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PROFESSIONAL'S PERCEPTION ON THE COST BENEFITS OF GREEN BUILDING PRACTICE AND ITS ADOPTION FOR CONSTRUCTION PROJECTS IN KOGI STATE.

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ABSTRACT.
Building account for a sizeable amount of total energy consumption and total greenhouse gas emissions around the world. Green building has consequently emerged as innovative building concept to lessen the environmental impact of these buildings. The aim of the study is to assess professional's perception on the cost benefits of green building practice and its adoption for construction projects in kogi state. The objectives of the study are as follows: to identify the most preferred cost benefits of green building practice and to assess professional's perception on the cost benefits of green building practice and its adoption for construction projects in the study area. A structured questionnaire was used to collect information from various respondents who were construction professionals. The survey was conducted in kogi state using random sampling techniques were used to select one hundred and thirty (130) respondents out of which (95) of them were suitable for analysis, which represent a potential responses rate of seventy three percent (73%) of the total. The data were analyzed using simple percentile and mean item score. The research shows that respondents have a low level awareness of green building in general. The finding revealed that green features that would be mostly adopted by professionals include: careful orientation and low energy, lighting design, the uses of renewable energy e.g maximum use of natural day lightening and the uses of energy efficient and eco – friendly equipment. In conclusion the study advocated for increased sensitization of benefits of green building among built environment practitioners in such a way to deepen the adoption of green building practice in the study area. The study recommend that professional bodies should train and educate their members on the importance of green building so as to incorporate the lofty practice in their daily practice.

Keywords: *construction, environment, cost benefits, green building, professional's perception.*

INTRODUCTION.

The negative environmental impact of buildings on the environment has led to a clamour for improve practice. The challenge of implementation of ecological principles to the entire construction projects lifecycle is as a result of such clamour and it has been linked to the evolution of a relatively new and evolving concept termed " green building ". Green building has been recognized as an essential practice for improving negative environmental outcomes of buildings. The building sector has been accounted to be responsible for about 25% - 40% of energy usage, 30 – 40 % of material resources consumption, 30 – 40% of waste production and 30 – 40% of green house gas released to atmosphere globally (Umar and Khamidi, 2012). Green building practice is a concept that emerges in the construction industry in the early 1990's. According to portalatin et al. (2010) the idea of green building practice emerged in the United Kingdom known as British Research Establishment Environmental Assessment Method (BREEAM) in 1990. This was followed by Leadership in Energy and Environmental Design (LEED) in the United States. Green building is the practice of creating healthy facilities designed and built in a resources efficient manner, using ecological based principles. Green building brings together vast array of practices and techniques to reduce the impact of building on energy consumption, environment and human health. Globally, the trend towards green building practices have accepted as a number of buildings have incorporated the principles (Nduka & Ogunsanmi 2015) Fischer (2010) views green building as integrated building practices that significantly reduce the environmental footprint of building in comparison with standard practices.

Green building practice are developed to prevent problems from occurring also different sustainability and green building literatures (Ali and AL Nasairat, 2009; portalatin, et al, 2010; Adegbile, 2013) have documented benefits of green building practices in terms of raising awareness of buildings negative environmental impact to players in design and construction sectors; setting benchmarks for building environmental practices to safeguard the minimum performances standard; inspiring new designs, ideas and technical solutions; creating healthier and more productive places, and reducing building operations cost. Some of these benefits could also be harnessed in construction projects in Nigeria if green building practices were to be integrated into construction projects fortunately; construction professionals are gradually becoming aware of the concepts of green building principles. Numerous studies on sustainability and in particular green building have been conducted in Nigeria by some researchers: (Ameh, Isijiola and Achi, 2007; Nwokoro and Onukwube, 2011; Abolore, 2012 and Waniko, 2014,Nduka & Ogunsanmi 2015; Uwazie, Igwemma & Okonkwo 2015; Olanipekun 2015; Dahiru, Dania & Adejoh 2014) on green building practice, challenges and prospect. (Adegbile 2013 & Baruwa 2011) study on green building rating system. The present study therefore has been undertaken to assess professional's perception on the cost benefits of green building practice and its adoption for construction projects in kogi state. The objectives of the study are as follows: to identify the most preferred cost

benefits of green building practice and its adoption for construction projects as well as professional's perception on the cost benefits of green building practice and its adoption for construction projects in Kogi state.

LITERATURE REVIEW.

CONCEPTS OF GREEN BUILDING PRACTICE IN CONSTRUCTION PROJECTS.

Various studies on green building have used various terminologies to denote the concept of green building. Green building involves the practices that reduce the environmental impact of components of the built environment which include: green building, green architecture, sustainable building, high performance building and low impact development. This is clearly supported by assertion presented in Fischer (2010). The study points out the differences in meaning ascribed to green building from standard practices to those aimed of environmental impact. Green building employs a '' life – cycle approach,'' estimating the cumulative environmental and social impacts of a building throughout its lifespan, from construction to use to demolition. This holistic approach to building is not new, but has only recently gained mainstream reputability (Baruwa 2011). Green building also known as green construction or sustainable building, refers to a structure and using process that is environmentally responsibly and resources – efficient throughout a building life – cycle from sitting to design, construction, operation, maintenance, renovation, and demolition (Okafor 2016). Green architecture defines in understanding of environmental - friendly architecture under all classifications and contains some universal consent (Bureu, 2015). It may have many of these characteristics: ventilation systems designed for efficient heating and cooling; Energy – efficient lighting and appliances; Water – saving plumbing fixtures; landscapes planned to maximize passive solar energy; minimal harm to the natural habitat; alternate power sources such as solar power or wind power; non – synthetic, non – toxic materials; locally – obtained woods and stone responsibly – harvested woods; adaptive reuse of older buildings; use of recycled architectural salvage; and efficient use of space.

COST BENEFITS OF GREEN BUILDING PRACTICE IN CONSTRUCTION PROJECTS.

Some researchers have supported findings that green building can be cost – neutral or cost – saving, others have refuted this testimony, Isa Rahman, Sipan, & Hwa (2013) affirmed that investors are attracted to invest in green office buildings due to higher investment returns and benefits expected. These include higher occupancy rate and market value, lower risks, higher cost savings from improved energy and water efficiency, and social and environmental benefits such as improved health and work productivity, many in the building industry perceive green and / or Leadership in Energy and Environmental Design (LEED) certified buildings to be much more expensive than conventional buildings (Building Design & Construction {BD&C}, 2003; McGraw – Hill Construction, 2005; Turner Construction, 2005). Langdon (2007) postulated that many projects are achieving LEED within their budgets and in the same cost range as non –

LEED projects. He further stated that construction costs have risen dramatically, but projects are still achieving LEED, bond and Perrett(2012) stated that the issue of cost prevents the incorporation of sustainable features in developments. While some researcher claimed that high development cost of green building is the biggest barrier in green building construction (Esa et al, 2011; Sood &Peng, 2011; Zhang, Platten & Shen 2011; Zainul Abidin, 2010; & Shari, Jaafar, Salleh & Haw 2009)

Project cost can be divided into land cost, hard costs and soft costs. Land costs cover those expenses for land acquisition and development of the project such as land purchase, title transfer, site clearance and others. Hard costs refer to direct physical construction costs of the building. While soft costs refer to other various costs incurred to move the project forward. These are the additional cost stated in the green building index such as green building consultancy fees, Green Building Certification Registration Fee and Green Building index Certifier's cost. Emerging Professional's Companion Report (2013) defined, ''Soft Costs include a variety of costs incurred by the owner to move the project forward. Design fees, management fees, legal fees, taxes, insurance, owner's administration costs, and a variety of financing costs fall into this category. In general, the cost of green building includes all costs incurs in non green building and additional eight variety of financial costs. The eight variety of financial costs are: Energy Cost; Sustainable Site Cost: Cost of water Efficiency; Green Building Materials Cost; Green Building Certification Registration Fees; Green Building Consultancy Fee; Green Building Index Certifier's Cost; Cost of Innovation in Design; and Cost of indoor Environment. In U S A the cost premium for green building assessment is 2% while in Hong Kong is 0 – 4% popularly acceptable cost premium for green building assessment is 1 – 5%. Potentially relevant studies were retrieved from literature collections of published peer – reviewed research articles and report for the purpose of identify cost benefits of green building and its adoption for construction projects ascertained to be twenty three are as follows: promote the use of renewable materials, enhance occupant comfort and health improve quality, conserve and restore natural resources, improve overall quality of life, sustain employment opportunity, enhance and protect bio – diversity and eco – system, improve air and water quality, energy saving, water saving, create, expand and shape market for green building product and services, encourage construction waste management, design that considered existing cultural pattern and behaviors, ensure financial affordability for intended beneficiaries, pursue quality in creating the built environment, prevention of pollution from construction activity, design for flexibility and adaptability, heighten aesthetic quality, create local materials protection policy, reduced capital cost, market benefits (free pass and product differentiation), attracting and retaining employees, careful orientation and low – energy lighting design, use of energy – efficient and co – friendly equipment (e.g low energy consumption through use of natural ventilation rather than air – conditioning.

Green Building Rating Systems (GBRS).

The basic aim of any building environmental assessment scheme is to set criteria against which to rate a building and then to provide a score or description rating for that building. This rating can be used to show the building's environmental credentials and can have commercial value in terms of promoting a sustainable, eco – friendly image. In

addition, a rating system allows a comparison to be made between the performances of similar building types (Adegbile 2013). Globally, seven variety of rating system have been developed around environmental and energy impact of buildings: BREEAM, CASBEE, GREEN GLOBES, GREEN STAR, HK-BEAM, IGBC green homes and LEED.

GREEN MATERIALS.

Wastiels & Wouters (2009) affirmed that material selection process is a complex process that is influenced and determined by numerous preconditions, decisions and considerations. They stated further that material selection is not about choosing the strongest, cheapest, or most obvious materials available, but considering a wide range of variables that affect the choice of materials during the design and selection processes. The environmental benefits of building green, according to Phatak (2015), include; safety of environments and biodiversity, enhanced air and water value, reduce surplus flowing into watercourses, and the preservation of natural capital. Baruwa (2011) opined that green buildings may incorporate sustainable materials in their construction (e.g reused, recycled - content, or made from renewable resources); create healthy indoor environments with minimal pollutants (e.g, reduced product emission); and /or feature landscaping that reduces water usage (e.g by using native plants that survive without extra watering). The materials for green building are generally consisting of renewable resources and environmental responsible due to the fact that their impacts are on project lifecycle consideration. In accordance with Cullen (2010), green building materials can be selected by evaluating characteristics such as re-used and recycled content, zero or low off-gassing of harmful air emission, zero or low toxicity, sustainable and rapidly renewable harvested materials, high recyclability, durability, longevity and local production.

RESEARCH METHOD.

This study deployed the survey methodology involving a combination of structured questionnaire and interviews as data collection tools. A total of 130 questionnaire were administered to five groups of construction professionals namely Architects, Builders, Quantity Surveyors, Civil Engineers, and land surveyors. The questionnaire comprises two sections namely A and B. Section A elicited background data about the respondents, while section B elicited data pertaining to the aim and objectives of the study. On the other hand, interviews were administered __ clients with considerable experience of procuring the services of these construction professionals. For the analysis of data, combinations of quantitative tools were deployed. First was the frequency distribution tool for data classification (Salvatore and Regeale, 2002), comprising frequency distribution tables, percentiles, arithmetic mean. The study adopted a variant of arithmetic mean known as the mean item score to obtain a quantitative equivalent of the average response provided by respondents in accordance with a 5-Point Likert scale. This Mean item score were targeted at analyzing the specific cost benefit factors identified in section 2.2 above. The formula for computing this variable is given as:

$$\text{Mean} = \frac{\sum fw}{\sum f} == \frac{(5\times f_5)+(4\times f_4)+(3\times f_3)+(2\times f_2)+(1\times f_1)}{f_5+f_4+f_3+f_2+f_1}$$

Where Σfw is the sum of the product of all weights and Σf is the total number of actual respondents.Accompanying the mean item score as a tool of data analysis is the deployment of ranking of mean score. Hence, for the 5-point Likert scale where 5 is the highest score, and 1 being the lowest score, the ranking of the mean score was carried out using the criterion indicated below.The mean item score and ranking were used to address the first and second objectives of this study.

$4.90 < \text{MIS} \leq 5.00$	Very significant (or very high (impact), very easy, etc)
$3.70 < \text{MIS} \leq 4.89$	Significant (or high (impact), easy, etc.)
$2.50 < \text{MIS} \leq 3.69$	Neutral (or medium (impact), neutral, difficult, etc.)
$1.30 < \text{MIS} \leq 2.49$	Insignificant (or low (impact), difficult, etc.)
$0.00 < \text{MIS} \leq 1.29$	Very insignificant (or very low (impact), very difficult, etc)

DATA ANALYSIS AND DISCUSSION

Questionnaire response rate

A total number of 130 questionnaire were distributed, 20 out of the total survey show no response, total number of potential responses, was 110 and total valid responses received was 95. Hence, with an achieved response rate of 73%, the data analysis had to proceed in spite of the 12% defective questionnaires and the 15% void response rate.

Respondents' background data

Respondents on this study consisted of top management or senior technical staff with vast experience in construction industry over 70% of the respondents who completed the questionnaire holds minimum of HND or BSC degree while an average of 50% of them are professionally registered. Majority of the respondents also have about 16 years experience in the construction industry and the responses on the ability to differentiate between conventional and green building revealed that 36.84% of the respondents could not easily differentiate between the two forms of construction and the result suggests that, in order to be more aware, there is the need to sensitize the professionals in the location under study. It is evident therefore, that the data collected for analysis are reliable to form good basis for this study, judging from the qualities of respondents' experience in the construction industry.

Table 1: Background information about respondents opinion on green building adoption.

Category	classification		Freq.	%
Academic qualification of respondents	MSC/MTech/ MEng		15	15.79
	PGD		20	21.05
	BSC/BTech/ BEng		35	36.84
	HND		25	26.32
	Total		**95**	**100.00**

Professional affiliation of respondents	Architect		25	26.32
	Quantity Surveyors		35	36.84
	Engineers		15	15.79
	Builders		11	11.58
	Land Surveyors		9	9.47
	Total		**95**	**100.00**
Years of experience in construction	1 – 5		5	5.26
	6 – 10		15	15.79
	11 – 15		20	21.05
	16 – 20		25	26.32
	21 – 25		30	31.58
	Total		**95**	**100.00**
	Mean	**16.16**	***Years***	
Ability to differentiate between green and conventional buildings.	Architect		35	36.84
	Quantity Surveyors		30	31.58
	Engineers		10	10.53
	Builders		15	15.79
	Land Surveyors		5	5.26
	Total		**95**	**100.00**
Level of awareness of green buildings.	Architect.		30	31.58
	Quantity Surveyors.		35	36.84
	Engineers		9	9.47
	Builders		17	17.90
	Land Surveyors		4	4.21
	Total		**95**	**100.00**
Source: Authors' survey, 2022				

Table: 2 shows the result of identified most preferred cost benefits of green building practice and its adoption for construction projects.

	Quantity	Land	Architects	Engineers	Builders	Overall

Benefits	Surveyors		Surveyors				
	Mean		Mean	Mean	Mean	Mean	Mean Rank
Preventing global Warming.	4.32	4.10	4.65	4.05	4.15	4.25	1st.
Decreasing environmental Damage cost.	4.95	3.33	4.60	4.26	4.08	4.24	2nd.
Improved productivity.	4.44	3.77	4.57	3.46	3.75	3.98	3rd.
Maintaining integrity of Environment.	4.00	3.22	4.11	3.38	3.11	3.56	4th.
Improving quality of life For individual and society As a whole.	4.09	3.02	4.19	3.11	3.00	3.48	5th.
Reducing energy consumption And cost.	3.88	2.89	4.00	2.77	2.60	3.23	6th.
Satisfying human needs.	3.45	2.55	3.56	2.50	2.44	2.90	7th.
Lowering infrastructural cost.	4.01	2.45	3.20	2.30	2.35	2.86	8th.
Improving return on investment.	3.32	2.25	3.12	2.14	2.00	2.57	9th.
Raising real income.	3.50	2.12	3.01	2.00	2.09	2.54	10th.
Reducing water consumption And cost.	3.35	2.00	2.65	1.88	1.50	2.28	11th.
Understanding the importance Of social and cultural capital.	3.22	1.86	2.45	1.76	1.33	2.12	12th.
Minimizing waste production Disposal.	3.10	1.55	2.35	1.45	1.30	1.95	13th.
Decreasing health cost.	2.99	1.45	2.30	1.22	1.15	1.82	14th.

Source : Author's survey 2022.

The result of the survey study indicated that the most preferred cost benefits of green building by study participants were preventing global warming with mean score of 4.25 ranks first, decreasing environmental damage cost with mean score of 4.24 ranks second and improved productivity with mean score of 3.98 ranks third. These results shows that the most important benefits of adopting green building practices in construction projects lies in conservation of environment. Another important benefits were maintaining integrity of environment with mean score of 3.56 ranks fourth, improving quality of life for individual and society as a whole with mean score of 3.48 ranks fifth, reducing energy consumption and cost with mean score of 3.23 ranks sixth while satisfying human needs with mean score of 2.90 ranks seventh. These results indicate that respondents' believe that buildings should be constructed with appreciation on the importance of providing high quality interior environments for all occupants and users. Other benefits of green building were lowering infrastructural cost with mean score of 2.86 ranks eighth, improving return on investment with mean score of 2.57 ranks ninth, raising real income with mean score of 2.54 ranks tenth while reducing water consumption and cost with mean score of 2.28 ranks eleventh, understanding the importance of social and cultural

capital with mean score of 2.12 ranks twelfth, minimizing waste production and disposal with mean score of 1.95 ranks thirteenth and decreasing health cost with mean score of 1.82 ranks fourteenth. These results suggest that they are as well important benefits of green building practice in the built environment.

These study is aligned to previous research (Ali and Al Nsairat 2009; Adegbile 2013) provides that the knowledge base of built environment professionals are on the increase. It can be inferred from the results of this study that the more knowledgeable the built environment professionals are the more adoption of green practices in construction projects in Nigeria.

Table: 3 shows the result of assessment of professional's perception on cost benefits of green building practice and its adoption for construction projects.

Benefits	Quantity Surveyors	Land Surveyors	Architects	Engineers	Builders	Overall Mean	Mean Rank
Promote the use of Renewable materials.	4.95	3.99	4.88	4.56	4.36	4.55	1st.
Enhance occupant Comfort and health Improved quality.	4.87	4.01	4.90	4.11	3.66	4.31	2nd.
Conserve and restore Natural resources.	4.20	4.00	4.80	4.13	3.85	4.20	3rd.
Improve overall quality Of life.	4.86	3.97	4.56	4.09	3.44	4.18	4th.
Enhance and protect Bio – diversity and eco – System.	4.55	3.88	4.50	4.00	3.22	4.03	5th.
Improve air and water Quality.	4.34	3.77	4.77	3.76	3.09	3.95	6th.
Energy saving.	4.28	3.43	4.66	3.51	3.01	3.78	7th.
Water saving.	4.40.	3.41	4.57	3.49	3.00	3.77	8th.
Create, expand and shape Market for green building Encourage construction Waste management.	4.33	3.22	4.40	3.33	2.99	3.65	9th.
Design that considered Existing cultural pattern And behaviours.	4.21	3.40	4.29	3.12	3.00	3.60	10th.
Ensure financial affordability For intended beneficiaries.	4.30	3.38	4.20	3.10	3.01	3.59	11th.
Pursue quality increasing The built environment.	4.28	3.30	4.18	3.09	2.98	3.57	12th.
Prevention of pollution From construction activity.	4.20	3.40	4.20	3.08	2.88	3.55	13th.

Design for flexibility And adaptability. 4.23	3.30	4.22	3.05	2.77	3.51	14th.
Heighten aesthetic quality. 4.25	3.27	4.18	3.02	2.78	3.50	15th.
Create local materials Protection policy. 4.10	3.20	4. 15	3.04	2.82	3.46	16th.
Reduced capital cost.4.00	3.10	4.07	3.00	2.66	3.37	17th.
Market benefits (free pass And product differentiation). Attracting and retaining Employees. 3.88	3.00	3.50	2.99	2.77	3.23	18th.
Careful orientation and Low – energy lighting Design. 3.80	3.05	3.77	2.50	2.60	3.14	19th.
Use of energy efficient And co – friendly equipment.3.50	3.00	3.66	2.55	2.88	3.12	20th.

Source: Author's survey, 2022.

The cost benefits factors of green building development according to the professionals' perspectives have been summarized in table 3 above. Respondents who participated in this study were asked to rank their level of agreement regarding the benefits of implementing green building and its adoption for construction projects. According to every professional involved, the quantity surveyors claimed that reduced aggregate future capital and maintenance cost is the most important benefits, while the land surveyors agreed to the creation of new opportunities for other industries. To the architects, improved internal air quality, productivity and the occupants' satisfaction were found to be most important, while the engineers agreed that structure which can withstand stress and durable for a period of time. Whereas according to the builders, the promotion of technological exchange across borders was the benefits of green building perceived to be the most important.

Based on the result of the study the most ranked of all is promote the use of renewable materials with mean score of 4.55 while the least is use of energy efficient and co – friendly equipment with mean score of 3.12. other cost benefits factors are as follows: enhance occupant comfort and health improve quality ranks second with mean score of 4.31, conserve and restore natural resources ranks third with mean score of 4.20, improved overall quality of life ranks fourth with mean score of 4.18, enhance and protect bio – diversity and eco – system ranks fifth with mean score of 4.03 were among the first five most significant benefits of green building. This implies that health wisely and other benefits of green building over similar non green building outweigh the extra cost associated with the green building. This is in agreement with Isa et al. (2013) affirmed that investors are attracted to invest in green office buildings due to higher investment returns and benefits expected. These include higher occupancy rate and market value, lower risk, higher cost savings from improved energy and water efficiency and social and environmental benefits such as improved health and work productivity. This present findings are in agreement with Dahiru et al (2014), where it was affirmed

that health and productivity gain was the most important benefits from green building construction

CONCLUSIONS.

The study concludes that the cost benefits of green building practice and its adoption for construction projects in kogi state. The overall perception of green building from all the groups of respondents has revealed, that most professionals are aware of the new trend (Green Building) and enormous cost benefits derived from it and they see green building as a basis for appealing livable homes and preserving natural resources while taking care of health. However, the general public are not fully aware of this development i.e level of awareness of green building is low.

RECOMMENDATIONS.

The study recommends that public enlightenment should be done by Non – Governmental and professional bodies through Continuing Professional Development (CPD) and funded by the same agents. Government should lead by example through the construction of green building for public buildings and provide incentive for those that want to construct green building. The government should make green building as part of the Community's Social Responsibility (CSR) undertaken by corporate bodies, especially oil companies, should be provisions of schools, health centre, clinics, and made of green building. The practice of green building should be encouraged by the government requesting for construction environmental management plan from contractors as part of tender documents.

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