Assessment of Challenges Confronting Construction Industry Professionals in Implementing Sustainable Practices on Construction Sites

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Sustainability in the construction industry is a panacea that ensures balance between environmental, social and economic dimensions. Despite the recognition, the implementation of sustainable construction practices faces challenges due to persistent obstacles. It is on this premises that this paper seeks to assess the challenges confronting construction industry professionals in implementing sustainable practice on construction site with a view to develop strategies for improving their adoption and effectiveness. A quantitative research approach was adopted using self-administered structure questionnaires to collect data from experienced construction professionals registered with Green Building Council of Nigeria (GBCN). A mixture of Purposive and snowball sampling technique was employed to select professionals with requisite experience, knowledge and involvement on sustainable construction practice. Data was analysed using descriptive statistics which is relative importance index (RII), to rank the severity of various challenges. The study revealed that professionals encounter significant barriers across economic, environmental and social dimensions. Among factors identified were high initial costs, investment risks and limited awareness of life-cycle cost benefits emerged as the most severe economic challenges. Environmental barriers, including poor understanding of sustainable practices and inadequate access to sustainable materials, further constrain the implementation, social factors such as low prioritization, poor perception, and limited government support exacerbate the situation. The study concludes that overcoming these obstacles requires stronger policy frameworks, increased awareness and training, and collaborative stakeholder engagement. In addition to improvement of awareness and understanding of sustainable construction, the study recommends the need to organize seminars and conferences to educate professionals and stakeholders on the benefits and lifecycle costing on sustainable practice to enhance the effective implementation of sustainable construction practices in Nigeria.
Keywords: Challenges; Construction industry; Life-cycle benefits; Sustainable construction; Nigeria

Introduction

The construction sector is very crucial to every nation's social and economic development by providing essential infrastructure, generating employment, stimulating investment and driving technological innovation. The Nigerian Construction Industry (NCI) has contributed immensely to the economy and social development of the nation, therefore, sustainability in the Nigerian Construction industry cannot be over-emphasized (Olowosile *et al.,* 2019). The NCI significantly drives economic growth, infrastructure development and employment (Bello *et al.,* 2024; Olanipekun & Saka, 2019). However, the NCI has been criticized as a non-sustainable industry due to its low productivity but high resource consumption (Maier & Aschilean, 2020).

Construction activities inherently impact the environment, economy and the society positively and negatively. Moreover, the nation's economy and social growth have benefited greatly from the Nigeria construction industry. A growing idea in the construction industry is sustainable construction, which attempts to apply sustainability basic principles to present building practices (Daniel *et al.*, 2018). According to Ifije and Aigbavboa (2020), sustainability is the ability to meet present demands without jeopardizing the ability of future generations to meet their own requirements in accordance with economic, social, and environmental dimensions. Isang (2023) highlighted that, despite the clear benefits and increasing global emphasis on sustainability, the adoption and effective implementation of sustainable construction practices face significant challenges, particularly in developing countries like Nigeria.

In the construction industry, sustainability is crucial and involves restoring and maintaining harmony between built and natural environments, thereby creating settlements that enhance human self-worth and economic equity (Ifije & Aigbavboa, 2020). Therefore, sustainability in the NCI cannot be over-emphasized based on the assertion by Oke and Aigbavboa (2019), which confirms that sustainability practice in the industry is one major and most important challenges currently faced all over the world especially in Nigeria.

Existing literature is replete with studies on sustainable construction in Nigeria, Aghimien *et al.* (2019) examined the challenges, barriers and ways of improving adoption of sustainable construction in Nigeria and found that sustainability knowledge, regulation and policy, sustainable materials and technology, information and management as the key

barrier factors inhibiting the adoption of sustainable construction practice in Nigeria. However, previous studies have shown that the concept of sustainability is still new to most construction experts in developing countries (Tomislav, 2018). Hence, there remains a critical need for a focused assessment from a professional's perspective to uncover the intricate interplay of the challenges and their impact on the successful adoption and delivery of sustainable projects within the Nigerian construction industry.

The benefits of sustainable construction are to improve social and economic conditions in construction-related industries and communities. Notable among the numerous benefits of sustainable construction include cost reduction, waste minimization, increased health benefits, environmental sustainability and reduced pollution in runoff waterways (Dahiru *et al.,* 2014). The success or failure of any construction project, particularly those aiming for sustainability, is highly dependent on the effective management and active engagement of all professionals (Alayande & Ola-Awo, 2021). These professionals included architect, builders, engineers, project managers and quantity surveyor. It is on this premises that this study was designed to assess the challenges confronting construction industry professionals in implementing sustainable practice on construction sites in Abuja.

Literature Review

Concept of sustainability

The concept of sustainability is based on the concept of development of socio-economic development in line with ecological constraints, the concept needs redistribution of resources to ensure the quality of life for all and the concept of future generations possibility of long-term usage of resources to ensure the necessary quality of life for future generations (Tomislav, 2018). Achieving sustainability in Nigeria is to establish an economy that is viable, environmentally sound and socially responsible (Ogbo *et al.,* 2017).

Sustainability is a broad and multifaceted concept that encompasses principles and practices aimed at meeting the needs of the present generation without compromising the ability of future generations to meet their own needs (Hariram *et al.,* 2023). It involves balancing environmental, social, and economic considerations to ensure that human activities are conducted in a way that preserves natural resources, promotes social equity, and supports economic prosperity over the long term. The notion of sustainability integrates multiple domains of existence to attain equilibrium among the economic, social, and environmental facets of human endeavours (Zhi-jiang *et al*., 2020). These principles align with the United Nations Sustainable Development Goals (SDGs), which seek to meet current needs without compromising the ability of future generations to meet their own (United Nations, 2022). It recognizes the interconnectedness of environmental, social, and economic systems and seeks to address the complex challenges facing humanity in a holistic and integrated manner. It acknowledges that decisions and actions taken in one aspect of sustainability can have cascading effects on others, emphasizing the importance of integrated approaches and systemic thinking.

Sustainability in the construction industry

According to Goh *et al.* (2023), sustainability in construction refers to the application of sustainable development principles to building and construction practices at every stage of the project's life cycle, including planning, building, operating, demolishing, and waste management. Goh *et al.* (2023) further stated that it is a process aiming to create suitable settlements for human and economic development without harming natural environment.

However, Sustainable construction is a growing force in the construction industry to alleviate the negative impacts of the industry on the natural environment, such as global warming, degradation of the environment, and depletion of natural resources (Ahn *et al*., 2013). Consequently, high-performance green buildings are created through the use of sustainable construction principles and methods to create a responsibly built environment (Kibert, 2016). Sustainable construction has been increasing rapidly around the world in recent years due to resource reduction and so has been facing a number of challenges and problems from a managerial, strategic and operational perspective.

In addition, the construction industry plays an important role in improving the quality of life and contribute significantly to satisfy societal demand (Hwang *et al.,* 2017; Doan *et al.,* 2017; Alwan *et al.,* 2017). The construction industry addresses the three dimensions of sustainability differently (Ibrahim, 2021). Ibrahim (2021), further revealed the three aspects of sustainability to be considered at all times. Environmental factors in sustainable construction encompasses the use of natural resources, efficient use of energy, waste minimization, appropriate use of water to avoid any effect on the environment. Social aspects refer to the interaction of each member of the construction team with each other to achieve required goal. Economic factors of sustainability further establish the contribution of the entire industry to the economic growth of the nation and employment. Salleh *et al.* (2022) buttressed that environmental, economic, and social are the three aspects of sustainability strongly influenced by the construction industry and the construction industry had greatly contributed to both Gross Domestic Product (GDP) and job opportunities. Sustainability studies have usually focused on two sectors which are buildings and infrastructures (Jimoh *et al*., 2021).

Challenges confronting construction industry professionals in implementing sustainable construction practices

In this new global economy, professional engagement is increasingly becoming a part of construction project practice in order to deliver excellent project outcomes. Nigeria, with its rapidly urbanizing population, faces significant challenges in adopting sustainable construction practices. While there is increasing awareness, actual implementation is constrained by financial limitations, lack of technical expertise, and weak regulatory frameworks (Ifije & Aigbavboa, 2020). Professionals in the Nigerian construction sector are becoming more aware of sustainability's importance however, challenges such as high upfront costs, limited access to green materials, and inadequate technical training impede broader adoption (Mba *et al.,* 2024). A well-managed professional engagement process helps the project stakeholder to work together to increase comfort and quality of life, while decreasing negative environmental impacts and increasing the economic sustainability of the project. Professional engagement should therefore be taken as a core element of any "sustainable development" plan (Yusuf *et al.,* 2024). Hence a project is more likely to be successful especially in the long-term, if it takes into consideration the expectations of the professionals and endeavour to meet their needs. Fear of higher investment costs for sustainable buildings compared with traditional building and the risks of unforeseen costs are often addressed as challenges for sustainable buildings (Hakkinen & Belloni, 2011). The primary barriers to implementation, are the misconceptions that by adopting a more sustainable design and construction, higher capital costs will be incurred, without a worthwhile benefit to market value (Dobson *et al*., 2013). Dobson *et al*. (2013) further revealed that it is critical, to evaluate the capital costs of sustainable building, against those of traditional buildings and prove their worth, in order to motivate professionals to consider and use methods of sustainable construction.

Various researchers had attributed a number of economic, social, environmental and technological related challenges (Djokoto *et al*. 2014; Ayarkawa *et al.* 2022; Huang *et al.* 2020; Dobson *et al.* 2013; Aigbavboa *et al*. 2017; Lu *et al.* 2020; Toriola-Coker *et al*. 2021; Gupta *et al*. 2020; Olawumi *et al*. 2018; Aigbavboa *et al*. 2016; Babuka 2016; Mane, 2017; Sev & Ezel, 2014; Umar *et al*., 2021; Fitriani & Ajayi, 2022a; Fitriani & Ajayi, 2022b; Oke *et al.,* 2019; Davies & Davies, 2017; Ali & Akkas, 2023; Shah *et al.,* 2021; Akinsulire *et al.,* 2024; Zhang *et al.,* 2018; Aghimien *et al.,* 2019; Osuizugbo *et al*., 2020; Ametepey *et al*., 2015; Uchenna & Abiodun, 2020). The highlight of these challenges is presented in Table 1.

Table 1: Challenges Confronting Construction Industry Professionals in Implementing Sustainable Construction Practices

Code	Challenges	Source (s)
	Economic Challenges	
EC1	High initial cost	Dobson *et al*. (2013); Djokoto *et al.* (2014); Huang *et al*. (2020); Ayarkwa *et al*. (2022);
EC2	High investment risk	Djokoto *et al.* (2014)
EC3	Ignorance of lifecycle cost benefits	Aigbayboa *et al.* (2017)
EC4	No input tariff for generation of renewable energy	Lu *et al*. (2020); Toriola-Coker *et al*. (2021)
EC5	Lack of alternative prevailing technology	Djokoto *et al*. (2014); Gupta *et al*. (2020)
EC6	Clients' preference for the traditional materials	Olawumi *et al*. (2018)
EC7	Reduction in maintenance costs	Sev and Ezel (2014); Aigbavboa *et al*. (2016); Babuka (2016); Mane (2017)
	Environmental Challenges	
EVC8	Lack of knowledge to consider alternatives	Aigbavboa *et al*. (2017); Umar *et al*. (2021)
EVC9	Poor understanding of sustainable Construction Practice	Aigbavboa *et al*. (2017); Oke *et al.* (2019); Fitriani and Ajayi (2022a)
EVC10	No method to verify Sustainability compliance	Toriola-Coker *et al*. (2021)
EVC11	Limited availability of sustainable materials and technologies	Ali and Akkas (2023); Shah *et al.* (2021); Akinsulire *et al.* (2024)
	Social Challenges	
SC12	Lack of administrative policies ideology	Zhang *et al.* (2018)
SC13	No role for initializing and leading sustainability	Toriola-Coker *et al.* (2021)
SC14	Poor skills among construction craftsmen	Toriola-Coker *et al*. (2021)
SC15	Lack of commitment from professional bodies	Aghimien *et al*. (2019)

SC16	Lack of resources to supervise building Requirement	Toriola-Coker *et al*. (2021)
SC17	Low priority on sustainability issues	Toriola-Coker *et al.* (2021)
SC18	Poor sustainability education in institutions	Aigbavboa *et al*. (2016)
SC19	Poor perception of sustainable construction	Fitriani and Ajayi (2022a)
SC20	Lack of sustainability measurement codes	Davies and Davies (2017); Fitriani and Ajayi (2022a, b)
SC21	Poor government support and irrelevant laws and regulations	Djokoto *et al.* (2014); Ametepey *et al*. (2015); Osuizugbo *et al*. (2020)
SC22	Lack of awareness among professionals hinders the widespread adoption of sustainable practice	Huang *et al*. (2020)
SC23	Resistance to change in construction methods	Uchenna and Abiodun (2020)

Research Methodology

Research methodology provides a structured approach to investigating the challenges confronting construction industry professionals in implementing sustainable construction practices on construction site in Abuja, Nigeria. This study employed quantitative survey research design approach using, structured questionnaires to extract information on the challenges confronting construction industry professionals in implementing sustainable construction practices in Abuja Nigeria. The target population for this study were professionals in construction firms in Abuja which were listed in Nigeria Directory online website (www.directory.org.ng) that are registered with Green Building Council of Nigeria (GBCN). The list had 201 construction firms, out of which only 20 firms in category of construction and renovation were considered. Data collected through a self-administration of 50 questionnaires to respondents that were purposively selected (Purposeful sampling, also known as purposive sampling, is a method of non-probability sampling that relies on a researcher's knowledge and understanding to select the necessary sample from a population for a study as stated by Etikan and Babatope (2019), and 47 questionnaires were returned. Data collected were analysed using Relative Importance Index (RII). This study RII was determined using equation such as: $\Sigma W / (N * A)$ where W is the weightage given to each factor by respondents which range from 1 to 5 using Likert's scale, N is the total number of respondents and A is the highest weight (5) which was aided by statistical software package for social science (SPSS) version 26 and Microsoft excel. The variables were ranked using decision rule ranging from point 0.00-0.20 least severe, 0.21-0.40 less severe, 0.41-0.60 severe, 0.61-0.80 very severe and 0.81-1.00 extremely severe.

Results and Discussion

Respondent's information

This section shows the demographic characteristics of respondents of this study. Respondents' profiles are presented in Table 1.

In terms of respondents' professions, it was revealed that Quantity surveyors was the highest, representing 44.68% of the population. It was also shown that most of the respondents are holders of BSc/BTech degree, representing 44.68% of the population. This is followed by holders of MSc/MTech who represent 40.5%. The respondents revealed were registered members of green building council of Nigeria. The profile of respondents also shows that most of the respondents have 11 – 15 years' experience, representing 38.30% of the total population. This however, shows that the respondents are educated, qualified and experienced enough to provide reliable information needed for the study. It was also revealed that 80.88% work in Privately Owned organization, while 14.9% are engaged by Public Limited Liability companies. Furthermore, 4.26% of the respondent practice in Partnership firms. A study conducted in Nigeria by Ogunmakinde *et al.* (2022) revealed similar situation, whereby 66.3% of the respondents were engaged by privately owned organizations. It revealed that 42.6% of respondents adopt 41-60 percent of sustainable construction practice in their organization, while 25.5% of respondents adopt 21-40 percent of sustainable construction practice. Furthermore, 17% adopt above 61 percent of sustainable construction practice and 14.9% adopts 0-20 percent of sustainable construction practice.

Table 1: Respondents' Profile

PROFILE		FREQUENCY	PERCENTAGE (%)
Respondents' Profession in the Organization	Architect	10	21.28
	Builder	3	6.38
	Engineer	9	19.15
	Project Manager	4	8.51
	Quantity Surveyor	21	44.68
	Total	***47***	***100***
Respondents' Highest Level of Education	BTech/BSc	21	44.68
	MSc/MTech	19	40.43
	HND	4	8.51
	PhD	3	6.38
	Total	***47***	***100***
Respondents' Years of Experience	11-15 Years	18	38.30
	6-10 Years	14	29.79
	16-20 Years	8	17.02
	1-5 Years	5	10.64
	Above 20 Years	2	4.26
	Total	***47***	***100***
Respondents' Company Ownership Status	Privately Owned	38	80.85
	Public Limited Liability	7	14.89
	Partnership	2	4.26
	Total	***47***	***100***
Respondents' Organization Rate in the Adoption of Sustainable Construction practice	0-20%	7	14.89
	21-40%	12	25.53
	41-60%	20	42.55
	Above 61%	8	17.02
	Total	***47***	***100***

Economic Challenges Confronting Construction Industry Professionals in Implementing Sustainable Practices

The perception of respondents on the economic challenges confronting industry professionals in implementing sustainable practices are presented in Table 2.

Table 2 revealed seven (7) challenges confronting construction industry professionals in implementing sustainable practices with Relative Importance index (RII) ranging between 0.85 and 0.60. High initial cost, High investment risk and Ignorance of lifecycle cost benefits with RII value of 0.85, 0.82 and 0.81 respectively. On the average, all the identified Economic challenges confronting construction industry professionals in implementing sustainable practice are very severe (average RII = 0.72). Past studies also support the findings of this study by revealing that there are challenges confronting construction industry professionals in implementing sustainable practice are similar (Djokoto *et al.* 2014; Toriola-coker *et al.* 2021). Also, in line with the findings of this study, Dalirazar and Sabzi (2020) revealed that high initial costs, investment risks, long payback period and high cost of sustainable materials were assessed as the top ranked barriers to the development of sustainable buildings.

Table 2: Economic Challenges

Code	Economic Challenges	RII	RANK	DECISION
EC1	High initial cost	0.85	1st	Extremely Severe
EC2	High investment risk	0.82	2nd	Extremely Severe
EC3	Ignorance of lifecycle cost benefits	0.81	3rd	Extremely Severe
EC6	Clients' preference for the traditional materials	0.72	4th	Very Severe
EC5	Lack of alternative prevailing technology	0.64	5th	Very Severe
EC4	No input tariff for generation of renewable energy	0.60	6th	Severe
EC7	Reduction in maintenance costs	0.60	6th	Severe
	Average RII	***0.72***		***Very Severe***

Environmental Challenges Confronting Construction Industry Professionals in Implementing Sustainable Practices

The perception of respondents on the environmental challenges confronting industry professionals in implementing sustainable practice are presented in Table 3.

Table 3 revealed four (4) environmental challenges confronting industry professionals in implementing sustainable practices with RII value ranging between 0.83 and 0.48. Poor understanding of sustainable construction practice as the most severe challenge with RII value of 0.83. On the average, all the identified environmental challenges confronting construction industry professionals in implementing sustainable practices are very severe (average RII = 0.75). The findings from this study are in tandem with submissions from Daniel *et al*. (2018) which revealed that poor understanding of sustainable practice is considered as the most severe challenge faced by construction professionals. To address this challenge, professionals should prioritize education, training and knowledge sharing. However, government and industry leaders can promote sustainable construction practice by providing incentives, developing clear regulations and showcasing successful projects. The findings of this study are further supported by Ding et al. (2018), which emphasize the need for targeted education, training, and awareness campaigns to address the poor understanding of sustainable construction practices in developing countries. This finding also affirms the submission of Toriola-Coker *et al.* (2021) which stated that the current construction practice in Nigeria is inadequate in terms of education to sustain the growth of the industry. Hence, academic institutions will need to brace up for sustainability teaching in their curriculum in order to enhance students' consciousness and understanding before they graduate so that they can be vanguard of sustainable practice.

Table 3: Environmental Challenges

Code	Environmental Challenges	RII	RANK	DECISION
EVC9	Poor understanding of sustainable Construction Practice	0.83	1st	Extremely Severe
EVC11	Limited availability of sustainable materials and technologies	0.78	2nd	Very Severe
EVC8	Lack of knowledge to consider alternatives	0.71	3rd	Very Severe
EVC10	No method to verify sustainability compliance	0.69	4th	Very Severe
	Average RII	***0.75***		Very Severe

Social Challenges Confronting Construction Industry Professionals in Implementing Sustainable Practices

The perception of respondents on the social challenges confronting industry professionals in implementing sustainable practice are presented in Table 4.

Table 4 revealed twelve (12) challenges confronting construction industry professionals in implementing sustainable practices with Relative Importance index (RII) ranging between 0.86 and 0.58. Challenges such as Low priority on sustainability issues, Poor perception on sustainability issues and Lack of awareness among professionals hinders the widespread adoption of sustainable practice were ranked first (1st), second (2nd) and third (3rd) as the most severe social challenges confronting industry professionals in implementing sustainable practice with RII value of 0.86, 0.85 and 0.84 respectively. On the average, all the identified social challenges confronting construction industry professionals in implementing sustainable practice are very severe (average RII = 0.68). In line with the findings of this study, Toriola-coker *et al.* (2021) revealed that addressing low priority of sustainability issues, poor perception and poor government support is crucial for promoting sustainable construction practices in Nigeria.

Table 4: Social Challenges

Code	Social Challenges	RII	RANK	DECISION
SC17	Low priority on sustainability issues	0.86	1st	Extremely Severe
SC19	Poor perception of sustainable construction	0.85	2nd	Extremely Severe
SC22	Lack of awareness among professionals hinders the widespread adoption of sustainable practice	0.84	3rd	Extremely Severe
SC18	Poor sustainability education in institutions	0.80	4th	Very Severe
SC21	Poor government support and irrelevant laws and regulations	0.79	5th	Very Severe
SC23	Resistance to change in construction methods	0.75	6th	Very Severe
SC12	Lack of administrative policies ideology	0.74	7th	Very Severe
SC14	Poor skills among construction craftsmen	0.74	7th	Very Severe
SC15	Lack of commitment from professional bodies	0.72	9th	Very Severe
SC13	No role for initializing and leading sustainability	0.68	10th	Very Severe
SC16	Lack of resources to supervise building Requirement	0.60	11th	Severe
SC20	Lack of sustainability measurement codes	0.58	12th	Severe
	Average RII	***0.68***		Very Severe

Conclusion

This study examined the multifaceted challenges confronting professionals in the Nigerian construction industry regarding the implementation of sustainable construction practices, with a focus on Abuja. Findings revealed that while professionals demonstrate a moderate level of awareness and adoption, significant barriers persist across economic, environmental, and social dimensions. The economic challenges, particularly high initial costs, high investment risks, and the general ignorance of lifecycle cost benefits, were ranked as the most severe. Environmental challenges were dominated by a poor understanding of sustainable construction practices and limited access to sustainable materials and technologies. Social challenges were found to be the most extensive, with low prioritization of sustainability, poor perception, and lack of professional awareness ranking as top obstacles. The study further reinforced that the success of sustainable construction in Nigeria is heavily dependent on professionals' commitment, government support, and an enhanced understanding of sustainable principles across the project lifecycle. The study also underscores the need for an integrated and inclusive approach that engages all professionals such as architects, builders, engineers, project managers and quantity surveyors in addressing these challenges for the effective adoption of sustainable construction practices.

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