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ARCHITECTS PERCEPTION ON THE IMPACT OF GREEN BUILDING IN CONSTRUCTION PROJECTS INDUSTRY JOS, PLATEAU STATE

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Abstract

The study is aimed at investigating architects' perception on green building awareness and benefits in construction projects in Jos, Plateau State. The study objectives include investigating the level of awareness on the use of green building in construction projects, and to determine the benefits of green building in various construction projects. A structured questionnaire was used to collect information from respondents who were architects in the built environment. Purposive random sampling technique was used to select one hundred-twenty (120) respondents, out of which ninety-five (95) responses which were used for the data analysis. Data collected were analyzed using descriptive statistics, likert scale and Mann Whitney test. The results indicate that most architects were aware of the green building practices applicable to construction projects. The study shows that there was no significant relationship on the level of interest in adopting green building construction base on sex ($P > 0.05$). Based on the findings of this study, it is recommended that the government should establish a formidable Green Building Council in Nigeria that will be responsible for public awareness to transform way of life to help save resources, minimize waste, enhance guidelines and approaches for realistic implementation.

Keywords: Architect, Construction, Green building, Perception, Sustainable

Introduction

Buildings has become the main energy consumers in today's cities that account for 70% of total electricity consumption and 30% to 40% of total energy consumption (Zian *et al.*, 2019; Zhang, *et al.*, 2019).The building sector generates 30% of the world's greenhouse gases, 40%–50% of water pollution to the environment and 14% of the world drinking water (Zhang *et al.*, 2019; Mattinzioli *et al.*, 2020).Furthermore, it is revealed that about 30% of recently built or reactivated buildings suffer from sick building syndrome which in turn exposes occupants to unhealthy environmental conditions. These issues have raised concern for development and practices that would mitigate the negative effect of buildings on natural environment (Nduka *et al.*, 2015).To address these issues, the construction of green buildings (GB) focuses on improving building energy efficiency and alleviating construction's negative impacts on the environment and resources (Zhang *et al.*, 2019).

The concept of green buildings according to The Green Building Council of Sri Lanka (GBCSL) (2015) is aimed at increasing the efficiency with which buildings use resources such as energy, water and materials while reducing the impact of buildings on human health and its surrounding environment during its lifecycle, through better designs, construction, operation, maintenance and removal, and recycling of waste. Globally green building designs are promoted by raising its awareness and popularity through the establishment and application of green building rating systems (GBRS) (Idowu *et al.*, 2018). Although the idea of 'going green' has been concerned in construction industry for past years, official statistics indicate that the industry continues to be a main energy consumer (Zian *et al.*, 2019).

A reconnaissance survey carried out within Jos metropolis has shown that about 70% of the construction projects are conventional and not green building. This agree with the findings of Nduka *et al.*, (2015) who stated that most construction projects have not totally adopted green building principles, in Nigeria and there is the need to investigate the construction professionals' perceptions on green building awareness and accruable benefits in construction projects. In addition, Akinyemi *et al.*, (2017), opined that all the private construction industries and property developers in Nigeria are yet to appreciate the long terms significance of sustainable development and that an implementation of Green Building Rating System will gradually strengthen the perspective of all local practitioners towards embracing sustainable development.

In Nigeria, studies have shown (in Nduka *et al.*, 2015; Abiodun, 2016; Akinyemi *et al.*, 2017; Allu *et al.*, 2017 and Dahiru *et al.*, 2014) a considerable attention in sustainability and in particular green buildings.

However, there are little or no known studies that investigated the Architects' perception on green building and the benefits in construction projects in Jos, Plateau State. This study therefore intends to fill the gap that exists. The study is aimed at investigating the level of awareness on green building and benefits to its use in construction projects among architects in Jos Metropolis with the view to provide better understanding of the goals of green building in real estate projects such as residential, corporate industrial etc. The specific objectives are to: (1) investigate the level of awareness on use of green building in construction projects, (2) determine the benefits of green building in various construction projects.

In realizing this goal, the following research questions were raised:

- i. What is the level of awareness on use of green building in construction projects?
- ii. What are the impacts of green building in in various construction projects?

These brought about the following hypothesis:

- i. The null hypothesis [**H₀**] states that there is no significant difference in the levels of awareness of green building use(s) in construction projects.
- ii. The alternative hypothesis [**H₁**] states that there is significant difference in the levels of awareness of green building use(s) in construction projects.

Result from the study is useful in approaching awareness campaign successfully in Jos, Plateau State. It helps in planning result oriented green building investment and implementation strategies in Nigeria.

Research Methodology

Research Locale

Plateau State (Figure 1) is one of the 36 states in Nigeria, and the city of Jos became the administrative capital of Plateau State in 1976. It is a colonial creation that was founded in 1902 by tin miners (Yakubu, 2017). In 2008 the National Population Commission (NPC) (2008) cited in Yakubu, (2017) estimated the population was 1.3 million and growing at 2.8 % per annum. Currently 52% of the population live in urban areas and 48% in rural. There continues to be migration into Jos leading to increases in accommodation costs and land (Yakubu, 2017).

Geographically, Jos is situated at about N9°55'48" and E8°53'24" in the Nigerian middle belt. The city is situated at the northern edge of a pear-shaped upland known as the Jos Plateau. This upland stretches for approximately 104km. from north to south, and 80 km from east to west covering an area of about 8,600 km² or 860,000 hectares. It maintains an average height of 1200 m (4000 ft) above sea level peaking at about 1766m (5829 ft) in the Shere Hills (Archives of National Centre for Remote Sensing Jos, 2007).



Figure 1: Map of Nigeria showing Jos, Plateau State
Source: <http://www.plateaustategov.org/visit/jos.html>

Data Collection

The research made use of both primary and secondary data. While primary data was gotten through instrumentality of structured questionnaires administered to respondents. The secondary data include documented information of internet, electronic journals, dissertations and geographical maps of Plateau State, Nigeria.

Population of the Study

Population of the study includes construction industry professional's (Architects) in public, private and academic organizations and institutions. The study was conducted in Jos metropolis. The sample for the study was selected by Purposive random sampling technique.

One hundred and twenty (120) questionnaires were delivered directly to respondents and filled questionnaires were retrieved one week after the administration. A total of ninety-five (95) responses were retrieved for data analysis. Data collected were analyzed using descriptive statistics, likert scale and Mann Whitney test.

The present study adopts the awareness programme through Seminars/conferences/training courses, information media like TV/Radio, newspapers, magazines and websites, Trade show events on green buildings and Education in Higher institutions.

Results and Discussion

This section gives in detail information gotten from data analysis in order to achieve the aim of the research. Findings from this study are as follows:

Background information of the Respondents

The socio-economic result in Table 1 below shows that out of the total respondents that participated in this exercise, majority (69.5 %) were males while few (30.5 %) were females. This implies that the male respondents participated actively in the study more than their female counterparts. It also reveals that 46.3 % of the respondent's falls between the ages of 36-45 years, 43.2 % falls between ages 26-35 years, 6.3 % falls between the ages of 16-25 years while 4.2 % are above 46 years. The percentage of males in this research were more than that of the females. Educational qualification results reveal that majority of the respondent (63.2 %) had M.Sc. qualifications, 30.5 % had B.Sc., and 4.2 % had Ph.D. while 2.1 % had HND qualification. Since most respondents have M.sc and B.Sc. degrees, they are academically qualified to provide information about awareness level of green building practices benefits to its use in construction projects. Further results in Table 1 of registration status shows that most of the respondents (67.4 %) are not registered while 32.6 % are registered. It can be inferred that most of the respondents gained more knowledge from their meetings. Among the respondents, 35.8 % are under government agency as their place of employment, others work at different firm such as architectural firm (26.3 %), owner/developer (22.1 %), contractor (9.5 %), and consultancy firm (6.3 %). The ownership status result shows that 90.5 % of the respondent have indigenous firm while 9.5 % have expatriate firm. Moreover, results in Table 1 on the duration of practice reveals that 52.6 % of the contacted respondent agree to the fact that they have being practicing between 6-10 years, 24.2 % between 1-5 years, 20 % between 11-20 years while 3.2 % said they have being practicing more than 21 years now. It can be inferred that most of the respondents have a reasonable level of experience.

Table 1: Socio-economic characteristics of the respondents

Respondent n = 95	Variables	Frequency (F)	Percentage (%)
Characteristics			
Sex	Male	66	69.5
	Female	29	30.5
	Total	95	100
Age Group (Year)	<15	0.0	0.0
	16-25	6	6.3
	26-35	41	43.2
	36-45	44	46.3
	>46	4	4.2
	Total	95	100

Educational Qualification	HND	2	2.1
	B.Sc.	29	30.5
	M.Sc.	60	63.2
	Ph.D.	4	4.2
	Total	95	100
Registration Status	Registered	31	32.6
	Not Registered	64	67.4
	Total	95	100
Place of Employment	Architectural Firm	25	26.3
	Government Agency	34	35.8
	Contractor	9	9.5
	Consultancy Firm	6	6.3
	Owner/Developer	21	22.1
	Total	95	100
Ownership Status	Indigenous Firm	86	90.5
	Expatriate Firm	9	9.5
	Total	95	100
Duration of Practice (Years)	1-5	23	24.2
	6-10	50	52.6
	11-20	19	20.0
	>21	3	3.2
	Total	95	100

Source: Field Survey, 2020.

Table 2 indicates the respondents' view on awareness of green building. It shows that 90 (94.7 %) > of the responses agree to the fact that they are aware of green building while 5.3 % are not aware. The awareness percentage was compared with the findings of Umar *et al.*, (2012) and Nduka *et al.*, (2015) of Nigeria. These results suggests that most respondents are aware of green buildings.

Table 2: Awareness of green building

Respondent n = 95	Variables	Frequency (F)	Percentage (%)	
Characteristics	Awareness of green building	Yes	90	94.7
		No	5	5.3
		Total	95	100.0

Source: Field Survey, 2020.

Table 3 shows that respondents have different knowledge and understanding on the word green building. To majority (43.2 %), green building improves the environment and health while 20 % have the understanding that green building help improve the environment, has energy and water efficiency, helps in reduction of consumption of natural resources and reduced maintenance cost, 16.8 % of the respondent have the understanding that green building are energy and water efficient. Others include reduction of consumption of natural resources (9.5 %) reduced maintenance cost (6.3 %) while 4.2 % had no idea at all. These suggest that most respondents who participated in the study considered the environment and health as best attribute of green building practice. This agrees with the findings of (Bahaudin *et al.*, 2014; Gou *et al.*, 2014; Zuo *et al.*, 2014; Nduka *et al.*, 2015; Akinyemi *et al.*, 2017; Ciner *et al.*, 2019) where green building improves the environment and health of occupants.

Table 3: Understanding of green building

Respondent n = 95 Characteristics	Variables	Frequency (F)	Percentage (%)
Green building	Improving the environment and health	41	43.2
	Energy and water efficiency	16	16.8
	Reduction of consumption of natural resources	9	9.5
	Reduced maintenance cost	6	6.3
	All of the above	19	20.0
	No idea at all	4	4.2
	Total	95	100.0

Source: Field Survey, 2020.

Table 4 represents the respondents’ source of information on green building. It shows that 31.6 % of the responses gets their information on green building from lecture courses/seminar, 27.4 % from personal research, 16.8 % source their information on green building from both lecture courses/seminar, personal research, internet and continuing professional development programme-(CPDP), 14.7 % of the respondents said they source their information from the internet, 5.3 % from continuing professional development programme-CPDP while 4.2 % recorded none. Results indicate that lecture courses/seminar, personal research, internet and continuing professional development programme-CPDP were the most effective means of communicating green building practice to stakeholders. While 4.2 % have low interest and expertise understanding.

Table 4: Source of information on green building

Variables	Frequency (F)	Percentage (%)
Lecture courses/Seminars	30	31.6
Personal research	26	27.4
Internet	14	14.7
Continuing Professional Development Programme-CPDP	5	5.3
All of the above	16	16.8
None	4	4.2
Total	95	100.0

Source: Field Survey, 2020

Table 5 shows the mean score on the level of interest in adopting green building construction. The result reveals that respondents were interested in the adoption of green building construction.

Table 5: Level of interest in adopting green building construction

ITEM (n = 95)	H (4)	M (3)	L (2)	VL (1)	Total	Mean	Decision
Level of interest	57	35	3	0(0)	339	3.57	Accepted

Note: H = High; M = moderate; L = Low; VL = Very Low (Mean score > 2.5 = high determinant factor). Source: Field survey, 2020

Table 6 represents the respondents’ view on suitable method for disseminating information of green building. From the responses gotten, the suitable methods includes Conferences/ Workshops/Seminars (48.4 %) > internet (21.1 %) > TV/Radio (13.7 %) > all of the above

(11.6) > billboards (5.3 %). These results suggest that Conferences/Workshops/Seminars are the most appropriate means of communicating the practice to stakeholders. This confirmed result of other similar studies in Nigeria that a higher percentage of Nigerian built environment professionals are aware and familiar with the green building concepts (Umar *et al.*, 2012; Nduka *et al.*, 2015).

Table 6: Suitable method for disseminating information on green building

Variables	Frequency (F)	Percentage (%)
Conferences/Workshops/Seminars	46	48.4
Internet	20	21.1
TV/Radio	13	13.7
Billboards	5	5.3
All of the above	11	11.6
Total	95	100.0

Source: Field Survey, 2020

Table 7 represents the respondents' view on best green building concept to adopt in construction projects. Results revealed that the best green building concept to be adopted in construction projects includes enhancing and protecting biodiversity and ecosystems; energy and water conservation; enhancing occupant comfort and health; reducing operating cost and create, expand and shape markets for green product and services) (47.4 %). Other best green building concepts are energy and water conservation (16.8 %) > to enhance and protect biodiversity and ecosystems (14.7 %) > enhance occupant comfort and health (11.6 %) > Create, expand, and shape markets for green product and services (6.3 %) > Reduce operating costs (3.2 %).

Table 7: Best green building concept to adopt in construction projects

Variables	Frequency (F)	Percentage (%)
Enhance and protect biodiversity and ecosystems	14	14.7
Energy and water conservation	16	16.8
Enhance occupant comfort and health	11	11.6
Reduce operating costs	3	3.2
Create, expand, and shape markets for green product and services	6	6.3
All of the above	45	47.4
Total	95	100.0

Source: Field Survey, 2020

Table 8: Mann-Whitney U Test analysis showing level of interest in adopting green building construction

The result on Table 8 below shows that there was no significant relationship on the level of interest in adopting green building construction base on sex ($P > 0.05$). This implies that interest in adoption of green building construction does not necessarily focus on a particular gender; therefore, result reveals that both male and females have the same level of interest in the adoption of green building construction in the study area.

Variables	N	Std.		Minimum	Maximum
		Mean	Deviation		
Level of interest in adopting green building construction	95	3.57	0.558	2	4
Sex	95	1.31	0.463	1	2

Variables	Sex	N	Mean Rank	Sum of Ranks
Level of interest in adopting green building construction	Male	66	48.30	3188.00
	Female	29	47.31	1372.00
	Total	95		

Source: Field Survey, 2020

Variables	U-value	P-value	Decision
Level of interest in adopting green building construction	937.00	0.85	NS

Significant level = 0.05; NS: Not Significant; ** = Significant

Conclusion

Green building practices are becoming increasingly recognized as a way of mitigating CO₂ emissions and energy consumption, with environmental, economic, financial, and social benefits accruing. Thus, raising awareness of green building practices among construction professionals (Architects) in construction projects has been linked to the better understanding of the goals of green building. The practice of green building should be embraced because of the benefits which are environmental, economic, social and human aspect.

In view of the findings emanating from this study it can be concluded that architects are aware of the green building practices applicable to construction projects.

Recommendation

Based on the findings, the following recommendations were made:

1. The Government establish a formidable Green Building Council and adopt green building construction in Nigeria.
2. There should be public awareness to transform way of life to help save resources of water and minimize waste, also to assist and enhance guidelines and approaches for realistic implementation.
3. There is the need for training professionals, manufacturers of building materials, building contractors on the benefits of green building products.
4. There is need to introduce green building practices in the education system, in order to increase public awareness and skills to spread green practices.
5. Advocate for policy and regulation to encourage the adoption and enforcement of the appropriate rating system and best practice in Nigeria in particular and Africa as a whole.

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