting is man-made and can spring up from fire, gas, candle light etc. [22]. Maximum yields opinion is that it is the opposite of natural light and is any source of light that is produced electrically. Some authors believe the sources of light are divided into two main parts and some others believe it is three. [15] believed that it is divided into thermal radiators (e.g: incandescent lamp and halogen lamps) and electrical/gas discharge lamps (e.g: fluorescents, metal halides, and sodium and mercury discharge lamps). The three major sources of light as observed by [22] are fluorescent, incandescent and discharge/LED lights which is quite similar to the argument of [15]. Both authors agree that the LED lamps are more efficient and economical than the others.

Factors that may affect artificial lighting as stated by Alagbe (2020) include, placement of lighting fixtures and fittings, poor installation, poor lighting principles used or little knowledge on how artificial lighting works, electrical issues, producing bad current and substandard lighting materials [15]. Also, artificial lighting should consider the positioning of the side light and top light in spaces.

Benefits of artificial lighting includes agricultural benefits, extended working hours [23], change mood [21], the right light can be picked for

any occasion, reduction of cooling loads, reduction of heat gain, colour variance, user satisfaction, glare eliminated and a form of safety [24].

Some disadvantages of artificial lighting includes health issues [21], the environment can be affected [20], installation needs skilled labour, initial investment/capital is a lot and increased electrical loading.

## 2. Lighting in Exhibition spaces

An exhibition is usually a program to showcase a number of art, products or different forms of skill [5]. It is an occasion where or marketing place in which a number of people display their works (goods or services) in order to sell to interested buyers [6]. The types of exhibition spaces stated by [5] includes commercial and non-commercial and [6] also agrees but calls them consumer and trade. There are also sub-categories of the types of exhibition which are; oral exhibitions, multimedia exhibitions, art exhibitions, trade exhibitions, consumer exhibitions and museums.

There is way more to exhibition spaces than just simply displaying of works. According to [9], intricate attention must be given to lighting in exhibition spaces because it needs an assurance of perfect visual performance while at the same time eliminating the ability of deterioration and keeping the integrity of the pieces if any. Different pieces take different materials and deteriorate and also act

differently under different exposures and this must also be considered.

There are three (3) things this kind of lighting must achieve, object visibility, object preservation and room illumination which can be done by both artificial and natural lighting [8]. In exhibition spaces all these things are needed for a good viewing experience. Like [8] mentioned, both artificial and natural lighting are needed for the achievement of good lighting and they must also be of perfect balance in order to achieve a good balance of lighting.

Both daylighting and artificial lighting have adverse effects on the exhibits as they contain rays that can cause several effects when the exhibits are exposed for a long time. With the designer freedom of being able to design the lighting in any way they want, the lighting must perform its functional duties and the lighting design depends on some planning parameters [7]. [7] believes that, lighting of a space is meant to harmonize while also considering proportion of the room, design of the interior, colour scheme of the room, daylight available, artificial light available and the nature of the exhibition.

Lighting is definitely a means of expression in exhibition spaces as it aids in the story telling process. Since lighting can invoke moods, lighting in a museum is very crucial to make the viewers understand the exhibition properly and get the right message. It also aids in the way finding and directing of the users through the exhibition space.

[8] suggested a number of design recommendations which are, to extend the footprint of the perimeter of the building in order, high windows should be situated in the wall or use of clerestory windows and roof monitors in order allow light go deeper into a space and reduce excess brightness, room brightness can be improved through reflection of surfaces in the room, sloping of the ceiling to direct light in a space and help in the increase of the brightness of the surfaces, try as much as possible to avoid direct

sunlight in the space as it can cause visibility issues and discomfort of occupant, filtering of daylight using vegetation, curtains, louvers and shading devices in general, understanding of the several building orientations that can be adopted to aid daylighting strategies, use of light shelves for bouncing and directing the light to where it is needed which is mostly in the deeper part and use of light tunnels to channel the daylight straight from the roof through a tunnel to the space where it is needed, artificial lighting can also be used to create a light tunnel in a dynamic and aesthetically pleasing manner.

### 3 Users Perception of Lighting in Exhibition spaces in Nigeria

A questionnaire was prepared and distributed by the authors who took consent from the Arts and Crafts Exhibition Centres in which the study was done. Questionnaires were distributed in Signature Beyond Art

Gallery, Nimbus Art Gallery, and Nike Art Gallery all in Lagos and National Museum Benin in Edo state and the observation. The estimated study population was 650 but the sampling frame is made up of four (4) Arts and Craft Centres. Three (3) were in Lagos state namely; Nike Art gallery (average visitors on a regular day=25), Nimbus art gallery (average visitors on a regular day= 5) and Signature art gallery (average visitors on a regular day= 10) and one (1) was in Edo state which is National museum Benin (average visitors on a regular day= 10). A total of 50 people in the sampling frame to which the questionnaire were administered. The questionnaires were distributed in the different art galleries and the results were collated. The results for the questions which majorly concern lighting are stated in Tables 1 and 2. The scales used were Yes or No in Table 1 and '1 to 10' collapsed into very poor (1 and 2), poor (3 and 4), neutral (5and 6), good (7 and 8), and very good (9 and 10), for easy description in Table 2.

Attribute	Nike Art Gallery	Nimbus Art Gallery	Signature Art Gallery	National Museum Benin	All Galleries
<b>Number of respondents</b>	24	3	6	10	43
<b>Appropriateness of Height of Exhibition space(s)/Size of space</b>	95.8% Yes	66.7% Yes	100% Yes	90% Yes	93.0% Yes
<b>Proper Placement of art works</b>	79.2% Yes	66.7% Yes	100% Yes	90% Yes	83.7% Yes

From Tables 2, with over 90 percent of all users saying Yes to Appropriateness of Height of

Exhibition space(s) showed very high level of agreement, and with over 80 percent of all users

saying Yes to Proper Placement of art works showed High level of agreement.

It is pertinent to note that the perception of Lighting component made up of the following five

(5) attributes, General Lighting, Artificial Lighting, Natural Lighting, Light intensity, and Colour of light was generally Very good (Table 3).

**Table 3. Overall Assessment (Lighting, Space, Finishes, Placement of art works, and Exhibition Perception)**

Components	Attribute	Nike Art Gallery	Nimbus Art Gallery	Signature Art Gallery	National Museum Benin	All Galleries	All Galleries (Components)
	Number of respondents	24	3	6	10	43	43
1	Lighting	Very Good	Very Good	Good	Good	Very Good	
	General Lighting	Very Good	Very Good	Good	Good	Very Good	
	Artificial Lighting	Very	Very	Very	Very	Very	

For all Exhibition Galleries in Nigeria, the results of the questionnaires revealed that the artificial lighting were more effective in the exhibition spaces than the natural lighting; and of the five components, only Art works Placement and Floor & Ceiling Material finishes; were

perceived as Good, the other three components (Lighting; Spatial Size, Shape & Colour; and Exhibition Perception) were perceived as Very good. Hence the Overall Assessment of all the components investigated was rated as Very good.

**Table 4. Comparison of the Two Aspects of the Results**

Attribute	Table 2	Table 3	Remarks
	All Galleries	All Galleries	
Number of respondents	43	43	
Size of space	Very good (93.0% Yes)	Very good	There was Agreement of the two parts
Placement of art works	Good (83.7% Yes)	Good	There was Agreement of the two parts

		Good	Good	Good	Good	Good	
	Natural Lighting	Good	Good	Good	Poor	Good	
	Light intensity	Very Good	Very Good	Good	Good	Very Good	
	Colour of light	Very Good	Very Good	Very Good	Very Good	Very Good	
		Very Good	Very Good	Good	Good	Very Good	Very Good
2	Spatial Size, Shape & Colour	Very Good	Very Good	Good	Good	Very Good	
	Size of space	Very Good	Very Good	Good	Good	Very Good	
	Shape or space configuration	Very Good	Good	Good	Good	Very Good	
	Colour of Paint	Very Good	Very Good	Very Good	Very Good	Very Good	
		Very Good	Very Good	Good	Good	Very Good	Very Good
3	Floor & Ceiling Material finishes	Very Good	Neutral	Very Good	Good	Very Good	
	Floor finish	Very Good	Neutral	Very Good	Good	Very Good	
	Ceiling finish	Very Good	Neutral	Very Good	Good	Very Good	
		Very Good	Neutral	Very Good	Good	Very Good	Good
4	Artworks Placement	Very Good	Neutral	Good	Good	Good	Good
5	Exhibition Perception	Very Good	Good	Very Good	Very Good	Very Good	Very Good
	Overall Assessment	Very Good	Good	Good	Good	Very Good	Very Good









Acomparison of Tables 2 and Table 3 as shown in Table 4 revealed that there was Agreement of the two parts of the investigation using 'Yes or No' in Table 2 and the other using




ten(10)-point collapsed into five(5)-point Likert Scale in Table 3.



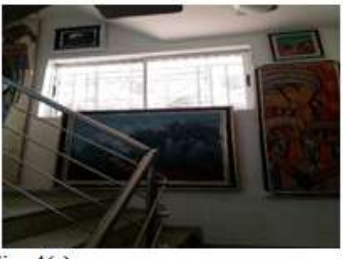


The study examined the characteristics of lighting, highlighted attributes of lighting in Exhibition spaces with suggested design

recommendations (for lighting), and evaluated users Perception of Lighting in Exhibition spaces in Nigeria to be very good. This was corroborated by




the pictures of lighting effects in the studied spaces as shown in Fig.1 to Fig.7.

<p>Fig. 1(a)</p> 	 <p>Fig. 1(b)</p>	 <p>Fig. 1(c)</p>
	<p>(i) Pictures from Signature Beyond Art Gallery, Lagos</p> <p>Fig. 1(a), 1(b) and 1(c). Images showing the natural lighting conditions in different spaces in Signature Beyond Art Gallery, Lagos</p>	
<p>Fig. 2(a)</p> 	<p>Fig. 2(b)</p> 	<p>Fig. 2(c)</p> 
<p>Fig. 2(d)</p> 	<p>(ii) Pictures from Nimbus Art Gallery, Lagos:</p> <p>Fig. 2(a), 2(b), 2(c), 2(d) and 2(e). Images showing artificial lighting conditions in different spaces in Signature Beyond Art Gallery, Lagos</p>	<p>Fig. 2(e)</p> 

 <p>Fig. 3(a)</p>	 <p>Fig. 3(b)</p>	 <p>Fig. 3(c)</p>
<p>(iii) Pictures from Nike art gallery, Lagos: Fig. 3(a), 3(b) and 3(c). Images showing the artificial lighting conditions in different spaces in Nimbus Art Gallery, Lagos</p>		

<p>Fig. 4(a)</p> 	 <p>Fig. 4(b)</p>	 <p>Fig. 4(c)</p>
 <p>Fig. 4(d)</p>	<p>Fig. 4(a), 4(b), 4(c), 4(d) and 4(e). Images showing the natural lighting in different spaces in Nike Art Gallery, Lagos</p>	<p>Fig. 4(e)</p> 



<p>Fig. 5(a)</p> 	<p>Fig. 5(b)</p> 	<p>Fig. 5(c)</p> 
<p>Fig. 5(a), 5(b) and 5(c). Images showing the artificial lighting in different spaces in Nike Art Gallery, Lagos</p>		

**Pictures from National Museum Benin, Edo State**



Fig. 6. Exterior, showing slender windows which natural lighting enters National Museum Benin City



Fig. 7(a)



Fig. 7(b)



Fig. 7 (c)

Fig. 7(a), 7(b) and 7(c). Images of artificial lighting in different spaces in National Museum Benin City, Edo State

## V. DISCUSSION

For Signature Art Gallery, the artificial lighting condition was the better condition in the spaces. The light used was generally white but there were some yellow/cream lights used. The colour of the spaces were white but one of the spaces was orange. The spaces had cream coloured Plaster of Paris (POP) for the ceiling finishes. According to the users as stated in the table in chapter 3, the exhibition spaces are appropriate with the lighting conditions which are available. In this case the lighting enhances the exhibition and gives a certain ambience.

According to the users of Nimbus art Gallery and the table in chapter 3 above, the major issue was the size of the exhibition space as majority tagged it as being very poor. The floor finish, ceiling finish and placement of art works were assumed by majority to be neutral. This basically shows that the materials used for the floor, ceiling and how the art works were placed were not able to have a major effect on the lighting conditions. The lighting predominant in the exhibition space was white fluorescent light with some as spotlight bulbs. The ceiling was a dark wooden ceiling, the flooring material was tiles and the wall was painted white. Even if the lighting in this space aids the exhibition, the finishes were not

able to aid the exhibition properly as judged by the users.

In Nike Art Gallery, the general lighting conditions were very good but the building did not pay attention to natural lighting and majority of the users considered the lighting conditions good. In this art gallery, the lighting in the exhibition spaces from the users perspective are very good and the height of the spaces and the proper placement of art works are appropriate. Every interior material in the space is white coloured and is very appropriate for the lighting conditions as they aid the artificial lighting conditions due to their colour and some of the reflective properties. The colour of lighting is also appropriate for the space as it allows proper viewing.

National Museum Benin majorly focused on artificial lighting rather than natural lighting as they considered the use of slender windows to allow light enter the building and utilized curtains and boards which covered majority of the windows. As a result of this, majority of the users believe that the natural lighting is poor. For the artificial lighting it is believed to be very good by majority of the users. The exhibit cannot be properly viewed without artificial lighting. The lighting in the exhibition spaces are seen to be appropriate according to the table 2. Also, most of

the materials used for the exhibition spaces were appropriate for the lighting conditions as they aid both the artificial lighting and the slight natural lighting which enters the building due to their colours and some reflective properties of some materials. The colour of lighting is also seen to be appropriate for the space as it allows proper viewing of art works.

## VI. V. CONCLUSION

This research is a case study research which, aimed at gaining the users perception of lighting, focusing on Nigerian arts and craft exhibition centres. The study was conducted to shed more light on lighting in exhibition spaces which showcase arts and craft in order to produce a document which would profit the professionals in need of this information especially, in the built environment. This study was conducted due to the gaps in existing literature which, did not concentrate on the users perspective. The research gave a broader understanding of lighting in exhibition spaces from the perspective of the users.

The findings from literature showed that, natural lighting produces more energy efficient solutions and if properly utilized, it could aid artificial lighting with the use of solar panels. The most energy efficient lighting fixtures were found to be the LED ones and that, could be incorporated in the design. Also, general recommendations which were identified for both natural and artificial lighting should generally be considered when designing. Since colours happen to be very important in order to invoke feelings and help in the exhibition process, colours of both the natural and artificial lighting including room finishes should be taken into proper consideration. Considering the daylight factor of the spaces, the visible light transmittance of the glazing, the geometry of spaces and positioning and size of windows or openings and shading devices should be considered. For artificial lighting, the lighting fixtures must be adequately picked and used. The major idea is to utilize advantages and minimize disadvantages of both natural and artificial lighting making sure that, lighting design avoids degradation of pieces. The general design recommendations for lighting also need to be considered while designing a space.

The users' perspective happened to give better insight on how the users of the exhibition spaces perceived lighting in the spaces. The users understood that lighting has an effect on the spaces and without it the exhibition cannot be viewed. The lighting also goes hand in hand with the materials

used in the spaces and the effect of these materials could also aid the lighting conditions. In this study, the conclusion of the users was that the general lighting condition in the spaces in Nigeria was very good and they were able to view and enjoy the exhibition as a result of this.

In all the case studies, artificial lighting was focused on more than natural lighting. The more sustainable options need to start being considered in order for buildings to last longer. In order to do this, one thing that must be adopted are good lighting strategies. Lighting is a very huge consideration as it gives comfort and adds to the life cycle cost of the building. Buildings are evolving and coming to the realization of needing to design buildings not only for now but, another 100 years or more. Generally effectiveness of artificial lighting and Art works Placement need improvement for enhanced performance

On the basis of Google and other search engines used for the literature and random selection of cases for the sampling frame, the findings in this study is very reliable and generalizable in the study context. The results have given insight on the effectiveness of lighting in arts exhibition spaces in Nigeria, thereby contributing to the body of knowledge on the subject investigated.

Therefore, further similar studies should look into with a broader scope (such as higher number of facilities, higher study population, higher number of sampling frame and sample size; with stratified random sampling for selection of sampling frame; and increased number of relevant variables) and new results compared with the findings in this study as referral.

## AUTHORS' CONTRIBUTIONS

Conceptualization, Osahon Ediae and Ogheneyoma Pela; Data curation, Osahon Ediae and Ogheneyoma Pela; Formal analysis, Olatunde Babalola, Egidario Aduwo and Peter Aderonmu; Investigation, Ogheneyoma Pela; Methodology, Egidario Aduwo, Peter Aderonmu and Noel Ekhaese; Project administration, Osahon Ediae and Olatunde Babalola;

Resources, Noel Ekhaese and Hillary Essien; Software, Olatunde Babalola; Supervision, Osahon Ediae; Validation, Peter Aderonmu; Visualization, Egidario Aduwo and Ogheneyoma Pela; Writing – original draft, Ogheneyoma Pela; Writing- review & editing, Olatunde Babalola, Peter Aderonmu, Noel Ekhaese and Hillary Essien.

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#### DATA AVAILABILITY STATEMENT

Data supporting reported results are available from the lead author on request.

#### CONFLICTS OF INTEREST

There are no conflicts of interest to declare.

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**APPENDIX**

**QUESTIONNAIRE**

**EVALUATING USERS IDEA OF LIGHTING IN EXHIBITION SPACE**

**Section A**

1. Do you consider the height of the space appropriate with regards the lighting conditions? Yes [1] No [2]
2. Are the art works properly placed with regards lighting conditions? Yes [1] No [2]

**Section B**

3. Tick as appropriate from ‘0 to 10’, where ‘0’ is the least (meaning Not Available or non-existence) and ‘10’ is the highest (or best), the conditions stated below considering how the lighting condition enhances the showcasing of the exhibition.

Attribute	0	1	2	3	4	5	6	7	8	9	10
General Lighting											
Artificial Lighting											
Natural Lighting											
Light intensity											
Color of light											
Size of space											
Shape or space configuration											
Color of paint											
Floor finish											
Ceiling finish											
Placement of art works											
How was the exhibition											