



Construction Professionals' Perception on Green Building Awareness and Accruable Benefits in Construction Projects in Nigeria

David Obinna Nduka¹,

Olabode Emmanuel Ogunsanmi²

¹Department of Building Technology,
Bells University of Technology Ota, Nigeria.

E-mail: davbinna@yahoo.com

²Department of Building,
University of Lagos, Nigeria.

E-mail: bode_ogunsanmi2004@yahoo.co.uk

Abstract: The negative environmental impact of buildings to the environment has led to a clamour for improved practice. Attempts of implementation of environmental friendly principles to the entire construction projects phases is as a result of such clamour and has been linked to the evolution of evolving concept termed “green building”. The study aims at investigating the construction professionals’ perceptions on green building awareness and accruable benefits in construction projects in Nigeria. The study objectives include assessing the level of the adoption of green building principles in construction projects and to determine the benefits accruable to its use in projects. A structured questionnaire was used to collect information from various respondents who were built environment professionals. Purposive random sampling technique was used to select one hundred-fifty (150) respondents out of which ninety-one (91) responses were used for the data analysis. The results indicate that most of the building industry professionals in Nigeria are familiar with green building principles. Building industry professionals agree on most of the rankings of the green building benefits. The study also indicates that there is no significant difference in the levels of awareness of green building practices among built environment practitioners. The findings have important implications for policy and practice. The study recommends full establishment of Green Building Council of Nigeria (GBCN) that will be responsible for awareness creation, introduction of guidelines, tools and techniques that will drive green building practices for future project.

Keywords: Awareness, Construction Professionals, Green Building, Nigeria, Perception.

Introduction

In a world of rapid urbanization with its attendant increase in building development and operation

requires close monitoring in terms of environmental impact. Buildings have long been acknowledged as one of the most significant artificial

structures imposing reasonable impacts on the global environment. Umar and Khamidi (2012) claimed that buildings have been accounted for being responsible for about 25-40% of energy usage, 30-40% of materials resources consumption, 30-40% of waste production and 30-40% of green house gases released to the atmosphere globally. 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. Since the adoption of Brundtland Report of 1987 which paved way to a new thinking known as sustainable development, new strategies for improvement on environment have emerged. Various progressive world events have taken place to increase the awareness on environmental and sustainability goals such as the Rio Earth Summit of 1992, Maastricht Treaty of 1992, Kyoto Conference on Global warming 1997, Johannesburg Earth Summit of 2002, and Washington Earth observation Summit of 2003. In Africa, experts, practitioners, and decision makers involving twenty countries declared their commitment to promoting and fostering Green Building Rating Systems (GBRS) in a conference

organised by UN-HABITAT in Nairobi in 2010 in which Nigeria is a part in the declaration. The ideas and plans instituted by these world events have inspired actions by many countries to implement and incorporate sustainability principles within their built industry. Subset to this principle of sustainability is green building. However, through green building concept the construction industry can contribute in a positive and proactive manner to environmental protection.

Green building is the practice of creating healthy facilities that are designed and built in a resource efficient manner, using ecological based principles. Green building brings together vast array of practices and techniques to reduce the negative impact of building on environment and human health. Globally, the trends towards green building practices have been accepted as a number of buildings have incorporated the principles. According to Ahn, Pearce, Wang, and Wang (2013) that construction stakeholders and their professional organizations that include the American Institute of Architects (AIA), Associated General Contractors (AGC), National Association of Home Builders (NAHB), American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHREA), and American Society of Civil Engineers (ASCE) have provided awareness on the gains associated with green building

practices. A recent study by Turner Construction as cited in Cheng and Das (2014) concluded that 90% of 718 United States Estate owners, developers and tenants support green construction. Result from this study indicates that over 13,000 green buildings were certified by Leadership in Energy and Design Environment (LEED) in 2013. Further results indicate that 61% of construction work is going to be sustainable or green construction globally by the year 2015. The successful implementation of green building strategies in the built environment would optimise the environmental, economic and social performances of buildings.

Numerous studies (Ameh, Isijiola and Achi, 2007; Udechukwu and Johnson 2008; Nwokoro and Onukwube 2011; Otegbulu 2011; Abolore 2012; Adegbile 2013 and Waniko 2014) on sustainability and in particular green building have been conducted in Nigeria by some researchers. Ameh, et al (2007) focused on the assesment of the sustainability of pulic buildings in Lagos Nigeria. Nwokoro and Onukwube (2011) has assessed the current practices and challenges of sustainable construction, Otegbulu (2011) analysed the effects of green design on environmental sustainability including its implication and occupiers preferences with respect to building components and services to ascertain the level of their appreciation of green elements.

Wherein, the study found that Nigerians are not green conscious in building design and environmental management. Abolore (2012) compared the perception of the building professionals/developers of sustainability in building construction industry in Nigeria and Malaysia. A similar study by Udechukwu and Johnson (2008) suggested that adherence to green principles of design will increase the economic, environmental and human value. Furthermore, Adegbile (2013) proposed a green building rating system applicable to Nigerian construction industry and Waniko (2014) assessed Nigerian built environment professional's familiarity with green building (Architects, Quantity surveyors and Engineers). From the studies identified, it can be seen that they addressed awareness levels of green building practices and its accruable benefits. Hence, this present study will draws on (Ameh et al, 2007; Nwokoro and Onukwube 2011; Otegbulu 2011; Abolore 2012 and Waniko 2014) in assessing the level of awareness of green building practices and its accruable benefits in construction projects in Nigeria.

In view of these research efforts in Nigeria and for the fact that most construction projects have not totally adopted green building principles, it may be necessary now to investigate the construction professionals' perceptions on green building awareness and accruable

benefits in construction projects in Nigeria. The aim of this study is to investigate the level of awareness on green building and benefits accruable to its use in construction projects. The objectives of the study are to find out the level of awareness on the adoption of green building principles in construction projects and to determine the benefits accruable to its use in projects. The study contributes to literature and knowledge on of green building awareness well as the accruable benefits of environmental, economic and social dimensions. It will be of good importance to the academia and to those practicing green building in developed and developing countries.

Concepts of Green Building 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. Fischer (2010) views green building as

integrated building practices that significantly reduce the environmental footprint of building in comparison with standard practices. In a similar vein, Ahn, Pearce, Wang & Wang (2013) termed green building as healthy facilities designed and built in a resource-efficient manner, using ecologically based principles. Chatterjee (2009) defines green building practice as a process to creating buildings and infrastructure in a way that minimize the use of resources, reduce harmful effects on ecology and create better environment for occupants.

Other definition as giving by Kamana and Escultura (2011) define green building or sustainable building as an outcome of a design which focuses on increasing the sufficiency of resource use: energy, water, and materials while reducing building impacts on human health and environment during the building's lifecycle through better location, design, construction, operation, maintenance and removal. Pan, Dzung and Yang (2011) added that a green building is an outcome of a design philosophy which focuses on increasing the efficiency of resource use. Thus, it can be deduced from the definitions, that green building is a form of practice(s) in which buildings are designed and built without causing environmental degradations throughout the entire building lifecycle exhibiting high level of environmental, economic

and social performance. However, the potential for improving the environment by harnessing the expertise and practices available in built environment makes green building a viable option. These definitions of green building are in line with the way green building is used in the present study.

The concept of green building has been adopted by many nations as a viable option of preserving resources and sustaining the environment (Samer, 2013). Documentations on green building suggest that green building has been used worldwide and according to Reed, Bilos, Wilkinson, and Schulte (2009) developments on green building practices are traceable to UK's Building Research Establishment (BRE) that pioneered the first assessment scheme called Building Research Establishment Environmental Assessment Method (BREEAM) in the year 1990 followed by USA Green Building Council's Leadership in Energy and Environmental Design (LEED) in 1996. As this concept has taken a global phenomenon, most developed and developing countries have resulted in adopting it of which Nigeria is no exception. Nwokoro and Onukwube (2011) study identified the prevailing laws promulgated by Federal Government of Nigeria to safeguard the Nigerian environment. These laws include: Federal Environmental Protection Agency Act of 1988 (FEPA), National

Policy on Environment (NPE) of 1989 and Environmental Impact Assessment Act of 1992 (EIA Act). Also, there were concerted efforts by professional bodies and private organisation indicating their commitments towards sustainable buildings. Shaba and Noir (2014) documented the existence of Green Building Council of Nigeria (GBCN) at prospective membership level with World Green Building Council. The report revealed that the newly established council is yet to produce any rating tool thus necessitating willingness by Green Building Council of South Africa (GBCSA) to allow the adoption of Green Star SA in rating Nigerian buildings pending when Green Building Council of Nigeria (GBCN) will establish and has the capacity to develop and operate its own rating system. The concept of green building is advocated for use in building development and operations so that environmental degradation caused by building practices will be minimised.

Green Building Principles

Previous studies of (Augenbroe and Pearce, 2009; Zhang, Platterm and Shen, 2011; Nwokoro and Onukwube, 2011; Otegbulu, 2011) have identified major principles of green building. According of Augenbroe and Pearce, (2009) fifteen (15) elements of green building have been identified to include: energy conservation measures, land use regulations and urban planning polices, waste

reduction measures, resource conservation strategies, indoor environmental quality, friendly energy technologies, re-engineering design process, proactive role of material manufactures, better measure and account for costs, new kinds of partnership and projects, adoption of incentive programmes, education and training and recognition of commercial buildings as productivity assets. Also in Zhang, Plattern, and Shen (2011) some green building principles identified include: energy efficiency, water efficiency, material efficiency, indoor environmental enhancement as well as operations and maintenance optimisation are categorised as principles of green building practice. Furthermore, this study classifies green elements into two strategies of architectural (passive) and mechanical (active). Active strategy refers to building design that does not require mechanical equipment for heating or cooling, which deals directly with the building envelope (air permeability, exterior walls, doors, windows and roofing), how it is oriented in other to optimise solar gain and loss and thus reduce energy consumption and life time costs , the use of sustainability sources and low carbon emissivity while in contrast, active design strategy refers to the use of artificial mechanical or electric green technologies to heat, cool or light a space which may include air

conditioning, artificial lighting, elevators, escalators, pumps and fans. Also, Nwokoro and Onukwube (2011) identify nine (9) elements that increase the sustainability of the built environment which include: energy efficiency, integrated design, indoor air quality, thermal comfort, visual comfort, site sustainability, acoustic comfort, spatial comfort and building integrity.

The study of Otegbulu (2011) equally highlights eleven (11) dimensions of green design to include: energy and water efficiency, waste reduction, building operation, construction, maintenance, occupant health and productivity, storm water management, climate and environmental integration. However, there is similarity in the different principles of green building identified by the various researchers. A green building will not necessarily have all the above stated principles, since no building can be totally green (Otegbulu, 2011). Therefore, the study will adopt: energy efficiency; water efficiency; environmental and resource conservation; recycling and waste reduction; site sustainability; indoor air environmental and quality, maintenance and building optimisation in its investigation. Data obtained represents the perspectives of stakeholders to adoptability of green building

principles to construction projects in Nigeria.

Awareness on green building practice

Familiarity draws on knowledge and experience and it goes beyond to include a sense of comfort. It is reasonable to expect that as one acquires knowledge and gains experience, comfort will increase as well. In an area such as green building practices, where the materials and approaches are changing constantly, acquiring such comfort can be a major challenge. According to Umar and Khamidi (2008) awareness on green building refers to ideal strategic model and promotion exercise which aids people to understand why a particular issue is essential and the desires of goals and what is necessary to accomplish a task. Furthermore, Abolore (2012) infers that awareness of green building depends on the understanding of the individual actions, quest for knowledge and absolute involvement and commitment to the principle. The primary meaning of awareness in the communication industry is to create a base audience for a product, service or issue. Hence, the primary goal of awareness is to achieve enlightenment to the people. Awareness campaigns are mostly championed by public institutions or NGOs with the basic aim of educating the public about an issue or completely on a new assignment. It is pertinent to say that awareness

campaign is occasioned with a reminder.

In advertising and communication industry, it has been shown that people must be exposed to messages several times before the message becomes successful. The innovation in technology has contributed in a positive means of delivering and collecting information for example, the internet, sign and print media. However, the green building concept must be disseminated in layman's terms to assist in general public acceptance. Umar and Khamidi (2008) suggest that advertisement in radio stations and TV; website development specifically for green building campaigns; media relations in terms of articles, news release and community relation by creating trade show participation are key tools in creating green building awareness.

Formal knowledge and awareness for built environment professionals is an important mechanism for developing green building knowledge and skills, a number of studies (Ameh, et al. 2007; Alnaser and Flanager 2007; AlSanad, Gale, and Edward 2011; Susilawati and Al-Surf 2011; Waniko, 2014) have been conducted by researchers on awareness of green building in the recent time. The study of Ameh, et al (2007) affirm that built environment professionals in Nigeria are aware of sustainability principles and sources of

information on sustainable building practices are mostly drawn from personal research. Alnaser and Flanager (2007) focused on implementing building –integration PhotoVotaic (BIPV) or Wind energy (BIWE) in the kingdom of Bahrain. This indicates the willingness of decision makers to set legislation for sustainable buildings. It was pointed out that policy makers are more concerned about the possible reactions from investors as they do not have adequate knowledge and awareness of positive impact of building-integration PhotoVotaic (BIPV) or Wind energy (BIWE) on the long term. In the same hand, Architects and Contractors in Bahrain are also interested and keen in sustainable building project but require more knowledge and training in building–integration PhotoVotaic (BIPV) or Wind energy (BIWE) installation. The study concluded that by advocating special training workshop twice a year; annual exhibition and participation of academics and researchers on the issue. AlSanad, Gale, and Edward (2011) explore the present knowledge, level of awareness and acceptability of the Kuwait's construction industry stakeholders to adopting the concept of green building. This study found out that the level of awareness of sustainability and green construction is considered to be in the 'moderate to good' range. However, the study recommends

that more actions are required to be taken by the stakeholders through education programmes such as training courses, conferences, seminars, study tour, public announcement and workshops in order to increase the level of awareness and knowledge. Similarly, Susilawati and Al-Surf (2011) investigate public knowledge and public awareness regarding this issue in the Kingdom of Saudi Arabia where a higher percentage of the respondents are not fully aware of green building practices. Conversely, Waniko (2014) assess Nigerian built environment professional's familiarity with green building (Architects, Quantity surveyors and Engineers). It is reported in this study that a higher percentage of the respondents are aware of the green practices.

The present study adopts the awareness programme through implementation of design concept, education, training and communication, individual and corporate participation through TV/Radio, Seminars/workshop/conferences, Internet, Billboards/banners as major factors for awareness creation. However, Zhang, et al (2011) study recommends easy-to –navigate website and utilization of tools such as YouTube, a blog, Twitter, facebook and flickr to increase the exposure to potential client and public.

Benefits Accruable to Green Building Practice in Construction Project

Green building practices are increasing in popularity and are being used widely for infrastructure development in the global construction industry. Construction practitioners, governments and their agencies worldwide are integrating and adopting green building principles into new and existing buildings (Ahn, et al 2013). Thus, the gains of green building practices in the built environment towards sustainable development could be immense. Abolore (2012) indicates that Green building practices should be pursued not only because it is beneficial for humans, to the environment or as a result of environmental legislation, but because it significantly increases financial profit and long-term competitiveness. Furthermore, Green building practice is, indeed, a highly profitable exercise and refurbishing the existing building stock while adopting green approach is a panacea for tackling the looming environmental crisis. There are no adverse side effects of applying Green building practices in construction projects as reported in literatures. Ahn, et al. (2013) opine that as a result of advancing green building practices in United States, the value of green buildings has rapidly grown from approximately 2% for non-residential and residential valued at a total of \$10 billion to \$36-49

billion in 2008 representing a significant growth. In addition to this, the 2013 Smart Market Report published by McGraw Hill Construction found that built environment professionals around the globe are focusing their work on sustainable design and construction by adopting at least 60% of their projects green, doubling only 13% of them at this level in 2009. However, based on the above findings the green building practices may displace many conventional practices in the construction industry when developing new facilities and maintaining the existing ones.

A number of research studies have identified different benefits of green building practices in different countries in the recent time. Such countries include USA (Wedding and Craw-Brown, 2007); Nigeria (Udechukwu and Johnson, 2008); Hong Kong and Singapore (Chan, Qian, and Lam, 2009); Canada (Issa, Rankin and Christian, 2010); UK (Alwaer and Crawford-Croome, 2010); China (Zhang, et al., 2011); Malaysia (Umar and Khamidi, 2012); USA and Hong Kong (Ahn, Pearce, Wang & Wang, 2013). From these studies Udechukwu & Johnson (2008) classify green building benefits into three areas: environmental, economic and social as supported by many literatures in sustainability. Chan et al. (2009) laid emphasis on business case for green building development in

Asian cities. The identified business reasons include lower operational costs and lower life-cycle costs. They advocated that investment in green building will not only benefit the buyers or consumers but also provides business opportunity for architects, developers, contractors and almost all stakeholders in the built environment. Similarly, enhanced day light and reduced toxicity in indoor environment increases employees productivity up to 16% and absenteeism.

Issa, Rankin and Christain (2010) infers that green buildings can be built at little to no additional cost as generally believed by researchers but practitioners often identify high initial cost as barrier to adopting green practices. However, this assertion reinforced the study of Zhang et al, (2011) on higher costs for green appliance design and energy saving material at design stage. Umar and Khamidi, (2012) identify operational savings, daylight and views, air quality as the three best reasons frequently admonished by occupiers of green building. There is a consensus that adopting green technologies does not only help in branding image of property developers but can also reduce administration cost when efficient experience sharing scheme can be established (Zhang, et al. 2011; Abolore 2012; Afolabi, Graeme and Runming, 2013).

Ahn et al. (2013) considered 20 unique drivers of sustainable design and construction as: energy

conservation; water conservation; environmental/ resource conservation; land use regulation and urban planning policies; waste reduction; proactive role of materials manufactures; better ways to measure and account for costs; better ways to measure and account for costs; green building rating systems (LEED, GREEN Globes); product and material innovation and /or certification; adoption of incentive programme; education and training; recognition of commercial buildings as productivity assets; performance-based standards and contracts; whole and integrated building design approach; new kind of partnership and project stakeholders; improving occupants productivity; improving indoor environment quality; increase awareness from clients; community and social benefits and decreased initial cost. All the twenty drivers mentioned above are drawn on for this study. However, Ahn et al. (2013) draws on the studies of Monoliadis, Tsolas and Nakou, (2006); Venegas and Pearce, (2000); Augenbroe and Pearce, (2010) and USGBC, (2009) in identifying green development benefits. It must be noted that such studies have also acknowledged some of the potential problem (barriers) with adopting this concept. Proving that green building does not mean people have to sacrifice functionality, productivity or comfort. In Ahn et

al., (2013), energy conservation was found to be a major factor linked to the adoption of green building principles. This is a pointer that effective adoption of green building in a developing country like Nigeria could significantly improve energy utilisation and ultimately aid socio-economic development.

Research methodology

A literature review was first undertaken to determine issues around green building concept, green building principles, awareness level of green building practices and benefits of green building in construction projects in Nigeria. The review also allowed a collation of perceived benefits of green building concepts that could be used for adopting green building principles. The intent of the research study is to use the result for the purpose of improving green building awareness in Nigerian built environment. A research questionnaire instrument was designed to collect data from parties who might be involved in the execution of green building projects either during the initial, construction, and maintenance phases of green building projects. Population of the study includes construction industry professional's (Architects, Builders, Civil and Services Engineers, Estate Surveyors, Town Planners and Quantity Surveyors) in public, private and academic organizations and institutions. The study was conducted in 'Lagos metropolis'.

Lagos has been considered as the nerve centres of commercial activities in Nigeria with relative high levels of construction workload as well as large concentration of building contractors and clients/property developers of various categories and sizes.

The sample for the study was selected by purposive random techniques. Initially, interviews were conducted with some professionals to identify their level of awareness/knowledge, experience, interest and expertise in possible green projects. Based on the findings, a sample size of one hundred and fifty (150) questionnaires were employed in reaching construction industry professionals from client/government establishments, consulting/contracting organizations and built environment lecturers in public and private tertiary institutions in the study area. One hundred and fifty (150) questionnaires were delivered directly to respondents and filled questionnaires were retrieved two weeks after the administration. Ninety one (91) responses were retrieved for data analysis. According to Moser and Kalton (1971), the result of a survey could be considered as biased and of little value if the response was lower than 30-40%, the response rate for the research is 61% which indicate an unbiased and higher value of survey.

Tables were used for representing descriptive result. The five-point Likert scale (1= strongly disagree and 5=strongly agree) was used to calculate the mean score for each benefit of green building which was then used to determine its relative ranking in ascending order of agreement. Kolmogorov-Smirnov and Shapiro-Wilk test were used to test the questionnaire statements and the hypotheses to determine whether they follow normal distribution or not. Kruskal Wallis test was to compare the perception the built environment practitioners on their level of awareness of green building practices. The chi-square statistics was used at 5% level of significance to test the research hypotheses formulated for the study.

Results and discussions

The result of the study will be discussed under the following headings:

Characteristics of Respondents that Participated in the Study

Characteristics of respondents that took part in the study are presented in Table 1. From the results presented, it is shown that for the type of business of respondents, 32% of the respondents are Contractors, 31% are in Academia, 12% are in Engineering firm, 8% are in Architectural firm, 7% are in Facility Management firm, 4% are in Consultancy services, 3% are in Government Agencies, 2% are owner/developer and the remaining 1% of the respondent are in Project

Management firms. This reveals that the respondents job description fall closely in line with built environment professions. Also, for the ownership status of respondents organization 7% of the organisations operate as Expatriate firm while 93% operate as Indigenous firm. Further results presented in Table 1 regarding the designation of respondents show that 20% of the respondents are Site Engineers and another 14% are Lectures in their various institutions, 13% of the respondents are Architects, 11% of the respondents are Quantity Surveyors and NSE- Technicians. 9% of the respondents are Construction Managers and 7% of the respondents are Project Managers and Consultants. 3% of the respondents are Site Managers and Facility Managers while the remaining 2% of the respondents are maintenance Officers. Since most respondents were Site Engineers and Lectures, it suggests that they must have good knowledge of green building practices in construction projects

Moreover, results in Table 1 on academic qualification of respondents indicate that 46% of the respondents have M.sc degrees, 44% possess HND/BSC certificate and degrees, 5% have PGD degrees while 3% and 2% have PhD and OND respectively. Since most respondents have M.sc and HND/BSC degrees, they are academically qualified to provide

vital and relevant information about awareness level of green building practices and the accruable benefits in construction projects in Nigeria. Further results from Table 1 indicate that 43% have 5 -10 years of experience, 31% of the respondents have below 5 years' experience, 12 % of the respondents have 11-15 years of experience while 7% have 16-20 years of experience and more than 20 years' experience respectively. It can be inferred that most of the respondents have a reasonable level of experience. In terms of the professional affiliation of the respondents in Table 1 , it indicates that that 24% of the respondents belong to Nigerian Society of

Engineers and Nigerian Institute of Building, 20% of respondents of the belong to Nigerian Institute of Architects, 17% of the respondents belong to Nigerian Institute Quantity Surveying, 7% of the respondents belong Nigerian Society of Estate Surveyors and Valuers, 6% belongs to other professional bodies like Project Management Institute and NSE-Technicians while remaining 2% belong to Nigerian Institute of Town Planners. Since all the respondents belong to various professional bodies in the built environment, they must have gotten enough insight into the practice of green building through their various meetings.

Table 1: Characteristics of Respondents that Participated in the Study

	<i>Frequency</i>	<i>Percentage (%)</i>
<i>Types of business</i>		
<i>Architectural firm</i>	7	8
<i>Contractors</i>	29	32
<i>Owner/developer</i>	2	2
<i>Government agency</i>	3	3
<i>Facility management firm</i>	6	7
<i>Consultancy firm,</i>	4	4
<i>Project management firm,</i>	1	1
<i>Engineering firm</i>	11	12
<i>Total</i>	91	100
<i>Ownership Status</i>		
<i>Expatriate firm</i>	7	7
<i>Indigenous firm</i>	83	93
<i>Total</i>	91	100
<i>Designation of Respondents</i>		
<i>Architects</i>	12	13
<i>Construction managers</i>	8	9
<i>Site managers</i>	3	3
<i>Site Engineers</i>	18	20
<i>Project managers</i>	6	7
<i>Quantity Surveyors</i>	10	11
<i>lecturers</i>	13	14
<i>Facility Manager</i>	3	3
<i>Consultants</i>	6	7

<i>Maintenance officers</i>	2	2
<i>Others(NSE-Technicians)</i>	10	11
<i>Total</i>	91	100
Academic Qualification		
<i>OND</i>	2	2
<i>HND/B.sc</i>	40	44
<i>PGD</i>	4	5
<i>M.Sc</i>	42	46
<i>Ph.D</i>	3	3
<i>Total</i>	91	100
Years of experience		
<i>below 5</i>	28	31
<i>5 -10</i>	39	43
<i>11-15</i>	11	12
<i>16-20</i>	6	7
<i>Above 20</i>	7	8
<i>Total</i>	91	100
Professional affiliation		
<i>Nigerian Institute of Building</i>	22	24
<i>Nigerian Institute Quantity Surveying</i>	15	17
<i>Nigerian Institute of Architects</i>	18	20
<i>Nigerian of Engineers</i>	22	24
<i>Nigerian Society of Estate surveyors and Valuers</i>	6	7
<i>Nigerian Institute of Town Planners</i>	2	2
<i>Others(PMP, NSE Technicians)</i>	6	6
<i>Total</i>	91	100

Construction Professionals Awareness of Green Building Practice in Construction Projects

According to the survey conducted as shown in Table 2. It indicates that 26% of the respondents are very familiar with green building concepts, 60% of the respondents are familiar with the practice, 10% of the respondents are not familiar with the concepts while remaining 4% of the respondents do not have idea of green building concept. The familiarity percentage in this study compares favorably with 63% familiarity of sustainability concepts of Nigerian construction professionals of Ameh, et al. (2007)

studies. Also, the construction industry familiarity of 58% of green building in USA by Ahn, Pearce and Ku (2011) agrees well with familiarity percentage obtained in this study. One of the questions that most respondents give high priority is what does “green building mean to you”? 51 % of the respondents believe that green building is all about environmental friendliness and 21% of the respondents considered that green building as energy and water efficiency concept while 9% considered that healthy indoor air quality is what makes green building popular and 8% said that green building means all

identified principles to them while the remaining 6% of the respondents said that it reduces maintenance cost, only 6% of the respondents said that they don't have any idea about what green building entails. These results suggest that most respondents who participated in this study considered environmental friendliness as the best attribute of green building practice. Environmental friendliness attribute of green building practice can enhance productivity and occupant's health thereby lowering absenteeism. Table 2 shows where the respondents heard about green building. Most of the respondents heard about green building from media\articles and internet which is 24%, 20% of the respondents said that they heard about green practice through Courses/workshop/seminars, 10% of the respondents said through Mandatory Continuing Professional Development and 3% of the respondents said they never heard about green building in all these identified sources. These results indicate that media\articles and internet channels of communicating green building are the most effective means of dissemination the practice to stakeholders. Furthermore, results from Table 2 suggest that majority of the respondents have moderate interest and expertise in possible green building practices which is about 50%, about 19% of the respondents have low interest and expertise,

about 18% of the respondents have high interest and expertise in green concept while 14% of the respondents have very low interest and expertise. These results suggest that Nigerian built environment professionals are ready to take advantage of this emerging opportunity. From the result it is deduced that 22% of respondents believe that environmental and resource conservation is the most perceived green building concept to adopt while 22% of the respondents said that they are not willing to adopt any of the concepts, about 20% of the respondents are willing to adopt energy conservation principle, about 13% of the respondents are willing to adopt maintenance and building operation concepts, 8% of the respondents said that occupants health and safety are concepts to adopt , about 7% are willing to adopt water conservation while 5% of respondents are willing recycling and waste reduction. To investigate further the respondents were asked to indicate the most appropriate method for disseminating information on green building. 54% of the respondents indicated seminars/workshop/conferences as the most appropriate method, about 28% of the respondents indicated TVs/radio medium while about 9% advocate internet, billboards/banners medium. These results suggest that seminars/workshop/conferences are the most appropriate means of

communicating the practice to stakeholders. These results confirmed the earlier results of other similar studies in Nigeria that a higher percentage of Nigerian

built environment professionals are aware and familiar with the green building concepts (Ameh, et al. 2007; Abolore, 2012 and Waniko 2014).

Table 2: Awareness level of Green Building Practice to Respondents

	<i>Frequency</i>	<i>Percentage (%)</i>
<i>Familiarity with green building concepts</i>		
<i>Very familiar</i>	24	26
<i>Familiar</i>	55	60
<i>Not familiar</i>	9	10
<i>No idea</i>	3	4
<i>Total</i>	91	100
<i>Meaning of green building</i>		
<i>Environmentally friendly</i>	46	51
<i>Energy and water efficiency</i>	19	21
<i>Healthy indoor air quality</i>	8	9
<i>Reduced maintenance cost</i>	6	7
<i>Don't have any idea</i>	5	6
<i>All</i>	7	8
<i>Total</i>	91	100
<i>Information sources of green building</i>		
<i>Media/ articles</i>	22	24
<i>Internet</i>	22	24
<i>Courses/workshop/seminars</i>	18	20
<i>Personal research</i>	17	19
<i>Mandatory continuing professional development</i>	9	10
<i>Nil</i>	3	3
<i>Total</i>	91	100
<i>Level of interest and expertise in possible green building</i>		
<i>Moderate</i>	45	50
<i>Low</i>	17	19
<i>High</i>	16	18
<i>very low</i>	13	14
<i>Total</i>	91	100
<i>most appropriate method for disseminating information on green building</i>		
<i>seminars/ workshop/conferences</i>	49	54
<i>TVs/radio</i>	25	28
<i>internet</i>	8	9
<i>billboards/banners</i>	8	9
<i>Total</i>	91	100

Method of green building concept willing to adopt

<i>Environmental and resource conservation</i>	20	22
<i>Non</i>	20	22
<i>Energy conservation</i>	18	20
<i>Maintenance and building operation</i>	12	13
<i>Occupant health and safety</i>	7	8
<i>Water conservation</i>	6	7
<i>Recycling and waste reduction</i>	4	5
<i>All</i>	4	5
<i>Total</i>	91	100

Kruskal Wallis Tests for Comparing Perception of built environment professionals of awareness in green building Projects

In other to compare the perception of Architects, Construction managers, Site engineers, Quantity surveyors and Lecturers of awareness in green building projects in Nigeria a research hypothesis was developed. The hypothesis enables inferential decisions about green building awareness to be undertaken. The

null hypothesis (Ho) states the null hypothesis (H₀) states that there is no significant difference in the levels of awareness of green building practices among built environment practitioners. The level of significance of the Kruskal Wallis test conducted was set at 5%. The results of the Kruskal Wallis tests for comparing the perception of built environment practitioners on awareness in green building projects are presented in Table 3.

<i>Awareness indicators</i>	<i>Chi-square</i>	<i>df</i>	<i>P-value</i>	<i>Sig.</i>
Familiarity with green building concepts	5.89	4	0.21	NS
Meaning of green building	11.53	4	0.02	S*
Information sources of green building	4.94	4	0.30	NS
Experience of company in possible green building concept	7.95	4	0.09	NS

Level of interest and expertise in possible green building	6.56	4	0.16	NS
Willingness to incorporate green building concepts	1.64	4	0.80	NS
Methods of green concepts willing to adopt	2.79	4	0.60	NS

Table 3: Kruskal Wallis Tests for Comparing Perception of built environment Professionals of awareness in green building Projects

On familiarity with green building concepts, the chi-square values χ^2 (df = 4) = 5.89, P-value > 0.05, hence the results are not significant. This supports the null hypothesis and hence it is accepted. This infers that there is no significant difference between the perception of Architects, Construction managers, Site engineers, Quantity surveyors and Lecturers on the familiarity with green building concepts for awareness of green building projects. Architects, Construction managers, Site engineers, Quantity surveyors and Lecturers perceive this Awareness indicator as the same and hence they are not different from each other.

Further, for meaning of green building, the chi-square values χ^2 (df = 4) = 11.53, P-value < 0.05, hence the results are significant. This does not support the null hypothesis and hence the alternative hypothesis is accepted. This infers that there is significant difference between the perception of Architects, Construction managers, Site engineers, Quantity surveyors and Lecturers on awareness on

‘Meaning of green building’. It infers accepting the alternate hypothesis which means there is significant difference in the levels of awareness of green building practices among built environment practitioners.

Table 3 also gives the values of chi-square values χ^2 (df = 4) = 4.94, P-value > 0.05 for Information sources of green building, Experience of company in possible green building concept with chi-square values χ^2 (df = 4) = 7.95, P-value > 0.05, Level of interest and expertise in possible green building gives chi-square values χ^2 (df = 4) = 6.56, P-value > 0.05, Willingness to incorporate green building concepts gives chi-square values χ^2 (df = 4) = 1.64, P-value > 0.05, Methods of green concepts willing to adopt gives chi-square values χ^2 (df = 4) = 1.64, P-value > 0.05. The p-values are higher than the set level of significance; hence all the results are not significant. It infers accepting the null hypothesis which means that there is no significant difference between the perception of Architects, Construction managers, Site engineers, Quantity

surveyors and Lecturers on these awareness indicators.

Perceived Benefits of Adopting Green Building Principles

The various benefits that drive green building practices on the construction projects are summarized in Table 4. Respondents who participated in this study were asked to rank their level of agreement of green building benefits in possible green construction projects. The results of the survey study indicated that the most perceived benefits of green building by study participants were pursuing active recycling (MS =4.84) ranks first, conserving natural resources (MS=4.56) ranks second and preventing global warming (MS =4.50) ranks third. These results suggest that that the most important benefits of adopting green building practices in construction projects lies in conservation of environment. Another important benefits were decreasing environmental damage cost (MS= 4.30) ranks fourth, improving productivity (MS= 4.15) ranks fifth, maintaining integrity of environment (MS=4.04) sixth while improving quality of life for individuals and society as a whole (MS=4.00) 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 using renewable

natural resources (MS=3.99) ranks eighth, reducing energy consumption and cost (MS=3.97) ranks ninth, protecting air, water and land ecosystem (MS=3.93) ranks tenth, minimizing waste production and disposal and decreasing health cost (MS=3.88) ranks eleventh, improving health and comfort and well-being (MS=3.77) rank twelfth, improving economic growth (MS=3.68) ranks thirteenth, reducing water consumption and cost (MS=3.60) fourteenth while reducing water consumption and cost (MS=3.51) ranks sixteenth. These results suggest that they are as well important benefits of green building practice in the built environment. In addition, respondents also identified lowering infrastructural cost (MS=3.48) ranks seventeenth, raising real income and improving return on investment (MS=3.42) ranks eighteenth, understanding the importance of social and cultural capital (MS 3.20) ranks nineteenth, Alleviating poverty (MS 3.19) ranks twentieth and understanding the multi-disciplinary communities (MS 3.12) ranks twenty-first. The other less recognised benefits of green building practices were decreasing absenteeism from work (2.99) ranks twenty-second, minimizing cultural disruption (2.85) ranks twenty-third, while providing education services (MS=2.83) ranks twenty-fourth. It must also be noted that all the identified benefits had almost mean

scores above 3.00, this shows that they all are significant in the present study. Furthermore, it also showed that green building produces functional results by

improving productivity and minimises negative environmental impact created by construction activities.

Table 4: Perceived Benefits of Adopting Green Building Principles

Perceived benefits	Mean score	Over-all ranking
pursing active recycling	4.84	1
conserving natural resources	4.56	2
preventing global warming	4.50	3
decreasing environmental damage cost	4.30	4
improving productivity	4.15	5
maintaining integrity of environment	4.04	6
improving quality of life for individuals and society as a whole	4.00	7
using renewable natural resources	3.99	8
reducing energy consumption and cost	3.97	9
protecting air, water and land ecosystem	3.93	10
minimizing waste production and disposal	3.88	11
decreasing health cost	3.88	11
improving health, comfort and well-being	3.77	13
improving economic growth	3.68	14
satisfying human needs	3.60	15
reducing water consumption and cost	3.51	16
lowering infrastructural cost	3.48	17
raising real income	3.42	18
improving return on investment	3.42	19
understanding the importance of social and cultural capital	3.20	20
Alleviating poverty	3.19	21
understanding the multi-disciplinary communities	3.12	22
decreasing absenteeism from work	2.99	23
minimizing cultural disruption	2.85	24
providing education services	2.82	25

Conclusions

The negative environmental impact of buildings and the accruable benefits of green building have been presented at the introduction

and literature sections of this study. Thus, raising awareness of green building practices among construction professionals in construction projects has been

linked to the better understanding of the goals of green building or sustainable development. The practice of green building should be embraced not only because of its humanity concerns and environmental legislation but also because of its capability to increase financial profit and long-term competitiveness of buildings. A survey instrument was developed and responses from ninety-one (91) respondents were collected. Twenty-five perceived benefits of green building factors were identified from literature review.

In view of the findings emanating from this study it can be concluded that Nigerian built environment professionals are aware of the green building practices applicable to construction projects. There appears to be moderate interest in the

practice. The result seemed to be consistent with results of other similar studies though there might be differences in methods. A Kruskal Wallis test set at 5 percent significance level showed that there is no significant difference on the levels of awareness of green building practices amongst built environment practitioners.

The study recommends the full establishment of Green Building Council of Nigeria (GBCN) that would introduce guidelines, tools or techniques that will drive green building practices for future project. This would encourage investors and practitioners in the built environment in adopting green building practices as a way of mitigating negative environmental impacts of buildings to the environment

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