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Asymmetry in Professionals' Perceptions of Sustainable Construction

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ABSTRACT

Sustainable construction is the response of the construction industry to the environmental, social and economic challenges arising from construction activities. Although the negative impact of construction activities is a global problem, it has local effects that require the inputs of indigenous stakeholders for mitigation. Hence, the study assessed the perceptions of professionals about sustainable construction with a view to boosting understanding of how individual awareness and commitments influence the implementation of sustainable construction. The study adopted a quantitative research approach to obtain information from professionals working in different sectors of the construction industry in Lagos, Nigeria. Descriptive and inferential statistics were used to analyse data from the survey. Findings revealed statistically significant differences in the perceptions of professionals about sustainable construction. The findings have implications for: the design of sustainable construction policies, the business case for sustainable construction and the diffusion of sustainable construction.

Keywords: Built environment, Climate change, Drivers, Green construction, Sustainability

INTRODUCTION

The activities of the construction industry have been at the expense of environmental and social sustainability. Some of the environmental effects of conventional construction includes the generation of wastes that increases landfills (Ajayi et al. 2015), frequent fragmentation, soil sealing, and compaction, which is a threat to biodiversity (Tunji-Olayeni et al. 2019b), unsustainable use of natural resources such as freshwater and timber, and the overdependence of fossil fuel for energy which triggers climate change (Akan et al. 2017). Moreover, high occurrence of accidents and fatalities in the construction industry have created a bad image for the industry, which inhibits the social sustainability in the industry.

Sustainable construction is the response of the construction sector to the environmental, economic, and social challenges arising from construction activities. Sustainable construction is simply construction that is socially responsible, environmentally friendly and economically viable. It is a comprehensive process with an objective of sustaining harmony between man and

the environment while creating habitable settlements and providing economic equality (Yilmaz and Bakis, 2015).

Despite the benefits derivable from sustainable construction its adoption remains low. Several factors have been identified as affecting the low adoption of sustainable construction including poor awareness (Durdyev et al., 2018) lack of government support (Omopariola, Albert, and Windapo, 2019), high initial cost (Ahn, et al., 2013), lack of technical knowhow (Akinshipe, Oluleye, and Aigbavboa, 2018). 13]. However, differences in the perception of stakeholders about the determinants of sustainable construction may be a major unexplored hindrance to the adoption of sustainable construction.

The construction industry is one of the most segmented sectors of the economy. It comprises of several players and organisations at different stages of the construction process including clients, design team (architects, quantity surveyors, civil engineers and services engineers) contractors and manufacturers. The perception of these stakeholders about sustainable construction is vital for its adoption. Dutra et al. [11] found that many professionals in the construction industry have different ideas about sustainability hence it is difficult to implement environmental sustainability requirements during construction. The perception of construction stakeholders about sustainable construction enhances their ability to incorporate sustainability principles into the construction process.

This paper aims to assess the perception of stakeholders about the determinants of sustainable construction with a view of enhancing understanding of how asymmetry in perception of sustainable construction may inhibit its wide spread adoption.

SUSTAINABLE CONSTRUCTION AND ITS DETERMINANTS

Sustainable construction involves the efficient use of natural resources and the incorporation of ecological principles for a healthy built environment (Kibert, 1994). It ensures that construction processes and practices do not hamper economic social and environmental outcomes. Sustainable construction is based on the tenets of sustainable development, which are: social, environmental and economic sustainability.

The wide spread adoption of sustainable construction depends on certain drivers or determinants. Awareness of sustainable construction among stakeholders has been long identified as a major determinant of sustainable construction. The studies of (Oke et al. 2019; Serpell et al. 2013; Hakkinen and Beloni, 2011 and Abidin, 2010) all emphasize the place of awareness as a determinant of sustainable construction. Awareness sets the stage for the demand and eventual diffusion of sustainable practices in the construction industry.

The availability of sustainable construction rating tools as a determinant of sustainable construction has also been discussed in the literature (Windapo, 2014; Ahn et al. 2013; Aghimien et al., 2018). Sustainable construction rating tools provide an objective way of measuring the sustainability of the process and product of a construction project. The absence of a sustainable rating tool inhibits the adoption of sustainable construction.

Availability of green specifications also determines the adoption of sustainable construction. Green specifications are effective contractual tools used to achieve green construction (Lam et al., 2011). Green specifications are vital elements in sustainable construction and convey the sustainability requirements for a project.

The availability of green or sustainable building materials have also been found to be a determinant of sustainable construction (Ametepey, Aigbavboa & Ansah, 2015). However, in many developing countries the technology to upgrade local building materials which are more sustainable is not readily available. Hence, there is a huge dependence on foreign sustainable materials.

Reduction in the tariff of sustainable construction materials will also determine the wide spread adoption particularly in developing countries that import it. Market based incentives such as reduction of tariff can encourage the adoption of sustainable building materials in the construction industry (Tunji-Olayeni et al., 2020; Sherwood & Pollard, 2018).

Stakeholders' interest in sustainability also determines the diffusion of sustainable construction at a personal level. The literature (Murtagh, et al. 2016; Aktas and Ozorhon, 2015) provide evidence of stakeholder's interest in sustainability as a determinant of sustainable construction.

Firms' value for sustainability is also a determinant of for the adoption of sustainable construction at an organizational level (Windapo and Goulding, 2015; Mulligan et al. 2014). This provides an organisational drive towards the adoption of sustainability practices in the construction industry.

Government support is also a significant determinant of sustainable construction (Ariff et al. 2009, Qi et al. 2010 and Oke et al. 2019). The authors believe that support from government can be viewed as a moderating determinant that can affect the strength of all other determinants. Hence, it was not considered as a factor in this work.

In spite of the determinants of sustainable construction identified in literature, there remains a gap in evidence of differences in the perception of stakeholders regarding the determinants of sustainable construction. This asymmetry has negative impact on the diffusion of sustainable construction. Hence, this paper sets out to assess the asymmetry in the perception of professionals about sustainable construction.

RESEARCH METHODS

The study adopted a quantitative research design with the use of structured questionnaires. The questionnaires were used to elicit information from construction professionals working in different sectors of the construction industry in the City of Lagos, Nigeria. The study respondents were mainly Architects, Builders, Estate Surveyors, and Quantity Surveyors. The questionnaire was divided into two parts. The first part of the questionnaire contained questions on the background of the respondents while in the second part of the questionnaire respondents were required to indicate their agreement level on the determinants of sustainable construction. The questions in the second part of the questionnaire were based on a five-point Likert scale, of 1 - strongly disagree to 5 - strongly agree. The reliability of the survey instrument was

Table 1. Respondents profile.

Profile	Frequency	Percentage
<i>Professional Background</i>		
Architects	34	36.56%
Builders	22	23.66%
Quantity Surveyors	25	26.88%
Estate Surveyors	12	12.90%
Total	93	100.00%
<i>Industry Experience</i>		
Less than 5 years	17	18.27%
6-10 years	26	27.96%
11-15 years	36	38.71%
Above 15 years	14	15.06%
Total	93	100.00%
<i>Organisational Type</i>		
Contracting	43	46.23%
Consulting	24	25.80%
Building materials	9	9.68%
Government agencies	17	18.29%
Total	93	100.00%

determined using Cronbach Alpha. A reliability score of 0.75 was obtained which indicates a good reliability (Pallant, 2011).

One hundred and fifty questionnaires were distributed based on a non-random sampling technique while 93 questionnaires were returned and found suitable for analysis, representing a response rate of 62%.

RESULTS AND DISCUSSIONS

Respondents' Profile

The profile of the respondents is presented in Table 1. The professionals who participated in the study included 34 Architects, 22 Builders, 25 Quantity Surveyors, and 12 Estate Surveyors. For the industry work experience of the respondents, 18.27% had less than 5 years, 27.96% had between 6 and 10 years, 33.71% had between 11 and 15 years and 15.06% had more than 15 years industry experience. This suggests that the majority of the respondents had sufficient experience to provide reliable data for the study. With regards to organizational type, 46.23% were from contracting organisations, 25.80% worked in consulting organisations, 9.68% were from building material companies while 18.29% worked with government agencies.

Professionals' Perception on the Determinants of Sustainable Construction

The study assessed professionals' perception on the determinants of sustainable construction. From table 2, the three most significant determinants of sustainable construction as perceived by all the professionals were availability of sustainable materials, awareness and availability of rating tools for

Table 2. Professionals perception on the determinants of sustainable construction.

Determinants of sustainable construction	Overall		Architect		Builder		Quantity Surveyors		Estate Valuers	
	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank
Materials	4.15	1	3.58	4	4.50	1	4.02	3	3.41	4
Awareness	4.04	2	4.00	1	4.00	6	3.84	5	4.17	1
Rating tools	4.01	3	3.08	7	4.10	4	4.07	2	3.83	2
Green specifications	3.99	4	3.75	3	4.20	2	4.36	1	3.50	3
Reduced tariff	3.79	5	3.25	5	4.03	5	3.93	4	3.11	5
Personal interest	3.74	6	3.83	2	3.73	7	3.43	7	3.09	6
Firms' value for sustainability	3.69	7	3.25	5	4.13	3	3.64	6	2.92	7

sustainable construction with mean scores of 4.15, 4.04 and 4.01 respectively. Sustainable materials are vital components of sustainable construction. Sustainable materials can significantly reduce the amount of greenhouse gases generated from the manufacture of building components and embodied energy in building materials. The study of (Ametepey, Aigbavboa & Ansah, 2015) also identified the availability of sustainable building materials as a significant determinant of sustainable construction. Awareness was also perceived by the respondents as a significant determinant of sustainable construction. This corroborates with extant studies including (Oke et al. 2019; Serpell et al. 2013; Hakkinen and Beloni, 2011 and Abidin, 2010). The availability of rating tools for sustainable construction was also perceived as a significant determinant of sustainable construction resonating with similar past studies such as (Windapo, 2014; Ahn et al. 2013; Aghimien et al., 2018). To accelerate the sustainability of the construction industry the availability of rating tools can enhance the understanding of stakeholders on the most objective way to assess the sustainability of the construction process. Professionals need to understand what it takes for a project to be sustainable. Hence, there is a need for sustainable construction rating tools especially such as reflect local realities.

In terms of Architects' perception on the determinants of sustainable construction, the three most significant determinants awareness, personal interest and green specification with mean values of 4.00, 3.83 and 3.75 respectively (Table 2). Architects perceive that awareness is a significant determinant of sustainable construction. Awareness of the knowhow and potential benefits of sustainable construction can increase its demand. Architects also identified personal interest in sustainability as a vital determinant of sustainable construction. By virtue of the Architect's early interaction and involvement with clients they may be able to influence clients interest in sustainability thereby increasing its wide spread adoption. The availability of green specifications was also identified by the architects as a crucial determinant of sustainable construction. Once the knowledge of green specifications become common to Architects it may be easier to incorporate sustainability features in the design and specification of construction projects.

According to the Builders, the three main determinants of sustainable construction were availability of sustainable construction materials, green

Table 3. ANOVA for professionals' perception on the determinants of sustainable construction.

Determinants of sustainable construction	F	Sig.
Materials	1.93	0.079
Rating tools	4.02	0.001
Awareness	0.35	0.909
Firms' value for sustainability	4.95	0.000
Reduced tariff	2.19	0.046
Green specifications	2.79	0.013
Personal interest	4.36	0.000

specification and firms' value for sustainability with mean scores of 4.50, 4.20 and 4.13 respectively (Table 2). Materials and specifications are components of construction projects that builders interphase with regularly on site. Hence, builders perceive the availability of sustainable materials and green specifications as significant determinants of sustainable construction.

Quantity Surveyors identified the availability of green specification, availability of rating tools for sustainable construction and availability of building materials as the most significant determinants of sustainable construction with mean scores of 4.36, 4.07 and 4.02 respectively (Table 2). Quantity surveyors as cost experts are inclined to factors that can significantly influence cost. Specification of construction resources influences overall cost of construction. Hence, the availability of green specification is perceived by quantity surveyors as a significant determinant of sustainable construction.

In the case of Estate Managers and Valuers awareness, availability of rating tools for sustainable construction and the availability of green specification were the most important determinants of sustainable construction with mean values of 4.17, 3.83 and 3.50 respectively (Table 2). As stakeholders that have closet interaction with end users, estate managers and valuers perceive that awareness especially of end users may be very vital in determining the demand and eventual adoption of sustainable construction. Also availability of rating tools can enhance their understanding of the sustainability of buildings in convincing clients who are knowledgeable about sustainable construction.

ANOVA for Professionals' Perception on the Determinants of Sustainable Construction

Furthermore, the study examined statistical differences in professionals' perception on the determinants of sustainable construction. Table 3 showed statistically significant differences in professionals' perception of the availability of rating tools, firms' value for sustainability, reduced tariff, green specifications, and personal interest at $p = 0.001, 0.000, 0.046, 0.013, 0.000 < 0.05$ respectively.

CONCLUSION

This paper assessed professionals' perceptions about the determinants of sustainable construction to gain understanding of how individual awareness and commitments affect the implementation of sustainable construction.

The asymmetry of professionals regarding the determinants of sustainable construction has several implications. Firstly, it affects the design and implementation of sustainable construction policies. Lack of relevant laws and policies has been identified as barriers to sustainable construction, particularly in developing countries. However, perceptual differences among construction professionals regarding the determinants of sustainable construction can further hinder the design of relevant policies that eventually inhibit its implementation.

Secondly, differences in professionals' perception on the availability of rating tools as a significant determinant of sustainable construction means that the industry may continue to struggle with the requirements and interpretation of sustainable construction thereby slowing down efforts in attaining the SDGs.

Thirdly, asymmetry in firms' value for sustainability inhibits the normative and mimetic forces that may emanate from firms' to drive sustainability in the construction industry.

Additionally, differences in perception on the reduction of tariff may discourage investments in sustainable materials thereby affecting the business case for sustainable construction.

Finally, this study justifies the need for social learning about the environmental, social and economic benefits of sustainable construction towards its adoption, particularly in developing countries.

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