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FACTORS INFLUENCING THE ADOPTION OF SUSTAINABLE ARCHITECTURAL DESIGN PRACTICES IN CENTRAL ADMINISTRATIVE BUILDINGS IN NIGERIAN UNIVERSITIES

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ABSTRACT

Purpose: The need to have a sustainable and energy efficient building cannot be overemphasized. However, there are critical factors that influence the extent of sustainability performance of institutional buildings. Hence the aim of this study is to assess the factors influencing the extent of adoption of sustainable architectural design practices in central administrative buildings in Federal Universities in Southern Nigeria with a view to improve the overall sustainability performance of central administrative buildings.
Design/methodology/approach: A quantitative approach was adopted for this study. Data for the study was obtained using structured questionnaire administered randomly to 120 construction professionals working in Departments of works and physical planning units in Federal universities in Southern Nigeria. The data was analysed using descriptive and inferential statistics.
Findings: This study found that perceived initial high cost of sustainable practices, benefits of sustainable practices, and lack of knowledge of sustainability concept are the top three factors influencing the adoption of sustainable architectural design practices in designs of Central administrative buildings in Federal Universities in Southern Nigeria. Moreso, the study found that the construction professionals agreed that all the evaluated factors influence the extent of adoption/implementation of sustainable design practices in Central Administrative Buildings in Southern Nigeria. It was discovered that 2.32% of the factors influencing the adoption/implementation of sustainable architectural design practices had very high influence, while 97.68%) had high influence on the adoption of sustainable architectural design practices of Central Administrative Building of Federal Universities in Southern Nigeria.
Practical implications: It implies that all the factors evaluated were considered to be critical. Therefore, these factors must be given adequate consideration while adopting/implementing sustainable architectural design practices in Central Administrative Building.
Originality/value: It is recommended that stakeholders should create more awareness on the benefits of adopting sustainable architectural design principles in central administrative buildings so as to increase its adoption among construction stakeholders. Government, and other relevant stakeholders should reduce the initial cost of sustainable construction through financial incentives

Keywords: Adoption; Central Administrative Buildings; Factors; Nigerian Universities; Sustainable Architectural Design Practices

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1. INTRODUCTION

Among the vast social and economic impacts of building, their contributions to environmental problems are also influential. Therefore, poorly designed and unethically procured buildings have negative implications on health, welfare, and economic prospect of businesses and communities making the adoption of sustainable architectural practices worth giving a consideration (Cole, 2020). Sustainable design reduces negative impacts of construction activities on the environment, health and comfort of occupants in the facility (Rooshdia *et al.,* 2014). Rooshdia *et al*. (2014) explained that sustainable design is a school of thought in architecture that focuses on creating infrastructure that incorporate principles of social and ecological sustainability.

Ardiani and Shateri (2018) further explained that sustainable architecture involves a combination of values: aesthetic, environmental, social, political and moral; It is about one's perception and technical knowledge to engage in a central aspect of the practice, that is to design and build in harmony with the environment. In addition, Ogunoh (2014) maintained that buildings are expected to function effectively throughout their expected life span, by functioning to accommodate the activities for which it is built, and provides comfortable indoor and outdoor climates to its occupants.

In order to achieve successful adoption of sustainable architectural design practices, there are some facilitating factors which could enhance its adoption. For instance, study by Oke *et al* (2019) identified the following facilitating factors to the adoption of sustainable design practices; Linking research to implementers, legislation / Legal requirement, building regulations, advocacy and awareness, developing regulatory mechanisms, client demand, strengthening implementing mechanisms, knowledge sharing, planning policy, resource efficiency, and resource efficiency. Others include resource efficiency, resource efficiency, reputation /image, financial incentives, creation of technologies to mitigate impacts, competitive advantage, creating regional centers of excellence, clarification of roles and responsibilities, benchmarking and assessment, changing the construction process, cost reduction, Attract and retain good employees.

Despite numerous benefits and facilitators of sustainable architectural design practices, some barriers exist. Barriers are situations that hold back actions or obstruct progress towards attaining objectives. Ayarkwa *et al* (2017) noted that, barriers attract negative impact on development and can be external or internal factors. Unfortunately, in spite of the huge benefits attributed to sustainable construction practice, its adoption and implementation is being confronted by a number of barriers. Though several steps have been taken by the developed countries to fully practice sustainable construction barriers still exist (Djokoto *et al*., 2014).

Opoku, *et al.* (2018) pointed that the weakness in regulation in the construction industry has to do with the fact that most of these regulations are designed for only new buildings. Therefore, in order to ensure a more sustainable future, both regulation and innovation must be considered within the construction industry

Opoku *et al*. (2018) enlisted some of the conditions inhibiting the adoption of sustainable design practices in developing countries as; Lack of technologies, absence of specific regulation on environmentally sustainable practices, non-acceptance of green designs by the public, clients' lack of understanding of environmental sustainability, lack of certification for sustainable designs, and no regard for environmental sustainability.

The Lack of demand for sustainable construction from clients in Nigeria has been recognized as one of the barriers to the adoption of sustainable design practices in different countries (Ametepey *et al*., 2015). Generally, increase in supply is usually as a result of increase in demand; Client's demand is key to the growth of sustainable construction and is

directly associated to education and training in the search for adoption of sustainable construction practices (Oke, Aghimien, Aigbavboa and Musengaa, 2019). Djokoto *et al.* (2014) noted that most clients are not convinced on the need to demand for sustainable construction. There is need for highlight on the benefits of sustainable construction among construction clients and public.

There is Low level of awareness of sustainable construction on the adoption of sustainable construction in Nigeria (Djokoto *et al*., 2014; Oke *et al.*, 2019). Level of awareness of sustainable construction by public plays a vital role in the adoption of sustainable construction (Davies and Davies, 2017). According to Oke *et al.* (2019), the adoption of sustainable construction is a process that begins with awareness and then interest.

In addition, study by Osuizugbo *et al.* (2020) further recognized and outlined the following as barriers to the adoption of sustainable design practices: Cultural change resistance, Poor government support for sustainable construction, Lack of relevant laws and regulation to drive sustainable construction, Lack of professional skill, Number of local green certification available, Lack of label, and Weak enforcement of building codes

Ifeanyichukwu *et al*. (2022) conducted a study on factors militating against the practice of Green Building as a New Paradigm in Construction Projects. The study was achieved through qualitative and quantitative research method. The result from the research revealed that, to a 'Great extent', lack of enforcement and limited research were the greatest militating factor facing practitioners in the adoption of green building concept, followed by lack of awareness.

Central administrative buildings serve as spaces where important decisions are made, including the approval of academic programmes, appointment of faculty members, formulation of policies, and awarding of degrees. In addition to their administrative functions, senate buildings often serve as architectural landmarks within university campuses. It is important to note that while the general functions and characteristics of university Central administrative buildings are similar across Nigeria, the specific designs and architectural styles may vary from institution to institution. Each university may have its own unique architectural vision and preferences, resulting in diverse and distinctive central administrative building across the country.

Based on the importance and relevance of the central administrative building in the tertiary institutions, it become imperative that such building should be sustainable and energy efficient. In order to make central administrative building green, sustainable and energy efficient, there is need to consider the critical factors that facilitate, and inhibit the successful adoption of sustainable architectural design practices. Hence, the aim of this study is to assess the factors influencing the adoption of sustainable architectural design practices in central administrative building in the tertiary institutions in southern Nigeria. The study also tested the hypothesis which states that there is no significant variation in the opinions of the respondents on factors influencing the adoption of sustainable architectural design practices in designs of Central administrative buildings in Federal Universities in Southern Nigeria.

2. LITERATURE REVIEW

2.1. Factors Facilitating the Adoption of Sustainable Architectural Design

There are some facilitating factors in literature which could enhance the adoption of sustainable architectural design practices in Nigeria. For instance, study by Oke *et al.* (2019) identified the following facilitating factors to the adoption of sustainable design practices; linking research to implementers, legislation / legal requirement, building regulations, advocacy and awareness, developing regulatory mechanisms, client demand, strengthening implementing mechanisms, knowledge sharing, planning policy, resource efficiency, resource

efficiency, resource efficiency, resource efficiency, reputation / image, financial incentives, creation of technologies to mitigate impacts, competitive advantage, creating regional centres of excellence, clarification of roles and responsibilities, benchmarking and assessment, changing the construction process, cost reduction, attract and retain good employees. Some of these facilitating factors are discussed below.

2.1.1 Legislation, Policies and Creating Awareness

The construction industry can be viewed as large and fragmented and slow to respond to change, preferring the 'tried and tested method'. The drivers to a more sustainable built environment will be increasing legislation and rising energy costs, if not ethics (Grierson and Moultrie, 2011). However, the level of 'greenness' of a building often depends on client aspirations and the approach taken by the architect and the design team (Grierson and Moultrie, 2011). Therefore, rising awareness to enlighten clients will facilitate adoption of sustainable architectural practices.

2.1.2 Benefits of Sustainable Practices

The benefits of sustainable practices have been recognized as facilitating factors to the adoption of sustainable architectural practices. Moreso, Dahiru *et al*. (2014) noted some benefits of sustainable design which he stated are drivers to the adoption of sustainable architectural design. These immense benefits include;

i. reduced capital cost,
ii. reduced operating cost,
iii. market benefit,
iv. health and productivity gains,
v. reduced liability risk,
vi. Attracting and retaining employees,
vii. Waste management,
viii. Preserving natural resources, and
ix. Satisfaction from doing the right thing.

2.1.3 High Demand for Infrastructural Development

There is high demand for infrastructural development in most developing countries for socio-economic development (Otali *et al*. (2021). With approximately 6.7 billion people on Earth now and a projected 9 billion by mid-century of 21, finding some new ways of reducing consumption is inevitable if avoiding dramatic environmental degradation and the potential of global ecosystem collapse is important for humanity (Rahaei *et al.,* 2016).

2.1.4 Changes in Climate

Changes in climate has led many organizations to embrace environmental sustainability and social responsibility even though organizational roles and responsibilities in sustainability initiatives have not been clearly defined. In general, Otali *et al*. (2021) pointed at desire to save energy and resources; the reduction and better management of generated waste; the need to use building materials and methods that address better indoor environment quality; and need to have efficient and cost saving buildings as the major drivers of adoption of sustainable architectural practices.

Studies have shown that adoption of sustainable construction practices would result in a substantial reduction in the greenhouse emissions from the construction industry (Osuizugbo *et al.,* 2020). Evolving a sustainable development practice is an emergent concern for the construction industry in both developing and developed countries. However, early human generations recognized the need to carefully use natural resources and that everything on this planet is equally dependent (Opoku *et al.,* 2018). Unfortunately, with the revolution of science and technology, this philosophy changed to an unsustainable approach to exploit

nature as efficiently as possible and to take for granted that nature's services will always be there. Therefore, sustainability as a predominant term has evolved in the course of the last few decades and it still evolves with ever changing human needs and perceptions.

2.2. Factors Inhibiting the Adoption of Sustainable Architectural Design

Noteworthy, barriers are situations that hold back actions or obstruct progress towards attaining objectives. The barriers attract negative impact on development and can be external or internal factors. Unfortunately, in spite of the huge benefits attributed to sustainable construction practice, its adoption and implementation is being confronted by a number of barriers. Though several steps have been taken by the developed countries to fully practice sustainable construction barriers still exist (Djokoto *et al*., 2014). The factors inhibiting the adoption of sustainable architectural design are the critical factors that hinder the extent of adoption/implementation of sustainable architectural design practices in infrastructural development.

2.2.1 Weakness in Regulation

Similar to other ideal practices, the ability to regulate a system has always been the prime factor militating the achievement of such desired agenda. In addition, Opoku, *et* al. (2018) pointed that the weakness in regulation in the construction industry has to do with the fact that most of these regulations are designed for only new buildings. Therefore, in order to ensure a more sustainable future, both regulation and innovation must be considered within the construction industry (Dohrmann *et al*., 2009).

2.2.2 Perceived Initial Cost

Higher investment costs associated with sustainable design and construction practices in comparison to the conventional construction approaches serve as a challenge, as clients' concern for higher risks has often influenced their choice on the utilization of sustainable design and construction practices (Nelms *et al*. 2005). Evidently, investigation on barriers to sustainable design practices by Opoku *et al*. (2018) fostered the believe that clients contribute to unsustainable development practices as most of her Interviewees were of the view that the practice of environmental sustainability comes with high initial cost and therefore prevents its adoption during the design of projects and in turn promotes the practice of unsustainable designs, which are welcomed by clients since those designs have minimal cost compared to the environmentally sustainable designs. However, Ala-Juusela and Shukuya (2014) explained that environmental sustainability offers major cost savings when implemented but this is not adequately communicated to developers. This confirmed Zhou and Lowe (2013) argument that developers hold the misconception that capital costs will rise when they apply environmentally sustainable practices in their designs.

2.2.3 Lack of Knowledge on Sustainability Concept

Sustainability is an emerging trend of discuss in the construction industry. The practice of environmental sustainability is therefore hindered due to the lack of knowledge and understanding of these practices (Kurul *et al*., 2011). Therefore, Kurul *et al*. (2011) pointed that while designers demonstrate confidence in their ability to access and use knowledge in general, this confidence falls when the specific issues of sustainable design practices are addressed. Therefore, they argued that only a few number of professionals in the construction industry possess the specialized knowledge and experience to design and construct environmentally sustainable projects.

2.2.4 Technological Difficulty

A study by Opoku *et al*. (2018) revealed that majority of the designers has expressed the efficacy of modern technology in the pursuit for sustainable design and construction practices. Their study acknowledged that although modern technology aids the achievement of environmental sustainable design but the technology software are not common in most developing countries, therefore designers would have to put in additional efforts to acquire

these technological software. This becomes a hindrance to the adoption of sustainable design practices.

2.2.5 Environmental Conditions in Developing Countries

Differences in environmental conditions between developed and developing countries present a lot of difficulties in the practice of environmental sustainability in the construction industry. Ofori (2012) posited that most construction industries in the developing countries face environmental problems. These problems therefore possess as barrier to the smooth implementation of environmental sustainability across the construction industry.

Furthermore, study by Opoku *et al*. (2018) enlisted some of the environmental conditions inhibiting the adoption of sustainable design practices in developing countries as;

i. Lack of technologies;
ii. Absence of specific regulation on environmentally sustainable practices;
iii. Non-acceptance of green designs by the public;
iv. Clients' lack of understanding of environmental sustainability;
v. Lack of certification for sustainable designs; and
vi. No regard for environmental sustainability.

2.2.6 Lack of Demand for Sustainable Construction

The Lack of demand for sustainable construction from clients in Nigeria has been recognized as one of the barriers to the adoption of sustainable design practices in different countries (Ametepey *et al*., 2015). Generally, increase in supply is usually as a result of increase in demand; Client's demand is key to the growth of sustainable construction and is directly associated to education and training in the search for adoption of sustainable construction practices (Oke *et al.,* 2019). Djokoto *et al.* (2014) noted that most clients are not convinced on the need to demand for sustainable construction. There is need for highlight on the benefits of sustainable construction among construction clients and public.

2.2.7 Low Level of Awareness

Effect of low level of awareness of sustainable construction on the adoption of sustainable construction in Nigeria corroborates with the findings from literature (Djokoto *et al*., 2014) in different countries. The result also supports the findings of Oke *et al.* (2019). Level of awareness of sustainable construction by public plays a vital role in the adoption of sustainable construction (Davies and Davies, 2017). According to Oke *et al.* (2019), the adoption of sustainable construction is a process that begins with awareness and then interest.

Moreso, study by Osuizugbo *et al.* (2020) further recognized and outlined the following as barriers to the adoption of sustainable design practices:

i. Cultural change resistance
ii. Poor government support for sustainable construction
iii. Lack of relevant laws and regulation to drive sustainable construction
iv. Lack of professional skill
v. Number of local green certification available
vi. Lack of label
vii. Weak enforcement of building codes.

3. METHODOLOGY

3.1. The Study Area

The Federal Republic of Nigeria before the amalgamation was divided into two protectorates; the Northern protectorate and the Southern protectorate. The present configuration of Southern Nigeria is made up of three geo-political zones or regions, namely; the South West (Comprising Ekiti, Lagos, Ogun, Ondo, Osun and Oyo states), the South East (comprising Abia, Anambra, Ebonyi, Enugu and Imo States) and the South-South (comprising Akwa Ibom, Bayelsa, Cross- Rivers, Delta, Edo, Rivers States) (Ikeanyibe, 2007).

Figure 1: Map of Nigeria showing boundaries of six geopolitical zones, 36 states and Federal Capital Territory (FCT-Abuja)

Source: Wong *et al* (2018)

Figure 1 shows the regions which constitutes the southern Nigeria protectorate. The Southern Nigeria as its name sounds, is located in the South of Nigeria, with the South-Western Nigeria lying between longitude 2°311 and 6°001 East and Latitude 6°211 and 8° 371N (Faleyimu, Agbeja, and Akinyemi, 2013). The south-western zone is bounded in the East by Edo and Delta states, in the North by Kwara and Kogi states, in the West by the Republic of Benin and in the south by the Gulf of Guinea (Faleyimu, Agbeja, and Akinyemi, 2013). The South Eastern Nigeria is located between latitudes $4^{0}40$' to $7^{0}2^{0}$' north of the equator and longitudes $60^{0}0$' to $8^{0}20$' east of the Greenwich Meridian (Kalu and Zakirova, 2019). South East zone is bounded by the River Niger on the west, the riverine Niger Delta on the south, the flat North Central to the north, and Cross River on the east. The region is divided between the Cross- Niger transition forest ecoregions in the south and the Guinean forest – savanna mosaic in the drier north. (Kalu and Zakirova, 2019). The South- South zone was created from both the western and eastern regions of Nigeria in 1997 through the recommendation of Alex Ekwueme panel, by the regime of General Sani Abacha. The zone stretches along the Atlantic seaboard from the Bight of Benin coast in the west to the Bight of Bonny coast in the east. It encloses much of the Niger Delta, which is instrumental in the environment and economic development of the region. The region has a population of about 26 million people, around 12 % of the total population of Nigeria as a country.

3.2. Population and Sampling

The population of this study consists of construction professionals in the department of works in the selected Federal Universities in Southern Nigeria which are University of Lagos (UNILAG), University of Ibadan (UI), University of Uyo (UNIUYO), University of

Port Harcourt (UNIPORT), University of Nigeria, Nsukka (UNN), Federal University of Technology Owerri (FUTO). Two universities were selected from each political zone which makes up Southern Nigeria. The selection of the universities was based on the criterion of the hierarchy of year of establishment of the institutions. Thus, the selected Universities are the oldest in the various regions.

The construction professionals are the Architects (Arch), the Builders (Bldr), the Quantity Surveyors (QS) and the Civil Engineers (CVE) in the works department and physical planning units of the selected federal universities of the geo-political zones in the southern Nigeria. The choice of these construction professionals was influenced by their role in achieving sustainability in building development. The choice of professionals in the works department in the federal universities was necessitated by their involvement in construction and use of the university facilities. Therefore, their experience in the construction and use of the central administrative building was sorted.

Furthermore, stratified random sampling technique was employed in selecting the respondents for this study. This technique was achieved by stratifying the respondents into their various professions in each of the selected universities in the geopolitical zones in Southern Nigeria, after which the required numbers that makes up the sample size for each profession in each of the universities was proportionately selected from each stratum at random.

The population size for the professionals which was obtained from researcher's pilot survey of registered professionals in the work department in the selected Federal Universities was 120. Census method of sample size was adopted, which implies that the entire population size will be sampled. The population size of the selected construction professionals is as shown in Figure 2.

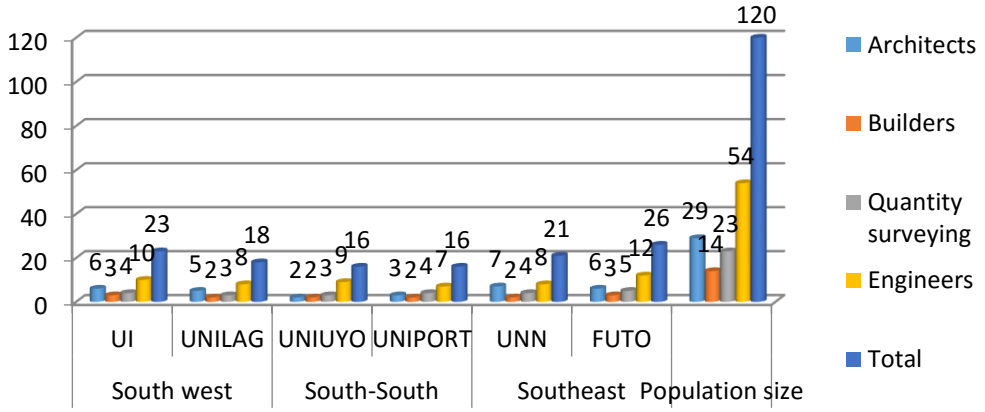

Figure 2: Population size and sample size of the construction stakeholders

3.3. Techniques of Data Analysis

Data collected from the questionnaire process were computed using Statistical Package for Social Science (SPSS) software. Data analysis techniques used in this study include simple percentage, mean and mean ranks. The decision rule will be that, Mean Score of 1.0 – 1.49 represents Very Low (VL), Means score of 1.5–2.49 represents Low (L), Means score of 2.5–3.49 represents Moderate (M), Means score of 3.5–4.49 represents High (H), and Means score of 4.5–5.0 represents Very High (VH). In addition, Kruskal Wallis test was used to test the hypothesis. Kruskal Wallis H-test was used at 5% significant level to test for significant variation in opinions of the selected construction professionals on factors influencing the adoption of sustainable architectural design in central administrative buildings in universities

in southern Nigeria. The decision rule is that, if P-value is less than or equal to 0.05 ($P \leq 0.05$), the null hypothesis will be rejected giving preference to the alternative. But if the P-value is greater than 0.05 ($P > 0.05$), the null hypothesis is accepted while the alternative hypothesis will not be considered.

4. PRESENTATION AND DISCUSSION OF RESULTS

Data obtained through questionnaire are presented and discussed in this section.

4.1. Questionnaire Administration

In order to generate data for this study, questionnaire was distributed to construction professionals in the works department in selected federal universities in southern Nigeria in order of zones; southwest, south-south and south east. The result order of the distribution of the questionnaire is presented in Table 1. The Table 1 shows the numbers of questionnaire distributed according to the selected universities and the selected professionals. Table 1 also indicated the response rate of the universities in each zone, and the overall response rate. university of Ibadan had a response rate of 82.61%, and university of Lagos had a response rate of 83.33% for. The overall response rate of South-West, Nigeria is 82.93%. Furthermore, University of Uyo had a response rate of 87.5%, while university of Port Harcourt had a response rate of 100%. The overall response of South-South, Nigeria is 93.75%. In addition, University of Nigeria, Nsuka had a response rate of 85.71%, while Federal university of technology, Owerri had a response rate of 76.92%. The overall response rate of South-East, Nigeria is 80.85%. The overall response rate of construction professionals that participated in this study across the selected three zones in Nigeria is 85%. Goves (2006) noted that a response rate of at least 50% is considered adequate for analysis and reporting, a 60% response rate is good and a response rate of 70% is very good. As a guide, researchers typically seek response rates of at least 70% to feel confident that their sample is representative of the sample frame. Hence, the overall response rate of 85 % in this study is considered adequate and satisfactory for the study.

Table 1: Questionnaire administration

Universities in Southern Nigeria	Construction Professionals	No. Distributed	No. Returned	Percentage Returned (%)	No. not Returned	Percentage not Returned (%)
SOUTHWEST						
UI	Architects	6	5	83.33	1	16.67
	Builders	3	3	100	-	-
	QS	4	4	100	-	-
	Engineers	10	7	70	3	30
	TOTAL	23	19	82.61	4	17.39
UNILAG	Architects	5	5	100	-	-
	Builders	2	2	100	-	-
	QS	3	3	100	-	-
	Engineers	8	5	62.5	3	37.5
	TOTAL	18	15	83.33	3	16.67
	SUM TOTAL	41	34	82.93	7	17.07

Universities in Southern Nigeria	Construction Professionals	No. Distributed	No. Returned	Percentage Returned (%)	No. not Returned	Percentage not Returned (%)
SOUTH-SOUTH						
UNIUYO	Architects	2	2	100	-	-
	Builders	2	2	100	-	-
	QS	3	2	66.67	1	33.33
	Engineers	9	8	88.89	1	11.11
	TOTAL	16	14	87.5	2	12.5
UNIPORT	Architects	3	3	100	-	-
	Builders	2	2	100	-	-
	QS	4	4	100	-	-
	Engineers	7	7	100	-	-
	TOTAL	16	16	100	-	-
	SUM TOTAL	32	30	93.75	2	6.25
SOUTHEAST						
UNN	Architects	7	6	85.71	1	14.29
	Builders	2	2	100	-	-
	QS	4	3	75	1	25
	Engineers	8	7	87.5	1	12.5
	TOTAL	21	18	85.71	3	14.29
FUTO	Architects	6	4	66.67	2	33.33
	Builders	3	2	66.67	1	33.33
	QS	5	5	100	-	-
	Engineers	12	9	75	3	25
	TOTAL	26	20	76.92	6	23.08
	SUM TOTAL	47	38	80.85		
GRAND TOTAL		120	102	85	18	15

4.2. Respondents Characteristics

For the purpose of understanding the demography of those who participated in the questionnaire process, a section of was reserved which shows the respondents education highest qualification, profession, professional affiliation and year of experience as seen in Table 2. From the Table 2, most of the professionals have MSc as their highest qualification in the Southwest; BSc in South-south and South east, at a percentage of 70.59, 46.67, and 50 for Southwest, South-south and Southeast respectively.

Also, the Table 2 shows that all the respondents are professionals and are members of their professional institute which means that they are knowledgeable in the subject matter. Furthermore, the Table 2 shows that most of the professionals in Southwest and South –south have 6-10 years experience. in Southeast most of the professionals have 6-10 and 1-5 years of experiences. These experiences are sufficient to make the to make the respondent conversant with the study subject matter

Table 2: Respondents' demography

Professionals demography	Sub features	Southwest Universities		South – south Universities		Southeast universities	
		Frequency	Percentage	frequency	Percentage	frequency	percentage
Educational Highest Qualification	HND	3	8.82	1	3.33	1	2.63
	B.sc	3	8.82	14	46.67	19	50
	M.sc	24	70.59	12	39.96	16	42.11
	PhD	4	11.76	3	9.99	2	5.26
	Others	-	-	-		-	-
	Total	34	100	30	100`	38	100
Profession	Architects	10	29.24	5	16.67	10	26.32
	Builders	5	14.71	4	13.33	4	10.53
	Quantity surveyors	7	20.59	6	20	8	21.05
	Engineers	12	35.29	15	50	16	42.11
	Total	34	100	30	100	38	100
Professional Affiliation	NIA	10	29.24	5	16.67	10	26.32
	NIOB	5	14.71	4	13.33	4	10.53
	NIQS	7	20.59	6	20	8	21.05
	NSE	12	35.29	15	50	16	42.11
	Total	34	100	30	100	38	100
Years of experience	1-5 years	9	26.47	6	20	10	26.32
	6-10 years	10	29.41	14	46.67	10	26.32
	11-15 years	5	14.71	5	16.67	8	21.05
	16-20 years	8	23.53	3	10	6	15.79
	Above 20	2	5.88	2	6.67	4	10.53
	Total	34	100	30	100	38	100

4.3. Factors Influencing the Adoption of Sustainable Architectural Design Practices in Designs of Central Administrative Buildings in Federal Universities in Southern Nigeria

In order to examine factors influencing the adoption of sustainable architectural design practices in the design of Central Administrative Building in Federal Universities in Southern Nigeria, some enhancing and inhibiting factors were identified in literature and forms the questionnaire which was piloted among the construction professionals in works and planning

department of the selected Federal Universities in Southern Nigeria. The sample statistics obtained through the questionnaire exercise was computed in SPSS and analysed to obtain mean and mean rank of the items as seen in the Table 3.

From the Table 3, the construction professionals in South West considered "Perceived initial high cost of sustainable practices" as the most influencing factor among other identified factors thus it ranked first with mean score of 4.71 followed by "financial incentive" and lack of knowledge of sustainability concept" which ranked second and third with mean score of 4.68 and 4.41 respectively.

Also, the Table 3 shows that the construction professionals in South-south also views "perceived initial high cost of sustainable practices" as the most influencing factor, thus it ranked first with mean score of 4.63 followed by "benefits of sustainable practices" and "environmental condition in developing countries" which ranked second and third with mean score of 4.57 and 4.47 respectively.

Furthermore, the Table 3 revealed that construction professionals in Southeast also considers "perceived initial high cost of sustainable practices" as the most influencing factor thus it ranked first with mean score of 4.58 followed by "benefits of sustainable practices", "environmental condition in developing countries" and "Lack of knowledge of sustainability concept" which ranked second and third with mean score of 4.53 and 4.50 respectively.

From the combined view, "perceived initial high cost of sustainable practices" is also considered the most influencing factor thus it ranked first with mean score of 4.64 followed by "benefits of sustainable practices" and "Lack of knowledge of sustainability concept"; "environmental condition in developing countries" which ranked second and third with mean score of 4.45 and 4.41 respectively. Other critical factors that have high influence on the extent of adoption of sustainable Architectural design practices include financial incentives (MS=4.24), developing regulatory mechanisms (MS=4.22), competitive Advantage (MS=4.14), client demand (MS=4.09), absence of specific regulation on environmentally sustainable practices (MS=4.07), knowledge sharing (MS=4.04), and planning policy (MS=4.03). 1(2.32%) of the factors influencing the adoption/implementation of sustainable architectural design practices had very high influence, while 42(97.68%) had high influence on the adoption of sustainable architectural design practices Central Administrative Building of Federal Universities in Southern Nigeria. It implied that all the factors evaluated were considered to be critical. Therefore, these factors must be given adequate consideration while adopting/implementing sustainable architectural design practices Central Administrative Building. The Tables 5.9 shows that the average mean of the zones and combined view is 3.95, 3.95, 3.94 and 3.94 for Southwest, South-south, Southeast and the combined view respectively. These average means fall within the mean range of 3.5-4.49 which represents "Agreed". Thus, it could be generalized that the construction professionals Agreed that the identified factors influence sustainable design practices in Central Administrative Buildings in Southern Nigeria.

Table 3: Factors Influencing Adoption of Sustainable Architectural Design Practices Central Administrative Building of Federal Universities in Southern Nigeria

Factors Influencing sustainable architectural design practices	South West				South South				South East				Combined			
	Sum	Mean	Rank	Remark	Sum	Mean	Rank	Remark	Sum	Mean	Rank	Remark	Sum	Mean	Rank	Remark
Legislation, Policies and Creating Awareness	133	3.91	16	HI	119	3.97	10	HI	147	3.87	14	HI	133	3.92	18	HI
Benefits of Sustainable Practices	145	4.26	7	HI	137	4.57	2	VHI	172	4.53	2	VHI	151	4.45	2	HI
High Demand for Infrastructural Development	127	3.74	21	HI	112	3.73	18	HI	142	3.74	19	HI	127	3.72	28	HI
Changes in Climate	123	3.62	25	HI	113	3.77	16	HI	137	3.61	22	HI	124	3.67	30	HI
Linking research to implementers	119	3.50	28	HI	103	3.43	22	HI	134	3.53	23	HI	119	3.49	33	HI
Legislation / Legal Requirement	124	3.65	24	HI	117	3.90	12	HI	153	4.03	9	HI	131	3.86	22	HI
Building regulations	129	3.79	19	HI	113	3.77	16	HI	142	3.74	19	HI	128	3.77	26	HI
Advocacy and awareness	137	4.03	12	HI	120	4.00	9	HI	149	3.92	12	HI	135	3.98	14	HI
Developing regulatory mechanisms	149	4.38	4	HI	127	4.23	6	HI	154	4.05	8	HI	143	4.22	5	HI
Client Demand	147	4.32	5	HI	118	3.93	11	HI	153	4.03	9	HI	139	4.09	7	HI
Strengthening implementing mechanisms	137	4.03	12	HI	121	4.03	8	HI	153	4.03	9	HI	137	4.03	10	HI
Knowledge sharing	130	3.82	18	HI	121	4.03	8	HI	162	4.26	4	HI	138	4.04	9	HI
Planning policy	128	3.76	20	HI	132	4.40	4	HI	149	3.92	12	HI	136	4.03	10	HI
Resource efficiency	136	4.00	13	HI	115	3.83	14	HI	144	3.79	17	HI	132	3.87	21	HI
Reputation / Image	127	3.74	21	HI	114	3.80	15	HI	143	3.76	18	HI	128	3.77	26	HI
Financial incentives	159	4.68	2	VHI	127	4.23	6	HI	145	3.82	16	HI	144	4.24	4	HI
Creation of technologies to mitigate impacts	127	3.74	21	HI	114	3.80	15	HI	145	3.82	16	HI	129	3.79	25	HI
Competitive Advantage,	146	4.29	6	HI	125	4.17	7	HI	151	3.97	11	HI	141	4.14	6	HI
Creating regional centers of excellence,	122	3.59	26	HI	109	3.63	20	HI	142	3.74	19	HI	124	3.65	31	HI
Clarification of roles and responsibilities	132	3.88	17	HI	119	3.97	10	HI	143	3.76	18	HI	131	3.87	21	HI
Benchmarking and assessment,	138	4.06	11	HI	111	3.70	19	HI	143	3.76	18	HI	131	3.84	23	HI
Changing the construction process	133	3.91	16	HI	117	3.90	12	HI	161	4.24	5	HI	137	4.02	11	HI
Cost reduction	138	4.06	11	HI	115	3.83	14	HI	144	3.79	17	HI	132	3.89	20	HI
Attract and retain good employees.	132	3.88	17	HI	119	3.97	10	HI	153	4.03	9	HI	135	3.96	16	HI
Weakness in Regulation	141	4.15	10	HI	118	3.93	11	HI	146	3.84	15	HI	135	3.97	15	HI

Factors Influencing sustainable architectural design practices	South West				South South				South East				Combined			
	Sum	Mean	Rank	Remark	Sum	Mean	Rank	Remark	Sum	Mean	Rank	Remark	Sum	Mean	Rank	Remark
Perceived Initial high Cost	160	4.71	1	VHI	139	4.63	1	VHI	174	4.58	1	VHI	158	4.64	1	HI
Lack of Knowledge on Sustainability Concept	150	4.41	3	HI	130	4.33	5	HI	171	4.50	3	VHI	150	4.41	3	HI
Technological Difficulty	125	3.68	23	HI	111	3.70	19	HI	142	3.74	19	HI	126	3.71	29	HI
Environmental Conditions in Developing Countries	144	4.24	8	HI	134	4.47	3	HI	172	4.53	2	VHI	150	4.41	3	HI
Lack of technologies	133	3.91	16	HI	118	3.93	11	HI	158	4.16	6	HI	136	4.00	13	HI
Absence of specific regulation on environmentally sustainable practices;	133	3.91	16	HI	125	4.17	7	HI	157	4.13	7	HI	138	4.07	8	HI
Non-acceptance of green designs by the public	129	3.79	19	HI	109	3.63	20	HI	154	4.05	8	HI	131	3.82	24	HI
Clients' lack of understanding of environmental sustainability	135	3.97	14	HI	118	3.93	11	HI	151	3.97	11	HI	135	3.96	16	HI
Lack of certification for sustainable designs; and construction	126	3.71	22	HI	120	4.00	9	HI	147	3.87	14	HI	131	3.86	22	HI
No regard for environmental sustainability.	137	4.03	12	HI	115	3.83	14	HI	146	3.84	15	HI	133	3.90	19	HI
Lack of Demand for Sustainable Construction	130	3.82	18	HI	117	3.90	12	HI	139	3.66	21	HI	129	3.79	25	HI
Low Level of Awareness	142	4.18	9	HI	116	3.87	13	HI	151	3.97	11	HI	136	4.01	12	HI
Cultural change resistance	129	3.79	19	HI	112	3.73	18	HI	144	3.79	17	HI	128	3.77	26	HI
Poor government support for sustainable construction	121	3.56	27	HI	106	3.53	21	HI	133	3.50	24	HI	120	3.53	34	HI
Lack of relevant laws and regulation to drive sustainable construction	130	3.82	18	HI	117	3.90	12	HI	148	3.89	13	HI	132	3.87	21	HI
Lack of professional skill	126	3.71	22	HI	114	3.80	15	HI	141	3.71	20	HI	127	3.74	27	HI
Number of local green certification available	134	3.94	15	HI	113	3.77	16	HI	148	3.89	13	HI	132	3.87	21	HI
Weak enforcement of building codes	130	3.82	18	HI	121	4.03	8	HI	152	4.00	10	HI	134	3.95	17	HI
Average	134	3.95		HI	118	3.95		HI	150	3.94		HI	134	3.94		HI

HI-High influence, VHI- Very high influence

4.4. Kruskal Wallis Test for Comparing the Opinion of Construction Professionals on Factors Influencing Adoption of Sustainable Architectural Design Practices Central Administrative Building of Federal Universities in Southern Nigeria

Table 4 shows the result of Kruskal Wallis Test that was conducted to test the hypothesis which states that there is no significant difference in the opinions of construction professionals on factors influencing adoption of sustainable architectural design practices central administrative building of federal universities in southern Nigeria. The p-value of 0.978 is greater than 0.05 significance level, hence the hypothesis was accepted. This implies that opinions of construction professionals on factors influencing adoption of sustainable architectural design practices central administrative building of federal universities in southern Nigeria do not vary.

Table 4: Kruskal Wallis Test for Comparing the Opinion of Construction Professionals on Factors Influencing Adoption of Sustainable Architectural Design Practices Central Administrative Building of Federal Universities in Southern Nigeria

Southern Nigeria Federal universities	Mean Rank
South West	64.69
South South	65.95
South East	64.36
Chi Square	.044
D.F	2
P-value	.978
Decision @0.05 Significance level	Accept

4.5. Discussion of Findings

The study revealed that perceived initial high cost of sustainable practices was considered as the most influencing factor, followed by benefits of sustainable practices, and lack of knowledge of sustainability concept. Other critical factors that have high influence on the extent of adoption of sustainable Architectural design practices include financial incentives, developing regulatory mechanisms, competitive advantage, client demand, absence of specific regulation on environmentally sustainable practices, knowledge sharing, and planning policy. 1(2.32%) of the factors influencing the adoption/implementation of sustainable architectural design practices had very high influence, while 42(97.68%) had high influence on the adoption of sustainable architectural design practices Central Administrative Building of Federal Universities in Southern Nigeria. It implied that all the factors evaluated were considered to be critical. Therefore, these factors must be given adequate consideration while adopting/implementing sustainable architectural design practices Central Administrative Building. The study showed that the average mean of the zones and combined view is 3.95, 3.95, 3.94 and 3.94 for Southwest, South-south, Southeast and the combined view respectively. These average means fall within the mean range of 3.5-4.49 which represents "Agreed". Thus, it could be generalized that the construction professionals agreed that the evaluated factors influence the extent of adoption/implementation of sustainable design practices in Central Administrative Buildings in Southern Nigeria. The study revealed that opinions of construction professionals on factors influencing adoption of sustainable architectural design practices central administrative building of federal universities in southern Nigeria do not vary. This study is in alignment with Opoku *et al.* (2018) who posited that the practice of environmental sustainability comes with high initial cost and therefore prevents its adoption during the design of projects and in turn promotes the practice of unsustainable designs. In addition, this study is agreement with Opoku *et al.* (2018) who revealed that majority of the designers have expressed the efficacy of modern technology in the pursuit for sustainable design and construction practices, but the lack of knowledge of the technological or expertise that can handle the methods serves as a setback in the adoption of sustainable practice. This study is also in consonance with Ametepey *et al*., (2015) who revealed that lack of demand for

sustainable construction from clients is one of the major barriers to the adoption of sustainable design practices. Furthermore, this study is tandem with Otali *et al*. (2021) who posited that some of the benefits of adopting sustainable design and construction principles/practices include energy saving, reduction and better management of generated waste; better indoor environment quality; and cost saving buildings. Moreso, the findings of this study align with Kurul *et al*. (2011) who argued that only a few professionals in the construction industry possess the specialized knowledge and experience to design and construct environmentally sustainable projects.

5. CONCLUSION AND RECOMMENDATIONS

This study assessed critical factors influencing the adoption of sustainable architectural design practices in designs of Central administrative buildings in Federal Universities in Southern Nigeria, and found that perceived initial high cost of sustainable practices, benefits of sustainable practices, and lack of knowledge of sustainability concept are the top three factors influencing the adoption of sustainable architectural design practices in designs of Central administrative buildings in Federal Universities in Southern Nigeria. Moreso, the study found that the construction professionals agreed that all the evaluated factors influence the extent of adoption/implementation of sustainable design practices in Central Administrative Buildings in Southern Nigeria. In addition, the study revealed that opinions of construction professionals on factors influencing adoption of sustainable architectural design practices central administrative building of federal universities in southern Nigeria do not vary.

Based on the findings and conclusion of this study, the following recommendations were thus proffered.

- **i.** There should be more awareness campaign on the benefits of adopting sustainable architectural design principles in central administrative buildings so as to increase its adoption among construction stakeholders.
- **ii.** Government and all relevant stakeholders should ensure that the initial cost of green and sustainable building materials are reduced through financial incentives.
- **iii.** Government and tertiary institutions should create regulatory framework and mechanisms that encourage the adoption of sustainable architectural design and construction principles in tertiary institutions buildings.

All the factors evaluated in this study were considered to be critical. Therefore, these factors must be given adequate consideration while adopting/implementing sustainable architectural design practices in Central Administrative Building.

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