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Stakeholders' Perception of Sustainability in Educational Buildings in Nigeria

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Abstract

Building plays a vital role in the delivery of quality education. It is therefore necessary to provide not just buildings but sustainable ones, since educational buildings are meant to serve both the present generation and generations to come. This paper presents the findings of the assessment of sustainability in educational buildings in Nigeria from the stakeholders view point. A survey design approach was adopted and questionnaire was administered on construction participants in selected higher institutions. Data gathered were analyzed using percentage, relative importance index, and Kruskal-Walis H-test. The study revealed that sustainability in educational buildings in the country is on the average with the social dimension ranking a bit higher than the economic and environmental dimensions. There is also a significant divergence in the view of construction stakeholders as to the sustainability features of educational buildings. This divergence tends to affect the priority placed on sustainability as some critical sustainability features such as thermal, visual and acoustic comfort, needed for sustainable educational buildings were found to be very low. If this is to change, then more orientation of construction stakeholders as regards sustainability is needed. The study therefore recommends that educating construction participants, on the concept of sustainability is necessary in order to improve the understanding of sustainability among participants, and achieve sustainability in its holistic form. The study contributes to the body of knowledge as it brings to light the sustainability nature of educational buildings in the country from the stakeholders' perspective; an aspect that has lacked research attention in the discussion of sustainable construction in the country. It is therefore believed that its findings will assist those responsible for the delivery of educational buildings across the country in delivering sustainable buildings for effective learning.

Keywords: *Educational Building, Project delivery, Stakeholders' perception, Sustainability*

1.0 Introduction

Building sustainably has become part of the issues that bedevils the construction industry in most developing countries around the world. Bold statements as to the poor sustainability of construction projects within the construction industry of developing countries have been made in recent time [1-4]. This poor sustainability performance cut across all sectors where construction products are required, and the education sector is no exception. The short comings in the delivery of sustainable construction projects; one that serves not only the present but also future generations has led to disrupt in the delivery of quality education within the academic system in Nigeria. The present democratic era in the country has suffered several industrial actions by academic bodies in the higher institutions. These bodies' demands among others include the need for standard and up-to-date infrastructures in the higher institutions [5]. According to Olanrewaju [6] buildings are critical factors of production in achieving desirable outcomes for tertiary institutions and any inadequacy in building facilities represents a loss in value not only to the institution, but also to its users and other stakeholders. This implies that providing not just a structure but a sustainable one should be paramount to those involved in the provision of quality education in the country.

It has been established that the world today is moving towards sustainable development through the delivery of sustainable construction; one that encourages the preservation of the natural habitat, promotes social wellbeing of the occupants, and provides reasonable economic stand for the investors [7]. This is as a result of concern that the ever rising population poses tremendous threat to the limited earth resources. The idea is to therefore provide construction projects that meet the needs of the present without compromising the ability of future generations to meet their own needs [8, 9]. Chaharbaghi and Willis [10] opined that sustainable development is a concept based on a structure which stands on three pillars, namely economic, social and environmental. Thus, a construction is said to be sustainable when it meets environmental challenges, responds to social demands and delivers economic improvement.

Alabi [2] opined that in a developing country like Nigeria, there is a low level of awareness in the aspect of sustainability. This situation is rather moderate in Malaysia and Turkey as observed by Abidin [11] and Akbiyikli *et al*., [9]. This low awareness level in Nigeria can lead to poor performance of building projects in terms of sustainability if not properly checked. Alabi [2] also discovers that building professionals define sustainability more in terms of effective protection of the environment rather than inclusion of both economic and social features. This was a further confirmation of Beheiry [12] observation that although considerable research has been and still being carried out in the area of sustainability, greater focus is generally placed on the environmental pillar. Ekung, Oaikhena and Ejekwu [13] however discovered that in terms of project management activities, most construction stakeholders in Nigeria perceived the social dimension of sustainability as the most important sustainability objective in the delivery of sustainable construction. This disparity in both researches further affirms Akbiyikli *et al*., [9] assertion that the level of sustainability understanding among participants and its implementation in the construction industry is piecemeal and unstructured.

Considering the need to provide sustainable educational buildings in a country where poor performance of construction is prevalent, assessing the sustainability of existing educational buildings is necessary. It is based on this knowing, that this study assessed sustainability in educational buildings from the stakeholder's view point, using selected sustainability criteria, with a view to providing possible measures for improving sustainability in buildings within the education sector. Subsequent parts of the paper include the review of literatures relating to the subject matter, the methodology used in carrying out the study and the findings of the study. At the end conclusions were drawn from the findings and necessary recommendations were made.

2.0 Literature Review

Sustainability has become a popular paradigm in the construction industry as a result of a rising concern that human activities are having serious negative impact on the environment. Sustainability is said to be complex in nature and it is all things to all people and as such, several definitions exist [14, 15]. However, the widely accepted definition today is that of the World Commission on Environment and

Development (WCED) [16] which gave the definition of sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". Therefore, in the delivery of construction projects, care must be taken not to exhaust the available resource to a point where by the ability of future generations to cater for their own need is endangered.

Bourdeau [17] viewed sustainable construction as the creation and responsible management of a healthy built environment based on resource efficient and ecological principles. Du Plessis [18] opined that sustainable construction is a holistic process aimed at restoring and maintaining harmony between the natural and the built environments and create settlements that affirm human dignity and encourage economic equity. Aje [1] further stated that Du Plessis view of sustainability takes sustainability further than just reducing negative impact as implied in most sustainable construction definitions by introducing the idea of restoring the environments as well as highlighting social and economic aspect of sustainability and explicitly defining what the goal of these aspects are.

Akbiyikli *et al.,* [9] stated that a sustainable construction can be seen as a path way through which the construction industry can move towards sustainable development. It incorporates the basic themes of sustainable development [19, 10, 20] and brings about environmental responsibility, social awareness, and economic profitability objectives to the key players in the built environment [21]. Thus, a construction can be said to be sustainable when it encourages the preservation of the natural habitat, promotes social wellbeing of its occupants, and provides reasonable economic stand for its investors [7].

In providing sustainability in construction, several studies have evolved. Several sustainability performance measurement parameters such as Leadership in Energy and Environmental Design (LEED), BREEAM, Green Building Tools and Civil Engineering Environmental Quality Assessment and Awards Scheme (CEEQUAL), have been developed by different countries to measure the environmental impact of construction projects [22, 23, 15]. Aside the environmental impacts, the economic and social implication of constructions are also being considered. Enshassi *et al.,* [24] and Shen *et al.* [25] developed a project sustainability performance checklist aimed at enabling project participants to assess the sustainability performance in the holistic process of the project life cycle. However, despite the availability of these sustainability measurement tools and checklist, limited works have emanated from Nigeria, in considering the sustainability nature of construction works in the country. Ekung et al., [13] observed that the researches on sustainability are more focused on sustainable construction knowledge issues. This includes its perception and awareness and sustainable facilities management [26-28]. Some others focused on renewable energy and energy efficiency [29, 30] and green buildings [31], while some focused on using divers materials and management tools such as value management in delivering sustainable constructions [7, 32].

For a construction to be sustainable, Wai *et al.,* [33] discovered that monitoring and control, realistic schedule, ability to solve problem, understanding project objective and well allocation of resources are critical. Zabihi, Habib and Mirsaeedie [34] also observed fourteen sustainability assessment criteria with thirty-six sub criteria for building systems and they were categorised under the triple bottom line of environment, economic and social sustainability. This include: environmental criteria - energy consumption, compatibility, waste, recycle criteria material, pollution criteria, resources consumption; economical criteria – cost, investment criteria, time, execution issues; social criteria – social issues, safety and health, design and architecture issues.

Hussin *et al*., [35] stated that in order to achieve sustainable construction, there must be a balance in the basic principles of sustainability - environment, economic and social aspects. Twenty-one important factors to be considered under these three sustainability dimensions were proposed in the study. In similar vein, Zhou *et al.,* [15] through the review of related literatures developed a conceptual framework of sustainable PFI indicators that has four dimensions (social, economic, environmental and technical) consisting of twenty-eight indicators. In a similar vein, Enshassi *et al.*, [24] assessed a total of fifty-three sustainability factors classified under the three dimensions of sustainability. These factors cut across a project life cycle and at the end important factors were identified, chief of which are; reusable/recyclable element, provision of services (improving living standard to local communities), energy consumption, water cost, and water pollution assessment.

It is noteworthy to add at this point that although construction situation differs with countries, certain peculiar sustainability criteria have seemed to reoccur in these studies. Importantly is the need for environmental consciousness, saving cost and promoting cultural value of the community. This underscores the fact that the trio of environment, economy and social dimensions of sustainability are paramount for any project that is to be termed "sustainable".

3.0 Research Method

Prior to the commencement of the study, 66 educational building projects executed within 2006 and 2016 in five public tertiary institutions in Nigeria were identified. These institutions include; Adekunle Ajasin University, Akungba, Adeyemi College of Education, Ondo, Federal University of Technology, Akure, Ondo State University of Science and Technology, Okitipupa, and Rufus Giwa polytechnic, Owo. These institutions are public institutions and are funded through various government funding schemes. Since the Government is a major contributor to the education sector, and these funding schemes are used in the provision of educational buildings in all public institutions within the country, it can be said that these selected public institutions gives a reasonable insight of happenings in most government owned higher institutions around the country. The private institutions were left out because they are individually owned institutions, and are funded as such. Their details are mostly kept confidential; hence getting data from such schools will be difficult.

A total of 207 construction participants (exclusive of double or triple usage) were identified to have been involved in the execution of these identified building projects. These participants are stakeholders on these projects. They include: The Clients, represented by construction professionals in the Physical Planning Unit/Works Department of the institutions; External Consultants (Architects, Quantity Surveyors and Engineers); and Contractors that handled the identified building projects. The end-users which include the workers (both academic and non-academic), and the students, were exempted from the study as most of them are not "construction learned" nor were they involved in the construction of the identified buildings.

A quantitative approach through the use of structured questionnaire, administered on all the 207 identified stakeholders was employed. A total of 134 questionnaire was however retrieved and deemed fit for analysis. The questionnaire used was designed based on information gathered from the review of related literatures. The questionnaire was designed in two parts. Part A dwelt on the background information of respondents. Information gotten from this section provides quality check to the data gotten from the other part of the research instrument. Part B dwelt on the objective of the study. A total of 28 criteria found to be related to construction of educational buildings were selected from literature and respondents were asked to rank them base on their applicability in the identified buildings using a 5-point Likert scale, with 5 being highly applicable, 4 applicable, 3 averagely applicable, 2 low and 1 not applicable. These criteria were selected based on the response gotten from the pilot survey carried out.

Fellows and Liu [36] suggested that research instrument should initially be piloted in order to test whether the questions are intelligible, easy to answer and unambiguous, as well as providing an opportunity to improve the questionnaire and determining the time required in completing the exercise. This was done through sending out of the first draft of the questionnaire to 6 randomly selected construction professionals that have executed education building projects in the past, and the final draft of the questionnaire was adjusted based on the result from the pilot survey.

The reliability of the research instrument was further tested using Cronbach's alpha test. This method is used to measure the reliability of the questionnaire between each field and the mean of the whole fields of the questionnaire. The normal range of Cronbach alpha value is between 0.0 and + 1.0, and the higher value, the higher degree of internal consistency. The Cronbach alpha value of 0.845 was derived for the assessed criteria as seen in Table 1. This shows that the instrument is reliable since the degree of reliability of an instrument is more perfect as the value tends towards 1.0 [37].

For this study, data analysis was done using Statistical Package for Social Science (SPSS) version 17.0. Frequency and percentage was used in analysing the background information of the respondents. For the second part of the research instrument, data gathered were analysed using Shapiro-Wilk test to check the normality of data, while Kruskal-Walis H-test was employed in testing the relationship in the view of the respondents. Relative Importance Index (RII) was used to rank the sustainability criteria of educational buildings as perceived by the stakeholders. RII was employed for two purposes which are: ranking and determination of significance of different factors of the collected data. The premise of decision for the ranking is that the factor with the highest RII is ranked 1st and others in such subsequent descending order. The Relative Importance Index (RII) according to Megha and Rajivis [38] is written as:

$$RII = \frac{\sum W}{A*N}$$

Where, W is the weighting given to each factor by the respondents (ranging from 1 to 5), A is the highest weight, and N is the total number of respondents.

Table 1: Reliability Test

	Case Processing Summary					
		N	%			
	Valid	100	100	Cronbach's Alpha		0.845
Case	Excluded[a]	0	0	Numbers of Items		28
	Total	100	100			
a. List wise deletion on all variables in the procedure						

4.0 Results and Discussion 4.1 Background Information of Respondents

Background information of the respondents shows that the most represented categories of respondents are the Consultants with 48.7%. This is followed by the Contractors with 31.3% and Clients with 20%. The most represented professionals are Engineers and Quantity Surveyors with 36.6% and 32.1% respectively. This is followed by Architects and Builders with 19.4% and 11.9% respectively. Most of the respondents sampled holds Bachelor of Science/ Bachelor of Technology degree (36.5%) and Masters of Science/Masters of Technology degree (35.8%), while 17.2%, 9.7% and 0.8% possess Post Graduate Diploma, Higher National Diploma, and PhD respectively. The overall average years of working experience of the respondents is 12.7 years. These vast years of experience in turn influences the number of projects handled by them as an average of 15 construction project was observed. Based on this general information, it can be assumed that the respondents are well equipped not only academically but also in terms of years of working experience, thus, making them capable to provide sufficient response that addresses the objectives of this study.

4.2 Stakeholders Perception of Sustainability in Educational Buildings

In assessing sustainability in educational buildings from the stakeholders view point, normality test was first conducted on the data gathered in order to determine the type of test to be carried out in analyzing the data. This was done to find out if the nature of data is parametric or non-parametric. Since the sample size of the study is less than 2000, Shapiro-Wilk normality test was adopted as suggested by Ghasemi and Zahediasi [39]. Result in Table 2 shows that the significant value of all the assessed sustainability criteria is 0.000 which is less than the 0.05 required criteria for normality. Hence the data gathered cannot be examined using normal parametric statistical techniques as they are non-parametric in nature. Kruskal-Walis H-test which is a non-parametric test used in ascertaining the significant difference in the perception of three or more categories of respondents, was therefore employed in determining consistency in the opinion of the three sets of stakeholders (Clients, Consultants and Contractors).

Table 2: Normality Test

Sustainability	Shapiro-Wilk		
	Statistic	df	Sig.
Economic			
Use of design and the environmental-friendly products which will take future operating costs down to a minimum	0.909	134	0.000
Use of durable materials used for construction of the building	0.902	134	0.000
Use of low maintenance materials for construction of the building	0.879	134	0.000
Installation of environmental features such as solar panels, water tanks etc that can end up increasing the value of the property	0.830	134	0.000
Use of readily available materials from local market used thereby optimizing cost by reducing transportation expenses	0.817	134	0.000
Efficient use of recycled materials to save cost	0.774	134	0.000
Environmental			
Design minimizes the need for future modifications to cater for occupants changing requirements, which reduces long term cost	0.877	134	0.000
Maximum use of passive solar design features, such as house orientation, ventilation, insulation and shadings etc.	0.801	134	0.000
Eliminating the need for air conditioning or other mechanical heating or cooling systems in the building	0.899	134	0.000
Appropriate use of building materials, fixtures and fittings that will ensure higher energy efficiency and help reduce household carbon emission	0.805	134	0.000
Rainwater being captured, used, recycled and re-used as much as possible within the building	0.811	134	0.000
Inclusion of grey water processing system in the structure	0.749	134	0.000
Efficient use of building materials and minimization of waste during construction	0.909	134	0.000
Use of materials with a life span equivalent to the projected life of the building used during construction	0.877	134	0.000
Does the design retain existing vegetation including trees	0.735	134	0.000
Landscaping considers natural features of the site (topography, natural and cultural features etc.)	0.908	134	0.000

Use of materials from local market used where possible, thereby minimizing energy used to transport materials	0.791	134	0.000
Social			
Preservation of the heritage streetscape (i.e. structure conforming to other existing structures in the area)	0.736	134	0.000
Building thermally comfortable	0.819	134	0.000
Building acoustically comfortable	0.855	134	0.000
Building visually comfortable	0.830	134	0.000
Sustainability	Shapiro-Wil		
	Statistic	df	Sig.
Social			
Building minimizes the possibility of falls and driveway run-over	0.778	134	0.000
Building employ design, features and fittings that reduces crime and protects it from malicious intruders	0.879	134	0.000
High security features to all doors and windows with simple locking systems	0.844	134	0.000
Use of open design to aid easy internal and external surveillance	0.806	134	0.000
Building provides easy asses for all kinds of individuals including those with disabilities	0.766	134	0.000
Use of local labour thus providing employment for people within the locality	0.766	134	0.000
Presence of "off-street" parking options to provide for proper parking system	0.853	134	0.000

4.2.1 Economic Sustainability in Educational Buildings

By economic criteria we can investigate the flow of money and revenue from a construction project. Although the assessed educational building projects are not profit oriented except for the hostels and some of the commercial buildings which generate some income for the institutions, it is expected however that there should be some measure of economic benefits in terms of low maintenance cost which can be as a result of the use of low maintenance material. Result in Table 3 shows the ranking of the different economic sustainability criteria as perceived by the different stakeholders. From the result it is evident that the use of durable materials used for construction of the building and the use of design and the environmental-friendly products which will take future operating costs down to a minimum are the most common. These two variables ranked closely with a RII of 0.615 and 0.610 respectively. The use of low maintenance materials has an overall ranking of third with a RII of 0.551 which is barely on the average. Thus, it can be said that frequent maintenance of these buildings should be expected and this will invariably increase the overall life-cycle cost of these projects. The efficient use of recycled materials to save cost ranked the least with a RII of 0.407. Reason for this can arguably be the deficiency of the Nigerian construction industry in the area of recycling of materials and subsequent use of same. Result from the Kruskal-Walis H-test conducted to ascertain the relationship in the perception of the respondents shows that there is a divergent view among the respondents as regards five out of the seven assessed criteria. The significant p-value of these five criteria is less than 0.05. This implies that stakeholders see the presence of these criteria in educational buildings differently.

Table 3: Economic sustainability in educational buildings

S/n	Economic Sustainability	RII	Rank	Chi. Sq	Sig.
1	Use of durable materials for construction of the building	0.615	1	6.347	0.042**
2	Use of design and the environmental-friendly products which will take future operating costs down to a minimum	0.610	2	10.591	0.005**

3	Use of low maintenance materials for construction of the building	0.551	3	0.544	0.762
4	Use of readily available materials from local market thereby optimizing cost by reducing transportation expenses?	0.503	4	35.458	0.000**
5	Design minimizes the need for future modifications to cater for occupants changing requirements, which reduces long term cost	0.470	5	4.501	0.105
6	Installation of environmental features such as solar panels, water tanks etc that can end up increasing the value of the property	0.416	6	7.811	0.020**
7	Efficient use of recycled materials to save cost	0.407	7	24.102	0.000**
	Average	0.510			

** Significant at $p < 0.05$

4.2.2 Environmental Sustainability in Educational Buildings

For the environmental sustainability of the assessed educational buildings, result in Table 4 shows the ranking of the different environmental sustainability features by the respondents. From the table, it is evident that the top features under this sustainability dimension are; the use of landscape that considers the natural features of the site, and the efficient use of building materials and minimization of waste with a RII of 0.601 and 0.594 respectively. Interestingly, the use of materials with a lifespan equivalent to the projected life of the building during construction ranked seventh with a RII of 0.472. This implies that the expected life span of these structures is actually not put into consideration during the course of purchasing materials for construction. This is not supposed to be the case as educational buildings are supposed to serve not just the present but also future generations. Kruskal-Walis H-test shows that there is an agreement among the stakeholders as regards this particular feature, as a significant p-value of above 0.05 was derived. The inclusion of grey water processing system in the building ranked the least with a RII of 0.354. This means that this feature does not exist in the identified educational buildings.

A cursory look at the table shows that there seem to be a disparity in the opinion of all the respondents as only one criterion (i.e. the use of materials with a lifespan equivalent to the projected life of the building) had a significant p-value of above 0.05 from the Kruskal-Walis H-test conducted. This means that the stakeholders view as regards the environmental sustainability of the identified educational buildings is not the same. This can be bad for construction as sustainability is a holistic concept, hence stakeholders should have a common view in other to provide same.

Table 4: Environmental sustainability in educational buildings

S/n	Environmental Sustainability	RII	Rank	Chi. Sq	Sig.
1	Landscaping considers natural features of the site (topography, natural and cultural features etc.)	0.601	1	10.226	0.006**
2	Efficient use of building materials and minimizing of waste	0.594	2	8.733	0.013**
3	Maximum use of passive solar design features, such as house orientation, ventilation, insulation and shadings etc	0.552	3	10.889	0.004**
4	Appropriate use of building materials, fixtures and fittings that will ensure higher energy efficiency and help reduce household carbon emission.	0.548	4	7.532	0.023**
5	Use of materials from local market, thereby minimizing energy used to transport materials	0.530	5	16.657	0.000**
6	Eliminating the need for air conditioning or other mechanical heating or cooling systems in the building	0.519	6	17.348	0.000**

7	Use of materials with a lifespan equivalent to the projected life of the building	0.472	7	1.404	0.496
8	Rainwater being captured, used, recycled and re-used as much as possible within the building	0.445	7	10.483	0.005**
9	Design retain existing vegetation including trees	0.412	8	45.889	0.000**
10	Inclusion of grey water processing system in the structure	0.354	10	64.009	0.000**
	Average	0.503			

** Significant at $p < 0.05$

4.2.3 Social Sustainability in Educational Buildings

Result in Table 5 shows the social sustainability criteria of educational buildings as perceived by the stakeholders. Result shows that the top ranked feature with a RII of 0.639 is the use of local labour during construction, which serves as a means of providing employment for people within the locality. Kruskal-Walis H-test conducted further shows that the three categories of stakeholders have a converging view as regards this feature being prominent, as a significant p-value of 0.861 was derived. Next to this is the provision of easy asses for all kinds of individuals including those with disabilities in the building, preservation of the heritage streetscape, and the use of design to aid easy internal and external surveillance. These three features have a RII of 0.621, 0.618 and 0.615 respectively. However KruskalWalis H-test shows that there is a significant difference in the view of the stakeholders as regards these features in the assessed educational buildings.

The least ranked feature under this sustainability dimension is the presence of high security features to all doors and windows with simple and consistent locking systems with a RII of 0.484 and a significant p-value of less than 0.004. This significant p-value shows that there is a significant difference in the view of the stakeholders as regards this feature. An overall look at the table shows that there is considerable divergence in the view of the stakeholders as regards the social sustainability features of the identified educational buildings. Only 2 out of the 11 assessed features had their significant p-value above 0.05. **Table 5:** Social sustainability in educational buildings

S/n	Social Sustainability	RII	Rank	Chi. Sq	Sig.
1	Use of local labour during construction thus providing employment for people within the locality.	0.639	1	0.298	0.861
2	Building provides easy asses for all kinds of individuals including those with disabilities.	0.621	2	52.843	0.000**
3	Preservation of the heritage streetscape (i.e. structure conforming to other existing structures in the area).	0.618	3	56.865	0.000**
4	Use of design to aid easy internal and external surveillance.	0.615	4	12.987	0.002**
5	Building employ design, features and fittings that reduces crime and protects it from malicious intruders.	0.588	5	20.146	0.000**
6	Presence of "off-street" parking options to provide for proper parking system.	0.581	6	2.137	0.343
7	Building is thermally comfortable.	0.555	7	12.021	0.002**
8	Building visually comfortable.	0.551	8	9.269	0.010**
9	Building acoustically comfortable.	0.542	9	11.739	0.003**
10	Building minimizes the possibility of falls and driveway run-over	0.534	10	11.034	0.004**
11	Presence of high security features to all doors and windows with simple and consistent locking systems.	0.484	11	11.054	0.004**
	Average	0.575			

** Significant at $p < 0.05$

4.3 Discussion of Findings

Finding shows that the social sustainability dimension has the highest average RII of 0.575. This followed by the economic with a RII of 0.510 and the environmental dimension with an average RII of 0.503. The presence of the identified sustainability features in the selected educational buildings can therefore be said to be on the average. According to Gray and Wiedemann [40] sustainability suggests change and improvement that is compatible with environmental, social and economic limits, both now and in the long-term future. However, judging from the above findings, it is safe to say that more needs to be done if the concept of sustainability and its inherent benefits is to be enjoyed in the Nigerian education sector.

Also it is evident from the result that social aspect of sustainability is considered more when compared to the economic and environmental dimensions. This result contradicts past studies which have shown that globally more emphasis is being placed on the environmental dimension of sustainability [2, 12]. The value preference of the construction stakeholders in the delivery of educational building projects therefore merits a second reflection. This result is however in line with Ekung *et al.*, [13] findings that most stakeholders perceive the social dimension of sustainability as the most important sustainability objective in the delivery of sustainability in construction project management activities. This therefore implies that construction stakeholders are yet to embrace the concept of sustainability in its holistic nature. This is evident from the findings of the study as a significant divergent view was recorded on the three dimensions of sustainability assessed.

Finding of this study is similar to Akbiyikli *et al.*, [9] observation that the level of sustainability understanding among construction participants and its implementation in the construction sector in a similar developing country like Turkey is unstructured and piecemeal. This is evident from this study as prominent sustainability features such as the use of low maintenance materials for construction, use of materials with a lifespan equivalent to the projected life of the building and the use of materials from local markets, were seen to have low level of occurrence. These features also showed a significant difference in the opinion of the stakeholders, thus corroborating the fact that the view of these construction stakeholders as to sustainability is divergent.

Findings shows that from the stakeholders perspective, the use of durable materials for construction, use of design and the environmental-friendly products which will reduce the future operating costs of the building, use of landscape that considers the natural features of the site, efficient use of building materials, use of local labour, and provision of easy access for all kinds of individuals including those with disabilities within the building, are some of the major sustainability features of the educational buildings assessed. However, according to Olson and Kellum [41] the physical environment provided by schools facilities has a significant effect on learning. Spatial configuration, noise, thermal comfort, lighting, and air quality all have an impact on the students, teachers, and staff who study and work in these schools. A sustainable school therefore provides a well-lit, healthy, comfortable environment conducive for learning and student achievement while saving money, energy, and resources. Unfortunately, these features are not the strong point of the assessed building projects as they were ranked low. For example, the comfort of the buildings; thermal, visual and acoustic, ranked seventh, eighth, ninth respectively under the social dimension.

Findings also revealed that the efficient use of recycled materials to save cost, inclusion of grey water processing system in the structure, and the presence of high security features to all doors and windows with simple and consistent locking systems were the least ranked features of the assessed educational buildings.

Reason for this can arguably be the deficiency of the Nigerian construction industry in the area of recycling, the level of technology within the country, and technical-know how of the professionals in the construction industry. If this is to change, then construction professionals need to improve on themselves in the area of construction, as suggested by Ofori *et al.,* [42] and the construction industry as a whole will need to start promoting the use of recyclable materials as this will save cost and time spent on procuring new materials for each new project, and also promote environmentally friendly construction as suggested by Miyatake [43].

5.0 Conclusion and Recommendations

This study set out to assess the sustainability nature of educational buildings from the stakeholders view point, with the intention of providing more sustainable educational buildings in the country. Using a study of sixty-six selected construction projects in selected tertiary institutions in the country, the study has been able to determine the sustainability nature of educational buildings within the country based on the perspective of stakeholder. Based on the findings, the study therefore concludes that sustainability in educational buildings in Nigeria is on the average, with the social dimension ranking a bit higher than the economic and environmental sustainability dimensions. This is not so pleasing considering the fact that these educational buildings are supposed to serve not just the present but also future generation. Also there is a significant divergent view among construction stakeholders as to the sustainability of educational buildings within the country. This divergence in view tends to affect the priority place on the sustainability criteria as some critical sustainability features needed for educational buildings were found to be very low. If this is to change, then more orientation of construction stakeholders as regards sustainability is needed.

The study therefore recommends that if this sustainability level is to be increased then, strict government policy on sustainable construction should be put in place and means of enforcing them should be provided. This will go a long way in ensuring that sustainability is a common goal for all project stakeholders, thus, allowing them to have a common stance in terms of sustainability issues and by extension increasing sustainability of construction works. Also educating construction participants through conferences, seminars, training, and workshops organized by the different professional bodies, on the concept of sustainability is necessary. This will help to improve the understanding and awareness of sustainability concept, and achieve sustainability in its holistic form in educational buildings and of course construction in general.

This study has been able to contribute to the body of knowledge as it brings to light the sustainability nature of educational buildings in the country from the stakeholders' perspective; an aspect that has lacked research attention in the discussion of sustainable construction in the country. It is therefore believed that its findings and recommendations will assist those responsible for the delivery of educational buildings across the country in delivering sustainable buildings for effective learning. The study shows the key areas where focus need to be increased if sustainability is to be achieved in educational buildings. The findings of this study however provide possible directions for future studies as it was limited to stakeholders' perception of the sustainability nature of educational buildings. Further studies can be carried out in measuring the sustainability nature of these educational buildings using suitable and applicable sustainability measuring tools like LEED and the likes.

References

[1] Aje, I. O. (2015). Effective Financing Options for Sustainable Construction in a Developing Economy. A Paper Delivered At a 2-Day National Seminar on Sustainable Construction in a Developing Economy: Challenges and Prospects organized by The Nigerian Institute Of Quantity Surveyors, Ondo State Chapter Held at

Theodore Idibiye Francis Auditorium, Federal University Of Technology, Akure Ondo State From Thursday 8th – Friday 9th October.

[2] Alabi, A. A. (2012). Comparative Study of Environmental Sustainability in Building Construction in Nigeria and Malaysia. *Journal of Emerging Trends in Economics and Management Sciences*, Vol. 3 No. 6 pp. 951961

[3] Al-Saleh, Y. M.; and Taleb, H. M. (2010). The Integration of Sustainability Within Value Management Practices: A Study of Experienced Value Managers in the GCC Countries. *Project Management Journal*, Vol. 41 No. 2 pp. 50–59

[4] Baron, N.; and Donath, D. (2016). Learning from Ethiopia – A discussion on sustainable building. In Proc. *of SBE16 Hamburg International Conference on Sustainable Built Environment Strategies – Stakeholders – Success factors*, Held from 7th to 11th March in Hamburg, Germany.

[5] Edukugho, E (2013). Education sector stinks! Infrastructure bad, now worse. Available on:http://www.vanguardngr.com/2013/12/education-sector-stinks-infrastructure-bad-now worse/

[6] Olanrewaju A. A (2010). Quantitative analysis of criteria in university building maintenance in Malaysia, Australasian journal of construction Economics and Building, Vol. 10 No. 3 pp. 51-61

[7] Aghimien, D. O.; Awodele, O. A.; and Aghimien, E. I. (2016). Providing Sustainability in Educational Buildings Through the Use of Compressed Stabilized Interlocking Earth Blocks. *Journal of Construction Engineering, Technology and Management*, Vol. 6 No. 2 pp.130-140

[8] CIOB (2009). Sustainability and Construction, Chartered Institute of Building, UK. Available on: www.ciob.org.uk

[9] Akbiyikli, R.; Dikmen S. U.; and Eaton D. (2009). Sustainability and the Turkish construction cluster: A general overview: *Proceedings of the Construction and Building Research Conference of the Royal Institution of Chartered Surveyors*, University of Cape Town, 10-11 September

[10] Chaharbaghi, K.; and Willis, R. (1999), Study and practice of sustainable development. *Engineering Management Journal*, Vol. 9 No. 1 pp. 41 – 48

[11] Abidin, Z. N. (2009), Sustainable Construction in Malaysia- Developer's Awareness. *World Academy of Science, Engineering and Technology*, 53.

[12] Beheiry, S. (2006). *Measuring Sustainability*. The American University of Sharjah, Sharjah, UAE. Available on: www.scheller.gatech.edu/centers

[13] Ekung, S.; Oaikhena, E.and Ejekwu, T. (2016). Validated Indicators of Sustainability in Construction Project Management Activities -Stakeholders' Perception. *In Ebohon, O. J., Ayeni, D. A, Egbu, C. O, and Omole, F. K. Procs. of the Joint International Conference (JIC) on 21st Century Human Habitat: Issues, Sustainability and Development*, 21-24 March, Akure, Nigeria, pp. 765-774

[14] Wood, B. (2005). Sustainable Building Strategy: Assessing Existing Building Stock. *The Queensland University of Technology Research Week International Conference*, Brisbane, Australia, 4-8 July 2005

[15] Zhou, L.; Keivani, R.; and Kurul, E. (2013). Sustainability performance measurement framework for PFI projects in the UK; *Journal of Financial Management of Property and Construction*, pp. 232 – 250

[16] World Commission on Environment and Development- WCED (1987). Brundtland Report "*Our Common Future",* United Nations Assembly, Report of the World Commission on Environment and Development. Annex to General Assembly Document A/42/427.

[17] Bourdeau, L. (Ed.), (1999). *Agenda 21 on Sustainable Construction*. CIB Report Publication 237, CIB, Rotterdam

[18] Du Plessis, C. (2002) Agenda 21 for Sustainable Construction in Developing Countries. Pretoria, South Africa: *The CSIR Building and Construction Technology*

[19] Parkin, S. (2000) Context and drivers for operationalizing sustainable development: *Proceedings of ICE*, Vol.138 pp. 9 – 15.

[20] Sage, A. P. (1998). Risk management for sustainable development. *IEEE International Conference on Systems, Man and Cybernetics*, Vol.5, pp. 4815 – 4819.

[21] Raynsford, N. (2000). Sustainable construction: The Government's role. *Proceedings of ICE*. Vol. 138 pp.16 – 22.

[22] Ding, G.K.C. (2005). Developing a multi-criteria approach for the measurement of sustainable performance. *Building Research and Information*, Vol. 33 No. 1, pp. 3-16.

[23] Howard, N. (2005). Building environmental assessment methods: in practice. paper presented at the 2005 World Sustainable Building Conference, Tokyo, Japan.

[24] Enshassi, A.; Kochendoerfer, B.; and Al Ghoul, H. (2016). Factors Affecting Sustainable Performance of Construction Projects during Project Life Cycle Phases. *International Journal of Sustainable Construction Engineering & Technology*, Vol.7 No. 1 pp. 50-68

[25] Shen, L.; Hao, J. L.; Tam, V. W.; and Yao, H. (2007) A checklist for assessing sustainability performance of construction projects, Journal of Civil Engineering and Management, Vol. 13 No. 4 pp. 273-281

[26] Abolore, A. A. (2012). Comparative Study of Environmental Sustainability in Building Construction in Nigeria and Malaysia. *Journal of Emerging Trends in Economics and Management Science*, Vol. 3 No. 6 pp. 951-961

[27] Magaji, N. (2015). Sustainable Facilities Management: Appraising the professionals' Awareness, Knowledge and Performance. *An unpublished Masters in facilities Management*, Dept of Building, Ahmadu Bello University, Zaria – Nigeria

[28] Nduka, D. O. & Sotunbo, A. S. (2014). Stakeholder Perception on the Awareness of Green Rating Systems Benefits and Accruable Benefits in Construction Projects in Nigeria, *Journal of Sustainable Development in Africa*, Vol. 16 No. 7 pp. 118-130

[29] Ahmed, A.; and Gidado, K (2008). Evaluating the Potential of Renewable Energy Technologies for Buildings in Nigeria. *In:* Dainty, A (Ed) *Procs 24th Annual ARCOM Conference*, 1-3 September 2008, Cardiff, UK, Association of Researchers in Construction Management, pp. 1175-1182.

[30] Bugaje, I. M. (2006). Renewable Energy for Sustainable Development in Africa: A Review. *Renewable and Sustainable Energy Review*, pp. 1-10

[31] Olanipekun, A. O. (2015). Successful Delivery of Green Building Projects: A Review and Future Directions, *Journal of Construction*, Vol. 8 No. 1 pp. 30-40

[32] Oke, A. E.; Aghimien, D. O.; and Olatunji, S. O. (2015). Implementation of Value Management as an Economic Sustainability Tool for Building Construction in Nigeria, *International Journal for Managing Value and Supply Chain, Vol.* 6 No. 4 pp.55-64

[33] Wai, S. H.; Yusof, A. M.; Ismail, S.; and Tey, K. H. (2012). Critical Success Factors for Sustainable Building in Malaysia. pp. 123-127

[34] Zabihi, H.; Habib, F.; and Mirsaeedie, L. (2012). Sustainability Assessment Criteria for Building Systems in Iran. *Middle-East Journal of Scientific Research*, Vol. 11 No. 10 pp. 1346-1351

[35] Hussin, J. M.; Rahman, I. A.; and Memon, A. H. (2013). The Way Forward in Sustainable Construction: Issues and Challenges. *International Journal of Advances in Applied Sciences*, Vol. 2 No. 1 pp. 15-24.

[36] Fellows, R. R.; and Liu, A. (2008*). Research Methods for Construction*, 3rd Edition. Wiley-Blackwell Science, London.

[37] Moser, C. A.; and Kalton, G. (1999). *Survey Methods in Social Investigation*, 2nd Edition. Gower Publishing Company Ltd, Aldershot

[38] Megha, D.; and Rajiv, B. (2013). A Methodology for Ranking of Causes of Delay for Residential Construction Projects in Indian Context. *International Journal of Emerging Technology and Advanced Engineering*, Vol. 3 No. 3 pp. 396 – 404

[39] Ghasemi, A.; and Zahediasl, S (2012). Normality Test for Statistical Analysis: A guide for non-statisticians. *International Journal of Endocrinol Metab*, Vol. 10 No. 2 pp. 486-489

[40] Gray, P. C. R.; and Wiedemann, P. M. (1999) Risk Management and sustainable development: Mulinal lessons from approaches to the use of indicators. *Journal of Risk Research*, Vol. 2 No. 3 pp. 201 – 218

[41] Olson, S. L.; and Kellum, S. (2003). The Impact of Sustainable Buildings on Educational Achievements in K-12 Schools. Leonardo Academy Inc.

[42] Ofori, G.; Briffett, C.; Gang, G.; and Ranasinghe, M. (2000). Impact of ISO 14000 on construction enterprises in Singapore, *Construction Management and Economics*, Vol. 18 pp. 935 – 947

[43] Miyatake, Y. (1996). Technology development and sustainable construction. *Journal of Management in Engineering*, Vol. 12 No. 4 pp. 23 – 27.