DETERMINING THE EFFECTS OF ADOPTING GREEN CONSTRUCTION SITE PRACTICES ON PROJECT PERFORMANCE IN NIGERIA

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by

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LIST OF SYMBOLS

β   Path coefficient

f^2 Effect size

Ň   Minimum sample size

R^2 Coefficient of determination

Q^2 Predictive relevance

LIST OF ABBREVIATIONS

APM	Airborne Particulate Matter
BMP	Best Management Practices
BPP	Bureau of Public Procurement
CONT	Contingency Theory
EIA	Environmental Impact Assessment
FEPA	Federal Environmental Protection Agency
FME	Federal Ministry of Environment
GBCN	Green building council of Nigeria
GBCSA	Green Building Council of South Africa
GCSP	Green Construction Site Practices
INT	Institutional Theory
LASEPA	Lagos State Environmental Protection Agency
LID	Low Impact Development
NESREA	National Environmental Standards and Regulations Enforcement Agency
NPE	National Policy on the Environment
PLS	Partial Least Squares
RBV	Resource Based View
RWH	Rainwater Harvesting
SEM	Structural Equation Modelling
SSWM	Sustainable Stormwater Management
VIF	Variance Inflation Factor
WGBC	World Green Building Council

MENGENALPASTI KESAN PELAKSANAAN AMALAN TAPAK PEMBINAAN HIJAU KE ATAS PRESTASI PROJEK DI NIGERIA

ABSTRAK

Kesan negatif amalan pembinaan tradisional ke atas alam sekitar telah mengakibatkan peningkatan sokongan terhadap amalan tapak pembinaan hijau untuk diguna pakai di negara-negara sedang membangun. Di sebalik sokongan terhadap pelaksanaan amalan tapak pembinaan hijau, kadar pelaksanaannya masih rendah dan perkara ini disebabkan oleh ketidakpastian prestasi projek, dan kurangnya perhatian yang diberikan kepada kerumitan projek. Kajian ini bertujuan untuk mengenalpasti kesan pelaksanaan amalan tapak pembinaan hijau ke atas prestasi projek dengan menimbangkan kerumitan projek. Pendekatan penyelidikan deduktif telah diambil menggunakan reka bentuk penyelidikan korelasional, dan kaedah tinjauan digunakan untuk pengumpulan data. Soal selidik tersebut ditadbir sendiri. Kajian menggunakan teknik pensampelan bukan kebarangkalian untuk mengumpul data dari populasi sebanyak 227 projek dan 168 maklumbalas yang boleh digunakan diperolehi dengan kadar maklumbalas sebanyak 78%. Data yang dikumpulkan dianalisis menggunakan statistik deskriptif (skor purata) dan pemodelan persamaan struktur sekurang-kurangnya kuadrat. Semua amalan tapak pembinaan hijau mempunyai kadar pelaksanaan yang tinggi. Adalah didapati bahawa semua amalan pembinaan hijau yang dikaji mempunyai kesan yang signifikan terhadap prestasi projek bagi projek pembinaan kecuali perancangan dan pembangunan susun atur tapak. Penemuan ini juga menunjukkan bahawa kerumitan projek menyederhanakan 2 daripada 6 hubungan penyederhanaan yang dihipotesis secara melemahkan hubungan tersebut. Kesan penyerhadaan yang paling tinggi adalah kesan kerumitan projek ke atas hubungan

antara pengurusan air hujan dan prestasi projek. Kajian ini akan membantu para kontraktor di Nigeria untuk merancang dan meramalkan projek mereka dengan lebih baik untuk mewujudkan kesesuaian yang lebih baik antara keupayaan organisasi, kerumitan projek dan amalan -amalan yang akan digunakan di tapak. Penemuan kajian ini akan membantu kerajaan Nigeria dan agensinya dalam mengetahui tahap masa kini pelaksanaan amalan hijau dan membolehkan mereka merumuskan dasar yang sesuai yang akan menggalakkan pelaksaan amalan tapak pembinaan hijau.

DETERMINING THE EFFECTS OF ADOPTING GREEN CONSTRUCTION SITE PRACTICES ON PROJECT PERFORMANCE IN NIGERIA

ABSTRACT

The negative effects of traditional construction practices on the environment has resulted in increased advocacy for green construction site practices to be adopted in developing countries. Despite the advocacy for the adoption of green construction site practices, the rate of adoption is still low and this has been attributed to uncertainties regarding project performance, and lack of attention given to project complexity. This study is aimed at determining the effects of adopting green construction site practices on project performance taking into consideration project complexity. The deductive research approach was adopted using correlational research design, and the survey method was used for data collection. The questionnaires were self-administered. Non-probability sampling technique was used in this study for a population of 227 projects and 168 usable responses were collected with a response rate of 78%. The collected data were analysed using descriptive statistics (mean score) and the partial least squares-structural equation modelling. All the green construction site practices had high rates of adoption. It was observed that all the green construction practices studied had significant effects on project performance of construction projects except for site layout planning and development. The findings also indicate that project complexity moderates 2 out of the 6 hypothesized moderating relationships but weakens the relationship. The highest moderating effect is the effect of project complexity on the relationship between stormwater management and project performance. The study will assist contractors in Nigeria to better plan and forecast their projects to create better congruence between organisational capabilities, project

complexity and practices to be adopted on site. The findings of this study will assist the Nigerian government and its agencies in knowing the current extent of adoption of green practices and enable them to formulate appropriate policies that will encourage adoption of green construction site practices.

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter presents and discusses the background of the study, the statement of research problem, research objectives, and research questions that this research aims to answer. The scope of the study and its significance are also contained in this chapter. As an area of great interest and importance, adoption of green construction site practices can contribute enormously to the overall value of the built environment, the economy of the society and most importantly, the quality of life of the various construction stakeholders. This research investigates the extent of adoption of green construction site practices in Nigeria. Also, the study examines the effects of adoption of green construction site practices on project performance. The moderating effects of project complexity on the relationship between the adoption of green construction site practices and project performance was also investigated. The definition of key terms and organization of the thesis concludes the chapter.

1.2 Background to the Study

Green construction has now assumed the focal point of sustainable development by construction organisations to curb cost, preserve the environment, improve quality of life of project stakeholders and complete construction projects in time on the construction site. The practice provides a balance of long-term economic, ecological and social wellbeing (Ajmal, Khan, Hussain, & Helo, 2018). It is an avenue for creating environmentally efficient buildings by means of adopting effective and efficient approaches of construction to ensure that the negative effects of construction activities on the environment and humans within the vicinity of the projects is reduced

(Yusof, Awang, & Iranmanesh, 2017). Green construction practices entails the construction of buildings and infrastructure using best practices, environmentally sustainable, and resource-efficient measures from the sourcing of construction materials to the eventual completion of construction works (Hand, Zuo, Xia, Jin, & Wu, 2015; Ojo, Mbowa, & Akinlabi, 2014).

The adoption of green construction site practices does not only impact positively on the health of the society and the environment, it also decreases operational costs, improves organizational marketability, increases productivity, and helps in creating a sustainable community (Guy, 2017). Generally, green construction practices are practices that are energy efficient, water conserving, and uses high-recycled and non-toxic content materials. Green construction initiatives is a concern that has received bigger attention from government agencies, private organizations and the public at large for almost a decade now (Suhaida, Tan, & Leong, 2013).

In Nigeria, construction is without doubt a very vital sector of the economy, not mainly because of its 3.72% contribution to the nation's Gross Domestic Product (GDP), but because of its contribution towards reducing high unemployment rate (National Bureau of Statistics, 2014). This is achieved through its provision of jobs for both skilled and unskilled labour, and its enormous multiplier effect on other economic activities (National Bureau of Statistics, 2014). Adewuyi, Idoro, and Ikpo (2014) reported that the contribution of the construction industry to the GDP of Nigeria has constantly been on the rise as it rose from 5% in 2001 to 13% in 2007.

Construction and its associated activities in Nigeria are on the rise. The increase in construction activities has been attributed to the need to carter for societal and demographic changes resulting from rural urban migration and increasing urbanization (Ogunde, Olaolu, Afolabi, Owolabi, & Ojelabi, 2017). The world bank

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as reported by Atanda and Olukoya (2019) estimates that 49% of the about 200million population of Nigeria live in urban areas and it is predicted that by 2030, the number will increase to about 66%. Ogunde et al. (2017) states that with increasing urban population in Nigeria, there is a greater need for more infrastructure. With the increasing need for housing and other infrastructure due to population growth particularly in urban areas, governments at both state and federal level in Nigeria have engaged in massive construction projects in major towns and cities in Nigeria and have provided incentives for private sector participation in construction through various public private partnership (PPP) arrangements and concessions (Okoye, 2016).

Also, as a means of taking the Nigerian economy out of recession, the federal government of Nigeria introduced the economic recovery and growth plan in 2017. This plan which is currently been implemented has at is core the increase in investment in the construction sector through strong Public Private Partnerships and also massive private investments in the real estate sector (Awunor, 2017). Prominent among the hub for construction in Nigeria are the major cities like Lagos, Kano, Port Harcourt, Anambra and the federal capital city, Abuja among others. As a result of the large size of construction activities in Nigeria, it requires enormous use of material resources, energy, and water, and also it is a formidable polluter of the environment (Ding, Quercia, Li, & Ratcliffe, 2011). Figure 1.1 presents the map of Nigeria showing the states in the six geopolitical zones of the country whose capitals are hubs for construction activities.
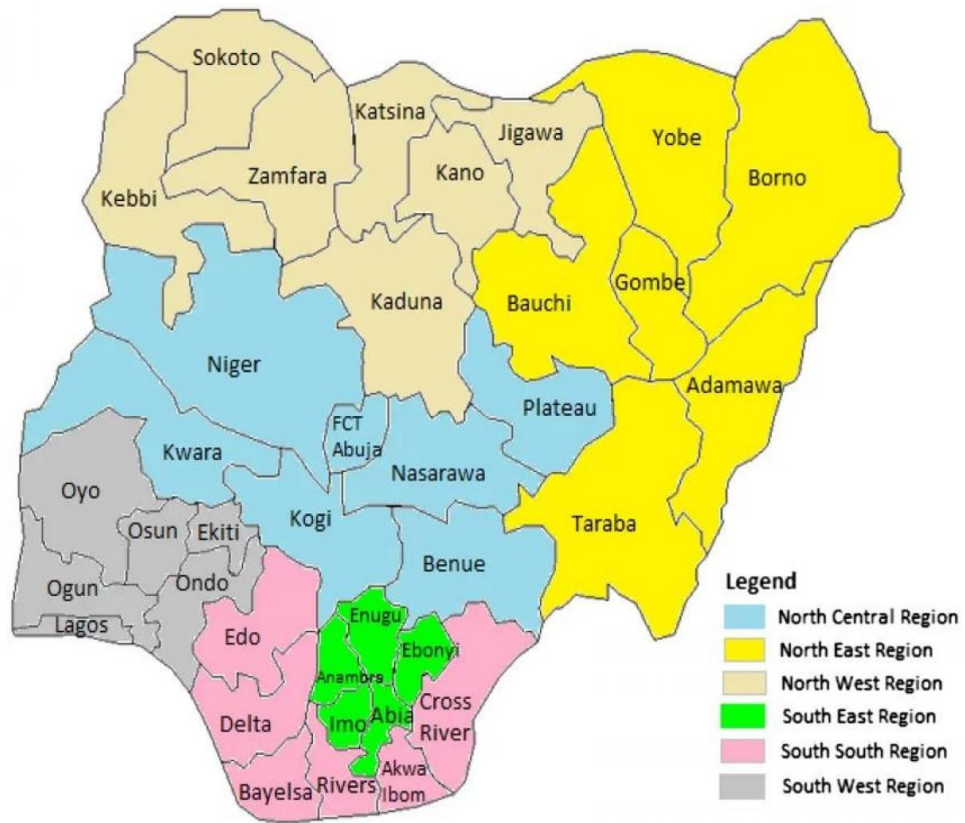
Figure 1.1 Map of Nigeria

Nigeria as a country has had some environmental challenges as a result of the aforementioned construction activities. Reports reveal that the entire scenario of environmental sustainability is true about Nigeria and Nigeria is now facing the challenge of enforcing compliance with globally accepted guidelines relating to adoption of green construction practices. In Nigeria, approximately 67.5% and 21% of the ecosystem and natural resources respectively are affected by construction activities (Olanipekun, Chan, Xia, & Adedokun, 2018). Consequently, the evolution and adoption of an environmentally conscious approach, standard guideline to building design, planning and construction techniques to bring about sustainability in the built environment is needed.

Several studies conducted before now shows that the construction sector is responsible for negative effects namely; high energy consumption, solid waste generation, global greenhouse emission, external and internal pollution, environmental damage and resource depletion (Chau, Tse, & Chung, 2010; Sandanayake, Lokuge, Zhang, Setunge, & Thushar, 2018). The compelling reason to secure nature's turf through green practices is progressively getting to be a topic of discussion the world over due to the extent of its resource consumption (Vilanova & Dettoni, 2011). In this regard, intense pressure is been mounted on professionals (builders, architects, engineers etc.) to adopt green construction practices in all aspects and phases of construction (Akadiri, Chinyio, & Olomolaiye, 2012).

Green construction practices involves the use of sustainable construction materials and methods, the conservation of natural resources, and the efficient use of resources aimed at minimising the negative effect construction activities has on the environment (Manso, Castro-Gomes, Paulo, Bentes, & Teixeira, 2018; Perkins & Bennett, 2018). Examples of green construction site practices include energy efficiency, waste management, material management, stormwater management, noise control, dust control and involvement in a host of other environmental efforts that occur during construction work or on construction sites (Lu, Ye, Flanagan, & Jewell, 2013).

However, the adoption of these green practices on construction projects have been accompanied with high performance expectations (Vilanova & Dettoni, 2011). Projects that adopt green construction site practices are expected to meet certain pre-planned performance thresholds in the aspect of health and safety, economic performance, environmental performance in addition to other project performance thresholds (Perkins & Bennett, 2018).

Next, is the research' problem statement.

1.3   Research Problem Statement

In Nigeria, the amount of construction waste generated between 2013 and 2018 is well over 6 million tonnes (Afolabi, Tunji-Olayeni, Ojelabi, & Omuh, 2018). Also several studies have identified that flooding which is described by Fubara (2014) as "the most potent environmental disaster confronting humans and the environment in the twenty-first century", is a major environmental issue in many Nigerian towns and city centres, and it has been attributed to construction activities (Chukwuma & Uchenna, 2018). The absence of drainage systems or inadequate drainage, construction activities on waterways (Odemerho, 2015), uncontrolled dredging, inappropriate construction waste management (Egbinola, Olaniran, & Amanambu, 2017; Jha, Bloch, & Lamond, 2012) are all said to be responsible for the perenial flooding in Nigeria. This has resulted in the death of 363 people and displacement of 2,157,419 people in 2012 (Egbinola et al., 2017).

The quest for a more prosperous economy, in addition to an ever-growing population has led to a rise in the demand for housing and other infrastructure which has worsened the issues of environmental pollution, soil erosion, climate change, and resource depletion (Xiao, Dong, Geng, & Brander, 2018). 45% of carbon dioxide emitted globally has been attributed to construction activities (O'Neill & Gibbs, 2018). According to Liu and Lin (2016) construction works and other construction related activities are among the top users of natural resources, high emitters of greenhouse gasses and are responsible for other types of pollution. These points have also been alluded to by Allu and Ebohon (2015) as they opined that the Nigerian construction industry is partly responsible for climate change because it is one of the main sources

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of carbon dioxide emission. Also, reports from a preliminary interview conducted on 9 contractors selected randomly points to the existing environmental problems resulting from conventional construction site practices in Nigeria.

As a result of these environmental challenges caused by construction activities, the Nigerian government has come up with various initiatives/interventions in the form of regulations, policies or incentives to assist in ensuring compliance with environmental best practices. Some of the environmental regulations and agencies set up to ensure compliance with environmental standards include, Federal Environmental Protection Agency (FEPA), the Environmental Impact Assessment Act enacted in 1992, the National Policy on Environment formulated in 1989, National Environmental Standards and Regulations Enforcement Agency Establishment act 2007, guidelines and standards for environmental pollution control in Nigeria produced by FEPA in 2008 and the National Building Energy Efficiency Code of 2017. These measures put in place by the government are still ineffective in tackling the myriad of environmental challenges caused by construction activities in Nigeria (Ojo et al., 2014).

The poor project performance and particularly poor environmental performance of construction projects in Nigeria has been attributed to the unknown status of green construction site practices adoption in Nigeria (Aghimien, Aigbavboa, & Thwala, 2019) as against the lack of relevant laws. Aghimien et al. (2019) therefore, states that it is very difficult in most cases for contractors as well as clients to move from the known (traditional practices) to the unknown (green construction site practices). The unknown status as well as lack of evaluation of adherence to environmental laws by the government thereby leads to project performance that is

below acceptable levels. A client will most likely stick to what he already knows instead of taking chances with practices whose outcome is largely unknown.

However, there is a dearth of studies to ascertain the extent of adoption of green construction site practices by contractors and construction companies (Balasubramanian & Shukla, 2017). Chan, Darko, Olanipekun, and Ameyaw (2018) analysed the hindrances in green construction technology adoption in developing countries and highlighted the gaps related to determining the level of adoption of green construction practices. Similarly, Abisuga and Okuntade (2020), Aghimien et al. (2019) and Zuofa and Ochieng (2016) also confirmed the lack of studies/information and data on the extent of adoption of green construction site practices on construction projects in Nigeria. These studies show that there is little, or no research done with regards to the rate of adoption of green construction site practices in Nigeria. This raises the first question of the research – What is the level to which green site practices are been adopted in Nigeria?

Additionally, it is universally accepted that green construction site practices meet environmental protection needs and utilizes human and material resources more efficiently (Ofek, Akron, & Portnov, 2018). Nevertheless, many studies have had differing views on the performance of construction projects that adopted green construction site practices (Darko, Chan, et al., 2017). Some of these studies report high project performance (Chang et al. (2018) and Robinson, Anumba, Carrillo, and Al-Ghassani (2006)) while other studies reported low project performance outcomes (Zhang, Wu, Feng, and Xu (2015) and Hwang, Zhu, Wang, and Cheong (2017)).

These inconsistencies has been attributed to the fact that other project characteristics like "project complexity" which is peculiar to each project were not considered in determining the project performance (Franz & Messner, 2019; Onubi,

Yusof, & Hassan, 2019b). Also, Zhu, Sarkis, and Geng (2005) posits that the variation reported in studies regarding the performance of construction projects that executed green construction practices is likely due to the heterogeneity in the types of green construction site practices considered. The type of green practice adopted could be different depending on the country under consideration and the emphasis placed on them in the country's environmental laws. This study is required in order to enlighten contractors on the relationship between the different green construction practices and project performance, with a view to helping them make decisions based on project idiosyncrasies, green site practices adopted and operating environment. This raise the second question of the research – What is the relationship between adoption of green construction site practices and construction project performance?

The level of performance of a construction project is a measure of the present status of the project and not the status of an organization (Cha & Kim, 2018). There is a consensus that every construction project has unique characteristics that makes them different from other projects (e.g., location of the project, method of project delivery, level of expertise required, and project objectives) (Kivilä, Martinsuo, & Vuorinen, 2017). The conflicting results with regard to project performance of green constructed projects as mentioned earlier have been attributed to different levels of complexity in construction projects that may moderate the relationship and the adoption of the same approach by contractors in managing these projects (He, Luo, Hu, & Chan, 2015). Also, the level of understanding of project complexity, and its impact on the performance of construction projects is very limited among contractors and other project stakeholders (Dao, Kermanshachi, Shane, Anderson, & Hare, 2016). This makes it necessary to measure project performance in this study by taking into account project complexity.

Project complexity refers to the multi-dimensional nature of projects that is characterised by uncertainties, risks and difficulties in understanding, planning, managing, operating, monitoring and controlling of projects (Hartono, Wijaya, & Arini, 2019;Nguyen, Le-Hoai, Tran, Dang, & Nguyen, 2019). Even though there are anecdotal proofs of the existence of the relationship between project complexity and project performance, much has not been done to either validate or invalidate this in green construction adoption studies (Golini, Landoni, & Kalchschmidt, 2018). This position was also supported by Geraldi, Maylor, and Williams (2011) who opined that there is a lack of theoretical base and empirical validation with regards to the perceived link between various aspects of complexity and project performance outcomes. This raise the third question of the research – To what extent does project complexity moderate the relationship between green construction site practices and project performance?

Three gaps have been identified from the review of past studies. First, there exists two gaps in existing studies on the extent of adoption of green construction site practices and secondly, the effect of adoption of each green practice on construction project performance. Previous studies have considered the moderating role construction project characteristics such as size of project, project type, and client type play in examining the relationship between green construction site practices and construction project performance. Limited studies have focussed on the moderating effects of 'project complexity' (Franz and Messner (2019) and Onubi et al. (2019b)). The few studies that have considered 'project complexity' have not been able to provide conclusive evidence whether project complexity strengthened or weakened the relationships.

This study aims to fill the identified gaps. The ultimate aim of this study is determining the effects of adopting green construction site practices on project performance in Nigeria taking into account project complexity. Next, the research questions and objectives are presented.

1.4   Research Questions

This study intends finding answers to the following pertinent questions;

i.   What is the level of adoption of green construction site practices among contractors in Nigeria?

ii.   What is the relationship between adoption of green construction site practices and construction project performance?

iii.   What is the moderating effect of construction project complexity on the relationship between green construction site practices and project performance?

1.5   Research Objectives

The ultimate aim of this study is determining the effects of adopting green construction site practices on project performance in Nigeria taking into account project complexity. To achieve the aim of this research, the following objectives were formulated;

i.   To determine the extent of green construction site practices adoption by the contractors in Nigeria.

ii.   To determine the relationship between adoption of green construction site practices and construction project performance in Nigeria.

iii. To determine the moderating effect of construction project complexity on the relationship between green construction site practices and project performance in Nigeria.

1.6   Scope of the Research

This research covers "Class A" contractors in Nigeria. Class A contractors are contractors permitted by the Bureau of Public Procurement (BPP) in Nigeria to undertake construction works with a monetary value exceeding 10 billion naira (USD 27,777,777). The reason for the choice of "Class A" rather than the entire contractors is due to the fact that they are most likely to have verifiable addresses unlike lower level contractors, they are usually involved in big and complex projects: as such their construction activities may pose negative impact on the environment, they are active and are aware of green construction practices unlike most lower level contractors who are mostly unaware of green practices and get contracts via subcontracting. Also, "Class A" contractors have more experienced and educationally qualified staff (based on BPP registration requirement) to respond to the questions asked. Furthermore, the views and findings to be sort in this study will be a project-based response to the questions posed by the research as against an organisational response.

The projects covered in this study include both building and civil construction projects. These projects are spread across the six (6) geopolitical zones of Nigeria. In the south western part of Nigeria, 23 projects were considered, while South-south, south east, north central, north west, and north east had 35, 21, 38, 22 and 29 projects respectively.

1.7   Significance of the Study

The findings of this study will be useful to Nigerian contractors. The study shows the various effects of the dominant green construction site practices in Nigeria on project performance. The findings provide contractors with an opportunity for good decision-making based on the uniqueness of individual projects which will invariably translate to better project performance. The introduction of complexity as a moderator in this study helps contractors understand the various levels of complexity in their projects, and the effects of project complexity on the relationship between each green practice and project performance. As such, it equips them with the needed information on how they can effectively manage these projects according to their (project's) respective degrees of complexity without jeopardising the anticipated project performance levels.

This study will be of great value to the government, contractors, and clients in Nigeria as the drive the world over tilts towards carrying out construction site processes in a more environmentally sustainable manner. By identifying the moderating effects of project complexity on green construction site practices and project performance relationship, it points out the role clients should play to facilitate a seamless adoption process and project performance.

The result of this study will be valuable to the government and other regulatory bodies. The government by being aware of the level of adoption of green practices on construction sites will be able to introduce incentives and other policy measures to encourage compliance and boost adoption. If the level of adoption is not known, it will be virtually impossible to appraise compliance. It will also aid in strengthening existing regulations if lapses are found or enact new laws governing other environmental practices not covered in the existing regulations through the feedback

from this study. To enhance the evolution of green construction site practices in the Nigerian construction industry, it is necessary to detect the green site practices that are seen as the most and least adopted by construction firms, as this will facilitate the allocation of scarce resources to the least adopted yet significant green practice as recommended by Chang et al. (2017).

1.8   Operational Definitions

The definition of the terms used in the study were adapted and are presented below.

Green: "Green" used in this study refers to "environmentally-friendly" and is used interchangeably with "sustainable", "energy efficient" and "low carbon".

Green Construction: Green construction is a term used to refer to the outcome of construction activities that are able to meet required environmental standards with regards to subjects which include sustainable land planning, usage of low embedded-energy materials, saving water and energy, providing healthy and comfortable medium, and control of construction wastes.

Site Practices: Site practices refers to a series of procedures, tasks and processes carried out in the location were a construction project is situated.

Adoption of Green Construction Site Practices: Refers to the acceptance and utilization (implementation) of green practices on construction sites.

Project Performance: Project performance is conceptualised as a measure of a construction project's characteristics of been constructed with less impact on the natural environment, meeting the pre-construction schedule, constructed within budget, posing less harm (health and safety) to the construction workers and persons

Project Complexity: Project complexity is conceptualized in this study as a measure of the degree of difficulty, sophistication and task interdependencies inherent in a construction project.

1.9   Organization of the Thesis

This thesis has six chapters and it is organised as follows;

1.9.1   Chapter One

The first chapter (Chapter one) starts by providing a background to the study on green construction site practices, physical development of Nigeria, and the role green construction plays in sustainable development. It is followed by the statement of research problem in which the gaps observed from previous researches in the field of green construction are presented. The identified gaps are then used to generate the research questions. Research objectives are formulated from these questions. Lastly in this chapter, the scope of the research and significance of research are then presented.

1.9.2   Chapter Two

The second chapter of this research focusses on a review of relevant literatures. It starts with the theoretical base of the study. Also contained in this chapter is an introduction to the concept of sustainable development with reference to green construction. Afterwards, some significant contributions from previous studies related to the area of green construction site practices, their adoption, the various government interventions in green construction and the effects of green construction site practices

on construction project performance in terms of cost, quality, time, environmental performance, stakeholders' satisfaction, health and safety performance among others. Also, this chapter discusses project characteristics with emphasis on project complexity and how it moderates the relationship between green construction site practices and project performance. At the end, the various variables of green construction site practices, and project performance are tabulated and later used as measurement items in the research methodology and questionnaire. The study hypothesises and theoretical framework are also developed in this chapter.

1.9.3   Chapter Three

The third chapter of this research discusses the methodology adopted in the research. It starts with the epistemology of the research, followed by research philosophy and paradigm. The entire research process, including the data collection technique, biases and ethics consideration, statistical data analysis, and hypothesises testing are discussed in this chapter.

1.9.4   Chapter Four

This chapter presents the results of the study. The results gotten from the data analysis are presented and brief discussions provided to answer the research questions. The chapter begins by presenting results on general information about the contractors, respondents and the projects. The second section of this chapter assesses the consistency and validity of the measurement model. Lastly, the results of the assessment of the structural model and hypothesis testing are presented.

1.9.5   Chapter Five

The fifth chapter (Chapter five) discusses elaborately results obtained from the analysis of the data. This chapter consists of two important parts. The first part provides a summary of the results presented in the previous chapter (chapter 4). The second part elaborates/discusses, compares the results with results of previous similar studies and makes inferences.

1.9.6   Chapter Six

This is the last chapter of the study and contains information regarding the research' contribution. First, a recap of previous discussion is presented, followed by a summary of the major findings of the study to support the research objectives. The implications of the study findings are also presented. Contributions of the study to the body of existing theoretical and practical knowledge in the relevant field are highlighted. Lastly, the limitations of the research and recommendations for future research are highlighted.

CHAPTER 2

LITERATURE REVIEW

2.1   Introduction

This chapter focusses on the literature review. It starts with discussions on the theoretical base of the study. The concept of green construction, government intervention in green construction, and green construction practice in Nigeria are discussed in this chapter. Afterwards, some important contributions from literature relevant to the topic of green construction site practices, the various green construction site practices found in literature and green rating tools, project performance indicators, effects of green construction site practices on project performance, and effects of project complexity on the relationship between green construction site practices are reviewed. In the concluding part of this chapter, the study hypotheses are developed as well as a theoretical framework.

2.2   Theoretical Base of the Study

Several researches on green construction site practices, project characteristics (project complexity) and construction project performance will be reviewed later in this research. Theories are however needed for proper understanding of the interactions between the aforementioned variables of green construction site practices, project complexity and project performance. The use of theories in this research is further backed by the assertion of Bernath and Vidal (2007) that theories are very important as they define, establish and explain relationships/interactions between different constructs.

Geng, Mansouri, and Aktas (2017) provided a summary of the various theoretical leanings from reviewed literature with regards to the study of green

practices and project performance. Although majority of researches conducted in this field did not make use of any theory, their findings show institutional theory (14%), contingency theory (12%), and resource-based view (12%) were found to be the most commonly used theories in the papers they reviewed. Majority of the studies used institutional theory (INT) as the theoretical base for investigating the adoption of green construction site practices (GCSP). Institutional theory was used to identify regulations, government incentives and other external drivers. On the other hand, contingency theory (CONT) is another frequently referenced theoretical base for explaining green construction site practices – project performance relationship by several researchers. The contingency theory defines companies as an open system where their performances are affected by the environment. Also, Van de Ven, Ganco, and Hinings (2013) opined that any assertion and interaction between variables that contains a moderating variable is best described using a contingency theory.

In another vein, Shenhar (2001) acknowledged the very crucial role contingency theory plays in the broad field of project management and specifically construction management field. Carvalho, Patah, and de Souza Bido (2015) and Shenhar et al. (2005) highlighted some moderating and control variables commonly used in contingency studies and mentioned project complexity as one among others like country, and company size. The resource based view was also used in studies whose focus was on the economic performance of organisations based on their unique characteristics and individual capabilities (Nason & Wiklund, 2018). It views the synergy of an organisation's unique resources and proficiencies as a means of gaining competitive advantage over other competitors.

These three theories (contingency theory, resource-based view and institutional theory) and the decision to adopt any of them are explained in the next section.

2.2.1 Institutional Theory

Institutional theory came about mainly from the ideas of John W. Meyer and his colleagues in 1977, who were ''reacting to the enduring individualism of American sociology'' (Jepperson, 2002, p. 3). Institutional theory (INT) explains the ways in which external pressures influence organizational behaviours (Xu, Boh, Luo, & Zheng, 2018). Institutional theory consists of three types of isomorphic drivers namely coercive, normative, and mimetic. Government intervention in the form of coercive pressure through the instrumentality of laws and government regulations were demonstrated to enhance green construction practices (Sarkis, Zhu, & Lai, 2011). The institutional theory was utilized by Jennings and Zandbergen (1995) in explaining firms' adoption/integration of green construction practices. There are three ways through which the institutional environment is taken through to construction organisations (Scott, 2005). The three ways are:

i. Coercive isomorphism: Coercive isomorphism emanates from the pressures put on firms by other dependent firms or from government agencies. Such forces may overwhelm the construction firms and come out as pure pressure, mere advocacy, or as an offering. Coercive pressure comes as a result of regulations put in place by various government bodies set up to ensure that less harm is done on the environment by construction activities (Prajogo, Tang, & Lai, 2012). For contractors and their firms to be seen as been law abiding by the government, they tend to comply with laid down rules and regulations concerning the environment as spelt out by the government (Chen, Yi, Zhang, & Li, 2018).

ii. Normative isomorphism: Normative isomorphism encompasses what structure is seen as suitable and what activity is deemed appropriate. They are set by

different agencies. Normative pressure has its origin from construction clients, media, users and also non-governmental entities (Krell, Matook, & Rohde, 2016). Normative pressure is an aggregation of norms and values, and it is basically intended to meet some social expectations which in this study is related to sustainable environmental behaviour (Zhang, Wang, & Lai, 2015).

iii. Cultural-cognitive isomorphism/Mimetic pressure: Cultural-cognitive isomorphism originates as an outcome of the rational aim of an organization to emulate other organizations' behaviour. Such imitation seems to be the product of the firms' belief that the copied act is valuable or rightful technically. Mimetic pressure comes from other competing construction firms (Daddi, Testa, Frey, & Iraldo, 2016). This is usually the practice among organisations that compete among themselves.

From the discussions, the institutional theory basically focusses on the pressures that influence firms to shape their behaviours and adopt certain practices. A major limitation of this theory is that it doesn't focus on the outcome of adoption of these practices, neither does it explain other factors which could influence the outcome of adoption of these practices. The current study focuses on predicting the performance outcome of adopting green practices, and the effects of project complexity on the relationship between adoption of green practices and project performance. Therefore, the institutional theory is not suitable for this study.

2.2.2 Resource Based View

The origin of the resource-based view can be traced to the seminal article of Wernerfelt's in 1984. The resource-based view (RBV) is the dominant theory used in explaining firm growth and performance (Nason & Wiklund, 2018; Zupic &

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Drnovsek, 2014). The RBV considers firms as an aggregation of peculiar resources (resources that are of immense value, scarce, inimitable, and cannot be substituted) and considers these resources as valuable for development of goods, services, and policies (Barney, Ketchen Jr, & Wright, 2011). Also, Gupta, Kumar, Singh, Foropon, and Chandra (2018) opined that the resource-based view suggests that an organization can edge out its competitors by synchronizing resources and its proficiencies, and as a result enjoy better performance (Barney, 1991). The superior firm performance can be attributed to a combination of dual firm's proficiencies namely; operational proficiency and dynamic proficiencies (Essex, Subramanian, & Gunasekaran, 2016).

These resources of organizations were classified into three by Grant (1996) as follows; individual based (knowledge assets and technical knowhow), concrete (physical assets and financial capital) and intangible resources (quality products, integrity and brand image). The resource-based view focusses on how companies can perform economically while deploying the resources at their disposal without taking into consideration other performance outcomes such as environmental performance (Tate & Bals, 2018). The limitations of this theory however lie in its focus on economic performance of firms as against an all-encompassing measure of performance consisting of the triple bottom line approach along with some other performance indicators which this current study is focused on. Also, the resource base view is concerned about organizations performance as against project performance which this current study is concerned about. Therefore, the resource base view is not a suitable theory for this research.

2.2.3   Contingency Theory

The contingency theory's history can be traced to the late 1950s, when Woodward (1958) argued that technologies are responsible for the variability in organisational features such as span of control, the extent to which authority is centralized and the formalization of rules and procedures. Also, Bruns and Stalker (1961) came up with the idea of mechanistic and organic organisations in which they advocated for the adoption of organic organisations in unstable environments. Furthermore, Lawrence and Lorsch (1967) conducted an investigation into how different rates of change can affect an organization's capacity to adapt. Even though the contingency theory was at inception concerned with the structural problems of organizations, other aspects where the theory can be used has evolved over the years.

The contingency theory (CONT) makes available an avenue for comprehending and assessing the performance outcome of construction projects (Zhu & Mostafavi, 2017). Several researchers have recommended the use of contingency theory as an appropriate approach for understanding and managing construction projects (Hanisch & Wald, 2014). Zhu and Mostafavi (2017) are also of the opinion that the complexity of a construction project can also be seen as a contingency factor. The extent of efficiency that will be recorded in a construction project is contingent on the level of synergy between the projects ability to cope with complexity and the level of complexity inherent in the project (Zhu & Mostafavi, 2017). This is particularly so considering that projects are susceptible to constant changes and cannot be predicted because of the multifaceted interrelations between several parts in a project (Zhu & Mostafavi, 2017).

The central idea behind the contingency theory is that the effectiveness of an organisation or project is reliant on the fit between the different facets of organizational

features (Donaldson, 2001). Several literatures that focused on contingency theory have acknowledged that it provides a very promising perspective in the comprehension, conceptualization and management of construction projects (Hanisch & Wald, 2014).

When performance of construction projects is examined using contingency theory, it gives prescriptive projections since it can assist contractors plan and work to attain better congruence. In reliance on the contingency theory, managers of construction projects need to understand the uniqueness of the project they supervise and avoid the perception that all projects are similar and should be managed in the same manner. In support of this view, Payne and Turner (1999) conducted a research and found out that there was high level of project performance when specific approaches of project management are used depending on the complexities of the respective projects.

The performance of construction projects is contingent on the congruence (fit) between project characteristics, and adoption of green construction site practices. Based on the contingency theory, a construction project that possesses a better fit between green construction site practices, and project characteristics would have a greater likelihood of achieving project performance goals. The contingency approach in the construction management field has evolved, with studies that demonstrate the significant impact of the variable project type (Carvalho & Rabechini Junior, 2015).

Green construction site practices are contingent actions taken. So also, is project complexity, and these have a contingent effect on the relationship between green construction site practices and project performance. The contingency approach has been used to explain that the type of project, project complexity or generally speaking, project characteristics can affect project performance and also determine