



SUSTAINABLE CONSTRUCTION AT THE FIRM LEVEL: CASE STUDIES FROM NIGERIA

Thesis submitted in partial fulfilment of the requirements for the Degree of
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Dedication

This work is dedicated to Almighty Allah, my parents, my beautiful wife Fatima and my lovely son, Adewale for all their love and support during this research journey.

Abstract

This research explored the adoption and implementation of Sustainable Construction (SC) at the strategic and operational levels by construction firms in Nigeria. It is argued that developing countries (DCs) stand to gain immensely from the pursuit of efficiency in resource utilization, energy, reducing waste and pollution and consideration for local communities which are central concerns of sustainability. Literature indicates that while the sustainability agenda offers advantages for DCs, its adoption and implementation is more prevalent in the developed world. Questions then arise as to whether SC offers any business opportunities and lessons to construction firms in DCs on sustainable built assets. While numerous publications exist prescribing SC strategies seemingly deemed suitable for DCs, very little known about sustainability in the context of Nigerian Construction. Many of these strategies are normative and prescriptive with little empirical evidence gathered within local contexts to support them. This thesis argues that firm-level adoption of SC would be the outcome of a complex relationship between the firm's understanding of SC, its capacity and capabilities and the characteristics of the local context. This relationship was studied through an exploratory multi-case study of three Nigerian firms. Multiple sources of data were used including interviews, observations and archival records. Transcripts of the interviews were analysed using thematic coding. The analyses indicate that there is a very limited business case for SC with numerous barriers in the Nigerian context. Firstly, SC awareness of is low across various stakeholders, resulting in low demand and capabilities for sustainable buildings. Secondly, the firms have more pressing issues to deal with in the NCS. Currently, clients remain the single driver of SC identified in this context. It is recommended that at this early stage of SC, the Government plays a more active role in stimulating the adoption of SC in the NCS.

Keywords: *Case studies; Firms; Nigeria; Sustainable construction; Sustainability transitions*

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Preface

During the course of this research, several conference publications were produced and presented based on the research undertakings. They include:

1. **Dania, A. A.,** Larsen, G. D., & Ewart, I. J. (2014). Sustainable Construction: Exploring the Capabilities of Nigerian Construction Firms. *Proceedings of the 30th Annual ARCOM Conference, 1-3 September, 2014, Portsmouth, UK, 3-12.*
2. **Dania, A. A.,** Larsen, G. D., & Yao, R. (2013). Mainstreaming Sustainable Construction: Case Studies of an Indigenous and Multinational Firm in Nigeria. Eds, Patricia Carrillo and Paul Chinowsky. *Working Paper Proceedings, Engineering Project Organization Conference Devil's Thumb Ranch, Colorado July 9-11, 2013.*
3. **Dania, A. A.,** Larsen, G. D., & Yao, R. (2013). Sustainable Construction in Nigeria: Understanding Firm Level Perspectives. In *Sustainable Building Conference Coventry University* (pp. 37-46).ARCOM

Declaration

I confirm that this thesis is my own original work and the use of all material from other sources other than me has been properly and fully acknowledged. No portion of this thesis has been submitted in support of any application for another degree or qualification at this or any other University.

Afolabi A. Dania

Date

Signature

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Abbreviations

A21-SCDC	Agenda 21 for sustainable construction in developing countries
BRE	Building Research Establishment
BREEAM	Building Research Establishment Environmental Assessment Methodology
CAQDAS	Computer assisted qualitative data analysis software
CBN	Central Bank of Nigeria
CIB	International Council for Building
CIOB	Chartered Institute of Building
DCs	Developing Countries
EA	Environmental Assessment
EIA	Environmental Impact Assessments
EMS	Environmental Management Systems
EPD	Environmental Product Declaration
FCT	Federal Capital Territory (Abuja)
FEPA	Federal Environmental Protection Agency
FGN	Federal Government of Nigeria
FMEHUD	Federal Ministry of Environment, Housing and Urban Development
FRN	Federal Republic of Nigeria
GBC	Green Building Council
GBCN	Green Building Council Nigeria
GDP	Gross Domestic Product
HDI	Human Development Index
LEED	Leadership in Energy and Environmental Design
LTI	Lost Time Injury
LZCT	Low and Zero Carbon Technologies

NA-21	Nigeria Agenda 21
NBS	National Bureau of Statistics
NCS	Nigerian Construction Sector
NEEDS	National Economic and Empowerment Development Strategy
NESREA	National Environmental Standards Regulation and Enforcement Agency
MSDS	Managing safety data sheets
MTF	Marrakech Task Force
MDAs	Ministries, Departments and Agencies (of the Federal Government of Nigeria)
MDG	Millennium Development Goals
OECD	The Organisation for Economic Co-operation and Development
PTDF	Petroleum Technology Development Fund
PWD	Public Works Department
SBS	Sick Building Syndrome
SC	Sustainable Construction
SD	Sustainable Development
SME	Small and Medium Scale Enterprises
SPOD	Sustainable Building Policies in Developing Countries
UNCED	United Nations Conference on Environment and Development
UNCSD	United Nations Commission for Sustainable Development
UNDP	United Nations Development Programme
UNEP-SCBI	United Nations Environmental Programme – Sustainable Buildings and Climate Initiative
WGBC	World Green Building Council

CHAPTER ONE
INTRODUCTION

Chapter 1: INTRODUCTION

1.1 Chapter Introduction

This chapter introduces the rationale for the research, the area of focus, the research problem and the overall structure of the thesis. The background section introduces the characteristics of the construction sector and concerns about the sectors sustainability credentials. A brief description of the research's sponsorship, the initial focus, eventual direction and rationale of the research is provided. The subsequent sections introduce the research aim and objectives followed by a brief description of the research process undertaken in carrying out this research. This chapter closes with a synopsis of the overall structure of the thesis.

1.2 Background to the Research

The construction sector often sits at the nexus of improving quality of life through its provision of the built environment and critical infrastructure necessary for development on one hand, and eroding the natural balance of the earth on the other (du Plessis, 2007). Studies have shown that the construction sector is responsible for some of the most unsustainable actions of humans. Construction activities results in negative impacts that are wide ranging across a spectrum of categories; for example, the construction, refurbishment and operation of buildings results in unsustainable water and energy consumption patterns, huge material and resource utilization, generation of large quantities of wastes, while also altering and sometimes destroying the natural ecosystem (Pearce et al., 2012; Kibert, 2013; Cotgrave and Riley, 2013).

Since the emergence of the sustainability agenda in the late 1980s, specific attention has been directed at development efforts that are conducted in a more thoughtful and responsible manner with future generations in mind (WCED, 1987). The most widely accepted

underpinning principle of sustainable development is to simultaneously pursue the triple bottom line of economic, social and environmental dimensions while arguing that development which is not inclusive of all three cannot be deemed sustainable. While this sounds simplistic in concept, practical applications of this sustainability model in various disciplines have been quite challenging (Norgaard, 1988; L   , 1991; Bansal, 2002; 2005).

The construction sector has not been left out of the sustainability agenda. The term ‘sustainable construction’ (SC) encapsulates the construction sector’s response to sustainability. Sustainability in construction was borne out of concern for man’s increasing consumption patterns vis-  -vis the limits of the earth’s carrying capacity to sustain such patterns. There is no consensus as to what Sustainable Construction means, neither is there a universally accepted approach to it. However, schemes such as Agenda 21 for sustainable construction (A21-SC) set early directions for different countries to implement SC strategies and to drive research and development initiatives (CIB, 1999).

The responses to the SC agenda have been varied especially across different country contexts. The more developed countries of Europe, North America and some parts of Asia have been more proactive in recognising, developing and implementing SC agendas within their national contexts (Bourdeau, 1999; 2005). Multilateral organizations such as the Council for Research and Innovation in Building and Construction (CIB) and the United Nations Environment Programme (UNEP) in conjunction with a few researchers (du Plessis et al., 2001; Reffat, 2004; Shafii et al., 2006; Abidin, 2010) have attempted to extend the application of the SD agenda to developing countries. This research argues that the recommendations from these efforts such as the Agenda 21 for sustainable construction in developing countries (A21-SCDC) have been largely prescriptive and not necessarily based on empirical evidence gathered from these contexts where these suggestions are meant to be implemented.

A possible explanation for these prescriptive and normative suggestions is that research in the developing world is often lagging behind the developed world, thus resulting in the thinking that the practices and lessons of the developed world can be ‘transferred’ to developing countries. While there are valuable insights that can be obtained from developed contexts, this research also argues that the peculiarities of a particular context have to be taken into consideration when developing a strategy for the application of SC. This research therefore attempts to address this problem by studying contracting firms operating in the Nigerian construction sector (NCS). This is in a bid to understand how these firms understand SC, their motivations, what strategies of SC are implemented and if there is a business case for SC in the Nigerian construction sector.

1.2.1 Initial focus of this research

This research was sponsored by the Petroleum Technology Development Fund (PTDF), a parastatal under the ministry of Petroleum Resources of the Federal Government of Nigeria (FGN). This sponsorship was based on the concerns of the environmental performance and capacity development of the Nigerian construction sector which actively serves the oil and gas sector. The initial focus of the research was to develop a quantitative cost metric for the assessment of environmental impacts of construction works in the Nigerian construction sector. This was in line with the thinking behind existing schemes such as environmental profiles (Edwards, 1997) and the BRE eco-points (Dickie et al., 2000). However, the sustainability literature suggests that changing the in approach to doing things is usually preceded by awareness and a clear understanding of the drivers for change.

With the eco-points metric gaining very little traction in literature and practice, and the seemingly low levels of awareness on sustainability that characterise less developed countries such as Nigeria, there was little evidence to support that the output of such an initiative in the

Nigerian construction sector would yield the desired outcome of utility and also successfully inform construction stakeholders on the environmental footprints of their projects. After extensive review of the literature (which is explained in Chapters 2 and 3), the focus shifted to understanding the context specific nature of the NCS and the factors that play a role in a corporate firm's mainstreaming of SC in their practice.

1.2.2 The researcher's background

The researcher is Nigerian by nationality and had spent over 6 years working in the Nigerian construction sector prior to this Doctoral research. This was in a mixed capacity as a full time academic in the construction management discipline at a local Nigerian University and also as a part time industry adviser. This background was essential in shaping the research problem and making sense of the output of this research. For example, the heavy contextual bias of sustainability practices required the understanding of the research context from both the perspective of the researched and the researcher alike. Thus the researcher's experience with this research context helped to make sense of the findings emanating from the research.

1.3 Research Problem Identified

From the perspective of a corporate entity, SC is implemented in a variety of ways (discussed in further detail in Chapter 2); as legislation to be complied with, as a best practice to be adopted or a business opportunity to be exploited. The advantages of SC are well represented in various literatures. To this end, sustainability strategies, assessment methodologies and new technologies have been developed and applied in countries with active sustainability agenda for construction (Lacasse, 1999; Circo, 2007; Ding, 2008; Bakhtiar et al., 2008). However, the platforms under which these strategies have been leveraged on are largely absent in developing countries (Ofori, 1998; du Plessis, 1999), such as strong institutional governance and robust technical capabilities for instance.

Typically, most developing countries are experiencing rapid urbanization, coupled with absence of critical infrastructure, lack of enabling rules and regulations, skills, knowledge and capacity for large scale change. They are also often faced with somewhat basic but far more pressing priorities such as addressing security, poverty, social injustice and inequity (du Plessis, 2001). As such, it is not clear if issues like sustainability in construction would be on the front burner in such countries (Larsson, 2005). Such changes in the construction sector are only likely to occur when stakeholders actually understand the purpose of such change and see a need for it (Pitt et al., 2009; Rodriguez-Melo and Mansouri, 2011; Bal et al., 2013).

This research also attempts to extend the arguments for the development of the construction sector in developing countries (Henriod and World Bank., 1984; Wells, 1986; Ofori, 1989; Ofori and International Council for Research and Innovation in Building and Construction, 2012) by exploring how the sustainability paradigm can contribute to this. In summary this thesis addresses the research question of understanding how and why sustainable construction is adopted and implemented by contracting firms in Nigeria. This research is done given that the assumptions that underpin the calls for a sustainable construction sector in most developing countries seldom engage or resonate with the experienced reality of personnel operating within firms in the NCS.

1.3.1 Corporate sustainability in construction

The pressure on the construction sector to become more sustainable requires new thinking and methods to be implemented over the life cycles of buildings. This pressure was exerted initially by high-level inter-governmental advocacy and national governments. The Marrakech Task Force (MTF) on Sustainable Building and construction explained SC as the ‘responsible supply, operation and maintenance of buildings that meet the needs of their owners and users over their lifespan with minimal unfavourable environmental impacts, while

encouraging economic, social and cultural progress’(Federal Ministry for the Environment, 2010). The 2008 UK strategy for sustainable construction specifies intervention/action in the following areas: procurement, design, innovation, people, regulation and climate change. Others are water, biodiversity, waste and materials (HM Government., 2008). The arguments for being sustainable include a resource efficient construction sector, a healthy built environment, a fair and just society, and also a balanced natural environment. This has created a market and new business opportunities for construction firms in the built environment.

1.3.2 Sustainability in developing countries

Multilateral organizations have advocated the need for sustainability strategies in developing countries also. The recognition of the peculiarities of developing countries on the African continent led to the adoption of a specific MTF theme called ‘Cooperation with Africa’ (Marrakech Task Force, 2007). Many of the countries in Africa make up the lower half of rankings on Human Development Index (HDI). Similarly, UNEP initiated several schemes such as the sustainable buildings and climate initiative (UNEP-SCBI) and also the sustainable buildings policies (SPOD) in developing countries (UNEP, 2011). Such programmes are geared at driving policies that facilitate the procurement of buildings sustainably.

The effectiveness of these sustainability schemes is difficult to discern from literature. A common critique of this advocacy is the emergence of ‘cosmetic environmentalism’ (Robinson, 2004); where even in more matured construction markets, sustainability only becomes a tick box exercise for the stakeholders involved. On the academia side, researchers such as Serpell et al. (2013), Abidin (2010) and du Plessis et al. (2003) have all looked at SC specifically in the developing countries of Chile, Malaysia and South Africa respectively. The emerging narrative from these and similar studies is that most of these countries are in the early stages of adoption, though with very little progress made.

Nigeria is Africa's largest economy and one of the fastest growing in the world. With a large and fast-growing population, rapid urbanisation and an active and vibrant construction sector, the performance of this sector is important to its development needs. The construction sector is charged with the responsibility of catering for extensive infrastructural and housing deficits currently prevalent in Nigeria of which contracting firms are to play a big role. Yet, very little is known about if and how these firms might be exploiting the 'opportunities' of SC.

1.3.3 Research problem explained

While several initiatives of the Nigerian government hint at encouraging development that is sustainable, there is very little guidance, nor legislation in place to direct the construction sector. This is despite the fact that there is evidence of this sector's adverse consequences on societies, the planet and economy. The operating climate for construction in Nigeria remarkably differs from what obtains in Western Europe for instance where there is a strong sustainability drive in the construction sector. A lot of the sources of information helping to shape the practice sustainable construction originate from outside of Nigeria. Thus, several questions remain unanswered: Do construction firms recognise sustainable construction as a new way of thinking that helps its business operations? What does sustainability mean to the firms in the context of Nigeria? How is sustainability implemented in the NCS? Are the benefits and lessons observed in other contexts applicable to the Nigerian context? It is with these questions that the following aim and objectives are set out for this research.

1.4 Aim and Objectives

The aim of this research is to explore the adoption and implementation of sustainable construction in the business operations of contracting firms in Nigeria. To achieve this aim, the following specific objectives were pursued:

1. To understand context specific meanings and understandings Nigerian construction firms attach to sustainability in construction.
2. To explore the specific local market and stakeholder characteristics that present a business case for firm-level sustainable construction in the Nigerian construction sector.
3. To explore the contextual drivers and barriers construction firms face and how they implement sustainable construction.
4. To examine the strategic and operational level provisions the firms put in place in mainstreaming sustainable construction.

1.5 Research Methodology

This section gives a brief overview of the research approach adopted for this study. An extensive critical review of literature was carried out to understand the different conversations surrounding sustainable construction and the implications for construction businesses. It tracked the emergence of sustainability, its development, evolution and diffusion within the construction sector in different contexts. The motivations for change or lack of were also explored within these various contexts. This critical review was carried out throughout the duration of the study; firstly, to understand the theories and practices of sustainable construction as they apply to corporate organisations, the drivers and barriers to sustainability, to situate the research in the context of Nigeria and identify the research problem.

The research set out to explore the firm-level understanding, drivers, barriers and modes of implementation of sustainability in the NCS. The objectives of the research were derived from the review of literature which indicated relevant themes that tracks how the adoption and implementation of the sustainability agenda has taken place over time. These themes were used as a basis for the data collection and the starting point of the thematic analysis of the

data. The nature of these themes meant that an interpretive research philosophy was deemed most appropriate and thus adopted in the research design process. Specifically, an exploratory multi-case study research design was adopted due to its suitability as a research tool for generating rich insightful data when seeking a deeper understanding of complex issues in their real life contexts (Yin, 2009). Case studies help emphasise detailed contextual investigations of individuals, groups or organizations and have been a tested and widely applied method in the social sciences. Figure 1.1 shows a representation of the overall research process undertaken for this research

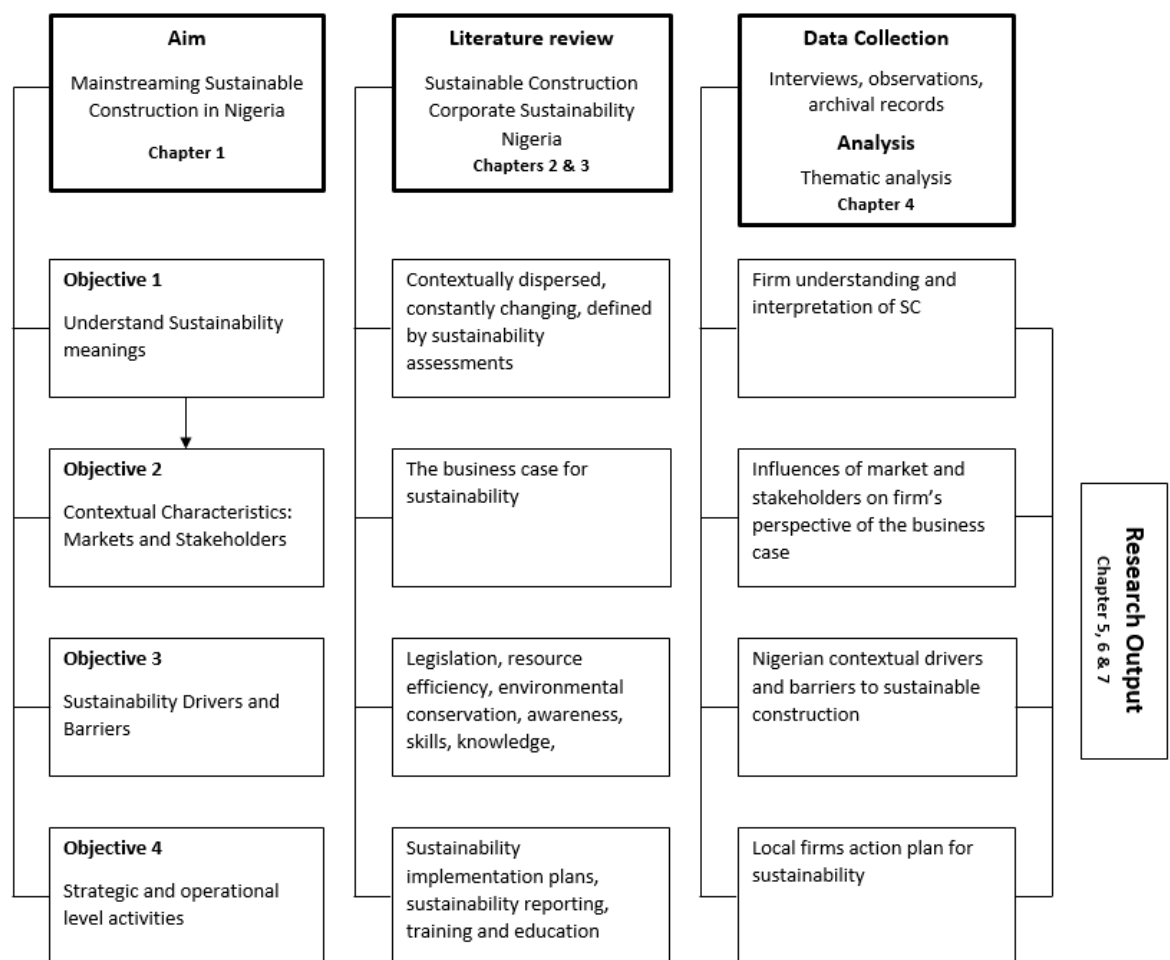


Figure 1.1: The doctoral research process for this study

The case study firms are the unit of analysis for the research and three firms were selected using carefully selected criteria emanating from literature. The size, type and nature of

ownership were amongst the criteria used in firm selection. The chosen method of data collection was semi-structured interviews, observations and archival records. The interviews in particular yielded large volumes of qualitative data which was transcribed and analysed against the themes of the analytical framework developed during this research. The NVivo 10 software was used manage the process of thematic analysis using codes, nodes and establishing relationships between the themes.

1.6 Thesis Organisation

The thesis consists of 7 chapters and a brief synopsis of each chapter is given as follows:

Chapter 1: Introduction

Chapter 1 provides the background information that explains the rationale for this research. It highlights a brief summary of sustainability, sustainable construction and the Nigerian construction sector, the research problem, significance of the research and aim and objectives. Also included are a brief description of the methodology and an outline of all the subsequent chapters/sections that make up the thesis.

Chapter 2: Corporate Sustainability in Construction

Chapter 2 explores the theoretical and practical foundations underpinning sustainability in construction. The three main areas of focus for this chapter are; the underlying concerns of a hitherto unsustainable built environment that necessitated a paradigm shift; the evolution of the nuances, theory and praxis of SC; and the review of the implications of this new paradigm for corporate firms. This review of the SC literature highlights the deliverables of SC, drivers and barriers, relevant stakeholders and the business case for sustainability.

Chapter 3: The Nigerian Construction Sector

The firm-level adoption and implementation of sustainability is grounded in local contexts. Arguments have been made that having benefitted from decades of pollution and wanton exploitation, policies of sustainability result in an unfair advantage for developed countries. On the other hand, the advantages accruing to such developed countries have been argued in literature. Thus, this chapter focusses on the context of developing countries and the construction sector of Nigeria where the research is carried out. As a developing country with significant differences to the operating environment for construction, an understanding of the nature of the NCS and its characteristics is key. This chapter reviews the history of the NCS, its characteristics, regulatory frameworks and what is currently known about sustainability in that context.

Chapter 4: Methodology and Research Design

Chapter 4 develops and explains the process of the research design and the reasoning behind the choices of interpretivism, the multiple case study design, the use of interviews for data collection and the method of analysis. Arguments are presented justifying the suitability of qualitative data for the research. Instruments of data collection and the process of analysing the morass of qualitative data generated by the research are explained in this chapter. Details of the case selection, interview process and the implications of the choices with respect to ethics, reliability, validity and transferability are presented in this chapter.

Chapter 5: Analysis of Case Studies

Chapter 5 presents the findings of the analysis idiosyncratic to each individual case. An across-case finding is also reported, detailing the areas of consensus and differences between the views of respondents across the three firms. The implications for the sustainability

transition framework are also explored with particular emphasis on the emergent themes from the research.

Chapter 6: Discussion of Findings

A robust discussion of the implications of the findings from the previous chapter is presented in this chapter alongside the connections (or deviations) to relevant literature. The implications for the practice of SC in Nigeria are explored and the relationship of these findings to the existing literature is discussed. This helps to tease out the original contribution this research has made to the sustainability body of knowledge.

Chapter 7: Conclusions and Recommendations

Conclusions are explained and the recommendations emerging from this research are also expressed. The limitations of the research are explained, followed by a section of suggested areas for further research.

1.7 Chapter summary

This introductory chapter has set out the background of the research and the gap identified that was deemed necessary to investigate. It clearly sets out the research motivation, aim and objectives, research question, research methodology and a concise outline of the remaining chapters of this thesis. The next two chapters contextualise the research by exploring the literature of SC and the NCS respectively.

CHAPTER TWO

SUSTAINABILITY IN CONSTRUCTION

Chapter 2: CORPORATE SUSTAINABILITY IN CONSTRUCTION

2.1 Chapter Introduction

The research sets out to understand ‘how’ and ‘why’ construction firms engage with corporate sustainability in Nigeria. This chapter critically reviews the key issues of mainstreaming sustainability in firms as represented in literature. To understand this, a brief review of the underlying concerns which led to sustainable development becoming a dominant paradigm across many different disciplines is undertaken. The chapter also explores the early origins of sustainability, its theoretical underpinnings and current practical applications particularly across firms. The strategic nature of construction as an important contributor and indicator of development, its responsibility and consequent impacts on the environment, societies and economies is also explored in this section.

In some academic circles, the principles of sustainability are argued to offer an approach to bettering quality of life, albeit in a responsible manner. Researchers such as Hill and Bowen (1997), du Plessis (2007), Kibert (2008) and Pearce et al. (2012) have highlighted what they regard as imminent gains of sustainability in construction while also proffering strategies on how sustainability principles can be implemented. This review highlights that conscious action is required to address the parallel concerns of improving the quality of life through buildings and infrastructure on the one hand and mitigating potential negative impacts emanating throughout the construction lifecycle. Technologies, legislation, incentives and assessment methods have been applied in this sector to drive sustainability with mixed results. Thus, this chapter explores these issues, the business case for sustainability as well as the strategies, drivers and barriers for these construction businesses. Challenges that mitigate progression to a sustainable built environment (barriers) are also explored along with stakeholder relationships.

2.2 Sustainability and Construction

2.2.1 Origins of sustainability

The human quest for better quality of life, along with increases in the global population, rapid urbanization and the depletion of finite, non-renewable resources have created attendant environmental, social and financial challenges (Kibert, 2013). To understand the place of Sustainability as an important concept of the late twentieth century and early twenty-first, it is necessary to explore the triggers for this paradigm shift (Dresner, 2008). As fears about the post-World War 2 industrial production capacity grew, so did the movement for better awareness of the adverse consequences of our development efforts (Robert et al., 2005). The environment was a major focus of these concerns and publication of 'Silent Springs' (Carson, 1962) and 'Limits to Growth' (Meadows et al., 1972) are two examples of the early environmental movement.

Carson (1962) studied the effects of pesticides on the natural habitat and brought to public consciousness that technological advancement (geared by economic progress) was often at odds with the natural environment. Hagen et al. (1996, pg 185) chronicles the problem thus: *'Amid the welcome prosperity, there were signs that all was not ideal. In residential communities, some people noticed that songbirds were declining'*, apparently due to indiscriminate use of pesticides by landowners. Meadows et al. (1972) with a Malthusian preposition were concerned about the Earth's capacity to keep up with the rate of population growth and the exploitation of finite, non-renewable resources. Using computer simulation, they modelled consumption patterns in three different scenarios across five variables. The results suggested that exponential growths in population and resource demand would not be sustainable in the long-term future. While this study came under criticism based on the basic assumptions of the model adopted by Meadows et al, this effort crystallized the concerns of early environment movement and the unintended consequences of development.

The rate of consumption of the earth's resource has since proven to be a problem as the use of resources such as timber, fossil fuels and mineral ores occurs faster than they are replenished (Kibert, 2013). These high consumption patterns are largely skewed in favour of developed countries. Given the populations and development aspirations of developing nations, it has been suggested that we would require three Earth's worth of resources to cater for our collective needs if these countries were to embrace a similar consumption pattern of developed nations (Pearce et al., 2012). However, the world is faced with other numerous challenges which are not limited to environmental concerns alone. By the late 1970s, the social concerns of poverty, inequity and social justice prevalent in the developing world had begun to gain traction, side by side concerns for the environment.

The term *Sustainability* came to global prominence in 1987 when the United Nations World Commission on Environment and Development (Brundtland commission) published its report *Our Common Future* and advanced arguments for human development that is sustainable. Sustainable development (SD) is deemed '*a logical extension of arguments within the environmental literature of the 1960s, 1970s and early 1980s*' (Robinson, 2004, pg 370) which harmonizes environmental and socio-political concerns. SD recognizes the inseparable link between people, planet and prosperity and promotes simultaneous consideration of these three factors in any endeavour. Spence and Mulligan (1995, pg 279) stated that SD is an '*understanding of the world and its inhabitants as a single system and the need to combine two key global aims in the development of human activities: to accelerate human development, particularly in the poorest countries, and to remove the gross inequities present in the world today; while at the same time avoiding the depletion of the resources and biological systems of the planet to such an extent that future generations would be impoverished*'

2.2.2 How Is Sustainable Development understood?

The labels of Sustainability or 'SD' suffer problems of boundary and definition (Beckerman, 1994; Mitcham, 1995; Pearce, 2005). A wide range of definitions attempt to capture the essence of the sustainability movement. The Brundtland commission defined it as *'development which meets the needs of the present without compromising the ability of future generations to meet their own needs'* (WCED, 1987, pg 43). While other attempts have been made to redefine SD, Cotgrave and Riley (2013) reviewed several of them that have emanated after Brundtland and argue that the 'new' definitions tend to overcomplicate the paradigm while failing to explain what actions are needed. Thus, the Brundtland definition remains the most widely quoted definition of SD in literature. Beckerman (1994) and Robinson (2004) for instance argue that definitions of SD are vague and offer very little in meaning due to its widespread use, while others seek a common consensus of constructed 'meanings' of SD in practice. There is some consensus in academic literature and practice that SD integrates three distinct dimensions: the social, economic and environmental dimensions (Elkington, 1997).

The three SD dimensions emerged from the early debates and perspectives of different researchers such as Barbier (1987), Daly (1990), Victor (1991), Colby (1991), and Gow (1992) to mention a few. The relationship between these dimensions has been a source of further debate. Several relational models of these SD dimensions have been argued such as the Russian doll model (Levett, 1998), the three pillars model and the Venn diagram model (Cotgrave and Riley, 2013) (Figure 2.1). Each of these offers its own strengths and weaknesses in guiding the principles and practice of SD. Empirical data to support these arguments for the different models are difficult to come by. However, the most widely referenced SD model is the Venn diagram model in 2.1(c).

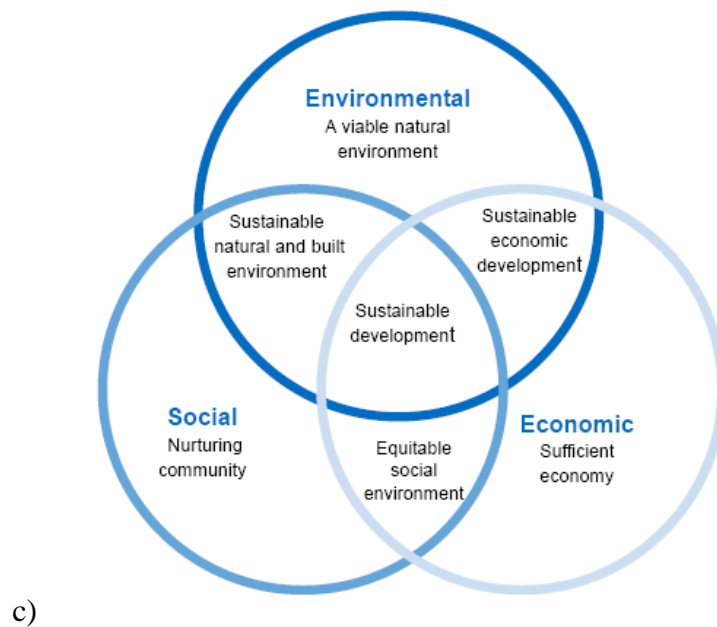
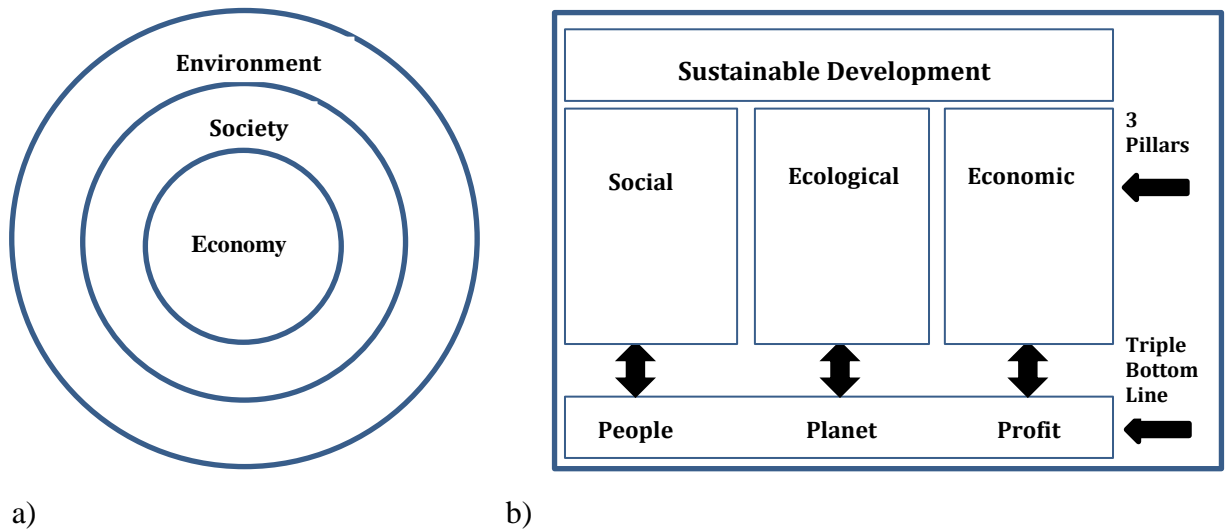


Figure 2.1: (a) Russian doll (b) Three pillars and (c) Venn diagram models of sustainability (Cotgrave and Riley, 2013, pg 4)

The attraction to this Venn diagram model is that it is argued that the complex, simultaneous consideration of all three dimensions is at the very core of SD. These dimensions have formed the basis for the numerous sustainability standards, codes of practice, regulations and certifications in existence today. The dimensions are discussed further below.

Economic dimension

The economic dimension of SD is rooted in environmental economics and promotes the establishment of a strong, responsive and competitive economy (Mebratu, 1998). It encourages achieving economic growth, efficiency and stability within environmental limits and its indices include raising real income, lowering associated costs of living (health, infrastructure, amenities), improving productivity and increasing economic growth (Pearce et al., 2012). These define the economic factors that need to be considered if development is to be considered sustainable. They answer the question of viability, costs, income, productivity and return on investments.

Environmental dimension

There is evidence that traces human concern for the environment to as early as the 1860s when John Muir set up an environmental movement called the Sierra club Dresner (2008). More recently, the seminal publications such as Carson et al. (1962), Meadows et al. (1972) and efforts of the Stockholm conference (1972), the International Union for Conservation of Nature and Natural Resources (IUCN, 1980) for example put the recent environmental challenges in perspective by creating awareness and hosting conferences. The environmental dimension cautions on the limited regenerative capability and carrying capacity of the ecosystem and requires that efforts are channelled into protecting the environment by reducing emissions, consumption of water and conservation of biodiversity (Bansal, 2002). Strategies such as waste management, low and zero carbon technologies, environmental impact assessments (EIA), environmental management systems (EMS), encouraging renewable energy sources and regeneration (Reed, 2007) have gained widespread awareness and some degree of use in recent times. This is to ensure that future generations have a chance to experience a natural environment which has not been compromised.

Social dimension

Drawing from the underlying concerns that led to the emergence of a sustainability paradigm, it was observed by the Brundtland commission that common good of the generality of people were often not considered in development activities. The social dimension largely addresses issues that affect quality of life (Murphy, 2012) such as security, equity, inequalities in the distribution of wealth, well-being and empowerment of marginalised, vulnerable and minority groups. Others are education, diversity, livability, justice, culture and rights (United Nations Commission on Sustainable Development, 2001; Dillard et al., 2008). However, this aspect appears to be the most obscure and ignored of the three dimensions (du Plessis, 1999; Cuthill, 2010). According to Moore and Bunce (2009, pg 603) *“the social tenet of sustainability is inevitably the messy pillar of the tri-partite model, and its delivery likely to be challenged due to oscillating interpretations and entrenched subjectivities”*.

2.2.3 Sustainable Development in literature and practice

Sustainability has been studied from a wide range of perspectives, disciplines and contexts (Berggren, 1999; Brennan and Cotgrave, 2014) which guides our understanding of SD and how we engage with it. The initial debates on SD revolved around ‘weak’ sustainability (Cabeza Gutiérrez, 1996) and ‘strong’ sustainability (Daly, 1991), contrasting between the substitutability or complimentary nature of human and natural capital. Beckerman (1994, pg 193) all together rejects both notions of strong and weak sustainability and criticises the concept’s mix-up of *‘the technical characteristics of a particular development path with a moral injunction to pursue it’*. Subsequent efforts have been made in a bid to provide clarity, purpose and direction for the concept with mixed results.

The United Nations Conference on Environment and Development (UNCED) convened in Rio in 1992 (Earth Summit) and a declaration of guiding SD principles and desired actions

was issued (United Nations Division for Sustainable Development., 1992). These principles and actions were contained in the Agenda 21 a document called which helped to set a non-binding, bottom-up, voluntary global-to-local framework for learning, researching and adopting the tenets of sustainable development across the globe. The guidance from this publication helped countries establish commitment by stakeholders, jumpstart policies, legislation, strategies, and importantly establish context specific research agendas for sustainability (Courtney, 1999; Sjoström and Bakens, 1999).

There has been a robust reaction to Agenda 21, albeit in more developed nations. This has taken the shape of legislation, targets, assessment and measuring tools, sustainability reporting and incentive schemes. Thematic indicators were developed (and continually modified) to understand areas requiring intervention and to manage performance monitoring. Other fallouts of this SD Agenda especially as they relate to corporate firms and their engagement with sustainability is discussed further in subsequent sections of this chapter.

Criticisms of SD

A fair amount of literature has been dedicated to critiquing the SD agenda. Robinson (2004) posits that while the underpinning concerns warranting the agenda are noble, the simultaneous consideration of all three parameters of people, planet and profit amount to ‘squaring the circle’ (reference to a task considered impossible by mathematicians). Pearce (2005) suggests that the best way for development to occur is to identify ‘trade-offs’ between a project goals and find a way of balancing them. The criticisms are further expatiated by Robinson and Cole (2014) who argue that there are four key problems of the SD agenda: the uninspiring message of sacrifice and scarcity, emphasis on reduction and damage limitation, overwhelming emphasis on the environment and not recognizing contextual understandings of ecological

limits and scarcity arguments. Dresner (2008) discussed the divergence between the views on the success of A21 by developed and less developed countries.

The concept of SD has also criticized as being normative, utopian and reductionist. Its proponents have developed indicator sets, of which it is expected that adherence to each component of these indicators would result in development that is sustainable. In practice, sustainability involves more than just engaging with the ‘sum of its parts’ (i.e. the social, economic and environmental dimensions). One consequence of the fuzziness of the concept and the prescriptive nature of existing strategies is that there is a possibility of sustainability becoming a ‘tick-box’ exercise for stakeholders to appear green, while doing little or nothing to change their activities. This phenomenon is sometimes referred to as ‘greenwashing’ (Najam, 1999; Hamann and Kapelus, 2004). To Doughty and Hammond (2004), there is no properly identifiable endgame where development can be definitively said to be sustainable. This often paints a picture of futility for the stakeholders.

Whilst it is obvious from literature that there is more emphasis on the environmental dimension of SD compared to the social and economic, this may be explained by the panic over climate change and global warming. Some of the points raised by Robinson and Cole (2014) are quite similar to ‘normal circumstances’ in many developing countries where large sections of the population suffer deprivation, negativity and scarcity whilst living in poor human conditions. This raises the question of whether SD can offer lessons from the developed world and have a positive impact on the lives of people living in developing countries. However critical we are on the concept of SD, a general consensus across literature is that it stimulates a re-thinking of development that brings the world closer to a desirable human condition, an enduring ecosystem, and a balance between present and future generations (Centre for Environment Education et al., 2007).

2.2.4 Sustainability in construction

The sheer size of the construction sector and the breadth of its activities mean that it is potentially one of the most significant industrial sectors in which positive outcomes of sustainability can be achieved. The output of the sector constitutes about ten percent (10%) of global Gross Domestic Product (GDP) while also employing about 7 percent of the global workforce (Pearce et al., 2012). The term '*sustainable construction*' (SC) was coined to encapsulate the concept of SD within the construction sector. However, Sustainable Construction equally suffers problems of definitions, understanding and translation to practice (Murray and Cotgrave, 2007; Bourdeau, 1999; Hill and Bowen, 1997). This research argues that SC is not a tightly defined concept with a clear definition but an evolving approach and thinking that continually influences the way the construction sector businesses operate.

The construction sector has a 'highly fragmented' and complex structure with the responsibilities of design being far removed from the responsibilities of construction. This complexity is further deepened by the interplay between a diverse mix of stakeholders acting within this sector. This structural fragmentation and complexity of construction has implications for how sustainability is implemented sector-wide, for understanding the social interactions between diverse business concerns and how we can study them.

The boundaries of SC are quite expansive; covering extraction and manufacturing of the building components, all phases of design, construction, operation up to deconstruction/demolition, and equally the relationships between buildings and infrastructure (Kibert, 2007). While the construction sector remains an engine room and indicator of growth, the impacts of the construction of buildings, their operation, demolition/deconstruction and associated practices have been highlighted in numerous literatures (Spence and Mulligan, 1995; Kibert, 2003; Halliday, 2008). These impacts are usually considered over the life cycle of the

building (Ortiz et al., 2009) and reinforce why the construction sector is strategic in achieving sustainability. The impact categories are discussed under the following:

Energy

The construction and operation of buildings is responsible for up to 25 – 30 per cent of total energy consumption in most of the developed world (Rohracher, 2001; Pearce et al., 2012). Energy studies recognise different forms of energy in the building life cycle: *embodied energy* which is used up in the production of materials used in construction; *grey energy* used in transportation of materials; *induced energy* in the construction or deconstruction phase; and *operational energy* consumed during the operation building (Cole and Rousseau, 1992; Gustavsson and Joelsson, 2010; Santamouris, 2013). The dominant factors for the consideration of energy efficiency in buildings are the costs of energy and the emission of greenhouse gases associated some forms of energy generation. Renewable sources of energy such as solar, wind and hydro power are being developed and encouraged as well as designs of net-zero and net positive buildings (Wang et al., 2009; Hernandez and Kenny, 2010).

Water

The construction of buildings and particularly human activities in their operational phase utilizes a lot of water. In the UK, buildings account for up to 52 percent of water usage, with Brownhill and Yates (2001) reporting a 70 percent increase in consumption in the past 30 years. As the cost of water supply is rising, water efficiency resulting in reduced consumption, harnessing available alternative sources of water and reduced production of wastewater is a factor in sustainable buildings (Ilha et al., 2009; Kibert, 2013). Water management strategies such as rainwater harvesting, water efficient technology, grey water reuse, vacuum operated WCs have been implemented to good effect (Friedler and Hadari, 2006; Cotgrave and Riley, 2013).

Waste

The construction sector generates a large quantum of waste (Bossink and Brouwers, 1996; Lu and Yuan, 2011). According to Parkin (2000), UK construction used to generate about 70 million tonnes of waste per annum, of which about 19 percent were unused materials. Waste streams from construction are usually diverse and in some cases toxic (Formoso et al., 2002). It is estimated that up to two thirds of non-industrial solid waste in the US comes from construction, renovation, and demolition. Waste management perspectives have been well explored in literature. Strategies like the waste hierarchy (DEFRA, 2011), lean construction (Formoso et al., 2002), GPS and GIS technologies (Li et al., 2005; Chen et al., 2002) have been implemented in managing construction waste. Others include low waste technologies incorporated at design, web based applications for material management optimisation (Osmani et al., 2006), labour and construction site waste management (Lu and Yuan, 2011; Solís-Guzmán et al., 2009), transportation and material handling, site planning and operations (McDonald and Smithers, 1998).

Indoor Environments and Outdoor air quality

As humans spend as much as 90 per cent of their time in or around buildings, the indoor environment affects comfort and health (Jones, 1999; Sundell, 2004; Pearce et al., 2012). The US Environmental Protection Agency (USEPA) states that indoor air may contain up to 2.5 times more pollutants than the outdoor air. Sources of pollution of the indoor air include HVAC systems, furnishing, finishing and paints. Indoor environments are thought to increase the risk of sick building syndrome (Fadeyi, 2012). Regarding outdoor air quality, up to one third of greenhouse gases are attributable to the construction and operation of buildings (Akadiri et al., 2012). Most of this attributed to embodied energy and operational energy, but

buildings also utilize coolants, fire suppressants and insulating materials which give off non-CO₂ greenhouse emissions (Pearce et al., 2012).

Materials

Construction is, and continues to remain a highly resource dependent sector. Over 40% of the material utilization goes into the construction of buildings globally (Roodman et al., 1995). This includes largely non-renewable materials such as gravel, steel and cement. Parkin (2000) stated that UK construction consumes 6 tonnes of material per person per annum. The quest concerning materials is to manage this resource effectively and promote alternative materials that are environmentally friendly and minimize resource depletion (Halliday, 2008). Systems such as environmental product declaration are designed to provide data to users on the environmental friendliness of materials used in construction. Similarly, ethical sourcing (Building Research Establishment, 2009) is a fast growing body of knowledge concerned with responsible harnessing of materials across the whole construction supply chain.

Land use

Statistics show that the percentage population of people living in urban areas is rapidly and continuously increasing (UN, 2010) which has ultimately put pressure on the natural environment (Spence and Mulligan, 1995). Other land challenges include loss of biodiversity, urban planning and land use, pollution, transportation, over exploitation of non-renewable resources and changes to the urban climate (Basiago, 1998; Curwell and Cooper, 1998; Chen et al., 2000; Haapio, 2012). This poses a challenge of how land in general, and urban spaces in particular are managed to ensure inter-generational equity and well-being of all.

2.3 Corporate Sustainability

2.3.1 Overview

Having explored the concept of sustainability and the relationship with the construction sector, one challenge for the corporate world has not only been how to incorporate this new thinking into its operations but also to create value from being sustainable. The corporate world is an essential contributor to development and wealth creation. However, businesses play a significant role in generating part of the problems that the sustainability paradigm emerged to address. The field of corporate sustainability explores this complex relationship of businesses and sustainability using more established disciplines such as management, ethics, environmental sciences, business and economics. This section explores the literature on the motivation of corporate entities in engaging with sustainability in their business operations.

2.3.2 Origins of corporate sustainability

Undoubtedly, sustainability has been transforming how corporate entities conduct their business operations. Elkington (1997) coined the term ‘triple bottom line’ as arguments of the late seventies and eighties sought to extend the traditional, capitalist, financial ‘bottom line’ of corporate objectives towards the more humane environmental and the social welfare of people. Several literatures have discussed this shift in emphasis over time. In particular, Bansal and Hoffman (2012) identified that this occurred in three phases (see Figure 2.2) over the last 50-plus years: the early stages of the 60s and 70s when regulations began emerge to regulate corporate activities (for instance, the ‘polluter pays principle’ of 1972); the proactive phase for firms in response to some of the high profile corporate disasters of the 70s and 80s (such as Bhopal and Chernobyl); and the third phase which emphasised the social aspects of sustainability. The second and third phase largely depicted a gradual departure from the initial ‘compliance phase’ of sustainability to a more voluntary and strategic orientation towards it.

This has birthed the concept of corporate social responsibility after many critiques highlighted the overwhelming emphasis on the environment over any of the other sustainability themes.

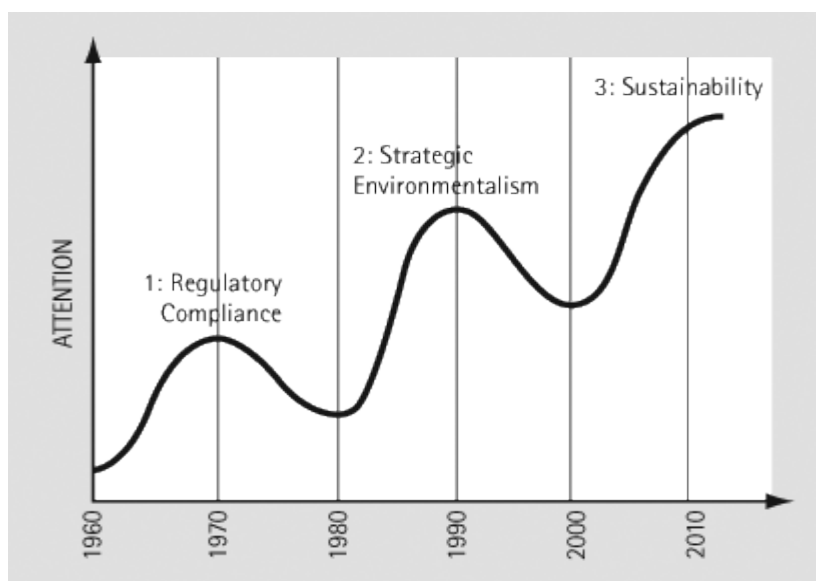


Figure 2.2: the three waves of corporate environmentalism, 1960-2010

2.3.3 Why firms engage with sustainability

Adopting new ways of doing things requires implementing new processes, investments in acquiring new skills and oftentimes adopting new techniques and technologies. This results in uncertainties for corporate organizations whose traditional interests were surviving and maximizing shareholder's profits. According to Dyllick and Hockerts (2002), the adoption of 'sustainable development' has been successfully occurring at the level of the firm with the adoption of eco-efficient principles and attention to social sustainability. van Marrewijk (2003) identifies three reasons why firms might adopt CS; either they feel obliged; they are made to do it or they want to do it. These resonate with the phases highlighted by Hoffman and Bansal in the sense that the first wave was driven by legislative compliance, the second driven by the firm's strategic interest to engage and lastly that sustainability is so far engrained in our consciousness that the firms are just genuinely concerned.

The literature also suggests that different firms have varying degrees of engagement with sustainability. van Marrewijk and Werre (2003) explored this further by identifying the values leading to multiple levels of implementation of corporate sustainability. The values-audit measures are: the core personal values of individual managers and employees; the core values within the current organization and the core values in the ideal organization (as perceived by the employees). They argue based on the position that there should be no universal yardstick for all firms with respect to CS. Therefore, these firms should determine their level of implementation based on its particular circumstances. The different ambition levels are identified in Figure 2.3.

Compliance Driven CS (Blue)	Profit driven CS (Orange)	Caring CS (Green)	Synergistic CS (Yellow)	Holistic CS (Turquoise)
Action primarily driven by response to regulations from authorities, charities or stewardship considerations. CS is deemed a duty, obligation or correct behaviour	This is the integration of social, ethical and ecological into business operations and decision making so long as it contributes to profit making	CS Consists of balancing economic, social and ecological concerns beyond profit or legal compliance concerns. Motivation is largely for human potential, social responsibility and care for the planet.	Involves a search for well-balanced functional solution in the economic, social and ecological realms of corporate performance in a synergistic win-together approach for all stakeholders	CS is fully integrated and embedded in every aspect of the organization in contributing to the quality and continuation of life of every being, now and in the future.

Figure 2.3: Colour coded ambition levels of Corporate Sustainability

More recently, it would appear that the lines of these levels are blurring with a higher uptake of sustainability among firms. Compliance, lower costs, concern for the environment and corporate image all combine to present a ‘business case for sustainability’. The business case for sustainability refers to the opportunities and benefits (see Figure 2.5) gained in being sustainable by business organizations (Salzmann et al., 2005; Berns et al., 2009). The business case for sustainability for corporate entities is discussed in general below while section 2.4.4 discusses the drivers for sustainability specific to the construction sector.

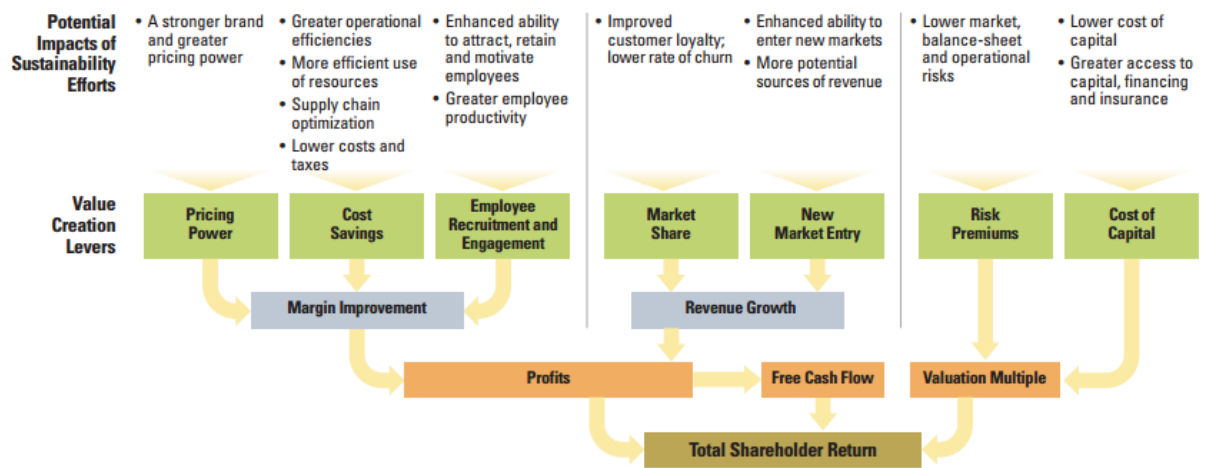


Figure 2.4: Potential benefits of Sustainability to businesses (Berns et al., 2009)

Cost efficiencies

Sustainability has been argued to bring about cost savings in the long run. This occurs in a variety of ways discussed by

- **Processes and technology:** increased focus on operating within environmental limits has brought about improvements in cleaner production methods and processes, innovation in technology and also material, energy, labour and product efficiencies Azapagic (2003):
- **Improved health and safety:** ‘softer’ social aspects of sustainability promote a safe and healthy environment for work. There is evidence that improved wellbeing translates into higher productivity of workers in the firm, a better motivated workforce, reduced lost time injury (LTI) and lower labour absenteeism. It also reduces the likelihood of claims for compensation and damages, and reduced dependence on social services.

Ease of doing business

Some of the fringe benefits of a positive sustainable corporate image include:

- **Company’s reputation:** A corporate organization displaying a commitment to sustainable development enhances its corporate citizenship status which boosts its image

and secures its social licence to operate. This also helps in attracting the best personnel to join the firm.

- **Market advantage and competitiveness:** some competitive advantage could be generated by a move towards sustainability (Russo and Fouts, 1997). Reinhardt (1998) identifies environmental differentiation which result in market premiums for a firm's goods and services. Also, implementing socially responsible schemes such as integrated supply chain management may allow building deeper relationships with customers and other stakeholders (Donaldson and Preston, 1995; Delmas, 2001).
- **Finance and insurance:** The potential gains of sustainability could result in lower loan rates or insurance costs from lenders, based on perceived lower risks achieved through implementation of a sustainability strategy. Also, there has been a rise in ethical and socially responsible investments where investors avoid unacceptable social and environmental performance.

Compliance

Regulatory provisions and standards are frequently identified as the starting point for driving sustainable change. Recent literatures on firm level sustainability do not frequently comment on compliance as a driver of sustainable practice compared to literature of the eighties or nineties for instance. However, this does not diminish the importance or impact regulations or standards (such as ISO 14001) have played in influencing corporate engagement with sustainability. Complying with such regulations and best practice places firms strategically and they have much less fines and damages to deal with.

2.3.4 How firms implement sustainability

Despite the business case for sustainability for corporate organizations, firms engage in sustainability in different ways (or not at all). Hahn and Scheermesser (2006) explored

different companies' approaches to corporate sustainability and classified them into sustainability leaders, environmentalists and traditionalists. Benn et al. (2014) describes six phases to characterise firms' engagement with sustainability. These phases are: Rejection, Non-responsiveness, Compliance, Efficiency, Strategic proactivity and the sustaining corporation

Azapagic (2003) summarizes the complexities of implementing sustainability; reactions to externalities such as market change and legislation, balancing and prioritizing each of the bottom lines, difficulty in appropriately quantifying the benefits of sustainability and even more importantly, how to translate the principles of sustainability into valuable business practise. To this end, he proposes a Corporate Sustainability Management System (CSMS) aimed at practical implementation of sustainability across its operations (Figure 2.5).

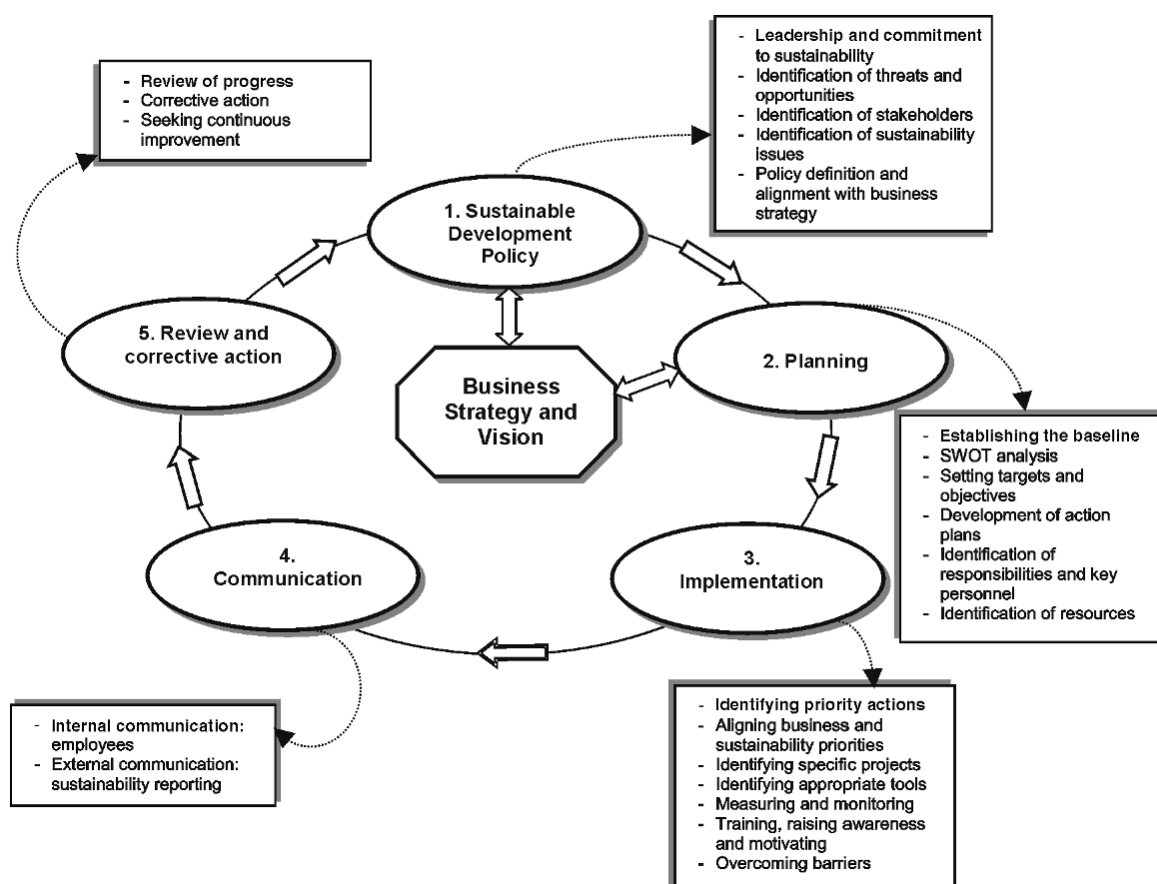


Figure 2.5: Corporate Sustainability Management System

The CSMS above is not presented nor discussed as a panacea to the challenges of implementing sustainability at the level of a firm. The major critique of such frameworks (such as this and Svensson et al., 2010) is that they hardly replicate what occurs in real life situations for corporate entities. Such frameworks are often presented as ordinal steps to be followed, where in actual fact, might occur in a different manner or for different reasons. However, it mirrors logical and strategic steps that are required to engrain sustainability into the vision and operations of the firm. Thus, this framework is used to structure the subsequent discussion of the literatures on corporate sustainability.

Business strategy, policy and planning

Discussions here centre on how firms consider and position themselves within the sustainability paradigm. This is ordinarily the remit of senior leadership (Berry and Rondinelli, 1998; Klassen, 2001) within the firm and key considerations at this stage are corporate identity (Paine, 2009), ethics (Carroll, 1991; López-Gamero et al., 2008) and regulatory compliance (Delbard, 2008). Once these firms become aware of, and identify potential benefits of implementing sustainability, it is imperative to provide a very clear direction the firm would like to thread towards sustainability. Werther Jr and Chandler (2010) argue that the rationale for firms implementing sustainability could be moral, rational or economic. Irrespective of the rationale, management translate sustainability principles into strategy, policies and action plans. D'Amato et al. (2009) explores leadership functions required for sustainability which often requires development of action plans, identification of responsibilities, resources, training and key personnel that are required to drive this agenda. Sustainability policies (Gallo and Christensen, 2011) have become an integral part of the vision and mission statements of such firms. This is required to demonstrate the leadership and commitment to sustainability, the opportunities, partners for sustainability and the sustainability issues to be addressed.

Implementation

The implementation phase requires translating strategy into action. Environmental Management Systems (EMS) have long provided a guide to implementing corporate sustainability by management. The implementation stage includes actions such as the recruitment and training of staff and restructuring the firm. At this stage, the plans are put into action, performance is measured, monitored and benchmarked against set targets and communicating outcomes. Azapagic (2003) summarises these tasks as identifying priority actions and alignment of the firm's business and sustainability priorities; projects for the integration of sustainability to business practice; appropriate tools for implementation and measuring and monitoring. Others are; data availability and collection; awareness training and motivating and overcoming barriers.

Communication

Sustainability reporting is a form of non-financial reporting which emerged in the 1990s as a major way of communicating the outcomes of a firm's corporate sustainability initiatives and achievements thus far. In competitive corporate environments, it demonstrates some form of accountability of the corporate governance of firms to the public (Kolk, 2008). Adams and Frost (2008) adduce the reasons why firms produce sustainability reports; i.e. for business, moral and practical reasons. In addition, sustainability reporting serves the following purposes; facilitates the tracking of progress against targets, convey the firm's commitment to investors, stakeholders and the public thereby enhancing its reputation, displays the firm's transparency and also propagates the message of sustainability internally within the firm.

Sustainability reporting is not without its own problems. There are questions regarding the limited adoption, scope, nature and credibility of contents, motives for production and contexts of such reports (Adams and McNicholas, 2007). Kolk (2010) indicates that larger

multinational firms are more likely to produce sustainability reports than smaller ones. Regarding contents, in an effort to standardize sustainability reporting, the Global Reporting Initiative (GRI) provides a standardized template for such reports (GRI, 2016). External verification helps to minimise the extent to which firms can claim sustainable impacts where little efforts have been put in place.

Review and corrective action

The implementation phase presents the opportunity for learning and review of the firm's sustainability progress. At the planning stage, targets are set and at the implementation stage, progress is monitored. From the review of sustainability documents and sustainability reports, it is possible to ascertain if these measures have yielded the desired results (Azapagic, 2003). This gives rise to identifying options for corrective action. The following sections discuss sustainability in construction and the implications for construction businesses.

2.4 Corporate Sustainability in Construction

The construction sector can be a major vehicle for advancing sustainability and corporate entities in this sector have a big role to play in improving our quality of life and reducing negative impacts stemming from design, construction and operations of buildings. This section of the critical review of literature explores corporate sustainability in construction.

2.4.1 Conceptualisation, awareness and knowledge

A lot of sustainability literature discusses how firms conceptualise and understand sustainability as this is important to their strategy. The early SC literatures such as Spence and Mulligan (1995), Hill and Bowen (1997), Ofori (1998), CIB (1999), Sjostrom and Bakens (1999), Bon and Hutchinson (2000) debated the meanings, theoretical provisions/underpinnings of SC, stimulated stakeholder interest and provided guidance and

directed research on this concept. Others such as Bourdeau (1999), Estes (1993) and Doyle (1998) further argue that these interpretations should be grounded within local contexts. The latter literature such as Kibert (2007), Reed (2007), HM Government. (2009), du Plessis (2012), Goh and Rowlinson (2013) reviewed the progress of SC, its relevance and the future trajectories for it.

In this body of literature, SC is presented as an unfolding interpretivist concept which in itself presents its own challenges for firms. The main challenges stem from the position that sustainability means different things to different people. Also, many of these literatures allude to the position that the level of awareness and knowledge of sustainability appears abysmally low amongst firms, resulting in different forms of engagement (or none at all).

2.4.2 Business case for sustainable construction

A number of studies have explored issues around how corporate entities make business sense of the sustainability agenda. Previous sections of this thesis have argued that SC is a fuzzy, constantly evolving agenda which can be subjected to a variety of interpretations by a wide variety of stakeholders. The business case for construction businesses is summarized under the following:

Design, construction and operating cost

Through renewed thinking and special emphasis on ‘doing more with less’ designs can become better alongside improvements in construction processes, resulting in lower whole life cycle costs. However, it is the operations of buildings that offer the best opportunities for cost savings. For instance, efficient buildings significantly reduce the amount of energy and water utilised. The adoption of efficient insulation and renewable sources of energy like photovoltaic panels or wind turbines reduce dependency on nationwide grids (Revell and

Blackburn, 2007). Feed-in tariffs (Ringel, 2006) offer owners of sustainable buildings an opportunity to earn an income by supplying excess power generated to the grid. On demand smart water and lighting systems, and rainwater harvesting are other ways in which operating costs can be reduced. Properties with higher energy performance certificates are suggested to have higher value due to life cycle considerations in the design with stage, maintenance costs are usually lower in these types of buildings (Fuerst et al., 2013).

Asset value, Risk mitigation and management

As investor and building users become more aware of the impacts of the built environment, there is growing demand for buildings with 'green credentials'. This growth may not be unconnected with the lure of lower operating costs of buildings mentioned in the previous section. This increased demand results in higher asset values for investors (Fuerst et al., 2013). Morri and Soffietti (2013) argues that the occurrence of 'green premiums' may be due to the transfer of increased costs of building sustainably. Similarly, in the real estate sector, sustainability is becoming a tool for managing risk (Lützkendorf and Lorenz, 2007). With buildings becoming ever so sophisticated, factors such as future value of property assets, resilience, obsolescence and efficiency have all become areas for consideration when assessing risk factors in real estate.

Workplace productivity and health

Sustainable buildings are argued to offer improved indoor environments such as air quality and as a result, improved well-being and productivity (Miller et al., 2009). Sick building syndrome and reduction in the workplace hours have been attributed to exposure to indoor environments (Redlich et al., 1997); Singh et al. (2010). Construction businesses stand to benefit by improving the workplace environment and also from the increase in demand from

clients for such facilities. Implementing safe operating environments for work also results in fewer claims for damages and litigation.

2.4.3 Sustainability standards and assessments

The key problem with sustainability stem from interpreting its principles across the spectrum of construction activities. The starting point was the development of assessment criteria, indicators and metrics as a means of managing the diverse concerns of SC (OECD 1991; United Nations Commission on Sustainable Development, 2001; Dickie et al., 2000; Ding, 2005). A variety of standards and assessment methods have been developed to translate SC requirements to actionable tasks for the construction sector. The following sections summarise some of these key standards that have driven corporate sustainability.

Environmental Impact Assessments

Environmental Impact Assessments (EIA) ranks amongst some of the earliest tools for used for assessing and predicting the extent of environmental impacts of human activities since the late 1960s (Wood, 1995). This system as the name implies is environment-centric and clearly inadequate to address the parallel concerns of society and economy of the more recent SD paradigm. However, EIAs are thought to be limited in computing off-site impacts of proposed developments (Lenzen et al., 2003).

Environmental Management Systems

Environmental Management Systems emerged as tool designed to help corporate organizations improve their environmental performance as firms tried to improve their environmental image and comply with environmental legislations of the early nineties (Berry and Rondinelli, 1998). EMS systems follow a 'Plan-Do-Act-Check' sequence and help firms integrate processes in their operations; environmental policy formulation, planning,

implementation and operation, checking and corrective action and management review (Liyin et al., 2006). The ISO 14001 remains the most widely adopted EMS system globally.

Building sustainability assessments

Building sustainability assessments are the most widely adopted strategy for implementing a green agenda and assessing building performance against sustainability criteria. According to Cole (2001), these tools *'have been key instruments in acknowledging and institutionalizing the importance of assessing building(s) across a broad range of considerations beyond established single performance criteria such as energy'*. These assessments also help to generate awareness and understanding amongst the building professionals as to the importance of sustainable buildings (Cole, 1998; Ding, 2008). Larsson and Cole (2001) argue that the research community and government agencies view rating and labelling systems as the most effective way of driving market transformation.

With the confusion surrounding the definitions and boundaries of sustainable construction, building assessment tools propose a standard definition in terms of performance requirements and help firms translate the confusing requirements of sustainable buildings into action (Yu and Jeong Tai Kim, 2011). As the landscapes for construction differ from country to country, bespoke assessment tools have been created globally for specific countries/regions. According to Kibert (2013), over sixty countries have developed or are developing country specific assessment criteria. Table 2.1 provides a snapshot of some of these assessment systems. The character of assessment tools lies in the different common criteria in which a proposed building can gain credits. These criteria are weighted so as to indicate the relative importance or priorities (trade-offs) of some criteria over others (Dickie et al., 2000).

Table 2.1: Some green building assessment systems and countries of use

Country	Label	Country	Label
Australia	Nabers/Green Star	Mexico	LEED Mexico
Brazil	AQUA/LEED Brazil	New Zealand	Green Star NZ
Canada	LEED Canada/Green Globes/ Built Green Canada	Philippines	BERDE/Philippine Green Building Council
China	GBAS	Portugal	Lider A
Germany	DGNB/ CEPHEUS	Singapore	Green Mark
Hong Kong	HKBEAM	South Africa	Green Star SA
India	Indian Green Building Council (IGBC)/(GRIHA)	Spain	VERDE
Italy	LEED/Italy/Procollo Itaca/GCCounil Italia	United States	LEED/Living Building Challenge/ Green Globes
Japan	CASBEE	UK	BREEAM

The proliferation of sustainability assessment tools has not been a solution to the challenge of green buildings in itself. Earlier versions of these tools were criticised for having an almost exclusive environmental focus without enough emphasis on the social and economic dimensions (Cole, 1998; Mateus and Bragança, 2011). Schweber (2013) argues the tensions between the need for comprehensiveness of the assessments to cover all impact categories of sustainability and the simplicity of use of the assessment. However, these methodologies have gone a long way to shaping the implementation of sustainability in the construction sector.

2.4.4 Drivers of SC

According to the CIOB (2013), a ‘business case for sustainability’ does not always exist for construction firms. However, there are a series of drivers: Government policies, legislations, technology, regulations and market forces ensure that other stakeholders develop an attitude to change. Through the breadth of SC literature of the past 30 years, constant mention is made of the dichotomies of drivers and barriers to this sustainable change. While this dichotomy simplifies the praxis of SC, they are important constructs which have been used to promote

the need for change on the one hand, and prepare stakeholders for the challenges they might encounter in the process on the other. Sustainability literature identifies a series of drivers of corporate sustainability. The RICS classifies these drivers as having either ‘push’ or ‘pull’ effects (RICS, 2016). The ‘push’ and ‘pull’ effects are distinguished by what is deemed within the influence of the firm or not. Neeteson et al. (2004) distinguish between formal (awareness, knowledge) and informal drivers of SC (legislation, regulations, treaties and voluntary schemes). Sayce et al. (2007) discusses bottom-up and top-down forms of drivers while Williams and Dair (2007) discussed pressures such as political and advocacy for a sustainable built environment.

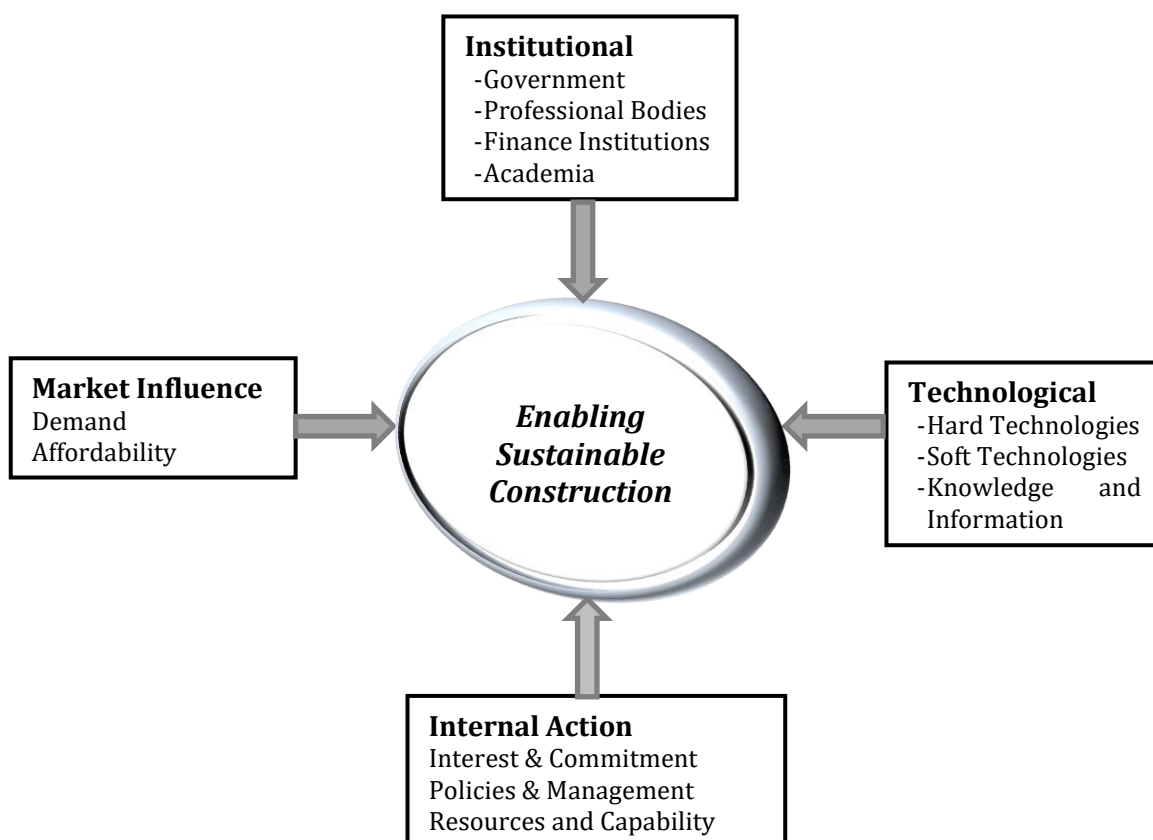


Figure 2.6: Enablers of Sustainable Construction

The initial driver of SC was its potential for mitigation of the negative impacts of construction on the environment (Pearce et al., 2012). These include reduction of wastes in terms of energy water and resources, conservation of non-renewable materials, reduction in global warming

and the protection and enhancement of biodiversity (Manoliadis et al., 2006; Qi et al., 2010). Subsequent literature such as Spence and Mulligan (1995) promoted softer drivers of SC where fringe benefits like increased business patronage resulting from green credentials and green premiums on property. du Plessis (2007) and Abidin et al. (2013) introduce the concepts of ‘enablers’ which are similar to drivers in some sense (Figure 2.9). A summary of these drivers are discussed subsequently.

Legislation Policy, and Regulations

Policy, legislation and attendant regulations have proved to be a big driver of sustainability in numerous countries using a ‘top-down’ approach. Together, they form a suit of institutional drivers (van Bueren and Priemus, 2002) for SC. Policies are a statement of intent: a deliberate system of principles that guide decisions to achieve rational outcomes. Policies can be activated at any stakeholder level. The policies emanating at the level of Governments shape how stakeholders respond to issues on SC. Legislations on the other hand compel sustainable actions at the level of the construction firm. Two broad types are identified in literature: international legislation (such as the Kyoto treaty or the UN framework convention on climate change) and national legislation which are usually peculiar to the context (for example, Land-fill tax in the UK and its consequent effects such as the implementation of site waste management plans (Morris et al., 1998; Martin and Scott, 2003)).

Other examples of regulations driving SC by compliance include the EU energy performance of buildings (Bull et al., 2012), EU renewable energy directive (Haas et al., 2011), EU Energy efficiency directive and Part L of the Building regulations, 2013. The mandatory nature of regulations means that stakeholders develop their capabilities to comply in order to avoid sanctions. One challenge with regulations is the issue of enforcement. Even in a mature

construction market like the UK, small and medium scale enterprises are often able to avoid strict compliance with no consequences.

Incentive schemes

Contrary to legislations which are ‘push’ factors, incentives are forms of support lent to stakeholders in stimulating positive actions and de-incentivizing negative actions towards sustainability. Usually granted by Governments, it has proven to be quite effective as highlighted by (Pitt et al., 2009). Construction stakeholders get special recognition, enhanced capital allowances, support and finance or tax holidays for embarking on a sustainability drive or utilizing sustainable products such as photovoltaic cells which are not cheap (Sayce et al., 2007). On the other hand, it may include increasing taxes on products or processes that are deemed undesirable; for example, landfilling wastes. The increased costs of such operations create an incentive to invest in cheaper and more beneficial strategies. This helps to mitigate the high costs often associated with embracing innovation or change. This position is supported by the findings of Brennan and Cotgrave (2014) in which “*it was expressed that disincentives rather than incentives would potentially drive SD in that it is better not to lose money than to make it*” (pg 322). In some other instances, demonstrating sustainability credentials is usually a pre-qualification requirement for some projects of a particular characteristic.

Markets: Demand, Corporate image and Competitive advantage

A few studies have explored the links between sustainability, business performance and competitive advantage (Wagner et al., 2001; Figge et al., 2002; Porter and Kramer, 2006). While much of these studies have been outside of the construction domain, Rodriguez-Melo and Mansouri (2011) and Tan et al. (2011) have demonstrated that this is applicable to the construction sector also. In much of the developed world, with being engrained in the social

fabric, sustainable buildings present a better corporate image for the construction firm. It has become more commonplace to ‘name and shame’ organisations with poor sustainability or ethical standards. Firms who regard their brand place high value in displaying their green credentials and showing that they are responsible corporate citizens (Heikkurinen, 2010). This in turn drives up clientele for such sustainable businesses (Bryson and Lombardi, 2009). Demand defines the function of value placed on products with sustainable credentials. Demand is a bottom-up form of driver that stems from market driven demand for goods and services that conform to sustainability. In the UK for example, there has been a steady rise in the number of applications for buildings conforming to BREEAM certifications.

Technology and benefits

Technology is often considered a barrier to SC, but has also been identified as being a potentially huge driver of SC. For new builds, refurbishments and retrofits, new products are constantly being developed that conform to newer standards for energy performance, embodied energy, and other requirements that might be stipulated in standards or client’s expectations. The potential cost savings from lower energy and water consumption, improved health from better indoor quality have been found to be drivers of SC. On the other hand, several commentators posit that new technologies suffer rejection due to entailing risks and unforeseen costs (Häkkinen and Belloni, 2011).

2.4.5 Barriers to the adoption of SC

Many barriers have been identified in literature as the challenges needing to be overcome by a stakeholder in the implementation of a robust sustainability agenda. Häkkinen and Belloni (2011) studied the ‘softer’ barriers to SC such as steering mechanisms, economics, client understanding and process changes. Others are underpinning knowledge risk perceptions and unforeseen costs. Williams and Dair (2007) identifies 12 barriers in a study of on sustainable

building in England. Matar et al. (2008) makes a distinction between two broad categories of barriers; general barriers and technical barriers. A summary of these are presented below.

General barriers

1. The lack of expressed interest from different project stakeholders.
2. The lack of training/education in sustainable design/construction.
3. The (perceived) slow return on investment in sustainable construction practices.
4. The (perceived) higher initial cost of sustainable building alternatives.

Technical barriers

1. The lack of a well-defined set of sustainable construction practices that can be practically engineered in construction projects.
2. The need for a well-developed framework of application for sustainable practices.
3. Lack of an optimum project delivery structure to attain sustainability.
4. The need for stakeholder specific drivers for change.

The confusion regarding the conceptual components of SC is the most often cited barrier to SC (Arif et al., 2009). The absence of a holistic and encompassing definition and boundary for sustainability in construction leads to confusion as to what exactly needs to be done. The limited awareness of the various effects of construction on the natural environment; the limitations in technical and knowledge of appropriate approaches of SC have also been reported as another barrier.

Sustainability management frameworks, while designed to guide the implementation of sustainability within a context have added another dimension of complexity. There are diverse tools which are either complicated or not context specific. Deciding which to implement and how has been regarded as problematic. Other barriers which practitioners cite are perceived high costs of adopting sustainability, policy, awareness, technologies, demand, (Zhang et al.,

2011; Bansal, 2002). Brennan and Cotgrave (2014) also deduced that higher costs, low client demand and risks were the biggest barriers to SC in the UK construction Industry. The findings of Pitt et al. (2009) echoed the similar barriers as Brennan and Cotgrave.

2.4.6 Construction stakeholders and sustainability

The construction sector is often described as a largely fragmented sector, combining the activities of a range of diverse stakeholders. The fragmentation and complexity of interactions between the different stakeholders with varying interests makes an already complex SC agenda difficult to implement (Whyte and Sexton, 2011). Despite these complexities, a successful SC agenda requires concerted effort and collaboration from these stakeholders (CIB, 1999; Shen et al., 2008). According to Cole (2011, pg 432), *‘changing buildings requires changing the context in which buildings are developed, designed, and operated and by implication, the role that various stakeholders play within this process’*. This can be quite challenging in a sector sometimes considered as being slow to adopt change (Brennan and Cotgrave, 2014).

Literature identifies various influences and contributions of stakeholders to the construction process and sustainability. A21-SC, Wallbaum et al. (2010), Cole (2011) and Bal et al. (2013) reference a similar list of stakeholders and their potential contributions towards a sustainable built environment. A summary of the stakeholders and the issues arising are;

Construction firms and Developers

Construction firms, through their activities are main consumers of natural resources and are amongst the major causes of environmental and social problems. Thus they are seen to have a huge responsibility of taking the lead in achieving a sustainable society (Dunphy, 2000). The motivations for construction firms and developers to implement sustainability in their

businesses stem from compliance to laws, improving corporate image, potential cost savings brought on by more resource efficient systems, competitiveness and increasing patronage of sustainable buildings. The role of developers is quite similar to clients on the one hand, and construction firms on the other. A21-SC (CIB, 1999) categorizes them in the same category as clients and owners. This research distinguishes them on the basis of strategic inputs they make in the design and construction of buildings relative to other types of clients and end-users. Developers are in a position to set sustainable demands and goals, while also responding to the demands for these types of products from the market. Zainul Abidin (2010) suggests that in Malaysia, large developers have shown some interest in SC, while small and medium companies are laggards.

Government

Governments are seen as being key in the sustainable construction agenda in two ways. Firstly, government at national and local levels are in a unique position to provide laws, guidance and incentives that can streamline the activities of the construction sector. Secondly, governments across the world often represent the largest client of the construction sector (Williams and Dair, 2007). From the onset of the sustainability agenda, almost all efforts were initiated by Governments or were directed at them. This is regarded as the ‘top-down’ approach for driving sustainability. This is exemplified by the fact that a lot of sustainability related research in the developed world refer to a government directive, initiative or legislation as the basis for change phenomena being studied (for instance, Bossink, 2002; Circo, 2007; Sodagar and Fieldson, 2008; Pitt et al., 2009). The obvious reason is that the sustainability agenda does not always present a business case for the other business minded stakeholders (Raynsford, 2000). A more effective way to drive sustainable change is for governments to get involved in line with the arguments of (Gan et al., 2015) by applying the necessary pressure and incentives on the sector. This is either by signing to international

standards and treaties, or developing laws and regulations, using price control mechanisms such as taxes, rebates or other incentives and funding sustainability teaching, research and development.

Client, owner and end-users

The procurement of the built environment is driven by the requirement of the clients, owners and/or the end users (Gan et al., 2015). This thesis makes the distinction between clients, who in some instances are the stakeholder who initiates the construction process and the owner or end-user who procures the asset after construction or obtains a lease to inhabit such a property. This brings to focus operational level activities such as user's behaviour which influences design considerations of the building. This influences the brief given by clients to designers therefore in determining the type and scale of construction, choice of design, procurement methods amongst others. This market driven demand for sustainable buildings is referred to as the 'bottom-up' approach to sustainability.

A survey of respondents in the UK construction sector by Pitt et al. (2009) identified the client as the most important stakeholder in determining SC practices. A21-SC recommends clients '*set concrete environmental demands on the parties involved in the design process as well as on the final product*' (CIB, 1999, pg 101). This recommendation is potentially problematic as some studies (eg, Brennan and Cotgrave, 2014) had suggested that the client's low awareness of SC was a barrier to SC. Thus, there are doubts as to whether clients are aware enough about SC to make such demands, or if they actually care enough to effect change. Also, despite the client being the driver of construction activities, they have not been the focus of many SC studies. Sterner (2002) is one of such few studies and concludes that clients in Sweden find the evaluation of environmental impacts of materials problematic due to inadequate evaluation models.

Designers/consultants

The design phase of the building life-cycle is the planning stage where the building's features, characteristics, materials and construction methods are specified. As stated by Mills and Glass (2009), sustainable building design occurs prior to the implementation of SC on site by the construction firm. At this phase, the designers and consultants to the client have an opportunity to consider the sustainability credentials of a building and make valuable recommendations in this regard. Magent et al. (2009) develop a design process evaluation system which identifies and evaluates critical decisions, define information required from various other stakeholders and identify stakeholder competencies. Project consultants also make informed decisions especially at the design stage. Assessment methodologies (discussed subsequently) such as LEED, BREEAM and Greenstar have been developed to aid design considerations at this stage. However, the knowledge of designers and consultants are not often enough to drive SC. For instance, Nielsen et al. (2009) found that sustainable design solutions are often regarded as risky in the Danish construction sector.

Suppliers/manufacturers

The material intensive nature of the construction sector means that the supply chain of construction materials contributes greatly to the sustainability agenda. In the UK, standards for ethical sourcing has been produced alongside other schemes such as BES 6001, Environmental Profiles and Environmental Product Declaration (Glass, 2011). These schemes have been developed to better inform stakeholders of their choices of construction materials. The arguments for a responsible supply chain starts at the point of extraction which is the purview of the manufacturer. The methods of manufacturing, the *embodied energy* and ethical considerations are subject to scrutiny. As for suppliers, their proximity to the point of utilization of the materials impacts the quantum of *grey energy* and thus, cannot be ignored.

Other stakeholders

Other relevant stakeholders include the academia and advocacy groups such as the World Green Building Council (WGBC), the CIB, and UNEP. The academia is responsible for ‘new knowledge’ and perspectives that drive sustainability initiatives while the advocacy groups stakeholders and drive the public consciousness towards sustainability.

The stakeholder challenge

Despite having individual stakeholder roles, responsibilities and interests discussed in literature (Mukherjee and Muga, 2010), many challenges still remain. For example, Williams and Dair (2007), Rodriguez-Melo and Mansouri (2011) and Berardi (2013) study different stakeholder perspectives on sustainability, while Cotgrave and Riley (2013) argue the inconsistent stakeholder views on sustainability. Cadman (2000) refers to the ‘vicious circle of blame’ between stakeholders (Figure 2.7) where no one takes responsibility for sustainability. Thus, there is a need for synergy of efforts between the different stakeholders.

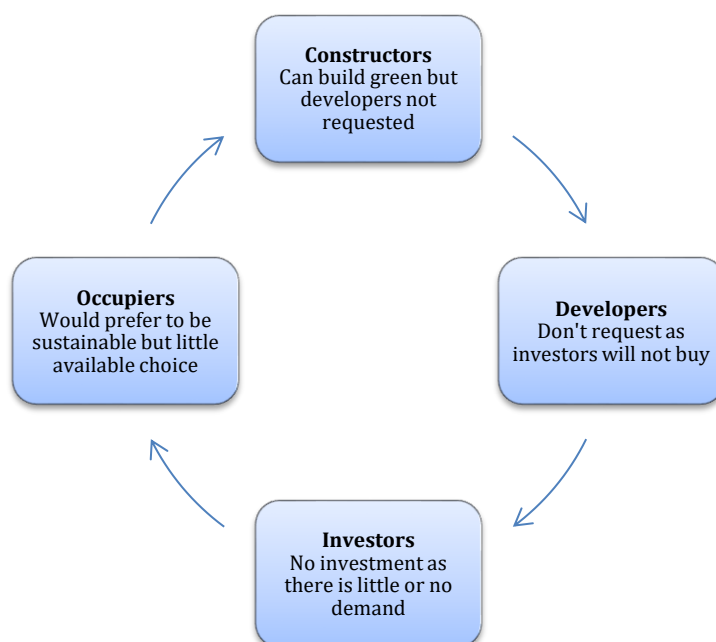


Figure 2.7: Vicious circle of blame (Cadman, 2000)

Shen et al. (2008) develop a collaborative framework for project participants based on a study of Hong Kong and du Plessis (2007) recommends the following actions for individual construction stakeholders in ensuring sustainability;

- Capacity building of the firm (internally and externally).
- Establishing partnerships and vehicles for cooperation across sectors and borders.
- Developing sustainable and accessible funding streams and methods for accessing these.
- Internal housekeeping to streamline organisational practices with sustainability.
- Developing and using appropriate mechanisms and tools for monitoring and evaluating organisational and industry performance.

Bal et al. (2013) came up with a stakeholder engagement process comprising of six steps for facilitating SC. Figure 2.8 maps the relationship of the contractor/developer with the other identified stakeholders and their roles (in red) in the construction sector.

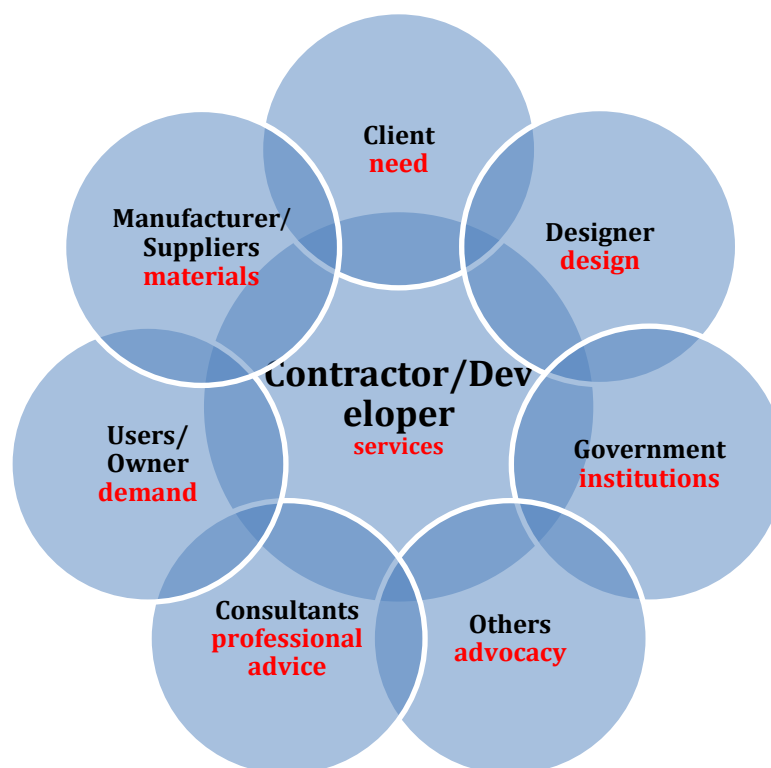


Figure 2.8: Stakeholder for sustainability

2.5 Synthesis of the Sustainability Literature

The nature of engagement of construction firms with sustainability has been covered in academic literature since the middle 1990s with the themes evolving over time. Researches have explored the underlying concerns which were triggers for the paradigm shift to sustainable thinking. There have also been a lot of attempts to conceptualise sustainability in construction, albeit with a lot of challenges. Sustainability in construction is still often viewed as an ill-defined, fuzzy, vague and confusing concept. Assessment methodologies have since played a big role in interpreting the requirements for sustainability. Importantly, other studies have explored what constitutes the drivers and business opportunities for construction firms (Revell and Blackburn, 2007).

Authors also make reference to SC as a journey of sorts. It is quite common to find in literature terms like ‘promoting SC’ (Moore and Rydin, 2008; Bakhtiar et al., 2008), ‘achieving SC (Dahiru et al., 2012; Bal et al., 2013)’ or ‘transition pathways’ (Rohracher, 2001; Westley et al., 2011). What these terms depict, or the strategies which should be used to mainstream SC become quite confusing for construction firms. This research argues that the biggest challenges of implementing SC lie in the firm’s understanding of SC and developing an appropriate course of action towards attaining SC goals. Over time, sustainability assessments have become increasingly important as construction stakeholders seek ways of translating the principles of sustainability into actionable, trackable strategies which could provide business opportunities for them.

Sustainability research in construction has also become more sophisticated. There has also been firm-level researches bordering on issues like green innovation (Qi et al., 2010), contractor improvement and performance (Tan et al., 2011), competitiveness (Li et al., 2011) and responsible sourcing (Glass et al., 2012). This means that the reasons for firms to be

sustainable have also become more complicated. However, considering that this research aims to understand the mainstreaming of SC in Nigeria at the firm level, this review identifies potential weaknesses and conflicts in the existing literature. Many of these ‘sustainable developments’ however have occurred more successfully in developed countries.

One resounding criticism of SC is that those who are most in need of newer, cheaper and more efficient forms of construction required to improve their quality of life are often those who are least equipped to make such change. This statement is made with developing countries in mind. Ofori (1998) in a ‘comment’ on Hill and Bowen’s (1997) seminal paper highlights the inadequacies of emerging strategies of sustainability to fit with the developing country context (especially those in Africa). Close to 20 years later, there is little or no evidence to indicate that Sustainability is a major concern in such developing countries particularly those on the African continent. All these researches appear to make assumptions that are not reflective of the realities in some of these developing countries. To establish current knowledge from literature, Chapter Three explores the sustainability literature on developing countries and positions this research specifically the Nigerian construction sector.

2.6 Chapter summary

This chapter has explored the sustainability literature in line with the research objectives set out in Chapter 1 (Figure 2.9). The chapter discusses the interrelated concepts of sustainability in construction and corporate sustainability and how they have shaped theory and practice. It explores the underlying concerns that led to the promotion of fresh ideas to the challenge of development. The chapter identifies the significance of the activities of the construction industry and why it is central in the sustainability debate. The review of existing literature helps us to understand SC as a constantly evolving concept aimed at mitigating the negative effects of construction. The chapter critically reviews how sustainability has shaped the

construction sector in recent times in terms of the products, processes and materials and how construction businesses are translating this into opportunities for business. The arguments surrounding an appropriate, encompassing definition of SC; the complexities of the various components/indicators; and the divergence of proposed strategies has resulted in varied understandings and interpretation on how sustainability is implemented by construction firms. It also emerges from the critical review of literature that majority of the progress made towards sustainable development have occurred in developed countries. The subsequent chapter offers a perspective and a critique of the African context and of the Nigerian construction sector which is the context under consideration for this research.

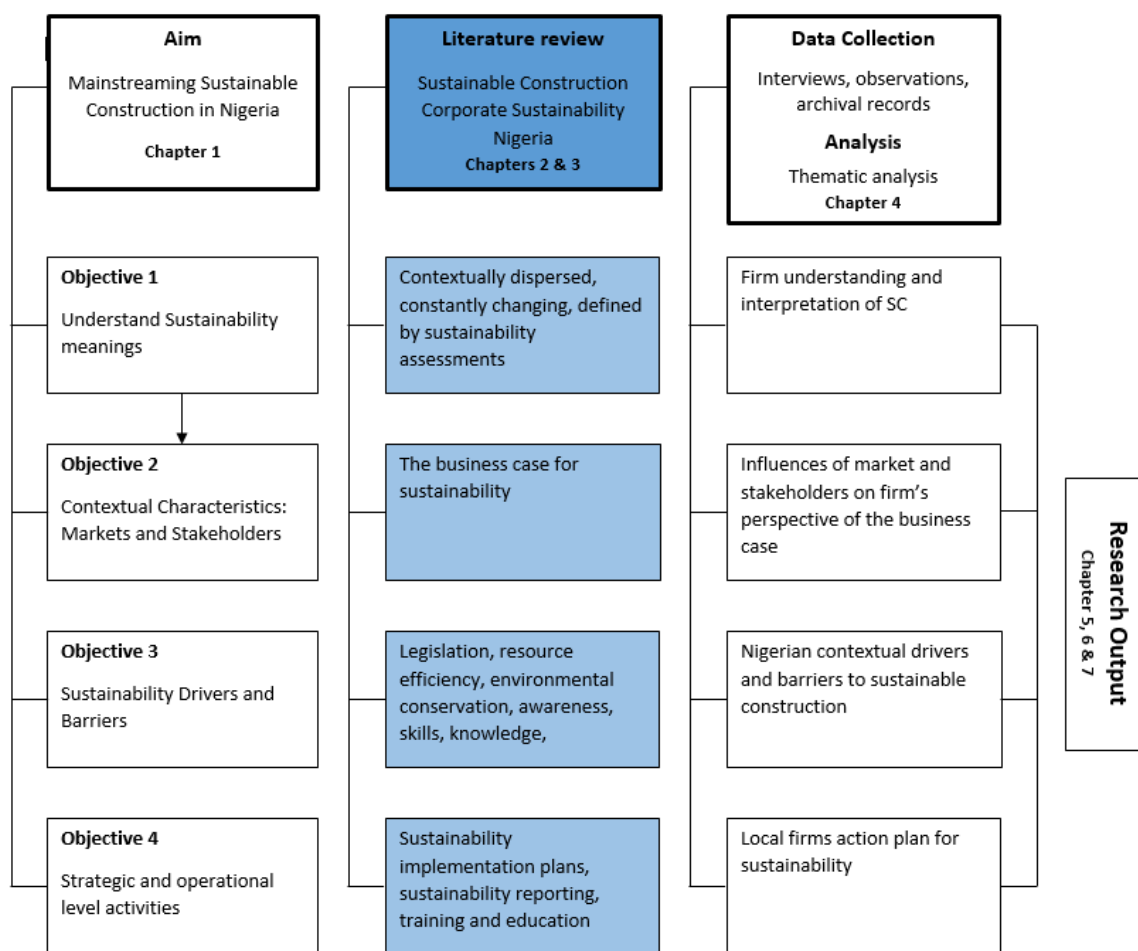


Figure 2.9: Positioning of the Literature in the Overall Research Process

CHAPTER THREE

THE NIGERIAN CONSTRUCTION

SECTOR

Chapter 3: THE NIGERIAN CONSTRUCTION SECTOR

3.1 Chapter Introduction

The previous chapter identified that a vast majority of the sustainability literature was concentrated in the context of developed countries. This prompted a cursory look into developing country literature on sustainable construction. The chapter also explores the literature on the construction sector of Nigeria, the country context where the empirical data for the research is sourced. This includes a historic overview of the demographic, economic, political and social characteristics of Nigeria. It then focuses on the construction sector and charts the historical antecedents that have shaped how the construction sector in Nigeria operates and its characteristics currently. The key regulators, regulatory frameworks and policy documents of the government which affect the activities of the construction sector are also explored. The chapter unlocks the current understanding of the Nigerian construction sector and the structural makeup that is likely to have a bearing on the performance of and willingness of construction firms to engage in sustainability practices. Reviews of SC specific publications in academic journals and also country reports by the Federal Government of Nigeria (FGN) and multilateral organisations such as the World Bank and UNEP are undertaken. These are presented in the subsequent sections of the chapter.

3.2 Sustainable Construction in Developing Countries

3.2.1 Developing countries

‘Developing country’ (DC) is a term widely used in literature albeit without characterization. This study adopts the World Bank income classification based on GNI; Low income economies, less than \$1,045, lower-middle income economies of between \$1,045 to \$4,125, upper-middle income economies of between \$4,125 and \$12,746; and high income economies of over \$12,746 (The World Bank, 2014). Majority of developing countries – especially in

Africa, and particularly Nigeria – fall into the low, lower-middle and upper middle classification (National Bureau of Statistics, 2014). This classification forms the boundary for developing countries in this research.

One key achievement of the Brundtland Commission was bringing to the fore, the dynamic tensions between poverty and environmental concerns. While developed countries have their fair share of environmental challenges, ‘softer’ social concerns are more prevalent in DCs. In much of the developed world, responsible and ethical conversations are beginning to dominate the corporate world and specifically organisations in the construction sector (Kibert, 2013). As DCs seek growth and development, questions arise as to if lessons have or can be learnt from these more developed contexts or if there are original stories from these DCs. The subsequent sections explore the literature of sustainability in developing countries.

3.2.2 Sustainability research in developing countries

Through this critical review of developing country literature on sustainability, it was observed that very little is reported on developing countries compared to developed ones. Even where they exist, there is a significant difference in the scope, depth and contents of these studies. For instance, Bourdeau (1999) makes the distinction and highlights the differences between sustainability practice in developed, transition and developing economies. In this paper, he drew from the experiences of 14 countries in discussing the main issues; barriers, policies, predicted changes and adaptations towards a sustainable built environment. He proposed a scalable global vision for guiding policy and indicators for Sustainable Construction (SC) to drive its uptake in less developed economies. In 2002, the Agenda 21 for sustainable construction in developing countries (A21-SCDC), modelled after the original Agenda 21 on sustainable construction was published to guide strategy and regional sustainability research in developing countries (du Plessis et al., 2002).

A few special journal issues on Agenda 21, SC and developing countries in *Construction Management and Economics (CM&E)* and *Building Research and Information (BRI)* journals recommend SC as a matter of urgency globally and especially for developing countries (Sjostrom and Bakens, 1999; 2005; Larsson, 2005; Ofori, 2007; Kibert, 2007). In the BRI special issue on sustainable development and regionalism, papers were published on the state of various regions in 2004 and they continue to highlight the difference between developing and developed country sustainability research. While developed country researches went into significant depth on specific sustainability sub-streams, developing countries were only attempting initiating and developing holistic sustainability strategies (2005).

The subsequent years showed a growing number of SC studies in developing countries. These studies have explored the conceptualization of SC (du Plessis, 2000; du Plessis, 1999), awareness issues (Reffat, 2004), sustainability strategy (du Plessis, 2007), sustainability policy (UNEP, 2011; Melchert, 2007), practice (James and Matipa, 2004; Steinert, 2008), energy (Urban et al., 2007) and assessments (Donald W, 1991; Ali and Al Nsairat, 2009). However, researches on sustainability in construction in developing countries, particularly those of the African continent are quite few and difficult to access, with South Africa happening to be the predominant country widely researched in these studies (Bourdeau, 1999; du Plessis and Landman, 2002; du Plessis et al., 2003; Gunnell et al., 2009). The following section explores the literature on corporate sustainability in Africa.

While a few guidelines and frameworks have been developed to stimulate sustainability in the construction sector of developing economies (du Plessis, 2007), it is difficult to discern from literature if this has been translated into business opportunities for construction businesses. Amongst the few studies on corporate sustainability in developing countries, Othman (2009) identified that 25% of architectural firms in South Africa were of the opinion that

sustainability was a marketing tool for the firms while the other 75% stated that ‘it was the right thing to do’.

3.2.3 The research problem explained

It is important for this research to note that the sustainability paradigm canvassed by the 1987 World Commission on Environment and Development had a particular focus and emphasis for uplifting developing countries. Around 30 odd years later, it appears that more steps have been taken in mainstreaming sustainability in more advanced countries than in developing nations. The construction sector plays a big role in achieving some of the goals of SD and holds the key for improving quality of life. The extensive literature review thus far has explored the implications of this thinking for construction businesses. A few issues emerge out of this review which shapes the direction of this research.

Context, as earlier identified plays an important role in shaping the sustainability strategies for construction firms. This means that the business case for sustainability might be different or non-existent for the developing world. For example, Irurah (2001) highlights a paradox where reference is made to the high levels of re-use and recycling of materials in slum dwellings in most of the developing world, but questions if the required quality of life is obtainable in those settlements. Would these attributes of SC be considered favourable? Pullen (2013) makes reference to an existing stock of buildings in England which are hundreds of years old that may not meet requirements for ‘high performance buildings’ of today. This creates a market for refurbishments and retrofitting, whereas, for most developing countries, much of the built assets are yet to be built and thus would generate a market in the design and construction phases.

There has been recognition of peculiarity of sustainable development in developing countries in Africa specifically (du Plessis, 2001; du Plessis, 2005; Marrakech Task Force, 2007;

Federal Ministry for the Environment, 2010). However, this research argues that the idea of an ‘African context’ discussed in these literatures is too generic. The size and diversity of cultures, climatic conditions and political landscape of the continent comprising of 54 sovereign countries means that the ‘one size fits all’ approach is not likely to yield much progress. However, several concepts and ideas contained in these studies are important to understand developmental priorities, limitations and barriers to sustainable construction within specific national contexts.

Different developing countries appear to be at different stages of adopting sustainability. For instance, a study comparing sustainability awareness in Nigeria with Malaysia reported a low level of awareness and knowledge amongst built environment professionals in Nigeria (Abolore, 2012). While this was similar to the situation in Malaysia, the significant difference was that the Nigerian respondents were reportedly coy about the future prospects for SC in Nigeria, while the Malaysian respondents were more optimistic.

From the critique of existing literature, it is also not clear if construction firms in Nigeria possess the capabilities or interest in SC. This is especially the case in a context where there are many other alternative priorities that are likely to be considered in the immediate. This research sets out to explore the question ‘are construction firms in Nigeria adopting sustainability principles?’ du Plessis (2007) suggests that the starting point for a sustainable construction sector in developing countries is to understand the country’s current situation. The next section of this review gathers perspectives of the Nigerian context which could inform or shape future strategies for firm-level SC in the Construction Sector.

3.3 Nigeria: the Research Context

3.3.1 Politics, economy and demography

Nigeria is located in the West coast of Africa and is Africa's largest country by economy and population. As of 2014, the World Bank estimated Nigeria's economy in Gross Domestic Product (GDP) terms at about \$568.5 billion with a population of roughly 178.5 million people (World Bank, 2015b). As a former colony of Great Britain, majority of the country's characteristics are influenced by its colonial legacies. For example, the official language is English and the nature of construction sector which is discussed in subsequent sections of this chapter.

Nigeria is a Federal Republic with the Government consisting of three tiers; the Federal level, State and Local Governments. Since 1999, the country has been experiencing uninterrupted democratic rule with three functioning arms of government: The Executive, Legislature and Judiciary. It also operates a present structure of 36 States and Abuja, the Federal Capital Territory (FCT) today with a further sub-division of 774 local government areas (FRN, 2010).

Nigeria is a lower middle income economy with a per capita GNI of \$2950 based on 2014 estimates (World Bank, 2015b). It is largely an agrarian economy but also has large quantities of Oil and Gas which is the Government's largest source of foreign exchange earnings. Recent economic growth between 2005 and 2015 made it one of the world's fastest growing economies. However, Nigeria still faces numerous challenges which are not unusual for similar developing countries. Among some of these problems are social inequity, institutional inadequacy, poverty, energy poverty, high illiteracy levels, unemployment and environmental degradation.

Table 3.1: Nigeria's 2013 GDP figures (₦¹ million) (National Bureau of Statistics, 2014)

Sector	2010	2011	2012	2013
1. Agriculture	13,048,892.80	14,037,825.84	15,815,997.51	16,816,553.01
2. Mining and Quarrying*	8,454,554.20	11,098,977.67	11,386,522.67	10,380,971.63
3. Manufacturing	3,578,641.72	4,527,445.06	5,588,821.69	7,233,322.48
4. Electricity, Gas, Steam and Air Conditioning Supply	179,472.19	275,853.54	375,844.05	492,675.21
5. Water Supply, Sewerage, Waste Management and Remediation	42,792.33	45,262.82	47,814.32	70,591.52
6. Construction	1,570,973.47	1,905,574.90	2,188,718.59	2,676,284.47
7. Trade	8,992,649.98	10,325,565.30	11,843,529.17	13,702,835.12
8. Accommodation and Food Services	245,760.58	283,376.43	353,222.80	648,392.25
9. Transportation and Storage	694,771.81	779,353.70	917,315.74	1,051,221.51
10. Information and Communication	5,955,059.67	6,379,560.10	7,266,722.68	8,359,406.86
11. Financial and Insurance	1,908,805.12	1,493,742.70	2,028,761.37	2,391,167.00
12. Real Estate	4,127,988.21	4,584,964.01	5,544,996.12	6,677,097.01
13. Professional, Scientific and Technical Services	1,711,698.01	2,175,732.74	2,632,335.44	2,953,818.88
14. Administrative & Support Services	13,140.14	14,806.77	16,070.40	17,891.85
15. Public Administration	1,998,470.88	2,471,238.64	2,210,045.75	2,384,903.57
16. Education	826,671.62	1,110,721.05	1,252,721.65	1,549,933.93
17. Human Health and Social Services	330,963.66	387,194.60	442,939.32	518,735.90
18. Other Services	900,022.87	1,000,970.13	1,684,479.51	2,023,269.82
19. Gross Domestic Product at Basic Prices	54,612,264.18	62,980,397.22	71,713,935.06	80,092,563.38

* Inclusive of the Oil and gas sector

The country is also characterised by very low levels of infrastructure and grossly inadequate housing stock for its population (Oxford Business Group, 2015). Saddled with the responsibility for providing infrastructure and the built environment is a relatively young but vibrant construction sector. Though the sector contributes only a tiny fraction to the country's GDP (under 3.5%), it has been growing at above 10 percent annually for each of the last 10 years. Table 3.1 shows the GDP figures for different sectors of the Nigerian economy in comparison to the construction and real estate sectors.

3.3.2 History of construction in Nigeria

The year 1960 is pivotal in Nigeria's history as the country attained self-governance. It should be noted that as at that year, there were very few urban areas in Nigeria and very little

¹ The official currency of Nigeria is the Naira (₦). Average official exchange rate in 2014 was £1=260

infrastructure (Smythe, 1960; Endsjö, 1973). The existing buildings and infrastructure at that time were built largely to serve the purpose of the colonial administration and the associated business of government that went on at that time. The swell in nationalistic pride brought about by self-rule resulted in a quest for development marked by rapid urbanisation and an overwhelming boom in construction activities. Majority of these projects were contracted by government in providing general infrastructure such as roads, bridges and dams, and institutional and residential buildings for education, government agencies and staff respectively. This also coincided with a period of discovery of oil which overtook agriculture as a source of income for Government.

A study of the history of construction activities indicates that earlier generations of the pre-Nigeria era comprised of vernacular architecture, using simple methods and traditional construction materials locally available (Rikko and Gwatau, 2011). These were usually constructed using non-stabilized earth bricks and palm fronds for thatched roofs. This form of construction is still prevalent in much of the rural parts of Nigeria. The first ‘modern’ buildings were constructed for early European settlers, churches and businesses. Some tribal chiefs also had pre-fabricated houses ordered from the UK and Portugal for assembly locally in Nigeria in the late 1800s and early twentieth century. Christian missionaries from the UK and migrants from former colonies of South America also shaped the architecture in some of the country’s earliest settlements, particularly in Lagos (FRN, 2010).

The organized construction sector in the country started to take shape in the early 1930s with activities of the Public Works Department (PWD) and the Royal Army Engineers (later transformed into the Nigerian Army Engineers) which was conducted mainly by direct labour (Mbamali and Okotie, 2012). Majority of these works were for the construction of offices and living quarters for officials of the colonial government in designated areas called Government Reservation Areas (GRAs). By the 1940s, a few European firms entered the country to offer

construction services on a contractual basis (Olowo-Okere, 1985). These firms brought with them technical construction expertise that were hitherto of very limited availability in the country. This signalled the birth of the organised construction procurement in Nigeria.

Shortly after independence, the Government of Nigeria instituted four ambitious National Development Rolling plans aimed at rapid growth and improving the standard of living (Ukah, 2008). The combined efforts of these development plans, the ‘Oil boom’ of the mid 1960s and the reconstruction efforts in the aftermath of the Nigerian civil war (1967-1970) resulted in an upsurge in construction activities (Ibietan and Ekhosuehi, 2013). It has been argued that many of these ‘development’ projects failed as they were poorly conceived, planned and worse still, executed. This was as a result of the relative inexperience of the young federal government at the time backed with large Oil-fuelled coffers and a strong desire for rapid development, but very limited in capacity. Also, this construction boom occurred at a time where the available skills and expertise could not cope with the rise in demand for construction. In the seventies, it was common to have calls for tenders ignored as there were many more jobs available than contractors that could execute them. The situation resulted in many local ‘emergency contractors’ with little or no expertise in construction filling in this gap (Adebayo, 1992). The consequence of this was an inevitable drop in quality of construction and degeneration of standards (Mbamali and Okotie, 2003).

3.3.3 Indigenous contractor development in Nigeria

The emergence of local emergency contractors resulted in the polarization of the NCS into ‘indigenous’ and ‘indigenised² foreign’ (Adams, 1995) or ‘international’ construction firms or multi-national corporations (MNCs) as some other literature refers to them. These foreign

² The term ‘indigenised’ refers to the ownership structure that became prevalent after changes to legislation required majority ownership by Nigerian indigenes. However, the management, staffing and technical expertise of these organisations remained largely foreign.

firms were usually larger experienced firms from Europe and other parts of the more advanced world. Foreign firms have always maintained some competitive advantages over their indigenous counterparts. Some of these advantages include; ease of access to the technology, machinery and foreign markets. They also possess higher capabilities, skill levels, experience, competences and easier access to low interest finances than their indigenous counterparts.

This research argues that the foreign-indigenous dichotomy exists till today despite efforts at indigenous contractor development. The late 1970s brought about the first government led initiatives of encouraging and building the capacity of these local contractors. This was done in several ways according to (Oladapo, 1977) by:

- The reservation of certain projects below a particular financial threshold of ₦100,000.00³ for indigenous firms only.
- Encouragement of partnerships/joint ventures with foreign firms on large projects.
- The formation of joint construction firms between Government and foreign firms.
- The promulgation of the indigenisation decree⁴ of the 1970s which stipulates between 40-60% Nigerian equity ownership.

One of the objectives of these initiatives and the indigenisation decree in was to facilitate the transfer of technology to local actors and achieve a level of self-sufficiency in terms of local manpower (Oladapo, 1977). These policies resonate with the recommendations of the ILO on measures for small contractor development in developing countries (ILO, 1987). Adams (1995) and Adams (1997) reports on the failures of most of these schemes. He reports that the

³ The exchange rate at the time was ₦1= \$1.25

⁴ Decrees are similar to acts of parliament and were the commonly promulgated 'laws' issued under military administrations. Majority of the relevant and useful ones were retained in the future constitutions of the country on transition to civilian administration.

major constraints for indigenous firms are uncertainty in supplies and prices of materials, procuring work, receiving payments and access to (affordable) capital. The latter study also revealed that a new crop of more competent contractors with relevant qualifications, skills and expertise was emerging in Nigeria with the potential to become large and competitive.

The summary of Government actions to improve the construction sector has been a mixed bag. While many of the initiatives were laudable and geared towards artificially nurturing a well needed industry to maturity, this research argues on the basis of anecdotal evidence of the NCS that these initiatives have not fulfilled their mandates. Instead, it has ended up creating undue advantages for a select few with access to government who are the largest client for the sector. Also, the desired effects of capability development by way of technology transfer has been very limited with Adams (1997) reporting that expatriate staff still dominate the management and technical functions in the foreign firms.

3.3.4 Nigeria construction sector characteristics

Given Nigeria's peculiar trajectory to nationhood and transition to a more modern society, its construction sector has evolved in its unique way in meeting the demands of its teeming population. The NCS grew at a rate of over 12% between 2006 and 2011, according to the National Bureau of Statistics (2014). The continued growth of the Nigerian economy, forecast by the NBS to remain around 7% until 2015, indicates a positive outlook for the sector. A critical review of academic literature, Government and consultancy reports highlights the characteristics of the NCS. These are discussed in the sections below.

Construction demand

As a result of a very large population and particularly the economic boom in the last decade, construction activities are in high demand in Nigeria. Just over a hundred years ago, many

Nigerian cities and urban areas did not exist. Mabogunje (1965) reported that as at 1952, just over 20 percent of the total population of 32 million lived in urban⁵ areas. Those dynamics have changed considerably with an estimated 47 percent of its current population of 177.5m living in urban centres (World Bank, 2015b) and requiring infrastructure such as roads, dams, buildings etc.. Traditionally, Government has always been the largest client for this relatively infant construction sector accounting for almost 90 of the sector's output (Oxford Business Group, 2011). Currently, strong fundamentals which include a high economic and population growth rate, a growing middle and upper class, rural-urban migration and an expanding business climate is supporting sector expansion and stimulating an increasing demand for housing, construction related services and improved infrastructure.

According to the World Bank, in 2011 Nigeria's population grew at a rate of 2.5% (UNFPA, 2011). Moreover, the UN has projected that Nigeria will experience the fastest urban population growth over the next 40 years, adding more than 200m people to the country's cities. This will place significant pressure on housing and infrastructure, but it will also create many opportunities for the construction sector. The World Bank estimates that the housing gap is around 12m-16m units while the FGN and projects that gap at between 15m-23m residential⁶ units (The World Bank., 2013; FMLHUD, 2014; Oxford Business Group, 2015). Efforts to alleviate the housing shortage are expected to drive demand for both construction materials and services.

⁵ Urban areas were defined then as compact settlements with populations of over 5,000 people.

⁶ Reliable data is notoriously difficult to come by in Nigeria. A very large informal sector coupled with a large population of people living in remote rural areas is partly responsible for this situation. Thus, figures on population and housing are usually made by statistical projections, resulting in a wide margin of error.

High competition

The factors identified in the previous section have created a high demand for construction in Nigeria. This has made construction quite lucrative with the NCS being described as a highly competitive construction market with several high profile foreign and indigenous firms competing for market relevance (Oxford Business Group, 2015). Adams (1997) also reports that by the 1990s, several indigenous firms began to emerge and compete for more technical projects than ever before. This is corroborated by the Coffey International (2014) report on the NCS. A recent entry of major Chinese construction firms has shifted the balance from the largely European firms that previously dominated the Nigerian construction market (Babatunde and Low, 2013).

Material (import dependent)

The NCS is heavily dependent on imports for most its materials, especially those that require industrial processing. Nigeria imports a lot of finishes including tiles, furniture, paints and gypsum. Some of these trends have begun to change recently. Some researchers such as Olotuah (2002) attribute the 'high costs' of construction to the dependence of imports and hence target local material development as a panacea. The sector however makes use of locally produced timber, aggregates and some stone finishing, and more recently, Nigeria attained self-sufficiency in local cement production. However, there is certainly plenty of scope for increased demand. Nigeria's per capita cement consumption was 126 kg in 2013, compared to a global average of 510 kg, according to (Cemnet, 2014).

Cyclical and sensitivity to oil price movement and inflation

The NCS has is cyclical and has demonstrated very high sensitivity to oil price movements. Three reasons are advanced to help explain this phenomenon. Firstly, oil is the largest foreign

exchange earner for the Nigerian economy. This makes up about 95% of the Government's earnings. Secondly, Government remains the largest client of the construction sector. As a result, construction activities boom during times of high price yields and expenditure shrinks during low prices (Olatunji, 2010; Aregbeyen and Kolawole, 2015). The Nigerian economy has also historically passed through many phases of high inflation rates. This resulted in significant cost overruns stemming from fluctuations to price levels in the economy. This often resulted in disputes, and subsequently time overruns and sometimes suspension or outright abandonment of construction works (Mansfield et al., 1994). As for the cyclical nature of construction, this is due the effects on weather. In most parts of Nigeria, construction activities are at the peak during the dry season and simmers down during the intense rainy season during the middle of the year.

Domination by large/foreign firms

The binaries of indigenous and foreign construction firms have been covered earlier. However, with the comparatively low level of private sector demand compared to public sector demand, the NCS does not comprise very vibrant small and medium scale firms of most countries. The sector is not fragmented into specialist trades and subcontractors like say the UK for example (Coffey International, 2014). It is quite common to find all trades and specialization in one construction firm. The competitive advantages of foreign owned firms discussed earlier results in domination of about 70 percent of construction output by revenue (Coffey International, 2014). Majority of the indigenous construction firms are one man businesses with very short lifespans. Figure 3.2 depicts the structure of the NCS.

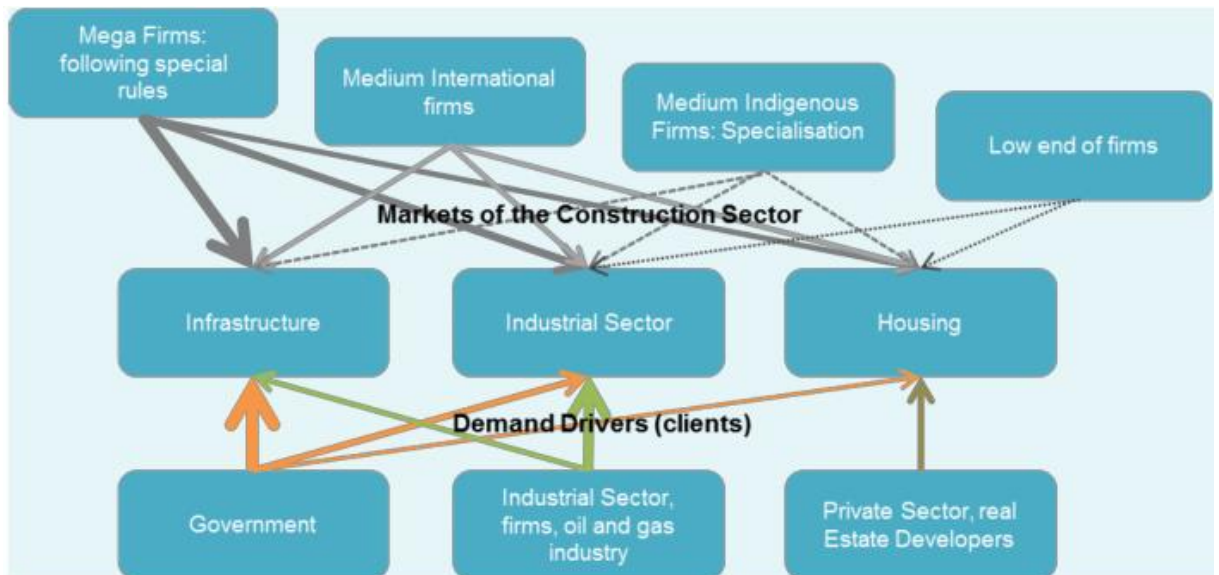


Figure 3.1: Structure of the Nigerian construction sector (Coffey International, 2014)

Capital intensive

This characteristic is typical of construction in general. However, in the Nigerian context, several other factors come into play that increase the dependence on capital. Unreliable supply chains, poor procurement management, fluctuations and a high dependence on importation of construction materials and foreign expertise often increase costs associated with construction (Okpala and Aniekwu, 1988; Coffey International, 2014). The high costs of capital also results in plants and equipment being relatively expensive to operate. Nigeria also ranks poorly on the ease of doing business scale (World Bank, 2015a).

High dependence on unskilled manual labour

With a large population, high levels of unemployment and high cost of plants and equipment, the construction sector in Nigeria is highly dependent on manual labour (Idoro, 2012). Much of this labour is unskilled and they undertake labour intensive tasks such as excavations and demolitions. The cost of labour is also very cheap due to a large pool of unemployed willing to undertake such tasks. This has an impact on time and quality of works (Oyedele et al.,

2015). The manual labour usually constitute the large informal sectors that characterise developing countries which are argued to be vulnerable by Wells (2012). This problem ties with one of the central messages of the SD paradigm.

3.3.5 Challenges of the Nigerian construction sector

The importance of the construction sector to developing countries cannot be overemphasised. It accounts for up to half of fixed capital formation and employs a sizeable proportion of the labour force (Henriod and World Bank., 1984). Much of the infrastructure and buildings required for optimal economic output are direct products of the industry. More so, it is particularly important for developing countries that not only have to maintain a large existing stock of buildings and infrastructure, but have to build them from the scratch. However, it is quite common to come across literature that engages with the characteristic challenges of the construction sector.

The construction sector in Nigeria is reputed to be very small based on the size of the economy. Previous estimates record it at just 1.3 percent of GDP based on 2013 figures. However, three potential challenges exist with that figure. GDP figures have been revised⁷ using a different base year resulting in an 89% jump in overall GDP figures; 2) there a very large informal sector which is not captured in this amount; 3) this excludes the real estate market. Coffey International (2014) recommends that for a similar developing country with infrastructure gaps, the size of the sector should be five to ten times larger.

Buoyed by demographic and economic growth, Nigeria's construction sector has the potential to become the largest and most competitive on the continent (Mitchell, 2013). In all areas of

⁷ An exercise was carried out jointly by the NBS and ministry for finance under the auspices of the World Bank to review the base year for the calculations of Nigeria's GDP from 1990 to 2010. This resulted in an 89% jump in GDP estimates from \$270 to \$510 billion for the year 2013. As a result of this revision, two separate estimates exist for Nigeria, the pre-2014 and post 2014 estimates.

the sector, from basic infrastructure to privately developed real estate, pressure from demand is rising. This has already attracted several players to the market, and the number of contracts on offer is set to dramatically increase in the coming decade. However, if the country is to realise its full potential, there are a number of challenges that need to be looked into first. While the operating environment has improved for construction contractors over the past five decades, there are still concerns over many regulatory, administrative, structural and fiscal aspects of construction in Nigeria. Highlights of these challenges are:

Access to finance

Financing construction projects has been a long lasting characteristic of construction in developing countries including Nigeria. Akintoye and Renukappa (2012) identify several challenges of finance in developing countries including globalisation and inadequate banking. While the Nigerian banking sector has strengthened considerably in the past decade, construction businesses still struggle to raise cheap capital in the Nigerian market. This gives the foreign players a strategic advantage as they are able to raise cheaper and larger capital offshore. (Coffey International, 2014)

Lack of reliable construction data

The reliability of data and statistics from Nigeria is quite questionable and as a result, it is quite common to see a wide range of figures in estimating data. The National Bureau of Statistics (NBS) in recent times has strengthened their data collection capabilities. However, concerns remain about reliable statistics such as population, rural-urban migration, employment figures to mention a few. The large proportion of the population living in rural areas, coupled with a large informal sector makes it difficult to collect reliable data.

Poor or limited managerial and technical skills

The Nigerian construction sector, in addition to its challenges of finance and unreliable data, is beset by low skills levels and shortage of skilled manpower (Oladapo, 1977; Ngoka, 1979). The manifestation of the poor managerial abilities of the NCS is exhibited by time and cost overruns (Mansfield et al., 1994; Dlakwa and Culpin, 1990; Aibinu and Jagboro, 2002), low productivity (Adams, 1995) and the dominance of foreign construction firms in the large commercial/public sector construction markets. Adams (1995) recommends emphasis on managerial and entrepreneurial skills for built environment professionals in Nigeria.

Inadequate regulation of construction activities

Weak institutional provisions mean that construction activities often go unregulated. The consequences of this include abysmally high levels of building collapse, haphazard urban developments and substandard materials. Milford (2012) identifies two types of institutions; builder and contractor associations and development institutions. In Nigeria, there has long been talk of a construction industry development board. However, this is yet to materialise and the limitations of institutional regulations in Nigeria have been expressed in previous sections of this thesis.

Transparency

The issue of transparency is one that plagues developing and developed countries alike, though to varying degrees (Ofori, 2012). The NCS has been riddled with allegations of lack of transparency and corrupt practices (Ameh and Odusami, 2010). These allegations are difficult to prove and even more difficult to research due to the reluctance of personnel or firms to discuss the issue. However, corruption continues to be mentioned in studies on the NCS for

instance Aniekwu (1995) and Bala et al. (2009). Corruption is reputed to have a profound effect on the quality of construction and a source of revenue loss to construction stakeholders.

Land administration

Land administration in Nigeria Access to land is reported as stifling the activities of the construction sector. Access to land remains relatively difficult especially in rural areas and on the fringes of urban areas. This is despite the Land Use Act⁸ of 1978 (modified in 1990) which sought to regularize the multiplicity of land tenure systems across the Northern and Southern regions of Nigeria from the colonial days (see Mabogunje, 2010; Omole and Akinbamijo, 2012 for more). Mabogunje (2010) while acknowledging the ease of access to land for the government, further elaborates on the negative effects the Act had in Nigeria and in particular for the construction sector.

Energy poverty

The contributions of the energy sector to the economic development of nations has been studied by authors such as Ebohon (1996), Wolde-Rufael (2005) and Akinlo (2008). The 48 countries of Sub-Saharan Africa, with a combined population of 800 million, produce roughly the same amount of power as Spain, a country of just 46 million. This constrains Africa's growth and keeps hundreds of millions in poverty. The situation is equally as dire in Nigeria as peak daily national power output wildly fluctuates between 3100 – 4,800MW out of an installed capacity of just under 10,000MW (Adaramola and Oyewola, 2011). Estimates project Nigeria's total demand for 2015 at roughly 30,000 MW (Sambo, 2008). Oyedepo (2012) reports on the implications of energy poverty in Nigeria as the reliance on fossil fuels

⁸ This Act abolished freeholds in Nigeria. According to the Act, all land in Nigeria belongs to the government and is divided into urban and rural land. The powers of management and control are vested in the State or Local Governments of the Federation, held in trust for the common benefit of the population.

to power local energy demands. This has negative effects on the indoor and outdoor air quality (Stanley et al., 2011) and costs of operations of household and businesses, including construction.

3.3.6 Regulatory frameworks and key regulators

The regulatory climate for construction in developing countries has widely been reported to be weak and inadequate (see Table 1.1, Chapter 1 of Ofori and International Council for Research and Innovation in Building and Construction, 2012). On the evidence of existing literature, Nigeria is not an exception. For example, until 2006, there was no nationally approved code for construction in the country and till date, this has not yet gained legislative backing and is yet to be enforceable (Federal Republic of Nigeria., 2006). Ajayi and Ikporukpo (2005, pg 362) conclude from their analysis of Nigeria's environmental strategies that regulatory frameworks in Nigeria have been '*piecemeal, poorly executed and have never been approached in a systemic way... while urban planning and land use have suffered from absence of land planning statues that encompass the evolving functions and responsibilities of urban areas*'. Governance of the sector's activities is achieved by a mix of imported standards, regulation by professional bodies and local development control authorities. This review is carried out with legislative provisions for SC in mind.

Development control agencies

The origins of development control laws stem from relics of the colonial government. The first nationwide development control act came by virtue of the Nigeria Town and Country Planning Act of 1946. This was replaced by the Urban and Regional Planning decree No 88 of 1992. These laws were adapted to the various states of the country with the setting up of regional town planning departments. The states have the powers to create building bye-laws to regulate the construction of the built environment (Aluko, 2011). There is very little

evidence of legislative provisions that govern the activities of these development control bodies. The infrequency of updates and the inadequacies of the existing laws suggest that they are unlikely to drive a sustainability agenda that has become mainstream only after the last update to the laws.

Government Ministries, Departments and Agencies

The federal government of Nigeria (FGN) operates a three tier structure of Ministries, with constituent Departments and Agencies (MDAs). There are several ministries of the Federal Government that are actively involved with the construction sector. They are the ministry of Works, the ministry of Lands, Housing and Urban Development (FMLHUD) and the ministry of Environment⁹. The ministry of Works oversees the procurement of Civil and Heavy Engineering Works of the FGN such as dams, roads and bridges while the FMLHUD oversees policies and programmes on land use and administration, housing procurement and urban developments. The aptly named ministry of Environment oversees environmental issues such as the notorious oil producing Niger Delta, pollution, desertification and erosion. Notable departments and agencies under these ministries concerned with the construction sector is the Budget Monitoring and Public Intelligence Unit (BMPIU) for ensuring standards in the tendering process, the National Environmental Standards and Regulations Enforcement Agency (NESREA) for developing and enforcing environmental legislation in the country and the Infrastructure Concession Regulatory Commission (ICRC) for regulating Public Finance Initiatives (PFIs) in infrastructure procurement in Nigeria.

⁹ In the past, these ministries have either not existed, or existed as one combined ministry. The creation of separate ministries under these titles is an indication of the growing concerns actualizing infrastructural, housing and environmental goals of the country.

Professional regulatory bodies

In the absence of enforceable building regulations in Nigeria, the responsibility of regulating the conduct of built environment professionals rests on the shoulders of professional bodies and their regulatory arms. These regulatory bodies set the minimum benchmark for academic training in their respective disciplines. They also issue practising licenses to members and require them to carry out their responsibilities in conformity with the British Standards (BS) and the American Society for Testing and Materials (ASTM). The most relevant regulatory bodies to the built environment are the Council of Registered Builders of Nigeria (CORBON), the Council for the Regulation of Engineering in Nigeria (COREN) and the Architects Registration Council of Nigeria (ARCON). Others are the Quantity Surveyors Registration Board (QSRB) and the Town Planners Registration Council (TOPREC). A review of their websites and publications does not reveal any concrete inclination towards SC, despite coining annual conferences with sustainability amongst the themes. Also, a study by Ameh et al. (2010) on the curricula of built environment degree courses yielded little evidence of sustainability in their contents.

Advocacy groups

Advocacy has played a big role in the quest for sustainable construction. In Nigeria, recent moves within the construction sector have seen the emergence of the Green Building Council of Nigeria (GBCN) with the status of a prospective member since 2012. Again, there is little takeaway in literature on how the GBCN has shaped the adoption of SC within the construction sector in Nigeria. In 2014, a local context report for adapting Greenstar-SA for use in the Nigerian construction sector was developed at the behest of the GBCN. The report recommended minimal changes to the structure, weightings and credits but with recourse to existing environmental or other relevant laws in Nigeria (WSP Group Africa (Pty) Ltd, 2014).

The Green Deal Nigeria, an initiative of the Heinrich Böll Foundation is another advocacy group aimed at encouraging green practices in Nigeria. It promotes this through competitions, publications and other means of awareness in many sectors including the construction sector. The foundation reports cases of green best practices in Nigeria. Examples of such are the affordable green housing for Nigeria and the Makoko-Iwaya waterfront opportunities. The efforts of the foundation are often blurred along the lines of sustainability.

3.3.7 Relevant construction policies, regulations and reports

In attempting to keep up with these commitments to construction sector growth and sustainable development, several initiatives have been undertaken by Government and/or stakeholders in the country. A review of some of these initiatives is given in the review of several policy documents in the subsequent sections:

Indigenization decree

The Nigerian Enterprises Promotion Decree (commonly referred to as the indigenization decree) of 1972 and 1977 has shaped the types of construction firms by ownership in Nigeria. Between independence in 1960 and the year when the decrees were issued, the big business in the Nigerian economy, including the construction sector were largely foreign-owned. This led to concerns about limited opportunities for indigenes. The regulations regarding ownership structures were reviewed leading to ‘nationalisation’ of many foreign owned companies and assets. The effects of this decree are still widely debated today. It is reported to have resulted in the loss of valuable technical expertise and investments but also largely credited for providing opportunities and a more equal platform for competition between foreign and indigenous firms.

National policy on environment

Responses to Environmental issues in Nigeria have largely been reactive rather than proactive. The environmental consciousness of the 1980s and an incidence of dumping of ‘toxic waste’ by a European firm on Nigerian soil in 1987 were the triggers responsible for the setting up of the Federal Environmental Protection Agency in 1988 and the development of a policy on Environment in 1989 (Ogbodo, 2009). Prior to this time, many loosely connected, sector-specific policies of different aspects of the environment existed in numerous government departments across the country (Ajayi and Ikporukpo, 2005).

The policy goals were to raise awareness, ensure environmental quality, conservation of natural resources and restore, maintain ecological processes and facilitate cooperation with foreign partners. Section 4.3 of the policy addresses construction, housing and human settlements while section 4.6 covers land use and soil conservation, along with strategies to be pursued (Federal Environmental Protection Agency, 1998). The provisions of the policy have been criticized as not been robust enough, imbalanced to different sectors, poorly executed and inadequate (Areola, 2001; Ajayi and Ikporukpo, 2005). The policy has undergone only one review in 1998¹⁰ as part of a vision to implement a robust environment agenda by the year 2010.

Anecdotal evidence suggests that the strategies for the construction sector are not adequate bearing in mind the activities and size of the sector and neither is the implementation. This can be explained by the focus on Oil related spills in the oil producing Niger-delta region, problems of desertification in the North of the country and erosion in the south appearing to have been given more priority than the effects of construction (Ajayi and Ikporukpo, 2005). In

¹⁰ The 1st Nigeria National Environment Summit reports that the National policy on Environment has undergone a review as at 2008 but was yet to have been published. There is no evidence that this has occurred since then.

summary, the policy on the environment is viewed as having limited impact on its broad objectives and being very limited in terms of the environmental requirements of the construction sector today.

Draft objectives and strategies for Nigeria's Agenda 21

As a participant to the Rio summit in 1992, Nigeria displayed her interest in SD by taking several steps in line with the outcomes of the summit. One of these steps included the drafting of the Nigeria Agenda 21 (NA-21) with the following objectives; integration of the environment into development planning, transit to SD address sectorial needs and strategies and foster global partnerships (NESREA). The NA- 21 did not contain any reference to the construction sector, nor recognise its prime position in the SD debate. This is however unsurprising due to the time of publication because as at that time, the concept of SD was just about taking shape. A historical appraisal of the application of this document suggests that (NA-21) never did gain any major traction in the country, or the NCS in particular. It is quite possible that the Nigeria Agenda 21 might have been prepared to fulfil a need to show compliance to global expectations at the time. The various related government documents, policies or guidelines that have emanated subsequently do not make any reference to it.

National building code

The first National Building code for Nigeria was produced in 2006 (reviewed in 2013) as the output of a process which began in 1987. Prior to that time, the building construction sector operated without any bespoke minimum standards developed for it. Buildings were designed and constructed based on earlier versions of British Standards and the ASTM. In the development of the code, input was sought from the seven recognised professional bodies of the Building Industry in Nigeria: Architecture, Building, Engineering, Estate Surveying and Valuation, Quantity Surveying, Surveying and Urban and Regional Planning (Federal

Republic of Nigeria., 2006). The need for the code as contained therein is based on the following existing conditions:

- a. Planlessness of towns and cities;
- b. Incessant collapse of buildings, fire infernos, and related disasters;
- c. Dearth of referenced design standards for professionals
- d. Use of untested products and materials
- e. Lack of adequate regulations and sanctions against offenders.

While the development of a code is a positive step, some concerns remain. It is yet to be passed into law by the legislature and is used only for reference purposes rather than compliance. The code development is expected to be a continuous iterative process slowly evolving to capture many other aspects of Buildings not yet incorporated. It does not make any significant contribution to any of the principles of sustainability (Dahiru et al., 2012). This study found the code to be limiting in provisions for a sustainable built environment, citing the absence of energy efficient designs and low carbon materials.

Report of the First National Environmental Summit

A first ever national environmental summit was convened in October 2008 with participants from the Federal and State governments, civil society and Academia in conjunction with the United Nations Development Programme (UNDP). This summit was held ‘to raise National awareness on the imperative of sustainable environment for national development and provide a dialogue framework for all stake holders to put the intricate linkage between environment and socio-economic development in proper perspectives and to further prepare the country to respond proactively to global environmental challenges’. The summit had over 700 participants and covered 12 environmental themes (Federal Ministry of Environment Housing and Urban Development, 2008).

Table 3.2: Environmental themes for group work and outcomes

Theme	Const. Emphasis	Comments
NEEDS/MDGs/7-Point Agenda and the Environment	No	Ecological problems, pollution, coastlines
Population, Lifestyles and Environment/Gender and Natural Resources Management	Partial	Environmental pressures brought on by population: urbanization, infrastructure and population.
Natural Resources Management for Sustainable Development/Food, Agriculture and Water Resources	No	Ecological belts of Nigeria, effects of oil exploration and desertification, water and food challenges
Oil and Gas in the Niger Delta and Environment/Energy Technology and Environment	Partial	Clean and renewable energy are discussed but not in strong relation to the built environment/Problems of the oil producing Delta
Environmental Hazards (Floods, Erosion, Drought and Desertification)/ Coastal Marine Environment Public	No	Erosion, desertification and inadequate institutional strategies
Awareness and Environmental Education	No	Education, curricula improvement,
Environmental Enforcement and Compliance/Environmental Statistics and National Accounting	No	Statistics, data collection, policy evaluation and laws.
Combating the Impacts of Climate Change	No	Institutional provisions for combating climate change
Transboundary Environmental Issues/Environmental Governance (local, national and regional integration – ECOWAS, NEPAD)	No	Regional Cooperation
Pollution and Waste Management/Environmental Health and Sanitation	No	Construction conspicuously absent from sources of pollution, health issues associated with the environment
Financing Ecological Problems	No	Institutional frameworks
Industry, Trade, Tourism and Environment	No	Inadequate/obsolete laws,

The report commented on three main technical themes: The Nigerian environment and economy, environment and development issues and sustainable development and financing environmental management. The participants of the summit were grouped into 12 themes (see Table 3.2) under which key issues affecting the environment were discussed. Despite being convened by the Federal ministry of Environment, Housing and Urban Development, no direct relationship was established between the state of the environment and the construction

sector. As a result, no suggestions or policy directions were advanced for mitigating the established negative effects of construction.

Local content act

Similar to the indigenization decree of the 1970s the Nigerian Oil and Gas Industry Content Development Act (popularly referred to as ‘local content’ act) was enacted in 2010 to increase indigenous participation in the Oil and gas industry by prescribing minimum thresholds for the use of local services, labour and materials and to promote transfer of technology and skill to Nigerian staff and labour in the industry. While this act was largely targeted at the Oil and Gas sector, it has immense contributions to the construction sector due to Oil and Gas being a lucrative client of the construction sector.

The Act applies to operators, contractors, manufacturers, services and other entities involved in any project in the oil and gas industry. A local content monitoring board was established to implement the provisions of the Act. A similar bill for the establishment of a local content act for the Nigerian construction industry is currently under consideration at the National Assembly. A review of the proposed bill by Fernz et al. (2013) critiques it for lack of clarity, proper characterization of the NCS and absence of identifiable targets for the industry.

Millennium development goals reports

Nigeria is a signatory to the millennium declaration with the Government showing commitment to its implementation. Goal 7 has a target of ensuring environmental sustainability. The MDGs share a common goal with Nigeria’s development ambitions as enshrined in its constitution, the transformation agenda and the Vision 20:2020. The MDG reports of 2010 and 2013 indicate that the country’s progress on goal 7 is slow with plenty of room for improvement. It also cites paucity of reliable data streams as a restriction to

adequately tracking progress. In 2015, the MDGs transit to the Sustainable Development Goals (SDGs), which have been expanded to 17 goals. Nigeria is also a signatory to this SDGs and the construction sector is expected to play a vital role in meeting the goals.

Vision 20:2020

This planning document by the FGN sets a strategic roadmap to becoming one of the top-20 economies in the world by the year 2020. According to the Central Bank of Nigeria, Nigeria would need US\$510 billion in investments in infrastructure between 2009 and 2020 if the nation is to achieve its vision of being one of the top-twenty economies in the world by 2020. The Vision 20:2020 document sets the agenda for how Nigeria could achieve sustainable development in becoming a top 20 economy by 2020. The document is replete with themes from the SD paradigm (National Planning Commission, 2009). The increasing demand for good quality housing is expected to be a key catalyst for industry sales growth. Consequently, it is anticipated that demand will remain strong, in the coming years.

National Environmental (Construction Sector) Regulations, 2011

As part of the restructuring and positioning of MDAs of the Nigerian government, NESREA morphed out of the old FEPA in 2007 (Ladan, 2012). Amongst the mandates of the NESREA are; to enforce all environmental laws, guidelines, policies, standards and regulations in Nigeria and enforce compliance with the provisions of all international agreements, protocols, conventions and treaties on the environment to which Nigeria is signatory. To this end, between 2009 and 2010, NESREA gazetted 24 new environmental regulations, one of which is directly targeted at the construction sector. This construction sector environmental law covers a few of the issues pertaining to environmental sustainability in construction such as site waste management plans, storm water drainage, lighting and dust and fugitive emissions. Others are restrictions in the use of hazardous substances such as asbestos and noise controls.

The regulation is the strongest indication of the government's resolve to tackle environmental issues stemming from construction and the closest to any provision for any of the themes of sustainable construction. However, some concerns are raised from a review of this regulation, side by side similar regulations in the UK. The Nigerian regulation attempts to cover a very broad range of concerns, but is quite limiting in depth. Some of the provisions appear ambiguous which could leave the regulated unclear as to the true interpretations of the regulations. For instance, no clarity is provided for what is meant by 'construction facility' or 'best available technology'. In a similar environmental protection legislation for England and Wales, contestable items such as 'controlled waste' or 'hazardous waste' are defined as a guide. In other words, they are more explicit (2011). Another challenge for the regulators is the limited geographical spread of the regulator, with presence in only 22 out of the 36 states in Nigeria. However, the development of such a regulation remains a welcome step

Green economy: Nigeria's path to Sustainable Development

This document was produced as the country report to the Rio+20 summit in 2012. The report comprehensively addresses the concerns of governance, population growth, education, poverty, urbanization and the environment in general. The report lists urban housing and livelihoods as one of its areas of interest and intervention (Federal Government of Nigeria, 2012). The strategies to encourage this are not clear, neither have any concrete progress been made since the publication of the report in 2012.

3.4 Critical synthesis of Sustainable Construction in the NCS

There is enough evidence in literature to suggest that Nigeria has some interest in pursuing development that is sustainable. The Nigerian Government is signatory to several international conventions and protocols which support the goals of SD such as the United Nations Framework Convention on Climate Change (UNFCCC) and MDGs. It has actively

participated in the Rio, Rio+5, Johannesburg and Rio+20 summits. Local stakeholder's summits for SD have been convened, while some local environmental legislation have been and continue to be developed. Whether this has resulted in any tangible results in the construction sector cannot be deduced from this extensive review of literature thus far. What has clearly been lacking in these efforts of the government are i) inadequate institutional guidance, drivers and regulation; and ii) the absence of a specific construction industry focus to these efforts as is the case in much of the developed world. Most of the regulatory efforts are aimed at the Oil and Gas sector. For example, in 2011, five Natural Environmental regulations were gazetted, all related to oil spills. Figure 3.3 shows a timeline of notable SD/SC events globally and Nigeria for comparison.

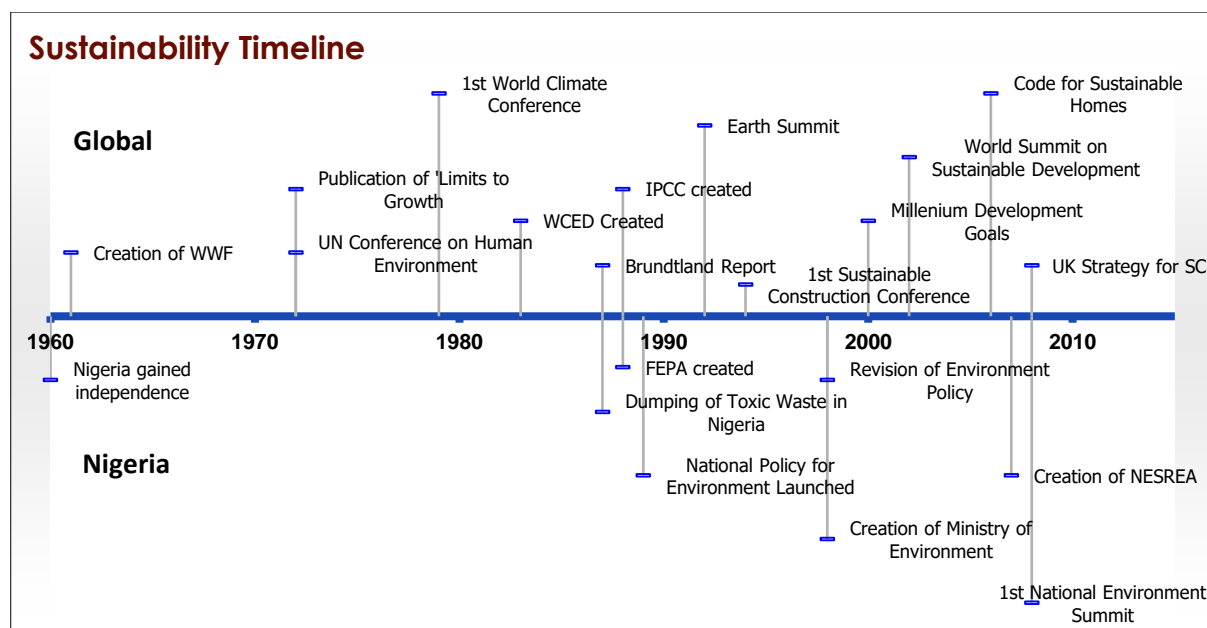


Figure 3.2: Comparative sustainable construction timeline

This review suggests that the awareness of SC is still in the very early stages in Nigeria. The existence of some literature especially dating from the later years of the 2000s indicates that sustainability in construction is on the horizon in Nigeria. Increasingly, in the local Nigerian academic literature, sustainability is becoming a buzzword for built environment research. For example, Dania et al. (2007) and Oladiran (2009) explored the practices of construction waste

management by firms. Daramola and Ibem (2010) studied sources and effects of environmental problems in urban areas while Dahiru et al. (2012) studied the adequacy of the National Building Code in driving SC in Nigeria. Other researchers such as Otegbulu and Adewunmi (2009) and Amao and Ilesanmi (2013) studied the contribution of the housing sector to the sustainable development of Nigeria and Ameh et al. (2010) explored the adequacy of sustainability content in built environment professional's training .

While some sustainability studies on the NCS exist, the direction, content, vigour and reliability of these studies does not address the research problem identified in this research. The use of the terms sustainability, SD or SC in some of these literature are oftentimes misapplied. In other instances, these studies highlight the multitude of barriers or the inadequacies of provisions within the country to drive SC. The research methodologies often conflict with the methods of data collection. However, they reflect that there is growing concern and awareness within the Nigerian context. The construction market in Nigeria is dynamic and open to forces of innovation, technology transfer and globalization of best practices. The evidence in literature is that the discussions on SC and the implications for industry are beginning to grow. However, this study is designed to explore if this interest in sustainability is replicated amongst contracting firms.

3.5 Concluding thoughts

This chapter reflects on the sustainability literature pertaining to developing African countries. It explores the significance of the differences in sustainability application and the appeal to construction businesses between the developed and developing countries. As it is argued that the context is key to shaping the approach firms take towards their engagement with sustainability, the chapter also explores the Nigerian construction sector. The age of the sector, the stakeholders, the socio-economic features, infrastructural demand, clients and

technical capabilities all interact to create a peculiar industry. External pressures of globalisation ensure that the markets are not only subjected to forces from within. Innovation and technology are open to a young industry filled with competing firms looking to provide construction related services to a teeming population projected to reach 400 million by 2050. In meeting these demands, it becomes imperative to explore what lessons can be learnt from the developed world and if firms see business opportunities in delivering the built environment sustainably.

It is widely agreed that sustainability has to be shaped, understood, accepted and implemented within local contexts. While the FGN has toyed on the surface with several initiatives incorporating sustainable development as the main theme, none of these initiatives clearly identify the construction sector's contribution to SD. The current remit of sustainability in construction goes clearly above the provisions in any of these official government positions on SD. It remains to be seen how far these initiatives have gone, if there are any impacts on the construction sector or if SC is being adopted in any form. In Nigeria, the construction sector's impact on national development is well appreciated. However, its sustainability footprint is grossly ignored from an institutional standpoint.

This thesis argues that researches on the construction sector in Nigeria are limited in terms of coverage, rigour and approach for understanding the sector's performance or how the sector makes sense of sustainability in construction. Majority of the researches on various aspects of the sector adopt a largely quantitative approach. Thus the opportunity to explore or understand certain features of the sector through this review is limited. Based on the evidence of this review, the current body of knowledge is inadequate to inform how firms engage with sustainability in Nigeria. This research proceeds to study how construction firms engage with sustainability within the local context of Nigeria using a qualitative approach.

3.6 Chapter summary

This chapter has presented a combined review of the African sustainability literature and historical and anecdotal perspective of the NCS. It is considered important to understand the path dependencies and forces that have shaped the NCS so as to provide a background against which to understand the responses of construction firms in adopting sustainability. The characteristics, institutional and regulatory frameworks are explored. So also are the historical and current challenges that the sector stakeholders have to deal with.

CHAPTER FOUR

METHODOLOGY AND RESEARCH

DESIGN

Chapter 4: METHODOLOGY AND RESEARCH DESIGN

4.1 Introduction

This chapter explains the research approach used to investigate the mainstreaming of sustainability by construction firms in the Nigerian construction sector. The two previous chapters explored the extensive and complex sustainability literature and the contextual issues facing developing countries and Nigeria in particular. This chapter sets out the scope of the inquiry and describes the steps taken to collect, interpret and analyse relevant. This chapter covers the following issues; (1) the research design; (2) the rationale for a multi-case study research design (3) the data collection methods and development of an analytic framework; (4) description of the data analysis and (5) the ethical issues concerning the research.

4.2 The research design

The literature review indicates that very little is understood about the practice of SC by corporate organisations in the Nigerian Construction Sector (NCS). Thus, the focus of the research was to seek rich insights and perspectives of corporate sustainability from selected construction firms in Nigeria. The research design considered and critiqued the science of methods philosophies and approaches of previous researches in this area.

Historically, the positivist paradigm is seen as dominating sustainable construction research. For instance, studies such as Sterner (2002), Majdalani et al. (2006), Sayce et al. (2007), Pitt et al. (2009) and Serpell et al. (2013) adopted quantitative approaches in studying SC. The study by Pitt et al (2009) followed a deductive approach and developed propositions from literature which were tested against questionnaire responses. Many other studies follow a similar pattern where categories or themes are developed from literature and compared with responses from questionnaire surveys. The data is computed in numerical and statistical terms and discussions of the distributions of responses follow. The commonality across these

quantitative researches is that they tend to 'measure' the phenomena under investigation or establish causality on the basis of 'how', 'what' and 'when' questions. However, certain gaps appear with these types of studies.

Quantitative researches are purported to have limited explanatory powers and seldom yield new information other than the categories (or themes) the researcher set out to investigate. Also, other questions arise as to the reliability of the findings of some of these researches. For instance, Zainul Abidin (2009) and Serpell et al. (2013) both alluded to a pervading state of low awareness of SC in their respective country contexts, but proceeded to question respondents on a subject they had earlier claimed the respondents knew little or nothing about. Thus, the quantitative approach would have been soliciting responses for which the respondents might have no credible answers for. The quantitative studies of Abidin and Pasquire (2005), Pitt et al. (2009) and Ogunbiyi et al. (2013) were conducted in more suitable country contexts where an active sustainability agenda was in place. It was more likely that the respondents of quantitative surveys would have some idea about sustainability, thus providing more realistic answers and giving the findings some validity.

Seymour et al. (1997, pg 118) argues against the dominance of the realist ontologies and epistemologies in the context of construction research by stating *'interpretative methods that researchers and managers use to make sense of the world.....that is primarily concerned with meaning rather than causality, and produces an account that recognizes the respective viewpoints of practitioners in the process'*. This viewpoint recognises that the Construction Management discipline involves understanding the interactions between individuals and groups alongside the more technical aspects.

Qualitative strategies have also been mobilized in SC researches where the focus was on understanding the 'how' and 'why' factors of the occurrence of sustainability. Authors such

as du Plessis (2007) employed a qualitative desktop study, while examples like Williams and Dair (2007), Häkkinen and Belloni (2011) and Brennan and Cotgrave (2014) used qualitative methods to understand respondent's worldviews of SC. Brennan and Cotgrave in particular conducted an exploratory, qualitative study on the current prevalence of SD practice in the UK construction sector from the perspectives of construction professionals. They premise the justification of the choice of a qualitative approach to the possibility of providing a *'more in depth view as to why the status quo remains with regards to SD in the CI (UK construction Industry) and what can be done moving forward to achieve SD'* (Brennan and Cotgrave, 2014, pg 316).

Having critically reviewed corporate sustainability in construction in Chapter 2, it is understood that sustainability is difficult to define and that stakeholders within the construction sector respond to the contextual pressures and opportunities when making strategic decisions that underpin sustainability. The plurality of definitions suggests that the 'interpretations' and constructed meanings of sustainability by corporate entities would equally be varied. Also, the focus on variability of context also discountenances the idea of an 'objective', external reality to these firms. It is quite likely that these constructed meanings shape how these firms respond to SC in their operations.

This research is aimed at understanding how construction firms operating in Nigeria understand corporate sustainability and engage with SC and importantly, why. Thus, in understanding the context specific meanings and actions of firms on SC in Nigeria, the research takes into cognizance that 'reality' is socially constructed by subjective interpretations of these firms. It is for this reason that a qualitative research underpinned by a constructivist ontology and an interpretivist epistemology are deemed more appropriate and used to guide the research strategy and techniques of this study. According to Pink et al. (2013, pg 2-3), *"deeper understandings of the realities and lived experiences of those within*

the industry would enable problems to be reframed in ways which account for both the specificities of the contexts to which they relate and the socialities, materialities and experiences through which they unfold”.

4.2.1 Case study design

After the detailed study of different qualitative research designs, a multi-case study design was deemed the most suitable and adopted for this study. Case studies are research designs that involve the intensive study of a typical phenomenon called the case. According to Yin (2009), case studies are empirical inquiries that investigate a phenomenon within a real-life context in which multiple sources of evidence are used. Case studies could be designed as either quantitative or qualitative researches depending on the nature of the enquiry (Yin, 1981). This research adopts a research design that draws primarily on qualitative data based on the arguments presented in the preceding paragraphs. The growing choice of case studies as a research design in construction studies is as a result of several advantages of this approach, many of which align with the requirements of this study and characteristics of the research problem which are:

Exploratory study and little understood context: Hartley (1994) argues that case studies are most appropriate for exploring new processes, behaviours or phenomena that are little understood. The fuzziness regarding how sustainability is understood and practiced in the NCS emphasizes the exploratory nature of the research questions emanating from the literature review. This research argues that the original thoughts and actions of these firms are considered to be of more value at this early stage of understanding firm-level adoption of SC.

The literature has also indicated that wider contextual factors influence the mainstreaming of sustainability and this implies that a proper understanding of the contextual settings of the NCS is important. Dyer and Wilkins (1991, pg 616) advocate for ‘better stories’ by

questioning *'whether the researcher is able to understand and describe the context of the social dynamics of the scene in question to such a degree as to make the context intelligible to the reader and to generate theory in relationship to that context'*. Case studies have been used effectively as a research design in similar researches due to the recognition of the limitations of quantitative methods to explain social phenomena under investigation. Thus, a qualitative case study provides an opportunity to probe these thoughts and actions of the firms.

Answers the 'how' and 'why': The critical review of literature was unable to ascertain if 1) there is a sustainability agenda in the construction sector of Nigeria; 2) if contracting firms practice sustainability or not and why; 3) how the practice of sustainability might be unfolding in this context. Thus, the case study research design was deemed suitable to understand how these firms might implement sustainability and the strategic reasons why this might be the case.

Flexibility: Based on the exploratory nature of the enquiry with many unknowns, it was difficult to fix the approach and methods of the data collection. Qualitative case studies offer flexibility in their design and deployment without compromising key attributes of reliability and validity. This flexibility becomes highly valued especially in such an exploratory study where it is difficult to predict what the responses or findings are. The research involved a period of immersion in Nigeria for six months while the data was being collected. The value of flexibility of research design afforded by case studies was that changes could be made to the research design while on the field rather than having to make multiple trips while modifying the research design to ensure its fit for purpose.

In-depth: The rigour and depth of the enquiry is a vital characteristic of research and of utmost importance in case study researches. According to Sarantakos (2005), case studies are in-depth enquiries involving the sourcing of first-hand information from subjects with a focus

on direct and verifiable life experiences. While case studies are well suited to single and specific historical events or ‘exemplary cases’, several researchers such as Eisenhardt (1989) advocates for richer data by studying more than one case. Based on this argument, multiple cases were selected for this research. Case study researches are not without their weaknesses which include; lack of generalizability of findings (applicable to most qualitative research); the personal impressions and biases of the researcher; lack of replicability; and the interviewer effect. These are discussed in section 4.5

4.2.2 The case study process

Eisenhardt (1989) enumerates a robust process for utilizing the rich data generated by multiple case study research. The rigour of the process prescribed is also applicable to exploring the practice of SC by firms in Nigeria. Thus, the process is slightly modified (see Table 4.1) from its original focus for theory generation to resonate with the objectives of this research. The steps in this process are discussed subsequently.

Table 4.1: Case study research process (adopted from Eisenhardt, 1989, pg 533)

Step	Activity	Reason
Getting started	Definition of research questions and identification of a priori constructs	Scoping or research, identification of relevant constructs
Selecting cases	Identification of potential cases based on characteristics, relevance and willingness to participate	Focusses efforts on contextually useful and cases
Crafting instruments and protocols	Multiple data collection methods and processes for data collection	Synergistic view of evidence and strengthens grounding of findings in empirical data
Entering the field	Gaining access, overlapping data collection and analysis, including field notes. Flexible and opportunistic data collection methods	Speeds analyses and reveals helpful field adjustments to data collection. Facilitates exploration of emergent themes and unique case features
Analysing data	Within case analysis and cross-case patterns using divergent techniques	Gaining familiarity with data, forcing examination of data beyond initial impressions by comparing multiple lenses
Discussions	Connection with conflicting and/or	Builds internal validity and sharpens

	similar literature	constructs
Conclusions	Synthesizing the findings and contribution to knowledge up the thesis	Potential answers to research questions and future application to research context

4.2.3 Getting started (literature review)

This step was carried out by an extensive review of literature conducted to understand the foundations and evolution of the sustainability in Chapter 2. Amongst the major issues observed from the sustainability literature is that firstly, developing countries have very little studies represented. Secondly, of the notable ones that apply to developing countries on the African continent, for example, Agenda 21 for sustainable construction in developing countries (du Plessis et al., 2002) and research papers of du Plessis (2007 for instance), they make great contributions to moving sustainable construction in Africa forward. However, they lack empirical data supporting the prescriptions for sustainability adoption in those developing countries. This research is intended to study SC differently by collecting empirical evidence from construction firms.

An integral part of this research borders on the research context. It was important to understand the context of the construction sector in Nigeria, prior to data collection to develop a rich picture of the sector, and also during the data analysis stage to make sense of some of the responses of the interviewees. This was done in Chapter 3 through the review of country reports, government policies as well as academic literature on the NCS and also through the case study. In summary, the literature review was carried out to achieve the following goals:

1. Provide a good foundation for the research by understanding the development and evolution of SC.
2. Identifying the research problem and question.
3. Understanding what is known about the context in which the research is situated.

4. Provided the basis of collecting and analysing the data on sustainability adoption by firms.
5. Provide a basis for interpretation of the findings of the research.

4.2.4 Selection of Case Study firms

In order to generate rich data as argued by Eisenhardt (1989), multiple firms were selected for this study. As described in Chapter three, the NCS is characterised by an indigenous - multinational firm dichotomy. This has implications for technical capabilities, access to capital and types of clientele available to these firms. Thus, it was considered important understand the thinking and approaches of different categories of firms operating in Nigeria towards sustainability.

Characterization of firm by size and ownership

The classification criteria were not straightforward. For instance, the Ministry of Works in Nigeria classify construction firms by virtue of the category of registration of project size in terms of monetary value. This was deemed inadequate for several reasons; firstly, the value of the Nigerian currency in which the classification was denominated has been subjected to numerous fluctuations over the years, making the values somewhat meaningless. Secondly, it did not factor in crucial criteria of company size based on turnover, capabilities and ownership structure (international or indigenous). For this reason, a more robust classification of firms by Coffey International (2014) was deemed more reflective of the nuances of the NCS and adopted for the selection process. The summary of this classification is given in Table 4.1. Based on this classification, one mega international firm and 2 lower medium sized indigenous firms were selected for the research as the literature suggests that bigger firms are more likely to be engaged with sustainability than smaller firms due to factors such as cost.

Table 4.2: Classification of construction firms in Nigeria (Coffey International, 2014)

Firm Type	Characteristics	Target Market
Mega international firms	2,000 to 20,000 staff. Vertically-integrated supply chain. Foreign origins and generally foreign management with, in some cases, significant local ownership. Typical market share of individual firms 10% to 30% with turnover of US\$340 million to \$1.3billion (NGN ₦54 billion to ₦207* billion)	Large scale infrastructure projects owned by Federal Government or State Governments
Medium-sized foreign controlled firms	Typically 50 – 2000 staff. Typically only building contractors with a market share of less than 1.3% to 0.5. Turnover of US\$15 million to US\$50 million (NGN N2.4 billion to N7.9 billion) for each company.	Small government contracts. Commercial construction shops, offices etc. Some housing
Lower medium-sized indigenous firms	Typically 50 – 650 staff. Indigenously owned and typically established in the 1990s. The most significant companies have a turnover averaging about US\$7.5 million (NGN ₦1.2 billion)	Smaller scale commercial and residential developments
MSMEs	Average of 2 staff per firm. Largely informal sector with poor skills. About 1m workers in this part of the construction sector, but this multitude of firms only collectively contribute about 10% of market share	Largely private housing
Input suppliers of cement, iron and steel	Typically, large but inefficient Nigerian companies, with some foreign ownership (eg LaFarge/WAPCO), protected by tariffs. Domestic cement producers gradually increasing market share although steel and aluminium are stagnant.	

*\$1 = 159 Nigerian Naira at 2014 prices

Despite efforts of the Nigerian government to develop the capacity and capabilities of indigenous firms in the late 1970s, international firms have several advantages over local firms. For ‘across-case’ pattern matching, it was deemed important to select firms with different ownership structures, capital base and market share. This criterion helped understand the relationship between sustainability engagement and firm ownership and size.

Age of Firm

The researcher was interested in firms that had been in existence for as long as practicable. The construction sector in Nigeria is notorious for having firms with very short life spans and a high mortality rate. The relative young age of the sector (less than 100 years) coupled with

the fact that the largest growth in the sector occurred in the last 20 years equally explain the high mortality rate. One common denominator for all the selected firms is that they have weathered the Nigerian construction market for over 20 years and through successive political administrations. The latter is considered a feat within the Nigerian context where patronage can often be a factor of political linkages. It was expected that this criterion would inform how progress on sustainable practices have evolved within the firm as sustainable construction became more topical in global consciousness.

Geographic spread

Nigeria being a country with a very diverse population equally has largely different cultures in different parts of the country. Selecting a firm that is geographically dispersed offered an opportunity to understand culture specific sustainability influences. Also, competitiveness of construction markets varies with regions in Nigeria. That influence was also discussed in the study (Chapter 3 contains some insights on the implications of geography in Nigeria).

Willingness to participate in the study

The willingness of construction firms to participate was a crucial factor in this study. The fact that Transparency remains an issue and that Government is the largest client to the sector has created a situation where firms are very protective of their businesses, even when the inquiry is not related to their financial transactions. This created problems of access which is discussed in section 4.4.5.

4.2.5 Profile of selected cases

A total of 10 firms were initially engaged with for the study, with only three eventually making the selection for the in-depth study or showing enough interest in participating. The profiles of the selected cases and their motivations for participating in this research are given

below. The firms have been anonymised and given fictitious names for the purpose of confidentiality.

Multibrix Nigeria Limited

Multibrix Nigeria Ltd falls under the Coffey classification of a ‘mega international firm’. Multibrix Nigeria Limited is an international construction firm with a proven track record of excellence in Nigeria. With technical subsidiaries in mainland Europe, it is highly organised, one of the largest and most technically capable and competent firms in Nigeria. Multibrix started operations in the 1960’s, shortly after Nigeria gained independence from the British colonial government and currently has operations across the various regions of the country. It has since grown from strength to strength, surviving Nigeria’s often turbulent and cyclical construction markets (discussed in section 3.4).

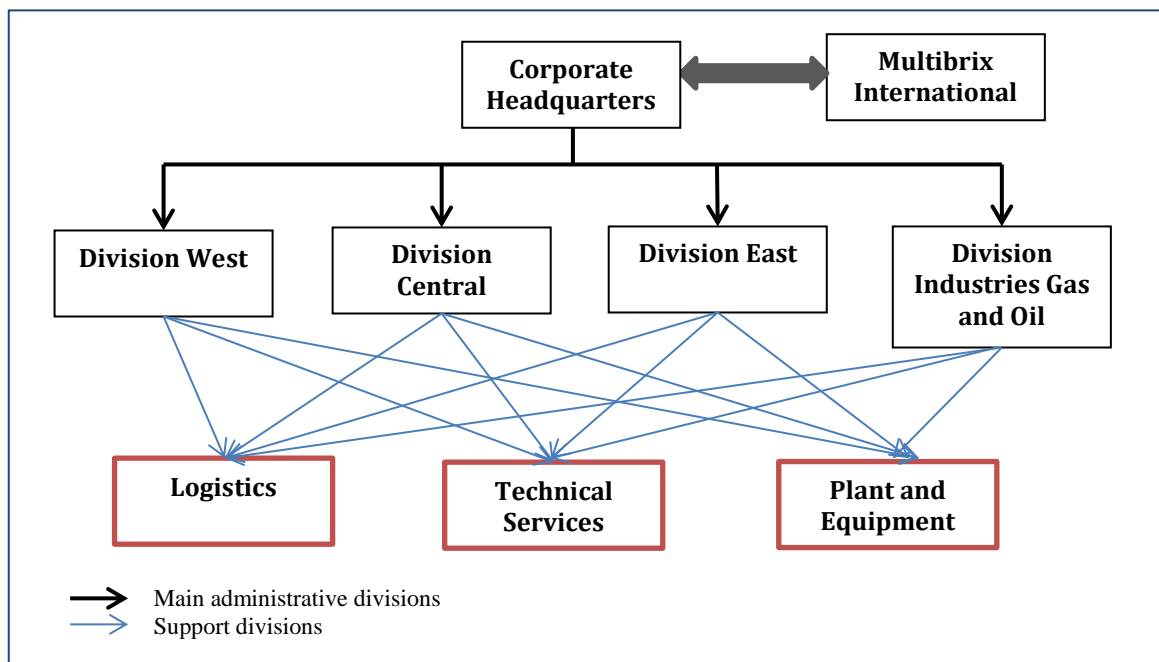


Figure 4.1: Administrative structure of Multibrix

Multibrix prides themselves as a market leader in the Engineering, Procurement and Contracting (EPC) sphere of the NCS. They were confident to participate in research when

assured of purpose, genuineness and confidentiality of the endeavour. Multibrix pools the largest expatriate staff of any firm in the country. The presence of these expatriate staff, particularly from Europe, brings together a dynamic workforce with diverse skill sets, expertise and experience which is a key ingredient of the firm's strength.

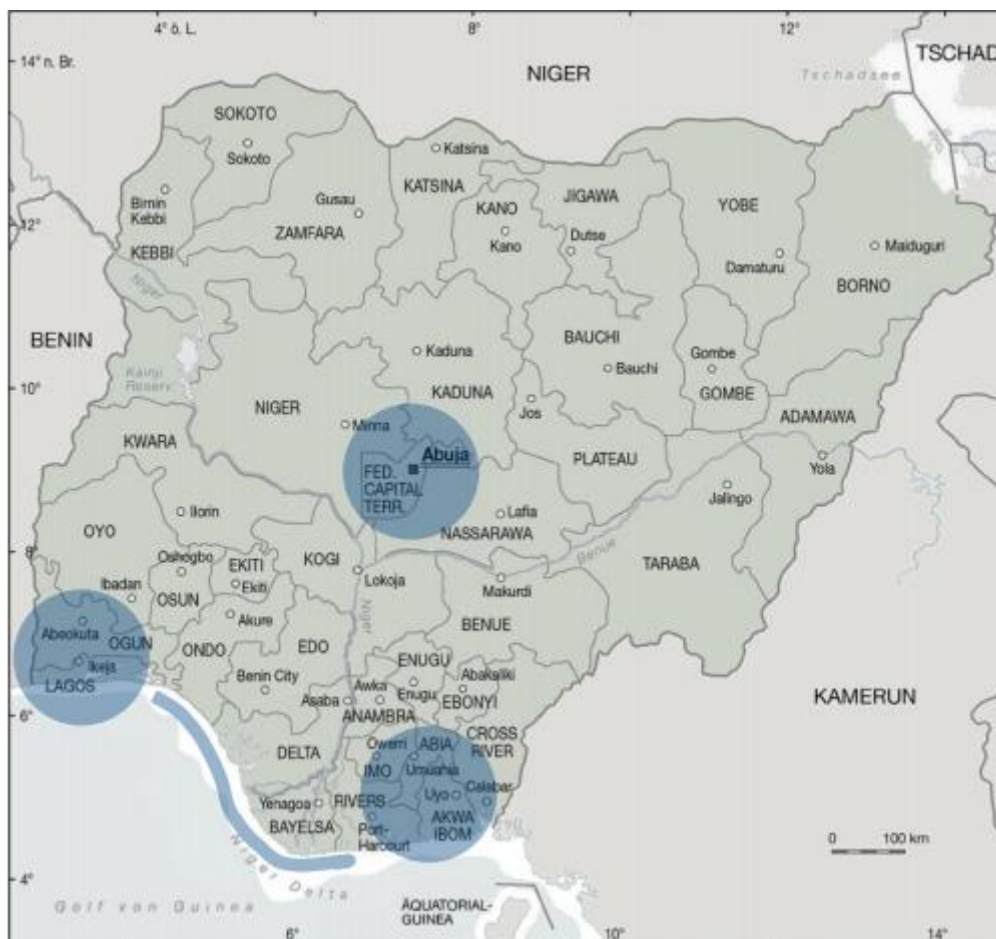


Figure 4.2: Geographic Distribution of Multibrix

Multibrix operates a divisional structure with four operational divisions (see Figure 4.1); central division Abuja, division West in Lagos, division East in Uyo and division industries, gas and oil (areas highlighted in blue in Figure 4.2). The operations of these four divisions are serviced by three service units, namely; technical services, logistics and plant and equipment based in the different divisional offices.

The geographical dispersions of the four divisions closely align with three powerful economic sub-regions in Nigeria with the most active construction markets and also Niger-Delta oil and

gas producing region. Division Abuja houses the corporate headquarters of Multibrix in the new capital city of Abuja. Several strategic reasons possibly explain this; the city is relatively new (with construction of the city commencing in 1976) with much of its infrastructure and buildings still largely under construction. This provides plenty of job opportunities for Multibrix especially from the Government which is the largest client for the construction sector and other high value clients. Secondly, as the FCT is located at the centre of the country (Figure 4.2), the city holds the gateway to the Northern region¹¹ of Nigeria.

Division West previously housed the corporate headquarters of Multibrix until its relocation to Abuja in 2001. This Division is responsible for its operations in the economic and financial capital of Nigeria, Lagos and also caters for much of the South West geopolitical zone. Akwa Ibom State in the South-South geopolitical zone is one of the richest administrative states (National Bureau of Statistics, 2014) in Nigeria and the State government has been a source of large infrastructure projects for Multibrix in more recent times. Lastly, as Nigeria's main source of revenue is from the oil and gas sector, Division Industries, Gas and Oil is set up to cater for high value clients in the Oil and Gas sector and other industrial construction markets.

During peak periods of construction activities, Multibrix has had in its employ up to 18,000 staff mostly made up of temporary site operatives, labour and support staff such as security guards and drivers. This is explained by the project nature of its operations, whereby the numbers swell when undertaking projects and thin out after project closeout. While majority of its projects have been for public sector clients, Multibrix sees itself playing an active role in the growing privately financed initiatives markets which it sees as the future amidst dwindling government expenditure and increasing responsibilities to other sectors.

¹¹ This region is two-thirds the landmass of Nigeria but has a significantly lower population density and economic power. In the history of Nigeria, when it was formed in 1914, it contained two regions: The Northern and Southern Region. The Southern region was sub-divided into the Eastern Region and Western Region. Together, these three regions (Northern, Eastern and Western regions) still characterize economic power divisions in Nigeria.

Table 4.3: snapshot of the focus of the responses from interview personnel¹²

Role (code)	Interview focus	Sustainability
Director of Operations (DoO)	Firm structure, overall capabilities of the firm, technology transfer, logistical challenges, quality, overall strategy, vertical integration, innovation, competition,	Proven capability, market in its infancy, government incentives, solar energy, LEED, community engagement
General Manager Design (GMD)	In-depth, detailed operational level issues with LEED, contextual differences and barriers, infrastructure, marketing, return on investments,	Solar and wind energy, insulation, sustainability assessments, rainwater capture, materials, passive cooling, double glazing, HVAC systems, pneumatic transport systems, greywater recycling,
Head Technical Services (HTS)	Firm organisation structure, firm strengths, competition, internal trainings, logistics,	Sustainability assessment tools, contextual variations, energy, M&E services, life cycle (implied), operational level issues
LEED Champion (LC)	Site operational level issues, awareness and training of site personnel, site progress reports and implementation issues.	Collaboration, LEED, waste management, Energy, insulation, emissions, indoor air quality, materials

Four interviews were conducted with varying mid-level to senior personnel (three expatriate and one indigenous staff) of Multibrix. This included a LEED site manager (called LEED champion within the organization), the director of design, the technical manager and the operations director who sits just below the managing director (Table 4.3). The transcripts of the interviews from this firm were analysed using the framework explained in section 4.4.4. The analysis yielded further categories that tell a rich story about the workings and thinking of Multibrix about sustainability. The interviewees were encouraged to talk freely as they liked on issues bordering on the firm and SC alike. This was to enable them reveal their original thoughts on SC without the researcher's influence. However, the prepared questions were kept handy so as to bring their attention to their thoughts on issues they might have left out when they were speaking earlier. The details of the analysis of the firm's engagement with sustainability, the contextual pressures, drivers and barriers of SC are discussed in chapter 5.

¹² The table indicates the diversity of the perspectives from the different respondents which is also indicative that depending on the operational level, the focus of the personnel varies slightly.

Multibrix demonstrated its capabilities of SC by the undertaking the construction of buildings (as of the time of the interviews), which were designed to achieve one of the LEED certification standards. These projects fall into the category of commercial/industrial buildings. The first two of these projects was to fulfil the requirements of two separate international clients. The third one was more opportunistic and was designed to demonstrate the benefits of SC and the capability of Multibrix to potential future clients. To brace itself for corporate sustainability, Multibrix had to adopt certain strategies within this bounded context of Nigeria to prepare itself. The understanding of Multibrix's mainstreaming of SC was supported with observations on site visits to Multibrix offices and sites, chats with staff other than those interviewed and analysis of company reports (years 2009-2014) and other relevant documents such as Health, Safety and Environment policy.

Dynamix Nigeria Ltd

Dynamix is a relatively young 'lower medium-sized indigenous firm'. Manned by young dynamic staff, Dynamix prides itself on being modern, quality oriented and 'open to innovation'. At just over 20 years, the company rarely engages in public sector jobs due to its concerns over Transparency and has carved a niche in the private residential, commercial and industrial building sector. The main motivation for participating in this research is to learn from the process.

Dynamix Nigeria Ltd is an active vibrant wholly indigenous construction firm. At just over 20 years old, it is has worked its way up the ladder of successful indigenous firms in a country where many firms have a very high mortality rate. According to the Coffey International (2014) classification of Nigerian construction firms, it falls into the bracket of lower medium-sized indigenous firms. The staffs of the firm thinks highly of its place in the industry and

draws its strengths from visionary leadership from its Vice Chairman/CEO who has put together a team of young focussed and dedicated professionals.

Dynamix is one of the dominant indigenous construction players in the commercial, industrial and residential sector in Nigeria. From the statement of the Operations Manager overleaf, it is evident that there is a general impression that the capabilities of foreign firms set the ‘gold standard’ that local contractor aspire to develop. The firm started out as a small construction business in the South-South¹³ city of Port Harcourt and has since expanded to 4 semi-autonomous business units as a result of the need to have focussed, competitive regional business and service units. Three of these units are geographically dispersed construction business units based in Abuja, Lagos and Port Harcourt, and one mechanical and engineering service unit that services the M&E needs of the other 3.

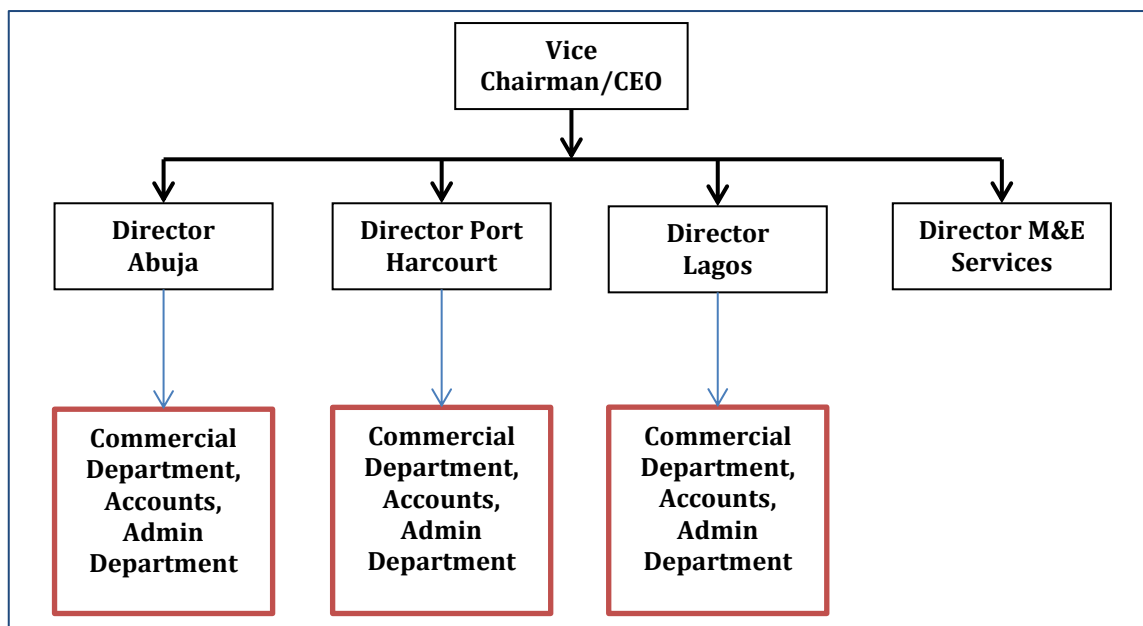


Figure 4.3: Administrative structure of Dynamix

Similar to Multibrix, the Abuja office caters for Northern region, the Lagos office for the South West and Port Harcourt for the South South/South East sub-region. Each of these

¹³ Referring to one of six geo-political zones in Nigeria.

business units is headed by a regional director. The activities of three of these four semi-autonomous business units are supported by their own commercial, accounts and admin departments (see Figure 4.3). The firm currently employs about 150 permanent staff, with the numbers rising to over 1000 during peak construction activities. These numbers swell to account for tradesmen and artisans hired on a temporary basis.

Dynamix were very willing participants to this research. The management are very open to learning and innovation and were of the opinion that this research would help appraise its position and readiness to engage with SC. Five top-level executives of Dnyamix were interviewed in this research. A similar snowballing technique was employed where the first interviewee recommended the next person within the firm until a point of saturation was reached. Again, even though an interview protocol was prepared prior to the interviews, the interviewees were allowed to talk freely as they liked on issues bordering on the firm, context and sustainability. A breakdown of the interviewees and their positions are given in Table 4.4.

Table 4.4: Snapshot of the focus of the interviews

Role (Name)	Interview focus	Sustainability
Vice Chairman (VC)	Overall strategy, contextual barriers, construction industry challenges, firm's values, history and structure, clientele,	Barriers, ideal drivers, LEED, Energy, paperless communication and offices, waste, health and safety,
Managing Director North (DN)	Contextual issues, Abuja construction market, firm's values, history and structure, clientele	Construction priorities, LEED, Health and safety
Executive Director M&E (DME)	Mechanical and electrical operations, construction industry practice, health and safety,	Sustainability awareness, LEED, smart taps, material sourcing, worker's welfare, local content, water, energy saving lights
Operations Manager and Head of Business Unit Abuja (OM)	Contextual difference between NCS and the US construction sector, international and indigenous construction firms, firm strengths, firm's innovation,	Material safety data sheets, toxic materials, LEED, barriers, energy and insulation
Regional Director Lagos (RDL)	LEED, embedded practices of Dynamix, Lagos construction market, firm's strengths, variation of context across the country, recruitment and staffing.	LEED certification, consultant's roles, community engagement, waste management, HVAC systems and air quality, hazardous materials and water.

Sheltarc Properties

Sheltarc is one of the leading housing developing firms in operating in Nigeria. While they are not a conventional construction firm, they operate in a niche market providing good quality housing and commercial properties in the major commercial centres of Abuja and Lagos. They undertake majority of their construction using in-house construction personnel, labour only subcontracting and direct labour hires. Sheltarc have also been in operation for upwards of 20 years.

Sheltarc Properties is one of the foremost real estate housing developer and management firms in Nigeria. It operates largely in the capital city of Abuja and Minna, with more recent forays into the vibrant but highly competitive Lagos market. It started out as a family business in the early 1990s and has about 23 years of operation at the time of data collection. Sheltarc is mostly in the residential market segment but have also done business in the commercial and retail sector. While Sheltarc is not a construction firm in a strict sense, it falls into the same size category as Dynamix Nig Ltd based on the classification by Coffey International (2014).

Sheltarc carries out its operations largely using an in-house team of designers, consultants and construction project managers. Under this system, tradesmen and casual staff are employed using a labour-only subcontracting system. For other large scale projects, Sheltarc employs the use of specialist subcontractors such as foundation or finishing subcontractors to carry out different stages of the construction, under the supervision of its project staff. The procurement of building materials is done in bulk for the whole spectrum of its projects across the country. The firm also pursues an active strategy of backward integration in its operations by producing bricks, blocks, roof tiles and aluminium profiles for doors and windows. Sheltarc are also in the process of transiting to material and labour subcontracts in response to logistical challenges experienced on the labour only subcontracts.

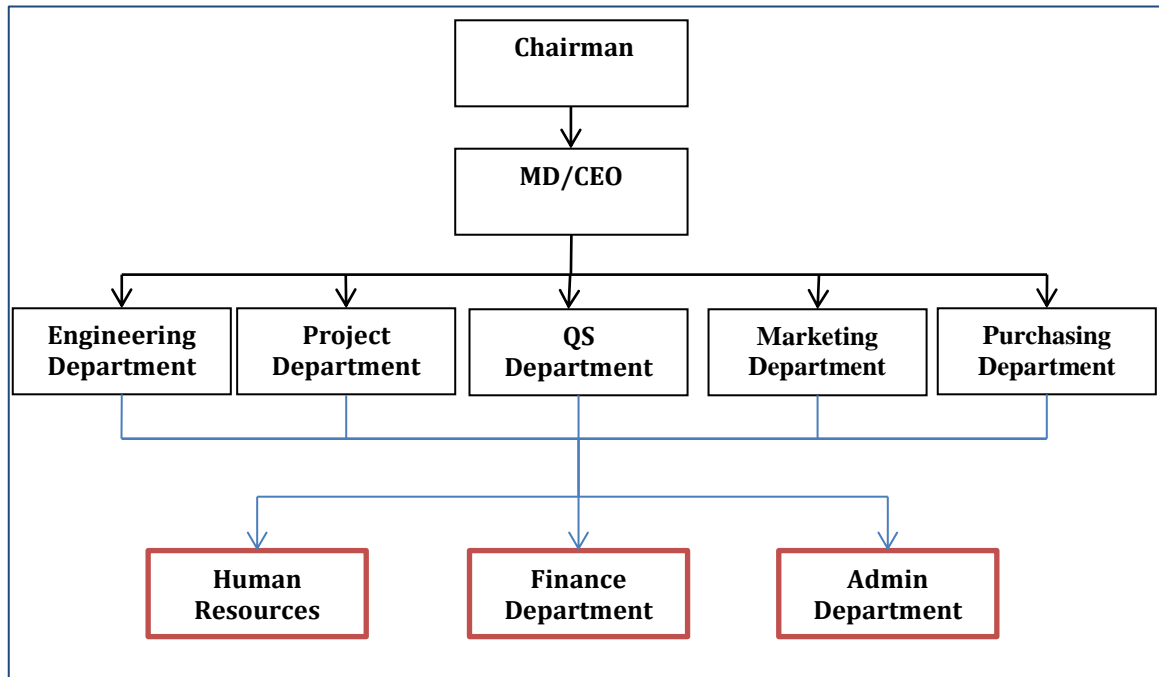


Figure 4.4: Organisational structure for Sheltarc

Sheltarc employs over 300 permanent staff in the professional cadre across its regional offices. The firm consists of several functional core and support departments as shown in Figure 4.4.

Table 4.5: Snapshot of the focus of the interviews

Role	Interview focus	Sustainability
Managing Director (MD)	Overall business structure, history of the firm, operational issues, turnover	No clear discernible knowledge
Project Manager (PM)	Project overview, company structure, industry experience, project administration	Client-led sustainability, insulation, water and energy use, waste, legislation, incentives,
Architect (PA)	Architectural designs, project planning	Passive designs, green roofs, building orientation, community interactions
Quantity Surveyor (QS)	Procurement systems, project administration, firm operations and structure	No clear discernible knowledge
Finance and Investment (FI)	Firm operations, cash flows, financing, capital administration	Planning, economic viability of projects and cash flows
Production Manager (PrM)	Project management, site supervision,	Community engagement, cultural inertia, barriers
Quantity Surveyor (QS1)	Firm operations, operational issues, contextual issues between Nigeria and the UK	Triple bottom line, cultural inertia

The firm also has several subsidiaries that all integrate to facilitate the core business of property development, such as roofing and brick production. Seven staffs of Sheltarc were interviewed for the purpose of this research. The Chairman of the firm was approached for research participation and given a brief of the nature of the study. Based on this, 5 staffs were recommended and 2 more were suggested by the initial interviewees. Table 4.5 shows a breakdown of the responses and the focus of the interviews.

The interviews did not yield as much discussions as the two previous cases of Multibrix and Dynamix. The interviews were also notably shorter than those of the previous cases because saturation point on the line of enquiry was reached much earlier in the discussions. The average length of the interviews ranged from the shortest of 11 minutes to the longest of 31 minutes. This in itself is revealing of the nature of the real estate development market as it relates to sustainable construction. Also, considerable lengths of time were spent in the office environment on four different days, having informal chats with the staff on and around its core business function and sustainability. The interviews were analysed using the analytical framework for this research and are discussed subsequently. This is followed up by an analytic summary detailing the implications for this particular case study.

4.2.6 Crafting the research instruments and protocols

After identifying cases for the research, a case study protocol was developed which contained a guide for the semi-structured interviews. The purpose of case study protocols is to provide the research with a uniform set of procedures. According to Yin (2009), a case study protocol should cover the following; overview of the case study project, field procedures, case study questions and a guide for the case study report. For this study, an overview of the study was prepared and sent out to the participating firms as part of the compliance to research ethics of the University of Reading. Importantly, a set of questions were developed based on the

themes in the research framework presented in Chapter 4. The initial set of questions that formed the interview protocol is presented in Appendix A.

4.2.7 Entering the field

This section describes the engagement with the research context. Entering the field involved traveling to and within Nigeria from the UK to engage directly with the participating firms. Prior to travel, potential firms and existing contacts were sounded out for the research and information sheets and formal invitations were sent out. Gaining access to organizations for the purpose of research is more often than not quite a difficult task. Construction firms in Nigeria are notoriously shy of participating in research. When they do, they are more likely to be protective of firm data especially those that border on finances and strategy due to competition and uncertainty as to how the data would be utilised. Another potential problem is the fact that self-administered, questionnaire based surveys dominates majority of research in that part of the world (Laryea and Leiringer, 2012). Thus, getting firms to participate in qualitative research where recorded personal interviews are the mode of data collection generates a feeling of unease amongst these firms. Gaining the trust of the firms was key to being granted access (Toma, 2000).

Two principal methods were employed to gain the trust of the firms; firstly, personal linkages to people who are in top level management of the firms. With the researcher being from Nigeria with years of practice in the construction sector, pre-existing relationships were harnessed which made it easier to explain the purpose of the research. Where this relationship did not exist directly, third party linkages were mobilised. These relationships proved to be the most important facilitator for gaining access. A possible explanation is the sensitivity of the financial and ethical practices of the Nigerian construction sector. Secondly, a clear outline of the research objectives was made available to firms that fit the profile defined for

the study. Supporting documents were provided by the University of Reading and PTDF, the research sponsors for validation where necessary.

10 firms were contacted for the study. In a few of these cases, the firms did not meet the pre-qualification guidelines set for the research. Two of these firms did not honour their initial decision to participate, while some persistence and convincing was required to assure one of the firms of the nature of the inquiry. Five of these firms were very happy to participate in the research as they saw an opportunity to learn from the process. The two of them actually invited the researcher for enlightenment talks with staff of their organisations so that they could generate awareness on sustainability within their organization. The local knowledge of the researcher also facilitated the understanding of local markets and ease of movement around Nigeria. The construction economic powerhouses of Lagos and Abuja formed the location for the bulk of the interactions, though all the case study firms with had a wider geographic spread. The techniques that were selected for the data collection are described below:

4.3 The data collection methods

The themes informing the data collection for this exploratory case study are derived from the objectives of the research which are given in Chapter 1 and strengthened by the critical review of literature undertaken in Chapters 2 and 3 (see sections in Figure 4.5 highlighted in blue). The review of literature identifies that corporate organisations respond to external factors such as local regulations and sustainability assessments in interpreting their specific interpretations of sustainability. This conceptualisation of sustainability coupled with factors external to the firm influences their decision and strategic thinking on sustainability. Adopting sustainability might require internal reconfigurations of the firm in order to implement a sustainability strategy and

monitor strategic outcomes. Thus, the research set out to collect data on the following themes: conceptualisation, external factors, drivers and barriers and strategy and output.

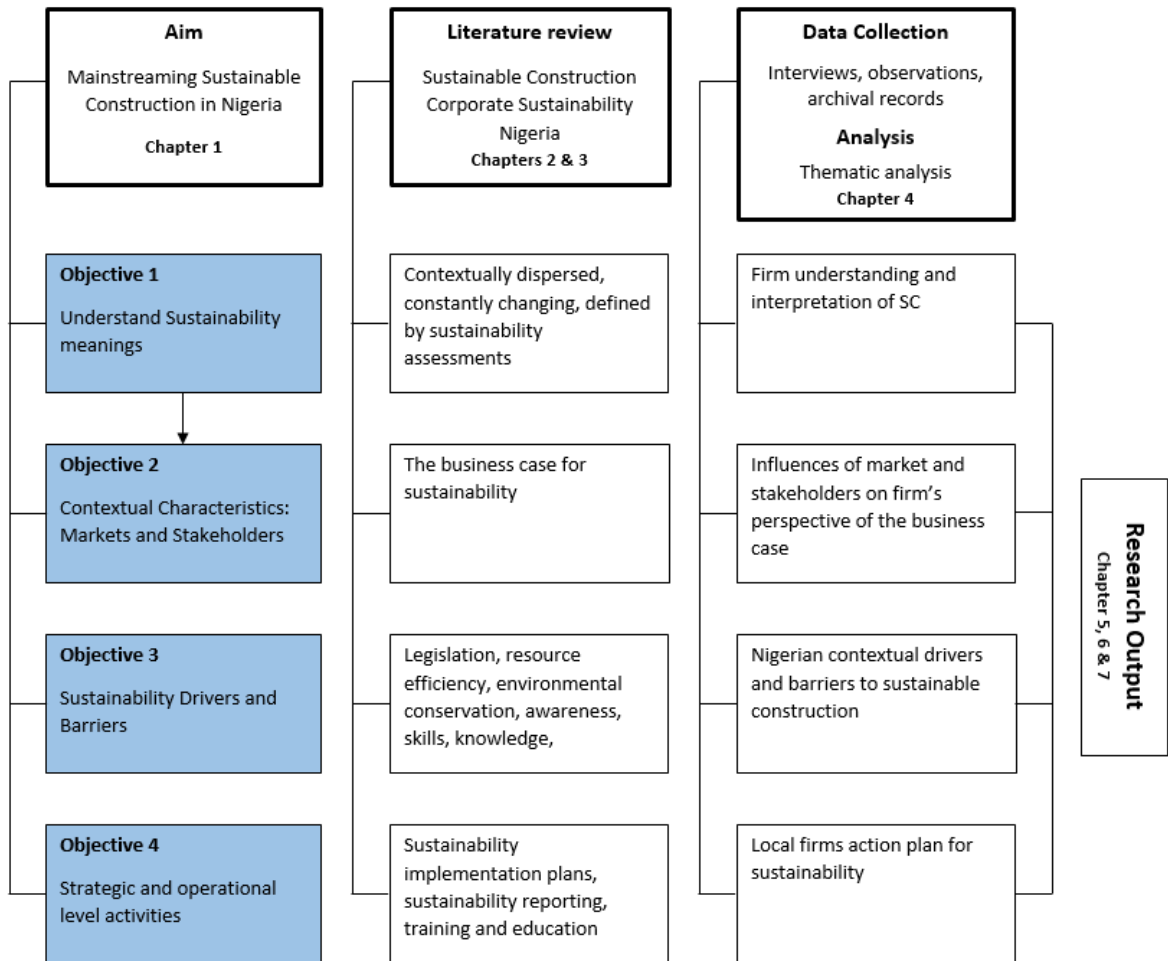


Figure 4.5: Objectives and Research Themes Informing the Data Collection

4.3.1 Interviews

Qualitative data was preferred for this exploratory research as it allows the researcher ‘access’ the original thoughts of the respondents. Interviews are a major technique in gathering data for qualitative research. Interviews give first-hand insight into the thoughts of the respondents on sustainability. Semi-structured interviews were preferred to structured or unstructured interviews. This was to provide some degree of focus for the questions while maintaining the ability to probe emerging trends or insights that were not envisaged at the time of preparing the interview protocol.

The interviews were conducted with middle-to-top level management of the selected firms. This was to solicit the perceptions of the interviewees on the various strategies employed during the procurement of construction activities by the firms. The choice of higher level management staff is also to understand the strategic motivations to engage with SC or not. Of interest were the interviewee's perspective of the concept of sustainability, the company's action, motivations and/or barriers and the peculiarities of operating in a developing country like Nigeria. A snowballing technique was employed whereby a key primary contact was secured within the firm. The contact in the firm helped to recommend who was most appropriate to speak with on the subject. This first interviewee then recommended other members of staff based on their knowledge on sustainability. This process was repeated until a point of saturation whereby no other personnel were available to give any further insight.

A total of 17 interviews were conducted across personnel of the three different firms listed in the previous section. The interviews spanned from about 20 minutes to 1 hour 30 minutes. The wide variation with the interview timings was as a result of the level of engagement of that respondent/firm with the concept of sustainability. Some of the respondents had a lot to talk about while others had very limited engagement with the idea or principles of sustainability. The interviews were recorded using a digital recorder with the consent (see section 4.5.1 on ethics and consent) of the respondents. Table 4.6 highlights the preliminary themes of the research and sample interview questions which are meant to facilitate the understanding of the research objectives. A sample of the interview transcripts are presented in Appendix B.

Table 4.6: Research objectives and sample interview questions

Category	Objective	Sample Questions
Conceptualisation of sustainability	To understand context specific meanings and understandings construction firms attach to sustainability in construction.	<ol style="list-style-type: none"> 1. How does your firm understand sustainability? 2. How does your firm learn about sustainability?
External factors	To explore the specific local market and stakeholder characteristics that present a business case for firm-level sustainable construction in the Nigerian construction sector	<ol style="list-style-type: none"> 1. How do legislation/regulations influence the operations of your firm? 2. Are there client driven requests for sustainable products? 3. Are there any global or local sustainability schemes your firm adheres to?
Firm – level drivers and barriers	To explore the contextual drivers and barriers construction firms face and how they implement sustainable construction	<ol style="list-style-type: none"> 1. Are you aware of any Government’s initiative on sustainability? 2. How does the firm’s approach social issues such as integrating with the local population? 3. What are the main project challenges faced?
Sustainability strategy and output	To examine the strategic and operational level provisions the firms put in place in mainstreaming sustainable construction	<ol style="list-style-type: none"> 1. Does the firm have a clear policy on sustainability? 2. Are there ‘firm-specific’ formalized processes for approaching projects? 3. Does your firm carry out any form of environmental reporting? 4. How have these processes changed over time and why?

4.3.2 Archival Records

The study also made use of archival records where available to support or contradict the responses from the interviews. According to Sarantakos (2005) the variability of compatible sources of data and methods adds to the richness of case studies. Records such as annual reports, websites, policy documents of various kinds where available were used to make sense of the interview data. The value of exploring archives was to establish what the firms thinking was before the influence of their encounter with the researcher occurred.

4.3.3 Observation

Observation was done throughout the duration of research visits to Nigeria to experience the contextual culture of the NCS, support the data that emerged from the interviews and to understand the context based on which strategic and operational level decisions were taken. Observation as a data collection method gave a lens for the researcher to corroborate the findings from the interviews and archival records. A few events that occurred during the period of immersion in Nigeria and examples of anecdotes are used to illustrate some of the findings of this research in Chapters 5 and 6. Observations were made on two levels; of the wider context of the NCS and at the level of the firms that were invited to participate. Institutional organizations and the academia formed examples of the NCS context. The observations were captured by the use of field notes during the visits to the case study firms.

4.4 Data analysis

The analysis of qualitative data involves the generation and management of large volumes of textual data. There are several approaches to analysing qualitative data such as narrative analysis, thematic coding and analytic induction. Sarantakos (2005) identifies the following steps for analysing qualitative data:

- Focus on the gathered data and familiarize oneself with it
- Identify chunks of data sharing some commonalities and code
- Note thoughts and initial reflections
- Work through the data to identify patterns, themes and sequences
- Construct matrices, network maps and diagrams
- Link generalisations together

For the purpose of clarity, this research identifies three key stages of the data analysis; transcription and familiarization with the data, coding and thematic analysis and categorisation, pattern matching and interpretation. These are explained in the following sections.

4.4.1 Transcription and familiarization with the data

The interviews were recording using a tape recorder with playback functions. The first step of the analysis process was to transcribe the interviews from audio to text using Microsoft Word software. Silverman (2011) provides some guidance on how this can be done effectively. The transcription was carried out by the researcher and this aided the process of getting familiar with the data. This is considered an important step by several proponents of qualitative research such as Creswell (2009), Bazeley and Jackson (2013) and Miles et al. (2014). As the transcription was done, notes were taken on emerging themes that helped to make better sense of the data.

4.4.2 CAQDAS and coding and thematic analysis

Managing the huge deluge of data is viewed as one of the disadvantages of qualitative research. However, this process is made slightly easier with the aid of computers and appropriate software (Bazeley, 1999; Bryman, 2008). Computer Assisted Qualitative Data Analysis Software (CAQDAS) are specifically designed computer software that performs a range of functions including storage, coding, sorting, retrieving, visualising and querying to mention a few. The transcribed documents were then uploaded to NVivo 10 software. The NVivo 10 platform is one of many CAQDAS which is provided for use by the University of Reading and was utilised for this study. NVivo 10 is a robust tool that enables the user to import a wide variety of data; text, (word files, PDFs, rich text, spreadsheets) audio, pictures, videos and social media feeds for analysis. The software is also equipped to edit documents

and import survey responses from online surveys such as SurveyMonkey. However, its most useful function is its ability to organise and classify data with ease, make sense of large qualitative data by coding sections under relevant themes, query datasets and subsequently link these ideas/themes if need be. For the following reasons, NVivo was deemed adequate as a CAQDAS tool.

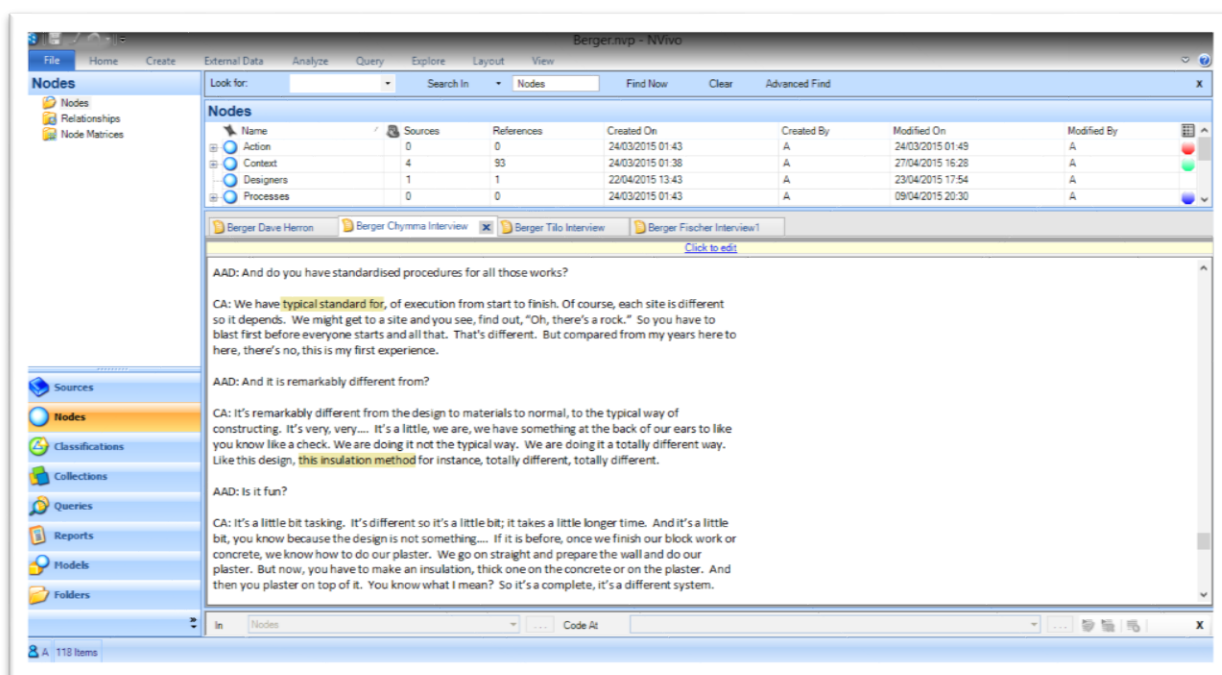


Figure 4.6: Screen capture of an active NVivo work sheet

After uploading to NVivo, the process of coding the data commenced. A code is *'most often a word or a short phrase that symbolically assigns a summative, salient essence-capturing, and/or evocative attribute for a portion of language-based or visual data'* (Saldaña, 2013, pg 3). Thus the process of coding involves the identification of words or phrases that represent a line of thought of the interviewee. The starting point for the coding exercise was the four themes originally derived from the objectives of the study. Section 4.4.3 explains the use of this coding process to critically explore and make better sense of the research data. Figure 4.6 shows a screen capture of an NVivo work sheet showing the interview transcripts, coding process (highlighted text) and nodes.

4.4.3 Categorisation, pattern matching and interpretation

The coding process initially began with four main nodes¹⁴ as informed by the research objectives: Understanding Sustainability, Contextual Characteristics, Sustainability Drivers and Barriers and Strategic and Operational level activities. However, as the process of interrogating the data in multiple iterations went on, further themes emerged which were deemed vital to understanding the position and activities of these firms with respect to sustainability. Given the very robust and diverse responses granted by the interviewees across all the firms, new themes were allowed to form idiosyncratically for each firm first.

This iterative process was carried out on the basis of an individual firm initially. Thus, all the transcripts for a particular firm were subjected to the same breadth of Nodes initially, but new themes were allowed to emerge differently for each firm. The analyses commenced with Multibrix first, followed by Dynamix and then lastly Sheltarc. When this process was complete for Multibrix, the analysis for the Dynamix began using the original nodes. Then additional nodes were created for the specific responses from interviewees from this second firm. The same process was repeated for Sheltarc. This system of starting with the same nodes base allowed the original and distinct views of each firm emerge without any bias of the direction or precedence of the previous firm.

Over a hundred themes and sub-themes were developed across the three firms (see Figure 4.7 and Appendix E). At the end of the analysis of each case, an across-case comparison of the emergent themes was carried out and analysed. This was done by grouping and consolidating all the sub-nodes from the three case studies into larger categories. These themes and sub-themes were grouped together, ungrouped and regrouped again in this process is was done in

¹⁴ NVivo codings are stored in nodes which are ‘terminal points’ or ‘points of connection in a branching network Bazeley, P. & Jackson, K. (2013). *Qualitative data analysis with NVivo*. Sage Publications Limited.

several iterations with the emerging codes constantly being reorganised into most appropriate categories based on the interpretations of the researcher. By the end of this exercise, the analysis yielded four major themes: Context, Firm Processes, Firm Action and Stakeholders as the common themes for explaining the findings across the three firms. These themes did not in any way replace the objectives of the study; instead, helped greatly to explain the commonalities and divergence of the data stream across each firm. The details of the analysis are provided in the subsequent chapter.

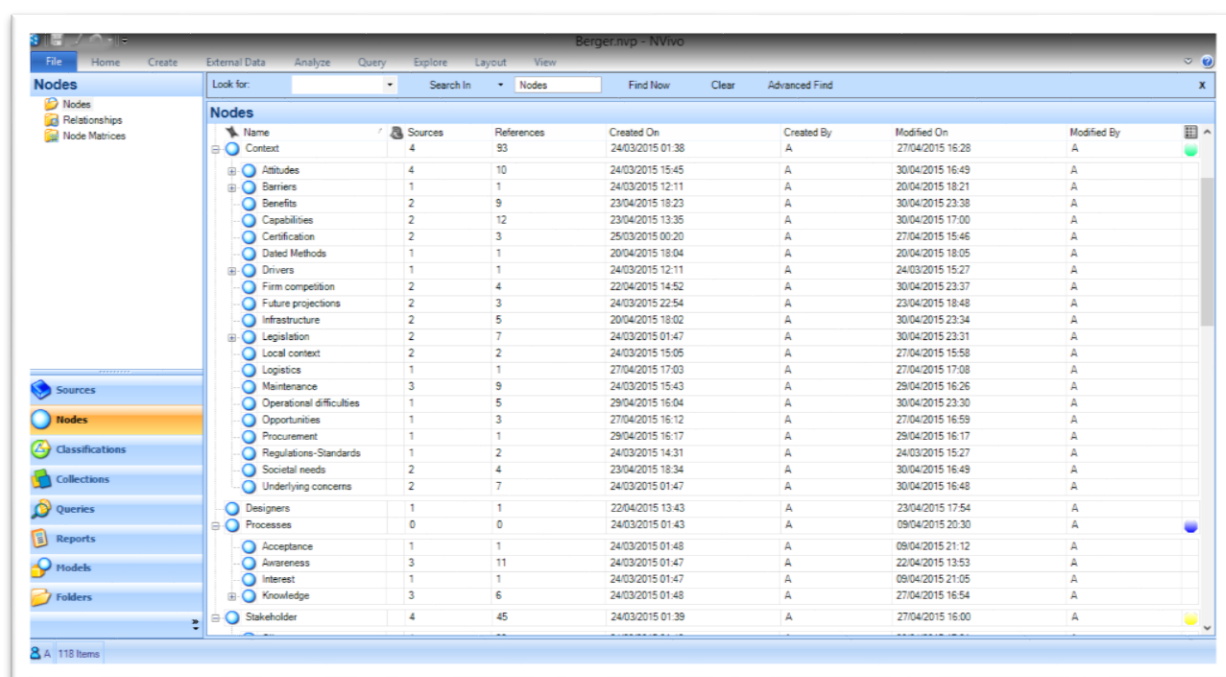


Figure 4.7: Screenshot of the coding process at existing and new nodes

4.5 Research attributes

To ensure that this research endeavour yielded valid, reliable findings, several key attributes were taken into consideration in the early stages of the research.

4.5.1 Research ethics

Ethics refer to the values that should be upheld in the undertaking of research activities. Creswell (2013) posits that in the course of the research design, it is imperative for the

researcher to consider what ethical issues might arise and how these should be addressed.

According to Bryman (2008), two pertinent questions are;

- How should we treat the people on whom we conduct research?
- Are there activities in which we should not engage in our relations with them?

The Framework for Research Ethics (FRE) highlights six principles to be addressed to ensure that the above criteria are met. They include explicitly defining the purpose of the research, confidentiality and voluntary participation in the research, ensuring that conflicts of interests are duly declared and safety is maintained throughout the research process. In this study, the University Research Ethics Committee reviewed the procedures in ensuring compliance as contained in the ethics form submitted by the researcher. The University of Reading guidelines stipulate that all the participating firms be forwarded detailed information sheets on the research, the researcher's affiliation, research sponsors and expectations from the participants. Also, assurances regarding the confidential nature of the research and voluntary nature of participation with the right to withdraw at any time were communicated by way of the consent form which was given to each participant and signed off. A sample of the information sheet and consent form is attached in Appendix C while a copy of the ethics form is contained in Appendix D.

Majority of the data generated from this research were electronic and were stored securely on password protected computers at the URS Building at the University of Reading. The few physical documents such as signed off consent forms were stored in secure lockers in a locked office at the same building. All the data generated for this research were treated with strict confidentiality, with only the researcher and the supervisors having access to them. The data is to be kept for a minimum of three years post completion of the research. Other ethical considerations included taking steps to ensure that the research participants and the researcher

were protected from harm in anyway. This was done by clearly getting the understanding and approval of the top management of the firms involved in the research and limiting the inquiry to issues only relevant to the research. The researcher's local knowledge of Nigeria was mobilized to ensure that exposure to risk was kept to the barest minimum. For instance, local knowledge of the construction market led to seeking firms based in Abuja and Lagos with very active construction markets which are also safe for travel and hospitality.

4.5.2 Reliability and validity and generalizability

Reliability, validity and generalizability are important, related constructs in establishing the quality and consistency of research. However, there are debates surrounding the applicability of these terms to qualitative research due to concerns about the irrelevance of measurements for instance (Bryman, 2008). It is also commonly agreed that qualitative researches do not seek generalizability; rather, they provide deep rich insights into the constructs of the world of social actors which may be transferable to similar circumstances. Guba and Lincoln (1994) discuss two validity criteria; credibility and transferability. Creswell (2013) recommends eight steps that can help validate qualitative research.

To ensure credibility in this research, great care and rigour was maintained in collecting and processing data. For instance, the different steps of the research process were carefully documented and a case study protocol developed. Before the collection of data, the research problem and design was presented at different fora including two international peer-reviewed conferences for proper feedback. The interview transcripts were proof read and quite often, the audio transcripts were played during the thematic coding using NVivo.

Regarding reliability, a detailed description of the research process is presented to ensure that this study is replicable and that the findings of the research can be traced to the data sources. However, it is widely argued in qualitative research circles that the results of such replicated

studies are unlikely to be the same due to the interpretivist nature of this type of study. Also, multiple sources of data were employed to build a coherent picture of the case studies. Although the interviews provided the biggest source of data, observations, annual company reports, company websites and other company documentation supplemented the data in understanding the case study firms in greater detail.

4.6 Concluding thoughts

This research argues that the strategies prescribed for driving the adoption of sustainable construction are normative and ignore the realities on ground in the contexts of developing countries, of which Nigeria is an example. There is a dearth of literature on firm-level sustainable construction in developing countries and thus, this research is an exploratory study into that area. The study seeks to understand sustainability in construction from the lens of selected construction firms operating in Nigeria. In studying these 'realities', the philosophical underpinnings of the different research designs were considered. After due consideration of their differences, vis-a-vis the nature of the research problem, a research design utilizing qualitative data was adopted.

Qualitative researches are undertaken to provide the perspectives and understanding of the actions of social actors (Sarantakos, 2005). In contrast, quantitative approaches are not likely to yield such understandings, nor present fresh insights to issues previously not considered. Despite criticisms of not being generalizable, outcomes of qualitative research lend itself to qualities of transferability. The flexibility of qualitative research and its provisions to probe areas covered by existing literature (Lincoln and Guba, 1985), side by side areas that unfold as the research progresses (Sarantakos, 2005) enhances its suitability for this study.

A multiple case-study design was deemed appropriate to identify a broad range of sustainability engagement across a diverse spectrum of construction firms. Case selection was

done on the criteria of firm classification by nationality, size and willingness to engage in the research. The method of data collection primarily employed was the interview with the support of observations and analysis of archival records. Data analysis was done with the aid of the NVivo 10 software. An overview of the stages, steps and expected outcomes of the research are presented in Table 4.7.

Table 4.7: Overview of the Research process

Stages	Steps	Outcome
Conceptualisation	-Initial scoping of the research problem	-Investigating how sustainability is adopted across the globe
Literature review	-Understand the genesis of SC -Identify key stages and milestones in the evolution of SC -Understand existing drivers and barriers of SC from literature -Understand the peculiarities of developing countries especially those on the African Continent -Understand the construction context in Nigeria	-Research context clarified -Contemporary issues identified as they would influence key research decisions -Identification of a target stakeholder for understanding the adoption of SC in Nigeria -Development of a conceptual model for the firm-level adoption of SC
Research Design	-Understand the role of theory in research -Understand the different philosophical persuasions -Identification of peculiar firm classification in the NCS -Selection of case study firms -Making contact with prospective firms	-Positioning of the research under the interpretivist realm -Granting of access by participating firms -Selection of interview as a data collection method -Design of case study interview protocol -Data collection
Data Analysis	-Transcription of the interviews to MS Word -Uploading transcripts to NVivo 10 -Creation of nodes based on analytic framework -Coding the interviews based on existing nodes -Coding of interviews based on new emerging nodes from the data -Comparing overall coding for all cases	-Understanding each firms implementation of sustainability -Understanding across-case comparisons of sustainability adoptionment -Understanding contextual drivers and barriers to sustainability in the NCS
Write up	Documentation of the whole research process and findings, complete with illustrations	-Conclusions and recommendations -Implications for the NCS

4.7 Chapter summary

This chapter discussed the research approach, choice of a multi case study research design, the data collection and analysis methods as well as the considerations for research ethics. An overview of the case study firms and a detailed discussion of the case study protocols were also covered in this chapter. Chapter Five presents the analysis of the data from the case studies.

CHAPTER FIVE

ANALYSIS OF CASE STUDIES

Chapter 5: ANALYSIS OF CASE STUDIES

5.1 Introduction

This chapter presents a breakdown of the analysis and the key findings of the three case studies. As described in section 4.4 of the previous chapter, the analysis begun with the objectives of the research as the main themes and then evolved into the four main themes used to discuss the findings of the research in this chapter. These themes provide an insight as to how contextual pressures influence how these firms make sense of sustainability in the Nigerian context, what actions were taken, and the role stakeholders played. This chapter presents a detailed analysis of the interviews on a per-firm basis. This firm level analysis is subsequently followed by another section discussing the ‘across case’ comparisons of the responses from the three firms. The chapter is then concluded with a synopsis.

5.2 Case Study 1: Multibrix Nigeria Ltd

5.2.1 Context

As the data analysis progressed, the evidence from the data increasingly emphasised that a firm’s adoption of SC is contingent on its contextual settings in which it is operating. This section explains how the setting of the Nigerian construction sector influenced the Multibrix’s decision to adopt SC from the perspectives of the interviewees. From the interview, it became apparent that Multibrix was involved with three projects which had sustainability credentials as one of the key objectives of the project. This indicates clearly that the firm has adopted sustainability on at least a handful of its projects. The analysis of the interview data involved coding a lot of sub-themes to understand how the context influenced Multibrix’s decision to undertake such sustainability related projects. These sub-themes are discussed subsequently.

Multibrix's Awareness and Understanding of Sustainability

The interviews were conducted with four senior level personnel of Multibrix (the acronyms in Table 5.1 denote the designation of each of the interviewees). Each of these interviewees gave their perspectives on sustainability which was based on their experiences and roles within the organisation. A common perception across all the interviewees was that they had a fairly detailed understanding of sustainability in construction. This was apparent from the way they talked about sustainability and the implied content of their responses to the interview questions. Common sustainability themes such as environmental sustainability, energy efficiency, water conservation, air quality and assessments were recurring throughout the interviews, though to different degrees of depth.

Table 5.1: Acronyms of the Different Interviewees

Designation	Acronym
Director of Operations	DoO
General Manager Design	GMD
Head of Technical Services	HTS
LEED Champion	LC

The general manager of the design department subsidiary of Multibrix talked in the most depth during the interviews. The underlying reasons for this are his experiences before joining Multirbix and his current role at the time in the design department. One of his mandates at that time was to deliver an in-house office project to the LEED assessment standards. The technical manager had also been involved in in-house training exercises in addition to giving an external presentation to private stakeholders on sustainability in construction.

The extent of awareness and understanding of the interviewees appears contingent on the international dimension of the firm. Many of the staffs are expatriate and the interviewees allude that their work and life, particularly in European countries has sensitized them to the

broader agenda of sustainability and subsequently its application in construction. For the indigenous staff, working within such a firm means that the awareness seeps through and as such the agenda is not entirely new, even if the depths of such understandings appear relative. The contents of Multibrix's annual reports corroborate the findings from the interviews. Box 5.1 contains extracts from the analysis of a relevant Multibrix documents.

Box 5.1: Multibrix Reports and Official Documents

The annual reports of Multibrix contain general information about the firm, its history, year-on-year financial performance, its operations, and current projects. They also showcase the firm's capabilities, competences and sources of competitive advantage. There is a deliberate signposting in these reports (2009-2014) of its sustainability footprint under areas such as on-going sustainable building projects, Health and Safety initiatives, commitment to the Environment and its capabilities to deliver LEED standard buildings. Other areas include increasing local indigenous participation through technology transfer and trainings and some green technology research. There is also Health, Safety and Environmental policy document which is in the public domain to illustrate its strategic position. These demonstrate that has been aware of sustainability well before the interviews for this research was conducted.

Drivers of Sustainable Construction

On the strength of the experience of the three sustainable building projects embarked on by Multibrix, the interviewees gave insight into their perceived drivers for sustainability within the context of the NCS. These drivers can broadly be differentiated into two; those currently driving the sustainability agenda within Multibrix and those that have the potential to be sustainability drivers in Nigeria in the future.

Clients: In the context on the NCS, Multibrix were only able to refer to 'bottom-up' market drivers of sustainability, without any mention of any 'top-down' drivers such as legislation. The biggest influencing factor for Multibrix that tailored the project decision to have a sustainability focus was the client and in particular, clients with an international background. The Director of Operations explains this in the following quote:

“... (A client) came to us and he wanted his head office to be state of the art and to contain the first ‘in the sense, real LEED features’ in a commercial building in Nigeria. So we had the abilities to fulfil that demand.” (DoO)

On two of those three LEED focussed projects, both clients were large multinational organisations that had specifically requested sustainable features to be incorporated into the buildings. On the third project, it was conceived, designed and constructed (it was under construction at the time of the interviews) by Multibrix as a client to itself in a bid to market the possibilities and benefits of sustainable construction to prospective clients in Nigeria. The international dimension of the clients (inclusive of Multibrix itself) was well communicated in the interviews across the different interviewers. An example is provided in the quote below by the Head of Technical Services (HTS) of Multibrix:

“In my opinion it is two drivers; one of the drivers is to convince our clients to save money if you invest more: it’s (a) cost issue. And the other issue in my opinion is companies coming from America or oil and gas companies. They have sustainability standards and these standards have to be used worldwide. And it makes no sense that you use a (different) standard(s) in Europe or in Nigeria”... (HTS)

There were no mentions of demand for a sustainable building from local clients, Government inclusive who have previously been amongst the biggest clients of Multibrix and the construction sector as a whole. For the clients with the sustainable building demand, Multibrix were of the opinion that it was important for those clients to demonstrate to be responsible corporate citizens:

“They (the clients) have the money, they put it in just to say ‘hey, we take the responsibility for the future’ ... (GMD)

Competitive advantage: Multibrix were of the opinion that developing capabilities and technical expertise in sustainable construction led to the company developing and maintaining a competitive advantage over its closest competitors. Multibrix is aware of the presence of competition from other international firms from Europe and particularly the recent inroads of Chinese firms into Nigeria. The Chinese firms in particular are major new entrants into the NCS with huge cash and Chinese government backing based on the Nigerian government sourcing many infrastructural development loans from the Government of China. This has had an effect on the strategies of Multibrix, who feel that maintaining competitive advantage would require leading the pack in terms of innovation amongst other measures of competition.

“We definitely have a competitive advantage when a client wants to do sustainable construction for instance because we have the experience and the ability to provide him what he wants. We are probably the only contractor in the country doing full LEED construction.” ... (DoO)

The concept of competition is closely linked to that of capabilities. Traditionally, majority of the players in the NCS have been of very questionable standards and quality. However, with impressive growth rates in the Nigerian economy, this competition is getting stiffer. Multibrix recognise this and explore all avenues to maintain their market position.

“...because if you get too confident, the competition would trample you. Nigeria is now a very attractive market, a growth market and it is identified by a lot of the major construction groups in the world as being a viable market. You can notice from the companies that are coming in; new markets, new companies appearing on projects all around the place. Of course, the Chinese are big movers into the country...” ... (DoO)

Marketing: the decision of Multibrix to procure a sustainable building to LEED certification for its design office was said to be a conscious effort to market the potentials of SC and the capabilities of Multibrix to future clients.

“That also creates in a sense good advertising; there has been articles written about it and so forth which keeps the company’s name in the public about what we are doing. It maintains our reputation of bringing innovation into the country.” ...
(DoO)

Cost savings: of potential drivers not yet being experienced by Multibrix within the NCS, the interviewees expressed their thoughts and highlight potential long term cost savings as a driver for SC in Nigeria. In their opinion clients with foresight also see a cost benefit in the long-run of being sustainable, thereby driving sustainability in the industry forward. For the clients, the benefits included long term savings especially in energy. In the words of the technical director at the company:

“It is a marketing argument; it is not only money. But if you look to the economic aspect you would see they get their money back. I know the case of a hotel in Lagos (Nigeria), they changed all the lamps to LED because the supplier and the office who sold them this idea, he showed them that in 3 years, they have (broken even) and then they would (start to) make money because the energy consumption is reduced by 60 or 70 percent.” ... (GMD)

International best practices: The general manager design added that another driver for Multibrix was the external pressures of best practices from across the globe. Multibrix prides itself as a reputable international firm. The firm’s reports demonstrate this by stating its adoption of international certification schemes such as the ISO 9001 Quality Management System and the Occupational Health and Safety Management Systems, OHSAS 18001. They

also show awareness that sustainability is becoming a welcome practice with a strong business case particularly in the developed world.

“...today in Europe and North America, sustainability, this energy saving, the LEED concept is a marketing concept. If you see also in Frankfurt today, all the high rise buildings of the banks, they put a lot of money in just to have not LEED, but German LEED certification (DGNB), gold and platinum (etc). ... (HTS)

Innovation: in the local context of Nigeria, the interviewees identified that they viewed Multibrix as a construction market leader and were of the opinion that they had to continue to lead in virtually every innovative ideas coming into Nigeria. Thus, whatever a client expects from a construction firm, Multibrix strive to be in that position to always meet the client’s need. This was thought to be another major internal driver for the firm.

“We are the major player here in the country for construction and therefore, we have to be up to date of the world class business, definitely... Normally, the innovation (idea) comes from clients that come to us with a particular problem that requires innovation (techniques) to solve the problem” ... (DoO)

Incentives: The Director of Operations of Multibrix makes the argument that government led incentives for sustainability in the construction sector which have worked in other (developed) countries could potentially drive investment in sustainable construction.

“...incentives are just one way; for instance, in solar power, a lot of governments around the world introduced incentives for people to invest in solar, where you got paid at a high rate to inject that power into the system. For instance, my house in Australia, we sell our power to the government...so instead of building new power

stations, houses put photovoltaic cells on the roofs of the houses and it goes into the grid and if there is a net or loss, you get money¹⁵” ... (DoO)

Contextual Barriers to Sustainable Construction

According to the interviewees, there are overwhelming factors that questions the preparedness and suitability of the Nigerian construction market to Multibrix’s implementation of an active sustainability strategy. Factors such as attitudes, awareness and education are thought to hinder any conscious efforts at sustainability. These factors are believed to cut across majority of the stakeholders identified in the study (stakeholders are covered in a separate section of this chapter).

Awareness: while awareness is seen as a driver of sustainability, the lack of it is often referred to as one of the biggest barriers to SC. A very low level of awareness exists in the sphere of operation of Multibrix. This transcends the various stakeholders Multibrix engages with and a vast majority of the indigenous staff in the firm. The General Manager Design makes particular reference to the quality of education and training received by the indigenous staff of Multibrix who have trained in local institutions and appear lacking in areas considered basic by their foreign counterparts.

Contextual variations and cultural inertia: with the absence of local standards or assessment methodologies for sustainability in Nigeria, the LEED US standard was adopted for the sustainable building projects undertaken by Multibrix. However, using the LEED standard as a performance marker for the sustainable building on a Nigerian project was not without its problems. In the implementation of this ‘borrowed’ environmental assessment methodology, there were several contextual misfits encountered. For example, the assumption of built up

¹⁵ Feed-in tariffs.

cities/towns in the LEED standard did not resonate with the status of Abuja where a lot of construction is still being undertaken. Abuja is a brand new capital city whose phased construction started in 1976. Thus, a lot of infrastructural amenities such as bus stops or public sewers are lacking or still under construction. This infrastructural situation is similar or sometimes worse in much older Nigerian cities largely due to poor urban planning.

Other identified mismatches were in the LEED recommendations for the provision for designated parking and charging points for electric cars and also bicycle stands to encourage cycling to work. These provisions are not resonant with the current realities on the ground in Nigeria. The cost of purchase and the poor state of power supply means that such cars are practically not built for the Nigerian market as of this time. However, there are LEED credit points allocated for such innovation in design. Also, the cultural orientations of the people did not always align with the provisions of LEED. For instance, the difficulties of changing people's attitudes to cycling to work rather than driving means those provisions for bicycle stands and multiple shower stalls in Multibrix's LEED office project would be grossly underutilized. Also, poor infrastructure for waste collection and management and attitudes such as poor waste management practices would not be resolved by sustainable designs. In the words of the General Manager, Design:

“The local challenges are to use the American knowledge for a developing country. Maybe you know the LEED standard maybe. There has to be some bicycle stands, there has to be in the planning, you have to be careful regarding bus stations. All these issues it sometimes looks more American than Nigerian.” ... (GMD)

In areas where some infrastructure was available, as a result of cultural orientations, they were not always being used in the same context as the US where the LEED standard was originally developed. For this particular example cited by the design director, the concepts of bus

stations in many Nigerian cities are not utilized in the same manner as they would in America. Also, while many rural dwelling Nigerian may use bicycles, they are more common with the poorer people of the society and largely uncommon with working class urban dwellers for factors such as cyclist's safety, weather and the long distances for commute that characterize Abuja where this particular LEED construction was taking place.

Poor planning and maintenance attitudes: As Multibrix has historically had mostly public clients in its patronage, the client's particular approaches and attitudes to planning and maintenance portends longer term challenges to a sustainable construction sector. This is explained by public clients mostly ignoring the operational phase of a building's life cycle where most sustainability considerations are actually implemented. Optimizing the efficiency of buildings to reduce water or energy consumption for instance, would require its components such as HVAC, insulation, to be in proper working condition with periodic preventive maintenance. The endemic attitude to maintenance is considered to make any current sustainable initiatives futile in the long run. On the evidence of several public projects that were constructed and maintained by Multibrix over the years, it was only when there was a complete breakdown that their services were requested. The GMD said;

“...it is an attitude that people have to get past. I would say as a general comment, most do not understand the benefits of preventative maintenance. You¹⁶ (only) fix something when it is broken...” ... (GMD)

Supporting infrastructure: sustainability initiatives require existing supporting infrastructure which would normally be taken for granted in many other developed country contexts. The absence of such in Nigeria is seen as a major factor hindering sustainability. The absence of a vibrant local manufacturing sector, adequate power generation, proper waste disposal

¹⁶ Referring to the Nigerian context.

systems, reliable supply chains and certification schemes have all been identified as contextual challenges. This situation is a reflection of the level of development of the construction sector and country in general. The power situation is particularly dire, with per capita production one of the lowest in Africa. Businesses and individuals who can afford it augment their power shortfalls by running on-site fossil fuel powered generators. On potential energy savings facilitated by designing to LEED standards, the Director of Operations said:

“...it is a bit of a crazy thing to work out the amount of money you can save on your building in terms of environmental protection and then destroy the whole concept with a diesel powered generator churning away...” ... (DoO)

The manufacturing sector in Nigeria has a very low capacity, thus its ability to service the needs of the construction sector with especially quality materials is very limited. Thus Multibrix rely on its robust international supply chains to procure quality materials in meeting the very high demands of its clients. Multibrix International and Multibrix services are subsidiaries that play a strategic role in facilitating these linkages and supplies of materials.

“We have problems to find producers for all the mechanical/electrical things. Like cabling, we can get here for instance, but all the (other mechanical and electrical) components, you have to bring from Europe or from America” ... (HTS)

This situation impacts on sustainability in two ways: firstly, the non-availability of required materials become a disincentive to firms. Secondly, a lot of grey energy is utilised in conveying these materials across huge distances when they are imported to Nigeria. Regarding the few instances of locally manufactured materials deemed to be of suitable quality, Multibrix complained of lack of awareness on the part of the manufacturers of relevant product labels and certification schemes that would market the products as sustainable materials and also qualify them for use either as ‘local content’ (section 3.3.7).

“We are using for example this PVC pipes from Kaduna, and they are more or less good. We are using them but the owner clearly said ‘I would not spend money to have a piece of paper showing that I have good quality and everything is well maintained and so on. These are the best pipes in Nigeria and I am selling them. And you would never have such piece of paper for me for a certificate or something. I do not need it for my market’. So how can I now cope with the politics¹⁷ to use material that in the same time, in the gas and oil industries, you are not allowed to use even a screw without a certificate that is complying with materials and geometry and use and whatever?” ... (GMD)

The above extract from an interview with the design director illustrates one of the many problems with the material supply chain in the NCS context. In this case, a reliable local manufacturer (called Pipex for this study) has a product that meets up with the very high standards expected by Multibrix and the stringent Oil and gas sector. However, in the mind-set of Pipex, they do not see the need and are unwilling to undertake any efforts to document and certify their products. They do not feel that it offers any advantages to their business. Multibrix finds this frustrating because they want to comply with the local content act which specifies minimum amounts of local materials and labour. In this instance they find the requisite quality with Pipex, but based on the documentation requirement of the Oil and Gas Sector, they have to spend more time and money to import products of similar quality from Europe where the manufacturers sell with the required documentation.

Technology also goes a long way in aiding sustainability where systems are developed that greatly aid delivering cleaner systems. Being a developing country, Nigeria has shortage of technology firms and vendors meaning again, linkages with foreign technology firms and

¹⁷ In reference to the political issue of compliance with the local content act.

vendors are required to collaborate with locally situated construction firms. Multibrix take every opportunity to highlight their strategic position in terms of its ability to deliver sophisticated technological solutions as evidenced in their company reports and documents.

Institutional drivers: Legislation and incentives are drivers of sustainability. As such, the absence of appropriate laws and incentives, coupled with weak regulatory institutions in Nigeria does not encourage Multibrix or other firms along the lines of compliance. While there are scattered pieces of legislation on the environment, majority of these are targeted at the more vibrant Oil and Gas sector.

“This is one, coming from the gas and oil industry, but this is also challenging in another way. Gas and oil want to have high level materials, everything imported, they have their DEPs (Design and Engineering Practice) rules of Shell and so on, but at the same time, they say ‘we want to have it from Nigeria’. Where do you get a really quality controlled product in Nigeria?” ... (GMD)

High costs: construction ordinarily is a very capital intensive endeavour. Thus, the higher costs (perceived or real) of procuring sustainable buildings are one reason alluded to by the interviewees hindering SC in the NCS.

“It is a high investment, but if it is run well, and maintained, after 3 years the investment is paid and then you make money. So those people who really study their projects in a real economic way, they know that it is not wasted money to invest in new technology and in good material and in good quality.” ... (HTS)

Barriers mentioned previously such as absence of reliable supply chains are seen to contribute to the high costs associated with sustainable buildings. This is as most construction materials have to be procured from abroad and ordinarily cost more than what they cost in the countries

they are procured from. The Head of Technical services in this instance refers to a sustainable building as a business case which if well maintained and operated would recoup the additional costs incurred in its sustainable features. However, from his experience in Nigeria, building owners are yet to consider sustainability from this point of view.

Logistical challenges in the NCS: The system of procurement and project financing adopted by the government especially which is the largest client makes it highly likely that projects remain unfunded for long periods of time leading to suspensions and sometimes abandonment of the projects. This also means that even if Multibrix have valid contracts for the execution of on-going projects, it does not mean the projects would be funded.

“Some of the difficulties in Nigeria! Projects are never funded for the duration of the project. They are just funded on a yearly basis based on budgetary allocations so if this year, the government have got other priorities, then the project is just not funded and the construction stops.” ... (DoO)

All these constraints result in operational difficulties Multibrix would rather not be dealing with. The consequences are that innovative schemes such as sustainability becomes relegated to the background where the firm has to deal with security, poor project administration, unreliable supply chains political instability and poor quality of workmanship to mention a few. Some of these logistical challenges have also been a source of innovation for Multibrix as demonstrated by its investment in a tyre refurbishment plant in Nigeria.

“When you have fast track projects and have to import a lot of the major equipment, materials and so forth because they are not available in Nigeria, or the quality is not available in Nigeria, there are often logistical issues with that. That is why we run our own port in Warri to try and overcome some of that. But you still get problems: you still get things stuck in customs. We run 1600 trucks moving material round the

country. There is a lot of the country that the road infrastructure network and so forth is deteriorated or not developed. That has a huge impact in just the cost of tyres. We go through thousands of truck tyres a year, to the extent where we now run our own tyre refurbishment factory, the only one in Nigeria I believe.” ... (DoO)

5.2.2 Firm processes

As a business entity, Multibrix remains very positive about the future prospects of the Nigerian construction sector. From the interviews, the concrete transformation processes initiated by Multibrix in order to develop its capabilities for delivering SC were not expressly stated. However, the company reports progressively talk about sustainability over the years. The first mention of ‘Sustainability’ was made expressly in the annual report for the year 2010 and in the 2012 report, there were mentions of its award to construct LEED certified buildings in Nigeria. From the interviews, the sub-themes emerging under ‘Firm Processes’ are the capability building actions of learning and training, collaboration, and the control functions of creating specific sustainability roles, monitoring, documenting and reporting site activity for feedback. These implied processes are discussed in the following sections.

Policy

As a firm, while the awareness of SC exists within the organization, there are no formal commitments to sustainability such as implementing applicable policies or procedures. However, there are bits of related policies such as health and safety and environmental policies that Multibrix have developed for its construction operations. The emphasis of the HSE policy is in reduction of Lost Time Injury (LTI), achieve zero fatalities and implement the ISO 14001 Environmental Management System. Multibrix make it clear that the motivation for this policy is its self-image as a market leader.

“What I think separates Multibrix out from a lot of the society here is that we self-police ourselves in terms of those regulations. We, to a certain extent, exceed the regulations” ... (DoO)

Learning

Multibrix over time has always prepared itself for the challenges of operating in a developing country like Nigeria. It conducts its own in house trainings which are high level, often times to the standards of a taught University Master’s degree.

“I...lecture for master(s) degree for colleagues. It is an internal study here in our company. It’s like a personal development programme and I have been responsible for one of this case, two times a year...” ... (HTS)

While this is not referring to sustainability learning, it indicates that Multibrix is a very organic firm with solid structures in place to quickly adapt to fast changing environments. The clearest example of learning about sustainability was by doing; i.e. implementing the construction of a LEED building in Nigeria under the tutelage of LEED certified personnel in their foreign subsidiary firm. According to the respondents, the undertaking of these projects has presented valuable learning experience for Multibrix and the learning experiences and contextual challenges are discussed in section 6.2.3.

Marketing/Creating awareness

The HTS claimed that the global economic meltdown of 2007/08 coupled with high energy (oil and gas) prices brought about a rethinking strategy within Multibrix to sensitize clients about ‘doing more with less’ and embracing sustainability. This position of the HTS goes further to illustrate the indigenous/foreign divide of perspectives. To the Western European personnel of Multibrix, the cost of energy prior to the boom period in 2008/09 was considered

low. However, for indigenous businesses, the cost of fossil fuels to augment power generation is regarded as prohibitive. Multibrix recognised this and saw an opportunity to market to businesses that there were substantial gains of energy efficiency brought about by pursuing a sustainability agenda.

“...in 2007/08, nobody cares about energy (oil and gas). The cost for energy was very low here in Nigeria...and then the crises came up and the oil prices...I think in 2009, one barrel cost \$140... and everybody was shaking a lot because if you have a building here in Nigeria, most of the people are using generators for their electrical energy but also for HVAC to cool the building and your bill was from one year to the other year, three times higher.” ... (HTS)

The HTS gave an example of Multibrix’s marketing and awareness creation drive by citing a sustainability presentation to construction stakeholders in Lagos in 2013. The pitch was reviewed in this study and some of its extracts are contained in Box 5.2. While no evidence was tabled that this yielded any increased demand for sustainable buildings, there are clear signs of Multibrix’s recognition of this business potential, and their confidence, preparedness and capability to meet any potential client demand.

Box 5.2: Sustainability Pitch to Prospective Clients

The Head of Technical services highlighted the following reasons that should underpin a change in client’s requirements:

- Minimisation of life-cycle energy costs in response to rising energy costs
- Reduction of CO₂ emissions in response to increased carbon concentrations
- Avoidance of pollutants in response to increased environmental degradation
- Resource efficiency in response to decrease in availability of resources

The pitch also contained statistics for the effects of construction on the environment and different global sustainability assessment tools and potential gains of sustainability, especially energy efficiency. At the end of the pitch, Multibrix’s capabilities were expressed, citing its on-going LEED projects.

Creation of roles

The implementation of these LEED compliant projects required expertise that was not readily available locally in the Nigerian office of Multibrix. Thus, a team of knowledgeable experts with LEED certifications was set up in one of Multibrix's foreign offices to collaborate with an on-ground team of local staff on the LEED projects. This is a form of technology transfer common with Multibrix's operations in Nigeria over the years: expatriate staff with the requisite knowledge and experience are often recruited or drafted from the foreign office or country to provide the expertise on on-going projects.

Another clear indication of the recognition of the SC agenda by Multibrix was the creation of a specific role in the project office to handle the specific procurement of its sustainable buildings. The title of this role is the LEED champion and the role involved liaising with the foreign office to implement the steps necessary for complying with the LEED standards. Other responsibilities attached to this role include the mentoring site staff, monitoring and documenting site activity as well as sending out daily progress reports to the team in the foreign office. The LEED champion comments on the sustainability role as thus:

“What I basically do is I go to site, I take pictures, I go around (the site) to make sure that they're following the strategies according to the checklist¹⁸. I do this any day during the week and at the end of the day, I come to the office, (and) all this information I get from the site, from the pictures - because I take pictures regularly - I need to see, to get it all together in a way that at the end of the day, I'll make out the report from it and then send it to (foreign office)” ... (LC)

¹⁸ Based on LEED targets

Training

Part of the formal procedures set up at Multibrix on the LEED project is the organisation of brief or short in-house training sessions for the other local staff, especially the site operatives, artisans and tradesmen. This was to periodically to bring them up to speed with requirements of the ‘special sustainability project’ and it involved the use of site briefings, brief training activities and ‘pep talks’ before the commencement of site activities for the day.

“Just like the, we have a pep talk on health, safety and environment, HSE. So it’s to give them a small quick talk on awareness of LEED.” ... (LC)

Monitoring and Control

On the LEED project, a checklist of site strategies based on the LEED standard was developed. A robust system of daily project reporting was set up to gather information on daily site progress. The methods of data collection include taking site pictures and documenting site activities for onward transmission to the overseas office.

“I’m working directly with them (foreign office). So they’ll feel like they’re here, walking through you know, in the sites with me. So it’s, it’s just basically going to site, getting all the information I need from pictures to having the small pep talk with the people on site to make sure they have an idea of what green construction is.” ... (LC)

Reporting and feedback

The reporting forms a feedback loop that is channelled to foreign team whereby corrective or improved action can be taken on future stages of the project, or on new projects. The overseas office had LEED certified staff that provided technical and logistical support for the project.

The reports were scrutinised for deviations from what was planned and control measures were implemented where necessary.

“... apart from the quick, small training and the pictures I take, I go around with my form to fill in events that I put also in my reports. At the end of the day, I come back to the office and then I put it together and make a report from it. (They) would review it (the reports) and say, ‘Oh, it is okay’ or ‘it’s not okay’ or ‘what do you think? Why don’t we do it this way?’ We always have meetings every week on (the) phone though.” ... (LC)

With the site activities constantly being monitored and controlled, the Multibrix believes it is primed to meet future client demand for such types of green buildings.

5.2.3 Sustainability action plan

Strategy

There was no evidence of an overarching sustainability strategy at Multibrix as only a handful of its projects involved sustainable designs. However, on the project level, the main strategy Multibrix has adopted in its procurement of sustainable buildings is the use of the LEED standard to interpret the sustainability requirements of the project. During construction, Multibrix state that several steps have been taken that is unique to these sustainability-related projects. For instance, nose masks were provided for workers when using materials that gave off harmful fumes or dust. The applications of finishes were zoned and proper ventilation of the spaces was ensured by not fitting all of the window panels, allowing for natural ventilation as much as possible. Some of these processes were verified during the visit to one of the LEED projects. Highlights of this visit are shown in Box 5.3.

Box 5.3: Site Visitation to LEED Project

A visit was made to Multibrix's new design office under construction which was designed to attain LEED certification. The construction was at the stage of finishing, with works going on with installation of finishes, painting and decoration. The visit was coordinated by the LEED Champion who used the opportunity to demonstrate how she carries out her daily tasks, what goes on on-site and some of the novel features of the projects. Insulation was a key feature of this project with triple glazed window units imported from Europe. Also, special wall insulation was embedded into wall partition units. The effect of the insulation was clearly visible as sections of the building were significantly warmer than the ambient temperature. There was zoning of the finishing such that areas where strong smelling glues and paints were being applied were not yet fitted with the window units to facilitate natural ventilation for the site workers. The provision for bicycles and electrical cars had been completed. Other features of interest were the use of high quality Nigerian granite finishing and a steel crown at the top of the building for screening solar radiation.

A few features are incorporated to enhance the energy performance of the buildings. Lighting systems are automated to go off when no users are in parts the building. Of particular importance were the choices of thermal insulation materials as Nigeria is a tropical country. The effect of this is that energy is required more for cooling than heating and it was deemed important for the building fabric to retain a lot of the coolness from the HVAC systems within the building.

Embedded Practices

Multibrix also have some embedded practices and non-project based activities that are neither explicitly required by the LEED certification, nor labelled as 'sustainability' but contributes to their sustainability credentials in their opinion. They claim to engage in reuse, recycling and responsible disposal of waste materials. In seeking to reduce operating costs, Multibrix commissioned a tyre refurbishment plant and recycles engine oil from its numerous plants and equipment. They had also considered the feasibility of converting a section of one of its large yards to a solar electricity farm. The decision on that was still pending at the time of the research. On project sites, waste materials are sorted into categories and are either given to lower cadre staff that may have some use for them, or they are sold off in secondary markets.

Reuse and recycling have more traction in the Nigerian context because given the social strata available in the country, what is considered waste by people on one socio-economic ladder often has use to people in lower ladders of the society. Other such embedded practices are:

Quality: Of these non-LEED specific requirements, Multibrix believes that adhering to strict in-house standards that ensure very high quality of works contributes to the sustainability agenda. This factor normally goes without saying, but in the NCS which is riddled with many less capable contracting firms, quality becomes a huge positive factor. The argument put forward by Multibrix is that in doing things right the first time and to a high quality means that that project would operate at an optimum for a long period of time.

“Yes, most of it revolves around the quality that is required and you can look at that as being sustainable. If you use good quality materials in the product, the product lasts longer. If the product lasts longer, it puts less demand on the environment and it is therefore sustainable.” ... (DoO)

Community engagement: On social sustainability, Multibrix employs the use of community liaison officers especially on construction projects in local and remote locations. There is often a perception amongst such communities that large multinational firms profit from such projects without the community benefiting from the project. The purpose of this official is to seek cooperation with the community, identify areas of mutual interest and ensure smooth operations on the project. The firm also makes a claim have a strong commitment to corporate social responsibility, which is a key feature in its reports.

“If you go to a remote location where you are not known, if you do not integrate with the local community, involve them, make opportunities available, you do not get anywhere. You get blocked, you get stopped. There are community liaison officers introduced, the project is explained and there are community policies put in

place; for employment of people from the communities, taking material from the communities and so forth” ... (DoO)

5.2.4 Stakeholders

Multibrix cannot adopt and implement sustainability in isolation without the coordinated input and collaboration of several other stakeholders. The interviewees highlighted that with the exception of few international clients, they had not had any of the other stakeholders contribute to the SC agenda. The stakeholders mentioned are the Government, designers, suppliers, manufacturers and users.

Designers

Designers are rarely mentioned in the interviews. This is partly because Multibrix offer design and build services on the one hand, and on the other have their in-house design teams ‘optimise’ designs conducted by mostly indigenous design firms. A foreign (emphasis on foreign) architectural design firm¹⁹ was contracted on the first of the three projects. Multibrix recognise a capability gap on the part of local indigenous designers. Subsequently, Multibrix set out to develop its own capabilities in designing sustainable buildings. The design of these projects differs from their ‘conventional’ buildings in terms of the targets set to meet the LEED design criteria.

Manufacturers/suppliers

The barrier of manufacturing and supply chains has already been mentioned in section 5.2.1. The procurement of a LEED certified building required high performance building materials not commonly used on other projects. Manufacturers and suppliers of building materials of

¹⁹ On this point, the interviewee emphasised the fact that it was a foreign design firm, highlighting the challenge of expertise and capabilities of local design firms.

the requisite quality are in short supply in the NCS. Thus, as a strategy, Multibrix has gained competitive advantage by morphing into a vertically integrated firm with different subsidiaries such as those that produce some of its materials such as aluminium and glazing finishes, stone finishes, wood works and aggregates. Another unit, Multibrix International handles the logistics of ordering, transportation and delivering materials from outside Nigeria so as to have a firm control of much of its supply chain.

“We have various subsidiary companies that we have set up over the years to take advantage of market segments that not only we as Multibrix need to service, but the market as a whole needs a service. So for instance, we have Multibrix profiles²⁰ that produces aluminium windows, doors and facia, we have Multibrix furniture which produces high quality, European quality furniture; office and household furniture. We have Multibrix services which does importation through the port in Warri....” ...
(DoO)

This illustrates the inadequacies of existing manufacturing and supply chains to effectively contribute to Multibrix’s operations and subsequently its implementation of SC (in addition to the points raised in section 5.2.1 under contextual barriers). However, Multibrix has been able to take advantage of some of these inadequacies through a vertical integration strategy to cement its market leadership of the NCS.

Clients /owners/users

The contribution of clients has also been explained in section 5.2.1 under contextual drivers for SC. From the experience of Multibrix, big international clients who have pre-existing global sustainability standards and have undertaken the responsibility for the ethical

²⁰ Subsidiary names changed for confidentiality reasons.

performance of their organisations were viewed as the biggest drivers of SC so far. However, market demand from the perspective of clients was very low.

Government

The government's role in providing the lead in the sustainability agenda was also discussed under drivers/barriers in section 5.2.1. The government at the federal level is the most developed and active form of governance in Nigeria compared to the lower tiers of government (states and local governments). This Federal level of government in addition to a few wealthy oil producing states of the country are the only levels of government that can afford the scale of projects that would warrant the engagement of Multibrix's size. Multibrix identifies the Government as that key stakeholder to drive the pursuit of an active SC Agenda. However, it was identified that there is no legislative initiative, sensitization events, advocacy nor incentives to drive sustainability in Nigeria construction as yet. Therefore, it was at the prerogative of the firm to chart a direction for itself by availing itself to its own standards and market forces only. The Director of operations said:

“But I do not think that there is any country in the world that has been able to do this without direction by the Government. The government must give direction; the government must give incentives. The government is responsible for administering the country as a whole. That is the role of government. They have to set the policies for the country.” ... (DoO)

5.2.5 Summary for Multibrix

Multibrix maintain a status as a giant in the NCS. The staffs make frequent mention of the firm's strengths as a power broker in one of Africa's largest construction markets. For this reason, the firm reckons it should be at the forefront of any innovation in the NCS. Being a

contractor of capability and choice, they have won the bids to construct two LEED certified buildings in Nigeria. The projects have provided an opportunity for capability development, self-assessment, learning and experience for the firm.

“The drive behind the change is that Multibrix is the eminent construction company in Nigeria and it has grown with the market and the needs of the country. So as the projects have become available, and been awarded to us, the firm has grown in size and stature and the ability to perform...” ... (DoO)

This experience cuts across its design subsidiary, the main construction company and facility management subsidiary amongst its functional units. The key strategy for implementing sustainability was using the LEED certification criteria for setting achievable targets on site. Many of these criteria were factored in early during the design stage. Particular emphasis was given to managing air quality, energy and water efficiency, use of local manpower and materials where available.

Multibrix decries the absence of a tight regulatory environment for construction in general and sustainable construction in particular. An interesting exception to this point of view is the existence of a Local Content Act (explained in Chapter 3) which encourages a minimum level of input in terms of man hours and material content to be locally sourced. The local content act specifically targets the Oil and Gas sector of the Nigerian economy. The Act was designed to ensure participation of indigent Nigerians on large technical projects and also transfer of technology. Given that Oil and Gas operators are also clients of Multibrix, this has gone some way into shaping its internal approaches to local content. However, the quality of these locally sourced materials and manpower are flagged up again as serious concerns by Multibrix.

There are indeed underlying concerns in Nigeria that could potentially be driving sustainability in the built environment such as energy poverty, scarcity of essentials, cost of

energy and pollution of ground water sources. Some of these societal needs can help prioritize any intervention schemes. However, contextual variations mean that systems or strategies cannot be borrowed from other contexts and implemented seamlessly. Examples are differing weather conditions, the existing systems which support sustainability or cultural orientations in other countries. Similarly, some contextual pressures mean that stakeholders might consider other priorities ahead of sustainability considerations.

The overall impression Multibrix has of the Nigerian construction context is that it is a very difficult one to operate in. Logistical challenges provide the number one challenge for its business operations. As a result, its priority strategy is ensuring that a robust supply chain is created within the company so that its operations are largely not dependent on any external influence. Security of life and property is another serious challenge that the management of Multibrix have to deal with. The absence of quality contractors in the NCS is a challenge but also a business opportunity for Multibrix, like setting up subsidiary business units that provide some of these services.

“This is also the reason why in many many cases we are asked for because unfortunately until now, only some contractors can do this quality: Quality in the sense of durability, of proper design” ... (HTS)

Yet, despite all these challenges, the promise of bright future based on impressive growth figures and a teeming population makes Nigeria an attractive market to Multibrix. In closing his interview, the director of operations at Multibrix had this to say:

“...sustainable construction is new to Nigeria; we believe we are at the forefront of it. It is not new in other parts of the world, so we have got the skills and the logistics to be able to call on what is available and to do our best to introduce it here. But we

have to be careful that we do not, in a sense, overstep the market tolerance at this stage...” ... (DoO)

5.3 Case Study 2: Dynamix Nigeria Ltd

The interviews were conducted with 5 high-level personnel of Dynamix across three of its main regional businesses (see Table 5.2 for designation and acronyms).

Table 5.2: Acronyms of the Different Interviewees

Designation	Acronym
Vice Chairman	VC
Regional Director Lagos	RDL
Managing Director North	MDN
Operations Manager and Head of Business Unit Abuja	OMA
Executive Director M&E	DME

5.3.1 Context

Understanding Sustainability

The staff of Dynamix appeared to be at an early stage of making sense of the SC agenda. This understanding stemmed from a prior engagement with an international client on a tender for a LEED compliant project which occurred a few months before the interviews were conducted. The client had specific requirement for a) a wholly indigenous construction firm; b) the project was to be construction to attain a Silver rating on the LEED certification scheme. Thus, there was a client-driven request for a sustainable building which triggered Dynamix’s interest in sustainability.

“We tendered for a project with Gambo and co²¹ but unfortunately we were not successful. But that was my real first experience with (a) sustainable project tender. In this company, we probably have not done any project that has taken sustainability into consideration, because first of all, the client must be willing to have a sustainable building or method of construction” ... (VC)

In responding to questions on sustainability, the staff covered very relevant issues such as air quality, material selection, energy efficiency, water conservation and waste management. Other areas included broad environmental concerns, the role of technology and social aspects of sustainability. The Lagos regional director was more robust in his responses to the sustainability questions as he was the one who personally attended to the LEED project tender. The Operations manager for the Abuja business unit also spoke with ease on some SC themes. He explained this from his industry experience gained practising construction in the United States. For the others, there was a tone of uncertainty to most of the responses which hinted that SC was outside their comfort zone. The Lagos director was the only one able to see SC as being broader than environmental concerns alone. This implied that a sustainability agenda is absent in its core business at the strategic level at Dynamix.

Awareness

Dynamix by its own admission are in early stages of making sense of sustainability. Its current positive disposition towards SC is a result of appreciating the potential business case of sustainability and the competitive advantages of such capabilities, brought on by their failed Gambo and Co bid. Towards the end of the interview, after brainstorming on many of the issues that had been discussed about sustainability, the VC summed up by saying:

²¹ Fictitious name given for confidentiality.

“Well, haven spoken to you, or we have been talking for a while; I feel that we probably do not have enough awareness about sustainability. We have an idea on sustainability, but I think the awareness level is low, even in a company like ours. So I can imagine going down the ladder (other construction firms), it’s probably a loss completely” ... (VC)

Drivers of Sustainable Construction

Clients: For Dynamix, clients have been the drivers of innovation in the NCS. Dynamix has amongst its clients, upcoming commercial banks, telecoms companies and a few oil and Gas sector clients. These clients represent the industry segments that have been at the forefront of Nigeria’s economy blossom in the last 15 years. The significance is that private commercial clients are more likely to be competitive and innovative as compared to public clients that traditionally dominate the NCS. According to the Dynamix, as was the case with health and safety previously (which has now become a mainstay in its operations), the sustainability initiative they encountered was initiated by the client. They draw upon a parallel argument advanced by Multibrix on the international/multinational dimensions of these clients.

“...most of the time, clients drive these things. Usually, we learn a bit from outside and we bring in, but more often, you meet a client, most of them international clients, who practice this where they come from and they want to come to Nigeria and they want to maintain that level of build. So when they come in, they teach us: even health and safety, where did start to learn about health and safety? It is from the oil companies. So if the clients, especially the international clients who have the exposure, if they are more concerned and they insist on having environmentally sustainable buildings, then we the contractors really have no choice than to learn, if we want to do business with them.” ... (VC)

Institutional drivers: Dynamix understood the role of legislation in particular in driving sustainable construction. However, the firm is of the position that institutional drivers play a limited role compared to the client related driver for sustainability. The regional director for Lagos echoed the similar views to the Vice Chairman:

“... When you have clients; the man who pays the contractor, say ‘look, this is how I want my things done’. We have done something (projects) for Willbros, doing something for Shell, doing something for Total. If Total says this is the way they want things done, contractors will comply. So I believe if those big influential clients insist on these, then you would have much impact. Well, it is okay to have government legislation so that those big clients are not seen to be doing something that the Government does not support. But when it comes to implementation proper, it would start from those big clients.” ... (RDL)

It would appear that the drivers mentioned by the personnel of Dynamix are largely limited to the client due to their very basic understanding of the broader agenda of sustainable construction. There was no mention of other potential drivers such as energy efficiency or life-cycle costs. The interviewees had a lot more to express about barriers to sustainability.

Contextual Barriers to Sustainable Construction

Awareness: Dynamix admitted to only becoming aware of sustainable construction and LEED in particular upon invitation to tender for the Gambo & co project.

“A key requirement on that project was LEED documentation; to obtain a silver categorisation. It made the higher management level to research more into what LEED is all about. As a person, I was only hearing of it for the first time as at my interaction on that project.” ... (RDL)

This represents a low level of awareness for a firm with up to twenty years' experience in construction, but also is an indication of the characteristic of the market and the fact that there has been very low demand for such a product/service in those 20 years.

Weakness of institutions and enforcement: according to the interviewees, weak institutions and poor enforcement of laws make it highly unlikely that legislation can drive a sustainable agenda in the Nigerian construction sector. From the experience of Dynamix, they are not aware of any regulations that enforce SC.

“No, not any regulation in the industry. There’s no such regulation in the industry that compels us to do such” ... (RDL)

The Regional Director goes further to explain that even in their previous sphere of operations where legislation exists (not related to sustainability), they are seen to be tick box exercises only to be taken into account when they mount a barrier in the tendering process.

“...Government legislations are everywhere. When they advertise for jobs, they list all sorts of documents; your QA/QC, your (health and) safety, even your pension scheme. People just photocopy documents and dump it on their tables. They (regulators) don’t look at those things. Even when they claim to look at it, to have used it to pre-qualify a particular construction firm, do those same government agencies follow through to see them practice those things? So if it is from Government legislation, I’m sorry to say it is just paper!” ... (RDL)

Knowledge gaps: education, training and awareness were also highlighted as barriers to the adoption and implementation of sustainability. As University degree holding professionals, all the interviewees did not receive any formal instruction on sustainable construction in their degree programmes. This is understandable given the fact that at the time all the respondents

went to the University, the sustainability paradigm was only just beginning to gain global traction. However, these issues were not on the agenda in the curriculum of local Universities that these staffs attended. Their on-the-job experiences also did not prioritize sustainability, until the tender for a LEED project by Procter and Gamble.

“First of all, in schools, at the time I went to school 25 years ago nothing like this was discussed. I don’t know about other people who went to school recently. When you learn, you learn in school and you come out and you learn from the job. If you don’t learn about it in school and you come out and you don’t learn about it on the job, then where do you learn it from?” (VC)

Cultural abstraction: Dynamix are of the opinion that the underpinning arguments of SC and the requirements of LEED as they see them are not resonant with the realities of stakeholders in Nigeria. However, this has more to do with the way sustainability is sold rather than a suggestion that there are no sustainable practices in Nigeria. Concepts like recycling and reuse are prevalent in Nigeria, though due to economic hardship and not necessary based on any voluntary or mandatory SC initiatives.

“... When your sphere of doing business is Nigeria, then if the culture of the country is not to engage in this, then it is strange to you. It is completely strange. So I think training is part of it. We do training, but we probably never see sustainability as part of the things that we should train on” ... (VC)

Industry structure: the age, structure and scale of construction activities in the NCS was also highlighted as a potential barrier to the uptake of innovative ideas such as SC.

“The US (construction sector) is more organised, more process-driven and they have a lot of experience from post-world war engineering corp. they are also very

equipment based as well because labour is very expensive... the main contrast is in the size of projects. In America, a small project is about 5 to 10 million dollars, whereas in Nigeria, that is a pretty sizeable project even for a company of our size”
... (OMA)

The implication for the performance of the NCS is that the priorities for the firms under such contrasting conditions would be grossly different. For instance, companies operating in the US are likely to face less logistical challenges compared to those in Nigeria and are more likely to undertake new innovations in construction. There are also restrictions on the nature of projects that Nigerian firms can undertake if there is a high dependence on manual labour. The access to large, affordable financing and imported technologies are also cited as a competitive advantage international firms have over local indigenous firms.

5.3.2 Firm processes

Policy

As an organisation, Dynamix Nig did not have any active policies on sustainability or the environment as a whole. But it was also observed that a lot of the firm's operations were not predicated on policies in general. There exists a system of organisational cultures that defines how it operates. These organisational cultures are not written or documented in any other format, but appear to constitute a code of practice for Dynamix. The stakeholders in the firm were however not able to identify specifically what this 'culture' is, but employees gradually find themselves immersed into this culture and performing 'the Dynamix way'.

“...we do not have any conscious policy but it's not that we are totally unaware that it might be required... part of our post-20 year anniversary strategy is to actually ensure that we try to be as standardised as possible in all aspects of construction

and that is one area that we have highlighted that we are not doing so much on and we need to improve on” ... (VC)

Training

Dynamix uses every opportunity to train its staff in order to remain competitive. In a move quite rare for both international and indigenous firms alike in Nigeria, Dynamix has sent out staff for training at Universities in England and the United States at its own expense. They also invite external consultants for in-house training sessions in areas where they feel deficient. On one of the days of the interviews with the firm, some of the staffs were undergoing training. However, these courses have more focus on construction management, health and safety and leadership. Dynamix also used the opportunity of this research to request a sustainability enlightenment training from the researcher.

5.3.3 Sustainability action plan

Adoption and Implementation of SC

Broadly, Dynamix had no project to date in which they had implemented any clear guiding principle of sustainable construction. All they had done thus far was to try and learn about sustainability in their own way; firstly, to meet the provisions of the client, and later on, to explore if any business opportunities or competitive advantage arose from the adoption and implementation of sustainability in their practice. In this case, the client for the LEED project was aware of the limitations of the indigenous in terms of sustainability of the contracting firms invited for the tender. In pre-tender meetings with all the pre-selected (all indigenous) firms, they indicated their willingness to develop the capacity of the winning firm by training a LEED officer and providing relevant training and learning materials.

Related embedded practices

An interesting fallout of the adventure with the bidding process for the LEED project is that though Dynamix were not successful (this was due to reasons other than their sustainability credentials), they realised that the label ‘sustainable construction’ was not entirely out of sync with a few of their engrained practices. Some of these practices aligned with the provisions of the LEED requirements. The regional manager expanded on this point, explaining some of these similarities:

“But I can tell you that in going through LEED documentation, I found out there are things we do already sub-consciously without necessarily knowing ‘oh it is LEED’. LEED is just attempt to bring this thing to our consciousness because for instance, recycled materials, recycled wood, air controlling systems, waste management systems; they are things we normally do, but it is not just documented as such” ...

(RML)

Community engagement: one of the requirements of the LEED standards which Dynamix have always incorporated to varying degrees is the active engagement of local host communities where some of their projects are situated. This is done for the purpose of creating employment opportunities, securing material supplies and sometimes pacifying elders with gifts to signify cooperation and ‘non-hostile intent’. However, this occurrence is more prevalent in small remote communities, especially those in the southern parts of the country and is almost non-existent in large urban areas and regions further up north of the country. While this seems like healthy corporate social responsibility by the firm, it is also an important step to ensure that the operations of Dynamix do not become targets of irate and disgruntled members of the community. This phenomenon is explained further in the discussion chapter.

“...we have a crop of workers (manual) that follow us from site to site. But whenever we reach any particular location, we always have to make sure that we have the local content of that particular locality engrained into your workforce. If not, in Nigeria, we have a very, very unstable kind of...” ... (RML)

Environment: Dynamix tried to demonstrate some commitment to some aspects of the environment. This commitment as they explain is carried out by ensuring that only quality and non-polluting materials were used on their projects. The firm emphasises on quality materials, even requiring clients to sign an undertaking if they insist on using alternative materials which they (Dynamix) cannot verify its quality on the project.

“On the environment, we are very conscious of not polluting the environment. Whatever we do, we ensure that it is done in that mind; safety and environmental concerns for protection. All materials that are brought to site are complete with a MSDS²² sheet.” ... (OMA)

Health and Safety: Dynamix have a commitment to the practice of Health and Safety on its many sites. Previous visits²³ to Dynamix’s construction sites have been subject to wearing personal protective equipment such as safety helmets and safety footwear. This has resulted in just one workplace injury in the past 5 years. This is quite impressive in the context of Nigeria where wearing personal protective equipment or the presence of regulated Health and Safety procedures with a dedicated HSE personnel on site operations is quite rare. Health and Safety was a paramount client requirement on the LEED project as they (the client) clearly expressed their preference to time overruns over having a single injury or fatality on the project.

²² Managing safety data sheets (MSDS)

²³ The researcher has prior research engagement with Dynamix and has visited at least eight of its construction sites in the past. Thus some of the explanations of the interviewees were easy to verify as the researcher had witnessed them in operation previously.

“With safety, we are buoying up on our safety companywide; First level safety training and we are continuing to train those who recognise unsafe conditions or unsafe acts”

Waste management: prior to Dynamix’s knowledge of SC or LEED for that matter, the firm has always implemented a waste management strategy on its projects. It has developed site waste management plans and dedicated specific personnel on its project sites for that role only. This happened to be another practice by Dynamix which is not common in the NCS.

“Typically on our site, we dedicate guys from the beginning of the projects that do not have any other thing than to clean up. It enables you to say ‘this is the waste management system, what kind of materials can be recycled, trying to segregate your deconstruction waste into the recycled one, to the one that cannot be recycled, and actually having somebody following up on what type of evacuation...” ... (RML)

5.3.4 Stakeholders

The contributions (actual or potential) of the relevant stakeholders to Dynamix’s implementation of sustainability have been largely explored under the sections for drivers and barriers. This section presents a summary of these positions based on the interviews.

Clients/owners/users

Dynamix share the view that ‘bottom-up’ market drivers of sustainability are important to drive the SC agenda in Nigeria. Their experience with the Gambo and Co tender reinforces this position. However, that experience has been a one-off and thus, the firm feels that there would be limited business opportunities or a business case for SC in Nigeria under the current circumstances.

Government

The government's role in pushing SC initiatives is recognised, though with a lot of scepticism. In the experience of Dynamix, where regulatory provisions have been made, they only serve the purpose of protocol, rather than a genuine effort at regulation.

Communities

Dynamix recognise host communities as being integral to the success of their projects, particularly in the southern region of the country. This is because there is likely to be unrests or a sense of neglect especially where the projects are domiciled in regions that have large populations of unemployed local youths. While national statistics put the population, level of poverty and unemployment as higher in the Northern part of Nigeria, this recognition of local communities is more common in the southern part of the country. The clamour for increased participation of host communities can be traced to oil producing communities in the Niger Delta region (in the South) who have always viewed oil exploration as exploitative and damaging to their environment and livelihood, while leaving the communities with little benefits.

Manufacturers/suppliers

Dynamix refers also to the challenge of availability of quality materials for construction either by virtue of local manufacturing in Nigeria or local supply chains. The consequence of this situation is the grey energy from transportation over long distances and increased costs of procuring these materials for their projects which are then transferred to the client. The firm appears to be unaware of material certification schemes such as environmental product declarations or Fairtrade schemes. This is hardly surprising as these schemes are foreign to the context of Nigeria.

“...you never really get really good materials locally. Yes, there are vendors that actually (keep) stock (of) them but hardly do you ever get them manufactured locally in Nigeria? So even if you get these materials locally, they most probably would have been imported one way or the other....” ... (RML)

Consultants/Designers

Dynamix also alluded their thoughts that design consultants, appointed by the client were in a better position to incorporate SC in projects especially at the design stage. This in itself lends to their argument that the client side demand is what they feel would drive sustainable construction in Nigeria.

“The way I see sustainability development, sustainable of construction; it is meant to originate from the consultant’s perspective. And you understand that we are a construction company; we put together the end of the thought process. We are at the tail end of the process itself...” ... (RML)

5.3.5 Summary for Dynamix

Strategic issues

Dynamix Nig Ltd is in the early stage of learning about sustainability. Two major incidences have driven this learning process; learning by tendering for a LEED based project and learning by participation in this research. The top management viewed their participation in this research as timely as they had just failed in the bid for the LEED project. It provided an opportunity for self-auditing, learning and understanding the importance of the sustainability agenda to their operations. This is in line with the firm’s view of itself as an innovative indigenous organisation that would explore all avenues to equip itself with relevant, state of the art technical know-how with the view to adding value to client satisfaction.

“...on our own, we are an innovative company, we try to be in the forefront of changes, but having spoken to you, I think it is something that has triggered some interest on this” ... (VC)

The sensitization of Dynamix to sustainable construction led to the firm considering recruiting a LEED certified consultant on its staff. However, this is planned future action and it remains to be seen if they still find such an option viable in the near future. It is not clear to the firm if many more clients would be in demand of such projects. It is important to note the role the LEED assessment methodology plays in interpreting and translating the requirements of sustainability for Dynamix.

Priorities

The recent expansion of the Nigerian economy has increased demand for construction, resulting in many more indigenous firms with rapidly improving capabilities. In this research, the respondents from Dynamix have highlighted that while they think sustainability is an important agenda as they come to terms with understanding its nuances, there are many more pressing issues that they feel are more important to concentrate their efforts on in the meantime; i.e. the market is yet to demonstrate a solid business case or firm-level competitive advantage to be gained by adopting sustainability.

The difficult operating environment for construction businesses has shaped where the Dynamix choose to focus. Resolving logistical issues, rolling out processes for improving construction, local labour workforce skills, supply chain issues and importantly improving the quality of the built environment (see next quote) are all problems the firm is trying to address. This sometimes provides a distraction from focussing on other areas of intervention like sustainability that may potentially hold value for all construction stakeholders.

“...the quality of the (constructed) items is actually something that is very, very important to us because we have kind of created that niche. I mean, the company being an indigenous company, we’ve kind of created a niche that, “Look, we might be indigenous but at least, we have an idea of how to source for really good materials.” ... (VC)

The company instead has channelled its energy on being innovative based on what it perceives as important. One area where Dynamix were keen to show their green credentials was by demonstrating its commitment to electronic forms of communication over more expensive, time consuming paper communications. Since approximately 2005, they had relied increasingly on the wave of telecommunications boom in Nigeria²⁴ to communicate its operations across three geographically dispersed regional offices and construction sites around those areas.

“It is a company policy. We do more of electronic; and of course it is easier too. If you are having three offices in difference locations: It is easier when people work by email. We have worked by email for years” ... (MDN)

Operating Characteristics

Dynamix refer to the state of the construction sector and how it shapes where they focus their business efforts. They paint the picture of a ‘buyer’s market’ (where in this case, the client is the buyer) where competing firms are scrambling for very few projects and as a result, most of the powers are dictated by the client. The procurement system equally does not follow best practice conventions as many stages of design/construction are not properly defined and

²⁴ The telecommunication boom occurred around the year 2000 when government granted licenses for private telecommunications companies to start operations in Nigeria. The telephone density has shot up remarkably from 0.4 per cent in 2001 to about 80% as at January 2015! Similarly, internet penetration has sharply risen from 0.06 percent in the year 2000 to 38% in 2013 (International Telecommunications Union, 2013).

mainly intertwined. Contracts are usually awarded to the lowest bidder, who often times are not competent enough to have incorporated costs associated with issues like Health and Safety. This puts firms like Dynamix at a competitive disadvantage in tendering.

“If not that we have the safety policy and we also transfer some of our safety equipment to keep the safety gear from one job to the other and thereby reducing the cost on one particular job, there are no provisions made in contracts except maybe when you’re working for an American company that comes and specifies it in the bill and we now get further clarification on what is required and we implement.” ...

(VC)

Prospects of SC in Nigeria

On the future prospects of SC in Nigeria, Dynamix are not too optimistic and this is based on their interactions with other stakeholders over the years. For starters, the firm is of the opinion that the demand is low, if not non-existent, the sustainability awareness, skills set and education is poor and legislative provisions and controls are virtually non-existent.

“We are a long way out, if you ask me, because we have a (weak) educational programme in Nigeria. A good population of people who work in the construction industry are illiterate completely. It is not something that is completely attainable in Nigeria if you ask me” ... (OMA)

Dynamix also saw the importance of participation in this research. In the aftermath of the interviews, the researcher was invited to give a presentation on the business case for sustainability to top management staff Dynamix.

5.4 Case Study 3: Sheltarc Properties

The interviews were conducted with 7 middle and high-level personnel of Sheltarc in its main businesses headquarters in Abuja (see Table 5.3 for designation and acronyms).

Table 5.3: Acronyms of the Different Interviewees

Designation	Acronym
Managing Director	MD
Project Manager	PM
Project Architect	PA
Quantity Surveyor	HQS
Finance and Investment Manager	FIM
Production Manager	PrM
Quantity Surveyor	QS1

5.4.1 Context

Understanding Sustainability

There were little or no takeaways from the interviews to suggest that Sheltarc as a firm had an understanding of the implications of the sustainability agenda in construction. Only two of the staffs interviewed were able to talk freely and with some degree of awareness, knowledge and understanding of sustainability. The analysis of Sheltarc's adoption of SC is almost exclusively done based on the responses of these two staffs that provided rich insights in their interviews. This is because Sheltarc had no discernible official position on sustainable construction like the previous two case study firms. There were no dedicated roles created for SC, neither were there any functional departments dedicated to the implementation of SC. However, there were few ideas being pushed across some of Sheltarc's specific projects which resonate with numerous SC themes. These ideas are the brain child of individual project staffs, rather than a collective strategic decision of the management of the firm. The

common denominator for these two staffs who showed an understanding of SC was the exposure gained during long periods of study and life in the UK and the United States precisely. The United States educated Project Manager (PM) said this about his contributions to Sheltarc's sustainability credentials:

“The last of couple of years that I’m here, especially with the, with the company here, I’m trying to introduce little things that makes a difference in the product that we provide. Little things that gives you efficiency when you come to how much money we spend, efficiency in operating aspect; its (sustainable construction) a process very developed elsewhere. But we are still slowly introducing the green aspect or sustainable aspects of construction” ... (PM)

Examples of the ideas that have been introduced are presented in section 5.4.3.

Awareness

The interaction with the firm, either during the preliminary introductory meetings or during the interviews, did not evoke any responses that showed that Sheltarc were aware of SC or a business case for it at the firm level. Different individuals based on personal experiences have awareness of sustainability, but have difficulty in passing such ideas across to management in order to formalise the holistic adoption of SC principles across the spectrum of its projects.

Drivers of Sustainable construction

The drivers of SC from the perspective of the Sheltarc staff were largely speculative rather than based on empirical evidence. This is because of the limited experience Sheltarc has in providing sustainable buildings. Thus, the opinions highlighted were based on reflections on what happens in other contexts. The following drivers were observed from the interactions with Sheltarc:

Clients: clients are seen by Sheltarc as important potential drivers of SC within the Nigerian context. The increasing importance attached to the role played by clients is predicated on the entry of big brand name business concerns into the Nigerian economy after years of sustained economic growth. The project manager at Sheltarc believes that the lure of ‘green premiums’ enhances the chances that major players in the commercial real estate sector would procure sustainable buildings to meet anticipated growth in demand. He also makes the distinction between a ‘sustainable building’ and a ‘certified sustainable building’ which highlights the importance of certification, even where sustainability principles are incorporated.

“I think right now for example; Nigeria is getting into the grade A²⁵ of the building systems. (We) already have international companies that come to Nigeria, to either rent or lease large office buildings. That could be a key; we have a schedule to start building the Sheltarc Tower in Lagos and a lot of the things we are looking at is; ‘what are the things you (we) can introduce that makes you not only a grade A office building, but a green approved grade A office building” ... (PM)

However, despite recognition of the potentials of clients in driving SC, Sheltarc are yet to holistically implement a sustainability agenda in its developments as demand for such developments are currently low. One potential reason advanced for this phenomenon is that Sheltarc try as a firm to respond to the immediate needs of clients which at the moment is geared at ensuring affordability. Due to the fact that the firm is in the business of mass housing, the specific requirements of individual clients are hardly taken into account. The project architect explains that upon taking possession of residential developments, few clients have been known to fix sustainable and energy efficient devices such as solar panels and

²⁵ A connotation to suggest high performance, environmentally friendly buildings

inverters for instance, in their properties. The project architect was able to know this because Sheltarc oftentimes provides aftersales facility management on a host of its developments.

“But after selling the estates, some clients bring these things (smart or sustainable products) to their houses...” (PA)

Internal Change agent: The Project Manager highlights his efforts at driving some changes through within his sphere of influence. Given his experience and practice in the US, he sees an opportunity to introduce some gradual ideas and changes to his projects. Examples of the sustainability ideas adopted on Sheltarc projects are given in section 5.4.3. He attributes this possibility to the flexibility the management gives to staff to drive innovation through. However, he does not provide any evidence that these ideas would form part of the company policy in the future.

“We thought about it (sustainability) as a company²⁶, let’s start thinking into them. Just as parenthesis I’ve been part of the green initiative in (Washington) DC, so I kind of know some of these things. We have a certain amount of things that we can introduce” ... (PM)

Green premiums: as a developer, Sheltarc seek to implement innovations that improve the demand for its products and services. In the estimation of the Project Manager, he identifies a business case for incorporating some of the SC principles/themes which could provide value for clients and should be considered on some projects. He believes some premium clients might recognise these features and be encouraged to patronise them. The academic literature however is yet to confirm with empirical evidence if green premiums actually exist.

²⁶ While he states the thoughts originating from the company, the ideas have originated from him based on his US experience and the management has only given passive support to him to implement in some of his projects.

“...things like (insulated) partitions, power and lighting, central cooling and heating system, all that stuff, are the things we can (do) on a design level that can make it a Grade A green building. Because having that accreditation to your office makes it more marketable to those companies. So I’m looking at that since we have a lot of these companies coming especially to Lagos and Abuja. A lot of developers might look into; ‘what can we do to be a green approve office building so that we can lease it to USAID?’ ... (PM)

While this claim by Sheltarc has not been supported by any evidence, the thinking of the PM lends some credence to the argument that sustainable buildings could be attractive to certain clients and have the potential to increase property or rental value.

Incentives: The Project Manager alludes to the presence of incentives as a driver for SC in other contexts. He specifically talks about a regime in the U.S construction sector where tax credits are awarded to firms to offset the higher costs associated with sustainable buildings. The point is made that no such incentive schemes exist in the NCS.

“I think the, the tax credit system in the US made it easier for a company to try to be involved or be outgoing towards change and resistance there, because for them if you spend that money upfront (on sustainability) then your tax break, your tax credit gives you back that money” ... (PM)

Contextual barriers to Sustainable construction

As with the drivers of SC highlighted above, the barriers are mostly referred to in a speculative manner rather than based on the empirical facts obtained from its operations.

Awareness: the deduction from the interviews with the personnel of Sheltarc suggests that the consciousness and recognition of acts that lend towards being sustainable was not prevalent

within the firm. Certain key personnel were unable to identify with questions involving basic SC themes such as renewable energy or site waste management as an example. The consequence of the lack of awareness expressed in these interviews is in the management not appreciating potential application of sustainable features such as energy savings from choice of HVAC or implementing site waste management plans for instance.

Costs: the perceived cost of sustainable buildings is viewed as a barrier to the adoption and implementation of SC. This is despite the fact that some of these strategies yield long term cost savings which are often ignored when project decisions are being considered earlier.

“Construction wise, anywhere you are in the world as of today, green initiative on the primary construction process will always be more expensive, but in the long run when you’re operating the (building) then you reduce it (cost) considerably” ...
(PM)

Attitudes and cultural inertia: it has been stated severally that SC requires changes from different stakeholders and at different levels such as the strategic and the operational level. Resistance to change is cited as one of the numerous barriers hindering change in the construction sector. In the experience of Sheltarc, the PM makes reference to a firm culture of pursuing short term goals rather than long term ones, even in the event where there are savings to be made long term. The interviewees allude that this occurs on many levels; at the level of the client and at the level of the users of the building and the management of the firm itself.

I apologise to say it, but we are a culture that looks at things as of today (short term). We tend not to look at the tomorrow aspect of it and when you tell someone ‘we are spending 200,000 naira more (in the short term), but think about it five

years along (the line) you are saving one million naira. They're like, "No, what about how much I have spent today" ... (PM)

The PM goes further to give two instances to buttress the management's resistance to adopting newer ways of doing things.

"We all like the split unit (a wall mounted I HVAC) which is not really quite economical and it's not really energy efficient. The centralised system could be a better system if we could allow... I think I did the renovation of this office about a year and a half ago and it's taken me about that (same) time trying to convince the board that we can actually introduce a central cooling system, but no" ... (PM)

After illustrating other examples of resisting change, the PM goes on to express pessimism on the willingness of other stakeholders to be sustainable.

"I think you just need to look at what can be the perception of the people around you and the environment as well. Are they more likely to accept the change? It is hard in that reason because people are scared of change." ... (PM)

5.4.2 Firm processes

Policy

Policy instruments are seen as systems of principles that guide decisions to achieve rational outcomes. Sheltarc do not have any policies on SC, the environment or any major theme on SC. This in itself hints at the strategic thinking of the Management of Sheltarc, though written down policies are often a luxury in Nigerian businesses. However, interacting with a number of top management staff of Sheltarc, it was clear that SC was not on the agenda as a strategic objective.

Creating awareness

The project manager highlights his future plans for diffusing the awareness of SC across Sheltarc having worked in the U.S on LEED accredited projects and appreciating the advantages of SC.

“I have been part of the LEED app accreditation back when I was in the US. And even if it’s not going to be on that level, what we are thinking about doing is bringing the topic (up) every once in a while. We have management meetings every month. What we could do down the line is to bring the topic at the end of each meeting. It could be energy, it could be emission and pollution, it could be sustainable construction. Whatever that is, it is bringing up the topic, discuss it at the meetings and slowly people will grow into what the technology is or what the issue is” ... (PM)

5.4.3 Sustainability action plan

Sheltarc have not wholesale adopted and implemented SC in their developments. But with a few staff being knowledgeable on the subject area, quite a number of initiatives they have adopted in their practice align with the sustainability agenda. This section explores these practices and the motivations for them.

Strategy

There is no clear cut strategy to guide the implementation of SC in Sheltarc. The SC agenda calls for a ‘holistic’ adoption and implementation of interventionist strategies across a broad range of different categories. As the PM pointed out, there were some areas of his prior awareness, knowledge and expertise in SC which he lent to a few of the projects under his

purview. This is indicative that this particular company action was decided by a mid-level project staff rather than higher level management.

Examples of sustainable practices

Sheltarc had engaged in a few projects which incorporated features that align closely with the requirements of SC. The following ideas were introduced to a few segments of housing belonging to Sheltarc.

Insulation: on one of Sheltarc's project, the development required high standards for thermal comfort as demanded by the client (international). With Nigeria being in the tropics, design requirements cater almost exclusively for cooling rather than heating as the case is in the UK. To make this project cost effective in terms of cooling costs, the decision to introduce special insulation on this particular project was taken. The experience and expertise of the PM was instrumental to ensuring that the requisite designs were carried through and that the supply chains required to actualise the design requirements were sorted out.

“At the commissar project, we have had a lot of insulation, actually more developed insulation process in our walls. We introduced the insulating dry wall system for the partition which is not very common in Nigeria. One thing it does it reduces the cost of heating and air condition. I mean heating doesn't really matter here, but more air conditioning and cooling. So that's something that we thought, could be a little add considering who the client is” ... (PM)

Energy efficient lighting: energy is increasingly becoming one of the biggest national issues facing Nigerians. The growing considerations for electricity demand management made it attractive for Sheltarc to introduce energy saving lighting bulbs and solar panels for garden and security lights.

“The second thing is the lighting; energy efficient lighting. I think what worked out pretty well, that would have helped them, into savings in their energy in their energy bills. And then the external lighting of the compound, a lot of it is solar, especially the ones for the garden. So we tend to introduce the small baller lights that have the solar panels” ... (PM)

Green roofs: The Sheltarc PM also introduced the concept of a green roof on another project site. The main motivation given for this decision is the potential of the vegetation to provide for insulation from direct radiation of the sun’s rays. Another plausible reason which was not expressed is the aesthetic appeal of a green roof. It is not clear from the interview if the other purposes of a green roof such as the absorption of rainwater or creating a wildlife habitat also informed the decision.

“We just finished a design right now for our Lokogoma project at the Promenade. I’ve introduced the concept of flat roof. So we’re trying to introduce the concept of green roof. Flat roof, felting, put a little bit dirt on top, and you can build, you can actually put grass on top...” ... (PM)

Water efficiency (reuse and recycling): Abuja FCT has one of the best water supply of any city in Nigeria. However, massive expansion of the city limits and population in recent times is putting a stretch on the availability of municipal water supply. Sheltarc is involved in residential or commercial buildings in areas where infrastructure is often inadequate or yet to be provided by local authorities (based on an arrangement with the Ministry of the Federal Capital Territory). The cost effectiveness of a grey water recycling system was considered for one of Sheltarc’s hospitality developments because of the economies of scale.

“We are trying to find a way to use (a) grey water system. It’s something that in the (single) housing system, it’s not that much profitable. But if you look at a hotel (and)

the amount of people you have, the amount of water you use, a grey water system can be very very useful. Basically all grey water will be collected instead of going towards the drainage and then it can be utilised again for flushing the toilets and everything else. So that's something that we're looking to introducing soon" ... (PM)

5.4.4 Stakeholders

Sheltarc makes the following responses on the potential contributions or hindrances of the various stakeholders to the SC agenda.

Client

Clients are considered the biggest facilitators of SC under the current circumstances. Current demand for sustainable buildings is low, despite the recognition of the potentially higher market value for such buildings in the NCS. The Project Manager reinforces the role of the client's understanding of sustainability. With this understanding brings the demand and cooperation required to procure such a building in a context not particularly suited for such type of construction. As an example, on one of Sheltarc's projects, the client facilitated the procurement of insulation products from the client's home country based on their appreciation of the benefits with regards cooling costs. On this project, the synergy between Sheltarc and the client eliminated administrative hoops normally encountered in the importation of these high performance insulation boards which were not locally available.

Well we did make special arrangements, like I said, since the commissar is the client, so most of the product that we get from (country), they become very easy for us since you don't have to go through the whole custom process of clearance and stuff because they, it becomes their property.

Government

Sheltarc make little or no mention of the Government in the interviews because the property development is largely for the private and commercial sectors which Government plays only a bit part role in facilitating access to land for development. The other implication of this is that the impact of any government initiative to drive a sustainable construction agenda is either non-existent or not being felt at all.

Communities

The construction of some of Sheltarc's developments often falls outside of the city fringes especially in Abuja FCT. These lands are notoriously fraught with squabbles over indigene-settler²⁷ dichotomies. Sheltarc realize that it is quite important for them to identify with these host communities in order to ensure smooth execution of their projects.

Manufacturers/Suppliers

The limitations of local manufacturing of quality materials and supply chains in the NCS were equally highlighted as a limiting factor for Sheltarc's operations. Sheltarc's housing or commercial developments business were initially procured using labour only subcontracts where they would provide the materials for the subcontractors to carry out the sections of work. The economies of scale (bulk purchases) were initially thought to provide an advantage for Sheltarc. However, over years of implementation of this system, the cumbersomeness of the supply chains, especially with heavy dependence on imported construction materials means that supply deadlines are often missed resulting in construction delays and conflicts.

²⁷ Despite the enactment of a uniform Land Use Act all over the country, land continues to be viewed as 'community property'. Government and developers (viewed as external parties) usually pay 'compensation' to local communities for taking over land previously used for subsistence farming by these communities.

For this reason, Sheltarc are exploring a transition to labour and material subcontracts for its future projects.

“We keep on having challenges of completion period. It's a serious challenge for us, using that procedure of labour-only (sub)contract. The reason being that some of the materials are sourced abroad, for example, China. We start having problems with time of delivery. We set the time for the project and engage these labour contractors in anticipation that these materials will come in on or before the time scheduled...” ... (HQS)

The absence of active material manufacturing in Nigeria is responsible for the unrealistic delays in supply chains. This heavy dependence on importation also results in the consumption of grey energy. The role of the client was once again emphasised where in a certain instance, the client was said to have facilitated the procurement of materials where they were not available in Nigeria.

“The reason why I say client facilitated is that the client made it easy because he appreciates what the product is, and he actually is more than happy to help us get it, since it will be, on the long run it'll be more beneficial to him than to us” ... (PM)

Competition

Sheltarc are convinced that the conditions that make it difficult to adopt and implement SC on its projects are the same faced by their closest competitors. They are however confident that their age, reliability and track record of delivering houses and property to clients over the years is what gives them a competitive advantage in the development market, not the implementation of special SC principles within their housing and commercial development projects.

“No, and I don’t think you will find any. There are companies that want to be forward towards sustainability. But I haven’t seen one so far that has done anything in that perspective” ... (PM)

5.4.5 Summary for Sheltarc

Sheltarc raise only a few isolated incidences of features and practices related to sustainability in construction in its business. The first incidence involves the office of a foreign mission with which they engage in a partnership for housing developments for its staff. On this project, one of the big requirements involves insulation and air-tightness in order to reduce cooling losses in the building. Again, this is driven by the client (a foreign embassy in Nigeria) who also understands the limitations of achieving such designs in the Nigerian context. They (the foreign mission) were in talks with Sheltarc to facilitate partnerships with construction material supply companies in their home country to provide suitable insulation materials for the housing project. Again, this casts shadows on Nigeria’s low manufacturing capabilities, and the absence of local supply chains to deliver materials that facilitate the procurement of a sustainable building. The other examples are in the introduction of green roofs, grey water reuse facilities and renewable or low energy products on other projects.

Implications of Sheltarc’s sustainability credentials

Sheltarc has been one of the major players in the housing development market in Nigeria’s new capital city²⁸. In recent years, the city has seen many developments in all the construction sectors; infrastructure and commercial, industrial and residential buildings. Majority of the developments are relatively up-scale compared to the general standards of living in Nigeria. Majority of Sheltarc’s portfolio is in the residential housing sector. As sustainability has not

²⁸ In Nigeria, the two major cities where private housing developers are very active are Lagos, the former capital city and commercial nerve centre of the country and Abuja, the relatively new capital city.

been holistically incorporated into the operations of Sheltarc, it demonstrates that they do not see a competitive advantage of sustainable construction in their operations. Given the fact that only few staff of Sheltarc display an understanding of sustainability within Sheltarc, it was difficult to get a firm-wide view or for the respondents to explain why SC is not catching on in their business. A possible explanation for this is the very low levels of awareness that are characteristic of developing countries.

“In Nigeria we haven’t really, sustainability is something that we’ve grown into. I mean the new technology isn’t there yet. We’re still moving the block and mortar sort of construction. But like I say here we are still slowly introducing the green aspect or sustainable aspects of construction” ... (PM)

Sheltarc is a very successful Nigerian developer based on its years of operation, and the scale of its activities. This implies that the properties and services Sheltarc provide are reflective of demands of its buyers and that currently, there is a limited business case for SC from their perspective.

5.5 Across-Case Analysis of the Three Firms

Eisenhardt (1989); (1991) makes an argument for richer insights based on the powers of multiple cases. From the analysis, there were some remarkable similarities and differences in the way Multibrix, Dynamix and Sheltarc spoke about sustainability. This section explores the variability of findings across the three case study firms.

5.5.1 Variations between firm backgrounds

This multiple case study explored the adoption and implementation of SC across three firms in Nigeria; Multibrix, Dynamix and Sheltarc. These firms broadly differed in size, ownership structure and mode of operations. This variable choice of firms was considered important to

understand how their different operating circumstances and structural make-up influenced their strategic approach to sustainability. An initial description is given of the basic firm characteristics in previous sections. This section explores how the firm’s characteristics shape the responses provided to the research question.

Table 5.4: Snapshot of firm characteristics

Firm	Multibrix	Dynamix	Sheltarc
Type	Engineering, Procurement and Construction (vertically integrated)	Procurement and Construction	Developer (Residential and commercial)
Age	Over 40 years	Over 20 years	Over 20 years
Regional	Yes	Yes	No
Classification*	Mega International	Lower medium sized indigenous	Lower medium sized indigenous
Staff strength**	Up to 18,000	Over 300	Over 300
Average turnover			
Client focus	Public and private	Private	Private
Sustainability policy	No (Environmental policy available)	No	No
Sustainability projects	Yes	No	No

* Based on Coffey International (2014)

** Approximate; varies significantly with workload

Table 5.4 represents a summary the research firms’ characteristic. It is evident from this table that Multibrix is a much larger organisation than either of Dynamix and Sheltarc. This has implications for the capacity and capabilities of the different firms. One other similarity between two of the three firms is the strategy of integration.

Firm size is a huge factor influencing the ability for the firms to roll out new capabilities and know-how such as adopting SC. Multibrix is structured in a manner that prepares it for identifying new trends or demands within the construction sector. It has a business development unit and a special projects department both geared at studying and exploring untapped market potentials in the NCS. The management of Multibrix believes that the absence of many products and services (including sustainability) in a developing country as Nigeria is often a business opportunity for the firm, once the feasibility is confirmed.

For Dynamix on the other hand, being a much smaller indigenous contracting firm means that they have much less resources or clientele at their disposal to match the strategic nous of firms like Multibrix. They attend to a much smaller pool of clientele and have less of a say in what capabilities they are able to develop. As regards Sheltarc, being a property developer, they are more sensitive and respond to market trends and the lack of SC activity can be related to very little awareness, demand or patronage from local clientele. In other words, while all three respond to client demand, Multibrix's position as a pacesetter offers them the ability to take some initiatives that the others cannot. An example is the decision to build a LEED certified building to showcase its abilities.

Multibrix is also able to employ staff with wide and varied experience when needed. This is key to its ability in developing new capabilities rapidly. The understanding of SC as presented by the Multibrix personnel draws heavily on their experiences of work and life outside of Nigeria. Dynamix and Sheltarc are predominantly staffed with indigenous personnel whose life experiences, education and training barely equip them with the requisite SC knowledge. There were exceptions however in cases where the staff were educated or lived abroad for reasonably long periods of time.

5.5.2 Variations between contextual influence on the firms

All the three firms operate within similar constraints and boundaries of the NCS. From the analysis, there were some remarkable differences between the way Multibrix, Dynamix and Sheltarc spoke about sustainability. Comparing how each firm understood SC, the personnel of Multibrix appeared more comfortable and grounded in their awareness and knowledge of SC. Their responses covered a broader range of SC themes and also to an appreciable level of detail and depth. For example, the Director for Design made reference his experience with SC in different countries and talked about different sustainable strategies and technologies, while

the director of Operations had first-hand experience with feed-in tariffs and solar electricity generation. Multibrix were also able to talk about its other concrete plans for sustainable interventions including commissioning a tyre refurbishment plant, an engine oil recycling plant and converting a large yard of theirs into a solar park for generating its own electricity.

This contrasts significantly with how the indigenous firms spoke about SC. Dynamix were in an early stage of making sense of the sustainability paradigm and were trying to decide whether it offered any advantages to its business and if they should engage with it going forward. Their experience of SC was limited to information at their disposal from tendering from a project. The significant contribution of Dynamix's interviews was the fact that while some of their previous actions met some of the provisions of the LEED standard, they were totally unaware that they were implementing some elements of sustainability. In the case of Sheltarc, they only engaged with elements of SC only due to the input of a few staff that had SC knowledge from outside of Nigeria. There was no clear discernible evidence that this was a strategy that would be carried forward in the future by the management.

The common denominator for the three firms is that their core business function involves the procurement of buildings for a diverse range of clients. All the three firms identified the client as common driver of sustainability in their operations. However, the extent to which the client encouraged the adoption of SC differed broadly based on the classification of the firm. For Multibrix as a mega international construction firm, its position as a top competent contractor allows it to engage with high value construction clientele in Nigeria. Multibrix reports that its clientele includes the government (at the Federal and state level), multinational oil corporations and fast moving consumer goods (FMCG) giants. These clients, based on their size and international profile have well defined ethical standards for business and would readily pay top dollar to maintain these standards globally.

As for Dynamix, they sit at a much lower tier populated by indigenous construction firms and quite similarly, deal with comparatively lower value clients. The demand for sustainable buildings by this category of clients has been virtually non-existent in their experience. In the case of Sheltarc, as a property development firm, while they undertake large scale development projects, their buildings are shared between multiple buyers, leasees, tenants or users who individually might not be aware of SC or cannot muster the resources to pay for more expensive sustainable buildings. Thus Sheltarc have only introduced features which would be appealing to these individual end users. As the sustainability consciousness is low across this spectrum of end clients of Sheltarc, SC is yet to be adopted holistically on Sheltarc's developments. Figure 5.1 shows a relational 2x2 matrix diagram of the relationship between the international and indigenous influences on the client's sustainability demand and firm capability.

	Indigenous Client	International Client
Indigenous Firm	No evidence of sustainable thinking in client's brief or projects and no evidence of sustainability capability of the firm	Interest in Sustainable projects with opportunity for capability development of the firm
International Firm	No evidence of sustainable thinking in the client's brief or projects and evidence of sustainability capability of the firm	Interest in Sustainable project tapping into existing available capability by the firm

Figure 5.1: A 2x2 Matrix Mapping Firms, Clients, Sustainability and Capabilities

The relatively slow pace of sustainability adoption can be traced to three major factors; the absence of institutional drivers, the low demand from clients and the strategic focus of the

individual firms. The three firms all agree that they are not aware of any laws or regulations that make it mandatory or encourage the adoption of SC or its principles. This means that ‘top-down’ drivers are not effective in this instance and that only ‘bottom-up’ market related drivers are likely to influence the firm’s strategic decisions. With respect to the firm’s image, Multibrix were of the opinion that they should be in the driving seat of any innovation coming into Nigeria. Thus, at the strategic level, they opt to be globally competitive and they recognize SC as a future determinant of competitiveness. Dynamix have chosen to be innovative in areas that affect smaller local clients such as project documentation, information technology and quality while Sheltarc fulfil a duty of reliability in terms of delivery dates and quality to its clientele.

There are some other common contextual pressures that make the adoption of SC difficult for the firms. The absence of local manufacturing puts a strain on supply chains, while supporting infrastructure such as reliable data sources, waste collection systems and proactive development control agencies are inadequate. Existing cultural and embedded behaviours and beliefs are also at variance with the provisions of some elements of SC. The textbox overleaf (Box 5.4) gives a snapshot of culturally embedded barriers that were explained by two of the firms. Thus, the firms remain sceptical about fully adopting SC in their operations. These constraints are uniform across the three firms. One of these is the operation and running of the built environment as captured by the GMD Multibrix:

“It is a long chain; you need the design, you need the procurement of materials, you need proper construction, but then you also need the proper maintenance and running of things. We can guarantee and offer design, procurement, installation and partly maintenance if someone wants to pay us. But the understanding; sorry, this is the responsibility of the society to train and educate the people” ... (GMD, Multibrix)

Box 5.4: Case study highlight on the Air Condition

The systems for Heating, Ventilation and Air Conditioning (HVAC) was used by interviewees from two firms to illustrate a systemic problem to the way clients and end users approach the use of buildings. Multibrix refer to a previous client who had central HVAC system installed at the completion of a large multi user office building. About 15 years down the line, the central HVAC has broken down and is in disrepair. This centrally efficient system has been replaced by a mix of hundreds of wall mounted and console air-conditioning units which require individual socket points for their operation and would only serve the room where they are installed. The consequence is that there is a much higher consumption of electrical power for the same effect, and also, the circuitry of the building was not designed to cater for that amount of electrical load. Sheltarc highlight a different dimension to the same problem whereby a staff lobbies management in vain to ditch wall-mounted and console units for a central HVAC system. Several factors are responsible for this occurrence; the lack of appreciation of energy demand management, maintenance, the problems of equipment suppliers and managers, and consideration of long term impacts in decision making. These are considerations of the sustainable construction school of thought.

Multibrix were also the only firm who could give constraints or barriers to SC based on practical experience in Nigeria. For example, it was mentioned that material documentation, cultural difference and level of development were mitigating factors and these were deduced from the few SC projects they had or were executing. They also mentioned challenges of introducing a foreign assessment tool to a developing country:

“This is also the reason why I have problems with all these assessment tools like LEED because I know all these technologies; I know how they work, I know they are economically viable when used in Europe and United States. But sorry, I think (the NCS) is not yet matured enough to have them...” ... (GMD Multibrix)

The two indigenous firms talked more about general construction sector problems that made it difficult to prioritise SC at that time. These two broad perspectives help to inform future decision making on what steps need to be taken in order to drive sustainability in the NCS.

5.5.3 Variations between the firm's processes

This aspect of the research was difficult to assess as either the firms did not have an active sustainability adoption plan or policy, or were just in the process of developing a plan. Multibrix have a robust system in place for driving innovation, whether sustainability related or some other ideas based on client's demands. This involves an extensive recruiting and scouting network across Europe and much of the developed world. They also have a purpose built special projects department designed to identify potential sources of new business.

"...we have for instance, the division called SPD; strategic projects department. Their main role is to look at where the company can go, what opportunities are available...so their role is to identify areas and investigate them and see if they are feasible and make proposals. We have our business development people that are constantly in the market looking at what is required" ... (DoO, Multibrix)

Multibrix were also able to key into existing training schemes within the firm to conduct ad-hoc sustainability training. Technology transfer from foreign staff has always formed a key part of Multibrix's strategy. The smaller indigenous firms rely on staffing and recruitment to gain new expertise into the firms. Dynamix in particular have a scheme where they encourage high level training of its staff in reputable institutions all over the world. But as they do not have a sustainability strategy as yet, sustainability training has not formed part of this scheme.

All the three firms without exception did not have an explicit policy on sustainability. Policies are usually indicative of a firm's strategic course of action. However, only Multibrix had a system of documented policies. For instance, there were written policies on environment and health and safety. For Dynamix, they had a system of organisational culture which represents its policies, but are not written down. The Vice Chairman of Dynamix said:

“There is no policy; it is more of culture (that trickles down from the head). What you met them (previous staff) doing, the next guy does it. But there is no deliberate company policy that tells you how to deal with (issues)... well speaking with you, maybe it is about time to have specific laid down policies” ... (VC, Dynamix)

Sheltarc also did not have any sustainability related policies engrained at the firm level.

5.5.4 Variations between the firm’s sustainability action plans

In terms of firm action, only Multibrix had experience of constructing sustainable buildings. At the time of the research, they were constructing three LEED standard buildings. Dynamix and Sheltarc had none. Across the three firms, the LEED certification appeared to have some familiarity amongst the interviewees compared to any other assessment strategy for implementing SC. Multibrix personnel in addition had knowledge of other sustainability assessment tools such as DGNB and BREEAM. The explanation of this section is done on the basis of the three firm’s interpretation of sustainability and how the commonly referenced LEED standard is used to make sense of their current or embedded practice. Multibrix referred to its reliance on its foreign office to train local staff and oversee the monitoring of works. They also had specific roles created for the execution of these projects

There are slight similarities with Dynamix’s approach when they were approached to tender for the Gambo and Co project. The Regional manager Lagos (RML) was given the responsibility to understand and prepare the tender, and also engage with the client. The learning outcome of this process for the RML was the realisation that sustainability was an amalgamation of several best practices, some of which were already part of Dynamix’s operations. The RML identified that Dynamix already integrated local host communities, considered ventilation of spaces during construction, sorted its wastes and avoided the choices of hazardous materials where necessary.

In the case of Sheltarc, their sustainability practices were not explicitly linked to LEED. However, the staff who introduced certain features such as green roofs, grey water recycling and energy saving appliances was aware of the LEED assessment methodology. Sheltarc also liaised with local communities where they had their projects in order to facilitate smooth operations of their projects.

5.5.5 Variations between Stakeholder relationships

The complexity of the stakeholder relationships that characterize the three firms is influenced by their size and nature of clientele. Multibrix understand the complexity of stakeholder relationship and its actions indicate that the apparent weaknesses of supporting stakeholders leave it liable to not performing at the high levels it wants to operate in the NCS. This is partially accounted for by a vertical integration strategy adopted by it. Multibrix relies on its own subsidiaries for the provision of the inputs to its construction processes. Only the construction client and a few international design organisations have been able to support and make inputs to the design and construction sustainable buildings.

This is a similar to the experience of Dynamix and Sheltarc where the clients have not only demanded sustainable buildings (or aspects of) but have also provided support services based on their understanding of the limitations of indigenous contracting firms and other stakeholders in the sector. In the case of Dynamix, the support came in the form of providing guidance on LEED in the tender process, which was to be followed by training if successful in the tender. In the experience of Sheltarc, the support from the client came in the form of facilitation of material procurement for materials that were not available locally in Nigeria. Across the three firms, there were no strong linkages that they established with any of the other known stakeholders such as Academia, consultants, designers and technology providers.

5.5.6 Implications

From the evidence of the comparisons of the three cases, it is deduced that SC appears to be understood as a foreign ‘construct’ and ‘export’ which is yet to gain any serious traction in the NCS. There appears to be two types of SC being adopted: ‘Certification SC’ which refers to the use of sustainability assessments such as LEED or BREEAM aimed at getting certification of the buildings; and ‘SC as practised’, which are practices that mirror the ideological provisions of SC but were not intended for certification by the firms. This is because of the almost exclusive identification of SC initiatives with either foreign staff, local staff with foreign experience or foreign clients being responsible for driving the few examples of SC observed within the ambit of the three firms. To illustrate this, the Regional Director of Dynamix while contemplating the recruitment of a sustainability expert to guide their implementation of SC describes the preferred candidate as thus:

“...we are currently making plans to advertise in national dailies and part of what we want to do is to get a LEED coordinator as an employee on the inside because we feel that if LEED is becoming important globally, it is better we catch the bus early...its most likely going to be an expatriate, or even a Nigerian that has worked abroad” ... (RD, Dynamix)

It is also noted that the responses from all three firms indicate that market-led bottom up factors are driving SC in Nigeria, with little or no evidence of top-down institutional drivers. There appears to be consensus amongst the firms about the barriers to SC. The absence of institutional drivers of SC, such as legislation, taxes or guides, and incentives mean that firms do not see the immediate need to be sustainable except at the instance of very few clients.

Also emerging from the across-case comparisons of the firms, it is evident that logistical constraints and character of the NCS shape each of the firm’s business strategies. For

Multibrix, they have carved a niche in the quality/reliability/technology segment for high value clients who include the government and private sector giants in a market starved of such primary expertise. The bearing of this on the adoption of SC is that it becomes satisfactory to achieve the above three criteria with limited focus on core sustainability values. For Dynamix, they attempt to fill a similar void but to lower value clientele meaning they are further down the SC adoption spectrum. For Sheltarc, operating in a context with huge housing deficits, a chaotic land tenure system and reliability issues indicate that SC might be considered a luxury on their projects for now.

A weak manufacturing base, poor supply chains also mean that product specifications are difficult to track reliably, making carbon footprints, embodied and grey energy difficult to estimate. Thus, for those few examples of sustainable building projects, the firms had to make use of foreign supply chains. An example was given by Multibrix where they could not use good quality, locally produced materials because the material did not have the requisite product declaration and the manufacturer did not see any importance of having any.

5.6 Chapter Summary

The chapter contained the analysis of the interview transcripts using the original themes from the objectives stated in chapter 1. Also, relevant company archives were analysed where available. However, record keeping and in particular company reports are not a strong point of most of the firms in this study. Only the large international firm produced annual reports. These reports were generic annual company performance. The analysis is first presented on an individual case by case format, and then these findings are then compared across all three cases. This helps to unravel what particular influences each of the firms have in adopting SC. The findings show that there is a very low adoption of SC by these firms and that international clients are the stakeholders having the biggest influence in making these

decisions. It was also observed that the Nigerian context hardly provides the firms with a strong business case for SC. The three firms also appear to have different capabilities regarding SC as at time of conducting the research. The discussion of these findings and the connections to existing literature/knowledge are presented in Chapter 6.

CHAPTER SIX

DISCUSSION OF FINDINGS

Chapter 6: DISCUSSION OF FINDINGS

6.1 Introduction and research overview

Chapter 6 discusses the main implications and emergent findings of this research by drawing connections to the corporate sustainability body of knowledge. The research explored how SC is adopted and implemented across three case study firms in Nigeria. The critical review of literature in Chapters 2 and 3 informed the relevant SC themes explored in this study and the development of the research objectives in Chapter 1 (see Figure 6.1). The themes of the objectives informed the data collection and were also used as a starting point of the analysis in a bid to making sense of the large volume of data generated from the study (see Chapter 5).

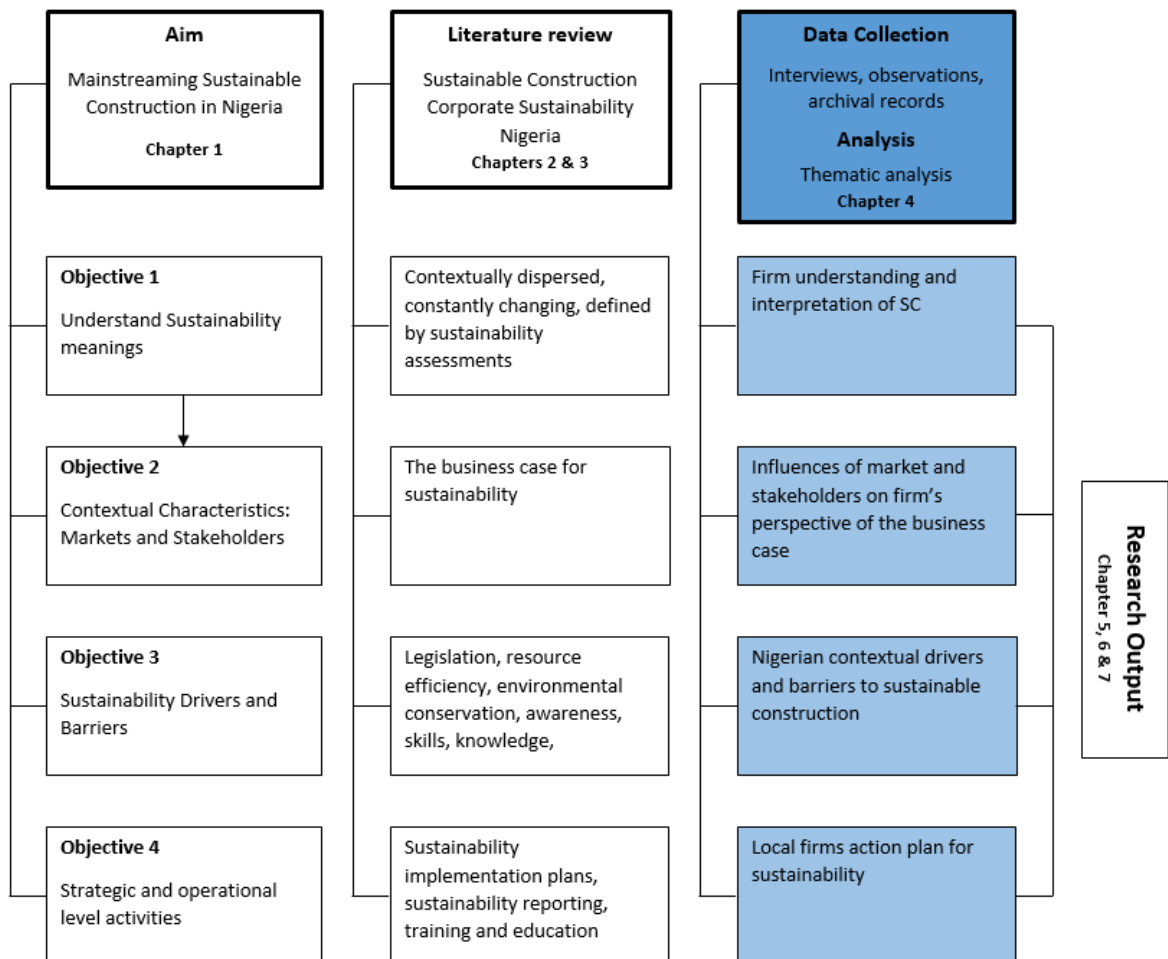


Figure 6.1: Mapping of the Research Findings with Research Objectives

From the analysis of the interviews, the pattern of SC adoption by the three firms emerges, so also does the contextual pressures that support or retard the adoption of sustainability in the NCS. This Chapter discusses the research objectives in line with the findings from the analysis in Chapter 5 and seeks to establish linkages with the existing sustainable construction literature on general or developing countries like Nigeria (discussed in Chapters 2 and 3). The firm's understanding of SC, the contextual characteristics, local drivers and barriers and the strategic and operational activities underpinned by sustainability are discussed further in this section. The Chapter also discusses the emergent findings from this research, the implications for further sustainability research and practice in the NCS and the original contributions of this research.

6.2 Objective 1: Understanding and interpretation of sustainable construction

The first objective set out to understand the context specific meanings the firms attribute to sustainable construction. SC evolved from a relatively simple concept in the 1990s to a very complex and multi-faceted field with so many divergent, sometimes interrelated, other times, contradictory sub-concepts. Numerous literatures on SD/SC argued that the meanings actors attribute to SC are grounded within local contextual needs of countries or regions which means that sustainability becomes contested and fragmented. Therefore, SC is a flexible agenda drawing on the needs of the context rather than an absolute one.

The understanding of SC across the three case study firms was primarily informed and guided by the 'imported' sustainability assessment standard, LEED. The provisions for the LEED standard identified action areas for the staff of the firms and the perspective of the interviewees were based on these impact categories. The common themes used to talk about SC cut across water, air quality, waste, energy and materials. This is consistent with the views of Cole (2005) and Schweber (2013) who argued that BREEAM played a role in defining,

communicating and operationalising ‘standard sustainability practice’ for not only construction professionals but also the public’s impression of sustainable construction.

The reason for the use of an imported sustainability standard is dependent on a number of factors. Despite an argument by Ding (2008) that assessment methodologies are usually designed for specific local contexts, there are no sustainability assessment methodologies that have been developed which are specific to the Nigerian context. This has not been for want of effort. In 2014, a group sponsored the WSP Group Africa (pty) Africa as consultants to prepare a report on the adoption of the South African Green Star sustainability assessment for use in Nigeria (WSP Group Africa (Pty) Ltd, 2014). There is no evidence in literature or from the case studies that this initiative had any impact on the NCS. The absence of local sustainability assessment criteria and the exposure of the international case study firm and their international clients were responsible for the adoption of the LEED sustainability assessment criteria as a means of translating the requirements of sustainability.

The implication of the use of a foreign sustainability assessment methodology for interpreting and translating the requirements of sustainability means that the firms are obliged to see sustainability as a foreign concept without much traction for local clients which form the bulk of the clientele. This is especially true for the indigenous firms more than it is for Multibrix, the international firm. The high-value, international clientele also explains in part the opportunistic posture of Multibrix who strategically demonstrate limited capabilities of being able to fulfil the client’s sustainability demand should the need arise. The choice of LEED is also strategic being that it is the most widely recognised and utilised assessment methodology globally. Thus, the clients are readily able to identify with this standard. There were mixed outcomes and implications of the transposition of these foreign sustainability assessment criteria and these are discussed further in section 6.5.4.

6.3 Objective 2: Influence of the market and stakeholder on sustainability

The second objective of this study was to understand the contextual influence of the Nigerian construction sector on the firms. The findings from the case studies reinforce the argument that the contextual characteristics of the construction sector would influence how the case study firms perceive a business case for SC. In this sector, some developing country specific issues such as poor institutional governance, low contractor capacity and capability, inadequate skills and dominance of multinational firms identified by Ofori (2007) and Wells (2012) linger in Nigeria today. A more detailed discussion is presented under the following themes:

6.3.1 Institutional governance

The ‘top-down’ institutional drivers of legislation have been the leading driver of sustainability in construction and other disciplines. According to Bansal and Hoffman (2012), regulatory controls triggered the first wave of corporate environmentalism of the early 1960s in response to concerns for the environment. These controls were deemed necessary to force corporate organisations to be more responsible to the environment. As corporate environmentalism morphed into sustainability by the 1990s, such regulations were still useful in driving sustainability even though the adoption has become more voluntary since then. The findings of the study show that the firms feel there is an almost non-existent regulatory framework for sustainability or related concepts in the construction sector. This aligns with the outcome of the literature review in section 3.3.6 where it was established that the current regulatory frameworks are inadequate to stimulate the adoption of sustainability amongst firms. The environmental policies in Nigeria were reactive due to a toxic waste incidence in 1989 and numerous environmental issues in the oil-producing Niger-Delta (Ajayi and Ikporukpo, 2005). As a result, the little regulatory frameworks focus on the oil and gas sector.

The implication for the firms is that they also do not see a reason for compliance to regulatory requirements as there are no regulations. This goes a long way in explaining why sustainability was not on the radar of the indigenous firms. As for Multibrix (the international firm), they allude to their quest for self-regulation. This explains why they appear ahead of the curve in the adoption of sustainability in Nigeria. King et al. (2012) offer an explanation to this phenomenon where firms voluntarily exceed the minimum strictures of existing regulations. There also remains a lot of scepticism for the effectiveness of such regulatory controls as one of the indigenous firms refers to weak control mechanisms for existing regulations of other aspects of their businesses such as planning edicts for instance (Box 6.1).

Box 6.1: Legislation, enforcement and Transparency in Nigeria

Much mention is made of regulations and legislation driving sustainability in other country contexts. However, there is much scepticism on how effective this could be in Nigeria due to concerns about enforcement and transparency. The case study firms indicate that they are not aware of any sustainability legislation. In a conversation with an indigenous staff of a multinational firm (which was not part of the case studies), he expressed deep reservations about the enactment of sustainability regulations. In his experience, he referred to how officials of regulatory institutions used existing planning bye-laws as a means of extorting construction businesses. He listed relevant institutional agencies that patronised construction businesses and expressed concerns that if such sustainability laws were enacted, rather than result in any serious adoption of SC, it would only empower another set of officials to add to the list of those extorting construction businesses.

6.3.2 Market characteristics

All the case study firms describe the Nigerian economy and consequently the construction sector as growing impressively and full of future promise. As the NCS continues to grow, the firms are responding to increased opportunities for business particularly from the private sector. Despite the three case study firms being positive about the viability of the NCS (a precondition proposed by du Plessis, 2007), they argue that Nigerian context did not provide the firms with a strong business case for sustainability. The demand for sustainable buildings or sustainable performance is low and this is attributed to the low awareness level of the

different stakeholders (particularly clients) in the construction sector. This resonates with the findings of several other researchers on SC in developing countries such as Shafii et al. (2006), Zainul Abidin (2010) and Serpell et al. (2013) but explains why in further detail.

Lastly, it is important to reflect on the differences in the sort of issues that dominate the sustainability in construction literatures and the issues that frequently mentioned by the case study firms in this research. For instance, in the few cases of sustainability implementation in the NCS, the emphasis is on new-build construction. This highlights the fragmentation within the SC literature as most matured construction markets harp on refurbishments and retrofits in as much detail as new-build. Also, in the broader SC literature, it is more likely to encounter technologies for insulating and heating buildings as against requirements for cooling based on the tropical temperature in Nigeria.

6.3.3 Stakeholders

Adopting sustainability requires the input of and contribution of various other construction stakeholders. This research explored the roles these stakeholders played in their contribution to the sustainability initiatives of the case study firms. Each of the identified stakeholders is discussed under their relevant headings below.

Government

The biggest responsibility appears to rest on the shoulders of government. Governments have traditionally determined appropriate steering mechanisms, strategies, research and development and courses of action for sustainability (Raynsford, 2000; Pitt et al., 2009; Häkkinen and Belloni, 2011). In the UK for instance, the government produced sustainability reviews (DTI, 2006), strategies (HM Government., 2008), progress reports (HM Government., 2009) and action plans (Government Construction Clients, 2012) which have

been well cited in sustainability researches in the context of the UK construction market. This is in addition to crafting enabling regulations and standards for the sector. Section 6.3.2 has already described the weaknesses of the institutional governance in the Nigerian context.

The case study firms were not able to demonstrate any knowledge of any government scheme or initiative for sustainability in Nigeria. Some staffs of Multibrix were able to identify the possible roles the government could play, both as a facilitator and a client to the industry which was not currently occurring. This possibly explains the general lack of awareness particularly amongst the indigenous firms, clients or other stakeholders in the Nigerian context. The literature review did highlight a few initiatives of the government in convening sustainability conferences and signing up to global environmental treaties. However, the focuses of these are largely due to the concerns in the oil producing Niger Delta and the construction sector is largely left out.

Design side stakeholders (Architects/consultant engineers)

Architects and engineering consultants hold a strategic position in specifying design parameters that ensure technical functionality of the built environment (Berardi, 2013). The case study firms affirmed this role but only offer sparing mentions of Architects and engineering consultants, while attributing more of the responsibility of sustainability to the client. On the LEED projects that Multibrix and Dynamix had encountered, the designs were carried out by design teams outside of Nigeria as the clients felt the capability was not obtainable locally. This seems apparent that based on the factors already identified such as the absence of regulations, low levels of awareness, demand for sustainable products and technical competence amongst local firms. It was for this same reason that Multibrix attempted to develop its own competencies in sustainable design by floating a design sub-division of the firm.

Supply chain: Material manufacturers and suppliers

The significance of material manufacturers and supply chains has recently been amplified by a shifting focus to ethical and responsible sourcing of construction materials (Glass et al., 2011). For a resource intensive sector like construction, the selection of products which have been carefully considered on the basis of the manner in which they have been sourced contributes to the sustainability of the finished product. There was no evidence of the awareness or practice of such schemes from the case study firms. From the experience of Multibrix, the procurement of the LEED projects meant the careful selection of construction materials and the preference was for them to be locally sourced. Multibrix found very few locally sourced products of the requisite quality and without the necessary certification papers to support their use on the sustainability projects. As a consequence, they found the manufacturing sector and existing supply chains as an uncooperative partner on their sustainability project.

Summary

None of the other stakeholders identified in this research apart from the client was seen to have an influence on whether sustainability was adopted. This finding contributes to the research objective by arguing that stakeholder relationships are weak and currently did not support, encourage or facilitate the adoption and implementation of SC for these firms. It is also indicative of the fact that while 'bottom up' market drivers of SC could potentially present a business case for the firms, currently there is not enough to drive a change agenda towards SC and need to be supplemented with top-down institutional drivers. Williams and Dair (2007) argue that the weak stakeholder support for sustainability might be as a result of poor knowledge of sustainability and the absence of a sustainability agenda for the construction sector as a whole.

6.3.4 Indigenous/International Firm Dichotomy

Lastly, the structure of the case study firms had a notable impact on their views and approach to sustainability. The interviews highlighted the age long division of contracting firms along the ‘international-indigenous firm’ classification dichotomy and their capabilities. This dichotomy has been referenced in a number of researches on the construction sector in Nigeria (Oladapo, 1977; Aniekwu, 1995; Adams, 1995; Adams, 1997; Bala et al., 2009; Okpara and Kabongo, 2011) and also discussed in section 3.3. These researches had provided a historical perspective to the formation of these different types of firms and the characteristics and strategic advantages they possess. The studies argue that international firms have certain competitive advantages over their indigenous counterparts in Nigeria. These include technical competence, access to cheap finance, experience, expertise and construction plant and equipment. Thus, they are able to take on construction projects of a scope and scale that indigenous firms are yet to develop such competences in.

This case study reinforced this position as Multibrix were able to mobilise a host of resources, locally and internationally to undertake the construction of several sustainable buildings. The size, structure and experience of Multibrix ensured that it had relative advantages in adopting and implementing sustainability that the other indigenous firms, Dynamix and Sheltarc could not muster. In addition, the advancement of the SC agenda in more developed countries meant that the expatriate staff had a better understanding of SC in comparison to the ‘home-grown’ staff of Dynamix or Sheltarc. Dynamix and Sheltarc do not have similar organisational structures, subsidiaries, strategic partnerships and importantly high value clients as Multibrix. Thus, the business case for sustainability was different to Multibrix. While they both remain relatively competitive and successful indigenous businesses, they concentrate their capabilities in meeting the needs of largely local clients who at the time of the research appeared not to be aware, or not interested in sustainability.

The absence of many quality indigenous contractors means that Dynamix, for instance boast about a lot of repeat clients based on its reputation for quality amongst indigenous firms. However, with their growing profiles, both Sheltarc and Dynamix have encountered international clients willing to engage with local contractors and facilitate their capability development in the process. In the case of LEED tender by Dynamix, the foreign client was willing to facilitate technology transfer through the vehicles of ‘strategic alliances’ with the winning tender and ‘counterpart training’ of the successful contractor as suggested by Ofori (1994).

6.4 Objective 3: Contextual drivers and barriers to sustainable construction

6.4.1 Drivers of sustainability

Market demand from clients

Clients were identified by the case study firms as the key stakeholder in driving the limited sustainability projects within the construction sector. This agrees with the arguments observed in literature which were discussed in section 2.4.4. For instance, Agenda 21 for sustainable construction in developing countries (A21-SCDC) spells out the responsibility of clients towards the SC agenda (du Plessis et al., 2002). These include understanding SC and its benefits, establishing stakeholder partnerships, consumer lobbying, modifying their procurement requirements from service providers and monitoring and evaluating outcomes. Also, Pitt et al. (2009) identifies the client as the most important SC stakeholder and also emphasizes the client’s awareness of SC as a driver and the converse situation as a barrier. However, this is the view of the contracting firms and in making this claim, there is a need to be conscious of the ‘circle of blame’ (Cadman, 2000; Figure 2.7, pg 66) where different stakeholders refuse to take responsibility for change.

The few examples of SC that the firms reported in this study have been solely down to the client's requirement. It was only a few international clients of the case study firms that were able to fulfil some of the prescriptions of A21-SCDC for clients, including understanding SC and establishing stakeholder partnerships. Unlike in parts of the developed world, these clients were not responding to local institutional pressures to be sustainable. Rather, the clients were maintaining a uniform ethical image across its global operations drove these demands for sustainability. From the perspectives of the three firms, majority of their client base focus on other project deliverables other than sustainability criteria such as reliability, quality, timely delivery and cost. For this reason, the demand for sustainable buildings in the NCS is low and all the three case study firms are of the position that SC is in its infancy in the NCS. Pitt et al. (2009) echoes a similar position of clients in the more matured UK construction sector where low awareness results in low demand for SC. The case study firms indicated their willingness to develop their competencies in this respect (SC) if there is a surge in market demand for such buildings.

Corporate image and reputation

Corporate image is understood to be the desired impression of a firm in the minds of key stakeholders and a major driver of firm-level innovation and recently sustainability (Amores-Salvadó et al., 2014). All three firms were relatively concerned about their corporate image albeit for different reasons. Sheltarc were concerned about their image of being one of the largest developers in Nigeria. Dynamix were concerned about becoming and maintaining an image of a leading, competent indigenous firm who could compete with some of the smaller international firms in Nigeria. Multibrix were equally concerned about their reputation of an overall market leader in construction as a whole. For this reason, they felt a strong obligation to 'lead the pack' in terms of any innovation which was inclusive of but not limited to sustainability.

6.4.2 Barriers of sustainability

This study however turned up many more barriers to sustainability than drivers. These are discussed under the following categories:

Awareness

Awareness of the sustainability agenda and its methods of implementation have been characteristically low in sustainability literature and are not limited to developing countries alone. In the earlier days of SC, lack of awareness was identified as the biggest barrier to the adoption of SC (see also section 2.4.5). More recently, Pitt et al. (2009) and Brennan and Cotgrave (2014) in studies of the UK construction sector found lack of SC awareness as one of the barriers to SC. This is despite the UK being a more mature construction market and numerous government/stakeholder guidelines that have been developed to educate on the various roles the different stakeholders can play in the SC agenda.

In the NCS, there are no provisions for creating awareness of SC in the sector. In the course of reviewing existing government agenda documents in section 3.3.7 of this thesis, it was observed that while the government is interested in sustainable development (as indicated by its commitment to the MDGs, hosting of a sustainable development summit, the preparation of national development plans or environmental policies for instance), the construction sector got (and continues to get) little or no attention despite its strategic position to play a huge role. This in part explains why from the perspectives of the case study firms, the stakeholders in the NCS appear to have a very low understanding and drive for sustainability. This is in addition to the very low levels of sustainability literacy in the training curriculum for built environment disciplines (Ameh et al., 2010) and the other contextual priorities identified for stakeholders in this study (discussed further in section 6.6.2).

Material manufacturing and supply

The construction sector is heavily material dependent and thus has been the focus of sustainability activists and clamours for responsible sourcing (see section 2.5.6). The manufacturing sector in Nigeria has been previously characterized as having very low output. The case study firms allude that the absence of good quality construction materials in Nigeria leaves them at the mercy of material suppliers. This posed a problem for a firm like Multibrix who value their ability to deliver on time even in the logistically challenging Nigerian construction market. Local manufacturing capabilities need to improve, and so also does supply chain in a bid to reduce the massive grey energy being consumed in moving construction materials over large distances to get to construction project sites.

Supporting infrastructure

This barrier of supporting infrastructure is one that emerges from the study. This topic has not been expressly identified in literature previously. One criticism of sustainability in literature is that the agenda makes certain assumptions in their prescriptions for the adoption of sustainability particularly in developing countries. In the Nigerian context, the absence of many supporting infrastructure hinders the operationalisation of SC. Certain systems considered basic in developed countries such as effective waste collection and disposal, cycling lanes, mass transit systems, steady water or power supply are not readily available.

The issue of lack of robust, reliable and accurate data emerges from this study as another characteristic of the NCS that makes it difficult for SC to be considered a priority for firms. From the review of literature, it becomes apparent that sustainability interventions are driven by the availability of data that reflect growing concerns about the effects of construction; for instance, energy demand and water consumption data etc. The absence of such data makes it difficult to explain the need for an overhaul of how construction is carried out and how

stakeholders could use such data to plan and strategize future sustainability interventions in the NCS. From the review of literature on the NCS, the analysis of the case study data, it was difficult to obtain reliable data figures that could inform this research or the case study firms on the need for sustainability interventions in the NCS.

6.5 Objective 4: Action plan for sustainable construction

Adopting and implementing the sustainability agenda has long been a topic of debate for researchers and practitioners alike. Roome (1998) argues that ‘managing for sustainability’ requires organisational development and change in management structure, systems and competencies. Normative studies such as Azapagic (2003) and Epstein and Buhovac (2014) have developed corporate sustainability implementation and management systems for firms. Across the three case study firms, there has not been a significant business case or an urgent need to mainstream principles of sustainability across their entire business platforms and the reasons vary from firm to firm. However, Multibrix identify a potential business case on the basis of its exposure as an international contracting firm and its attractiveness to large value clients who are sensitive to sustainability. The indigenous firms are at different stages of making sense of the sustainability agenda. For Dynamix, they are exploring the agenda at the senior level management to decide an appropriate course of action, while Sheltarc appear unmoved at the management level. This is despite having a few members of staff who have tried to drive this agenda from the middle ranks. This section discusses the approaches to these activities and their outcomes.

6.5.1 Sustainability strategy

Multibrix has demonstrated that it has been able to successfully exploit some of the characteristics of the NCS to its strategic advantage by developing capabilities along the lines of sophistication, quality and reliability. Also, with its business development and special

projects department, it is able to sense when new capabilities are required and thus exploit its linkages with its international subsidiaries in making the required reconfigurations to its operating capabilities. These characteristics mean that Multibrix is able to effectively serve high value clients and remain competitive. Multibrix was able to utilize its international linkages and the foreign LEED certification as its strategy for planning and implementing sustainability. The LEED criteria were used to set targets to be achieved on the three LEED projects. The similarity with the other firms was in the use of the LEED standard in describing the requirements for sustainability.

6.5.2 Organisational structure

Sustainability was not implemented across the whole spectrum of Multibrix and so the changes in organisational structure occurred on a project by project basis. The LEED projects meant that additional project roles were created for planning, monitoring, reporting and controlling the project activities to ensure that the goals of the project were met. This involved the creation of a remote project monitoring team in the European subsidiary of Multibrix and a local implementation team. Multibrix explained its minimalist reconfiguration by describing how it liaises with its foreign office, recruits expatriate expertise, and conducts in house training to develop new capabilities in general and sustainability in particular, when the need arose. Gupta and Govindarajan (2000) explain the strategic advantages multinational firms have in his study which concludes that these firms have great experience in managing knowledge flows between subsidiaries which creates value for the firm.

On the other hand, the Dynamix took a much less formal structured path during the failed bid for the sustainability project. They opted to develop their capabilities by combining the role of one of the regional managers to oversee the learning and development of sustainability in the firm. In Sheltarc, there were no adjustments to the organisational structure of the firm as there

was no management sanctioned adoption of sustainability. The sustainability features that were implemented on the commissar project by Sheltarc were executed using the same project structure that exists on every other project. The difference in approach of the different firms is indicative of the strategic thinking of management towards sustainability.

6.5.3 Implementation

Implementation refers to translating the vision and plans of the firm into sustainable action. According to Azapagic (2003), this involves prioritizing actions which align the activities of the firm with sustainability priorities. As identified in section 2.4.3, sustainability assessments and environmental management schemes inform the strategy for construction firms (Ding, 2008; Schweber, 2013). However, the use of such tools does not guarantee sustainable outcomes out-rightly. While the drivers push firms towards sustainability, certain barriers hinder such progress. This makes it imperative to put in place monitoring and control policies to track actual performance against what was actually planned. These are usually the contents of sustainability reports and the lessons learnt feedback into the strategy process so that corrective action can be implemented.

Only Multibrix implemented the LEED sustainability methodology holistically on any single project. However, all the case study firms explained that they had implemented elements of sustainability practices that fit the requirements and interpretations of the LEED criteria. In the case of Multibrix, this was through the preparation of small project teams to handle the construction of the 3 separate projects (these projects did not run concurrently and so lessons from one project was transferred to others). The description of the implementation has been provided in section 5.2.3. The highlights of the implementation phase for Multibrix was the use of remote monitoring and control across international offices to ensure compliance on the LEED project. Multibrix put in place robust systems for tracking the progress of the project

daily and feeding back to the subsidiary office every few days. However, it was the outcomes (see section 6.5.4) of this process that yielded some interesting findings for the study.

For the two indigenous firms, the case was significantly different. Dynamix could only reflect on the requirements of LEED and identify that they inadvertently applied some of these principles on their past projects. With regards to the Commissar project for Sheltarc, they were not seeking the LEED certification so all they needed to do at this phase of the project was to install the specially ordered insulating materials in the buildings. The implication for these two firms was that they did not have a reporting and feedback mechanism for tracking their sustainability progress and hence, could not have been able to capitalise on any potential positive ethical image for the firms.

6.5.4 Outcomes

There were several outcomes for the implementation of sustainability across the three case study firms. The adoption of a foreign sustainability assessment methodology had different outcomes. The study discusses them under the following categories:

'Positive' sustainability

Positive sustainability refers to the outcomes of the use of the LEED assessment methodology which were positive for the case study firms and yielded or were bound to yield the desired output. For example, on the Multibrix LEED project, there was energy saving fittings that were installed in one of the projects which was visited in the course of the research. Other examples of 'positive' sustainability were the air-tightness of the building to reduce cooling losses and the choice of local materials where available such as white granitic finishes for the outer façade of the project. For these impact categories, they were quite straightforward to understand and implement where necessary. Multibrix pursued obtaining credits in these

categories to ensure they met their requisite points for the LEED rating which were set at the planning phase of the project. In these cases, the LEED assessment criteria worked seamlessly in achieving the projects objectives.

'Accidental' sustainability

The research also observed that the case study firms (in particular the indigenous ones) engaged in some practices which could be considered sustainable and could be mapped against LEED criteria without being aware of it; hence the term 'accidental sustainability'. During the interviews, a staff of Dynamix alluded that they only began to recognise some of their embedded practices as unintended implementation of SC when they participated in the bid for a LEED certified project. This meant that the LEED assessment sustainability criteria also inadvertently played the role of a self-auditing tool for the previous practices of Dynamix. This also helped to further shape their understanding of SC within the Nigerian context. Examples of such practices which were considered as 'accidental sustainability' include the practices of delegating a construction waste manager on site, high levels of reuse of construction waste, the engagement of community liaison officers to address some social concerns on projects and the management of air quality during construction by zoning the spaces carefully. This implies that even though the use of foreign assessment methodologies presented sustainability as a foreign concept, the ideas are not completely strange to the firms in the NCS.

'Inappropriate' sustainability

Interestingly, the research also highlighted a lot of problems with the use of this LEED assessment methodology which was not developed for this context. Firstly, this assessment methodology was apparently developed under some assumptions which were not reflective of the current state of the Nigerian context. Multibrix highlighted a number of these issues and

some of them are illustrated accordingly. For instance, the design of Multibrix's project office required the incorporation of energy efficient fittings such as LED bulbs and automated heating and cooling devices. However, the energy situation in Nigeria warrants businesses to rely on self-generated power using fossil-fuel generators. The effect of burning large quantities of fossil fuels negates most of the benefits of the technologies incorporated in the project through the emissions.

Another example linked to the energy problem in Nigeria was the LEED requirement to provide parking and charging ports for electric cars. The use of electric cars in Nigeria is not common and it is highly unlikely that these ports would be useful. This is because electric cars are currently expensive to purchase and operate and coupled with the poor availability of power, not currently a popular or viable choice. Other examples of the cultural insensitivities of the assessment methodology to Nigeria are the requirements regarding provisions for bicycle stands, proximity to town planning facilities such as bus-stops, restaurants and mass transit facilities, all of which are not developed in Nigeria to the same standard. Also in terms of energy efficiency, the requirements for triple glazed windows for the project might appear useful for temperate regions seemed very inappropriate for a tropical region where temperatures would reach 35 degrees centigrade. Despite contributing to the insulation of the building, it also had the effect of raising the temperature of the building by a few degrees which also increased the requirements for cooling. Existing literature suggests that passive cooling techniques might result in overall reduction in cooling requirements.

As a consequence of these contextual misfits, the use of the LEED assessment in these instances often created more problems than what they were employed to solve. This hereby underscores the arguments for an appropriate, contextually sensitive, Nigeria-centric assessment methodology as the evidence from the study is that these methodologies are key to interpreting sustainability into actionable tasks for these firms.

6.6 Emergent discussions from the literature

The analysis done in Chapter 5 highlights a few discussion points that have emerged from the study. These points help us to understand the firm-level application of sustainability and put forward the implications of the study. These are discussed in the subsequent sections.

6.6.1 Firm-Level Sustainability in Nigeria

The evidence from the research findings indicates that firms are practising SC in the NCS. The firms have been seen to implement sustainability not always as a deliberate philosophy of construction, or in a very efficient manner, neither is much of it occurring for the same reasons and definitely not according to the same standards as some of the most matured markets where SC has been practiced such as the US or UK for instance. However, this context-specific implementation (in particular, the unintended implementation of SC) provides a platform that can be built upon which would be reflective of needs of the NCS rather than the often times cosmetic, box-ticking exercise that SC tends to become in some other contexts. The following sections summarize the emergent findings of the research and the implications for firm-level sustainability in Nigeria.

The business case for sustainability

The contracting firms did not see a significant business case for sustainability within the Nigerian context to warrant a holistic or widespread adoption of sustainability. This appears contingent on the fact that most of the arguments for a business case identified in literature are not reflective of the experiences or realities of these firms within the Nigerian context. Long term cost efficiencies brought about by sustainable interventions are discouraged by perceptions of the different stakeholders that such interventions require a higher initial capital outlay. The weak legislative environment in Nigeria is also indicative that the compliance

approach to sustainability is not a feasible sustainability driver for these firms. In terms of ease of doing business, there were many other capabilities and competences the firms demonstrated to enhance their corporate image, reputation and competitive advantages in the sector. Of particular note is the quest for delivering built assets to quality and time in a sector with a reputation for questionable quality and time overruns.

Other factors contributing to this limited business case for sustainability include low demand stemming from an apparent lack of awareness of the sustainability agenda particularly from clients and lack of incentives to stimulate the adoption of SC. It is also plausible that if clients have a limited perspective of sustainability, that other construction stakeholders such as designers, consultants and material suppliers and manufacturers also would not see opportunities to key into by being sustainable. There were also no mentions of the role of risk management and the impact of buildings on workplace productivity and welfare. However, the international firm (Multibrix) considered its reputation as one of its reasons for considering sustainability, while the developer (Sheltarc) considered asset value as a potential business opportunity occasioned by the sustainability agenda.

Drivers and Barriers of sustainability

Drivers: There was just one factor observed to be driving SC amongst the case study firms. This driver was the demand for sustainable buildings by only a handful of international clients. The international firm, Multibrix developed and demonstrated capabilities for SC but are cautious about how matured the Nigerian construction market is for widespread sustainability adoption. This is despite the Nigerian context having many underlying concerns which could potentially be drivers of sustainability. These include issues such as energy poverty, recent economic prosperity resulting in the influx of numerous international clients and growth of local businesses competing for efficient operating environments.

Barriers: There were numerous barriers for the firms implementing sustainability that were identified in this study. These were largely shaped by the history and characteristics of the construction sector in Nigeria. Some commonly mentioned barriers relate to inadequate infrastructure to support sustainable activities, poor awareness, lack of requisite skills and regulation. Weak stakeholder coordination, cultural inertia and local attitudes were also mentioned as barriers to the adoption of sustainability. In addition, it emerged from this study that the capabilities of the firms for sustainability was quite limited, often relying on foreign support and interventions to implement SC. It was also evident from the analysis of Sheltarc that there was the absence of sustainability leadership within the organisation. The Sheltac staff that was acting as an internal sustainability change agent (Dunphy et al., 2007) within the firm was operating at a middle-level managerial position which meant his efforts only resulted in limited sustainable features on a few of their projects.

The role of sustainability assessments

The research findings indicate that SC is implemented by firms in two broad ways in the NCS: through the use of assessment methodologies to gain internationally recognisable certification labels for SC on the one hand (LEED in this particular study); and through other unintended actions of the firms on the other. For instance, the three firms talked about LEED (though to varying degrees) not only as a means of interpreting sustainability, but also a way of rubber-stamping the sustainability attributes of a building to interested external parties. In this regard, only Multibrix had practical experience of LEED use in Nigeria and they highlighted problems with some of the LEED provisions fitting the Nigerian context. For the clients who owned those sustainability projects in Nigeria, it was important for the buildings to be labelled as a LEED building, even more so than the actual overall performance of the building. This underscores the perceived value sustainability assessments bring to construction stakeholders. Multibrix not were alone in recognising this value; Sheltarc

recognised that buildings with such labels might command higher attraction and rental from potential international tenants/owners.

However, the adoption of the LEED assessment, whose development was meant for application in the US context and is problematic in its own right, raises many other problems when applied to a totally different context such as Nigeria. From the evidence of this research (discussed in section 6.5.4), it would be a mistake to adopt wholesale, imported SC codes such as LEED or BREEAM in Nigeria. Instead, the sector can leverage on some of its current good sustainable practices such as recycling, utilization of local materials and workforce and engagement of local host communities to form the basis for the adaptation or development of a dedicated NCS code for SC. A familiar and locally derived sustainability assessment would likely result in more positive outcomes for adopting and implementing sustainability.

The research also identified potential gaps in the LEED assessment methodology for the Nigerian context which are not expressly captured in the requirements. Multibrix argued that quality should be and is indeed a sustainability requirement for the construction sector. The issue of quality has since dominated the construction research from time immemorial. However, as most sustainability literature cover developed countries, it is tacitly implied that quality is not a major requirement. It is plausible that this is the case because anecdotal evidence suggests that there is a significant difference in the nature of quality issues between developing and developed countries. Dynamix and Sheltarc also have quality as a strategic goal of their respective managements. This indicates the importance of quality and the potential contribution this could make to the sustainability agenda.

The role of stakeholders

The research also indicated that there appears to be very low stakeholder interest, capability and engagement with sustainability. For most of these stakeholders, it is unlikely that they

possess the agency to bring about change. The sustainability body of knowledge shows that Governments at various levels possess this agency to drive sustainable agenda at the level of a firm and across the whole industry in the following ways:

Guidance: creating awareness is usually the first step in driving change and the construction sector can benefit from a Nigeria-centric guide for Sustainable Construction similar to the UK strategy for Sustainable construction. As awareness, and consequently demand is currently low in the NCS, contracting firms or other stakeholders are unlikely to invest heavily in strategy or research and development on such issues. The government also remains the best stakeholder to fund research and development on sustainability such as this research²⁹ and use the output to provide guidance for the construction sector.

Legislation and regulation: the literature recognises self-regulation by firms in going over and above regulatory provisions. However, this has not been very effective in Nigeria despite some evidence that Multibrix does self-regulate. The government is the only stakeholder capable of enacting laws and regulations aimed at stimulating and enforcing sustainable practices in the NCS. Such methods have been applied successfully in other contexts. For instance, in the face of low uptake of sustainability in the UK, the Government made sustainability assessment tools a mandatory mechanism for government procurement and a pre-condition for funding (Schweber, 2013). Gradually, as sustainability gained traction in the UK construction sector, the mandatory assessments have been gradually replaced and integrated into building regulations such as Part L. A similar process can be adopted in the NCS while considering contextual issues such as transparency and enforcement that have been identified in this research. Areas of interest for regulation include construction materials, performance standards for building designs and integration of communities.

²⁹ This Doctoral research is an example of a Nigerian government funded research on Sustainable Construction.

Incentives: adopting sustainability can oftentimes be expensive for all stakeholders. In many developed countries, certain incentives have been put in place to encourage the uptake of sustainability. This has occurred in different ways. Funding mechanism, tax breaks and waivers can be developed to augment stakeholders who are interested in investing in sustainable buildings. An area where incentives can be brought into play is in respect of energy. Given Nigeria's dismal energy generation and its potentials for renewable sources of energy such as solar, tax breaks and feed-in tariffs can be implemented.

Government as client: The Government in Nigeria at the three levels still remains the largest clients for the construction sector (estimated at about 90 percent of construction output). This portends an area of huge potentials for the government to make a huge difference like was the case in the UK where sustainability assessments became a criterion for public procurements. Sustainability can be incorporated into the procurement process as a pre-qualification requirement. This can have a profound effect on the construction sector given the sheer size of government client participation in the NCS across all cadre of contracting firms.

6.6.2 Reflections on sustainable construction in Nigeria

Sustainable construction has been around for over 20 years now. Despite the tensions surrounding its definitions and modes of implementation, it portrays a constantly evolving agenda that has forced a renewed thinking into how construction resources are mobilised and how the impacts of construction on the global society are minimised. Like Braithwaite (2007) argues, sustainability is a continuous process of improvement rather than being an achievable objective with a fixed endpoint. Its requirements are all encompassing, requiring input, collaboration and coordination from various stakeholders. Whilst considerable changes have been noted to take place in the more advanced countries, developing countries appear to have the most to benefit from SC. However, there was little a priori empirical evidence in literature

that SC is being adopted in developing countries like Nigeria. This study argues on the evidence of the case studies that firms are indeed adopting SC in Nigeria even though the circumstances differ considerably from what would happen in a more matured market.

In recent times, the more dominant strategy for implementing a broad sustainability strategy is the adoption of certification-type sustainability assessment criteria such as LEED. Nigeria at the moment does not have context specific sustainability assessment criteria. This lends to the narrative amongst the firms that SC is an imported agenda which does not reflect the realities or aspirations of majority of the stakeholders in the NCS, regardless of the benefits that are proclaimed. The problem with the adoption of SC based on imported standards and certifications is that the provisions tend to miss issues which are of higher priority in the context of application, compared to the context of the assessment criteria's origin. This calls for a local context dialogue as to what sustainability should entail and how this should shape its practice in the NCS.

Having engaged with the three case study firms, it can be argued that there is potentially a strong case of SC in Nigeria though this might not align with a strategic business case for the firms at the moment due to low demand. The pressures that provide a strong case for sustainable interventions in Nigeria are clearly evident: energy poverty is prevalent, rapid rates of urbanisation, expensive construction methods and local communities in dire need of skills acquisition and integration into the development of community projects. However, the evidence from the study show that contextually, the awareness of the SC agenda is still very poor, thereby hindering the case study firms' drive and enthusiasm to key into this agenda.

The heavy hand of the past

The construction sector in Nigeria is relatively young and has been beset by some challenges since its origins in the early 1930s. The unique characteristic of being dominated by more

capable international firms (Oladapo, 1977; Adams, 1997) mean that most of the high-value projects are executed by international firms. These are the projects that are more likely to incorporate innovative and perhaps certification based sustainable ideas and strategies. Also, the low entry barrier that has characterised the NCS has resulted in numerous indigenous contracting firms with limited capabilities and high mortality rate (Aibinu and Odeyinka, 2006). This research has shown that Multibrix is more capable and knowledgeable on SC than their indigenous counterparts. This is indicative that the patterns of the capabilities of the firms have been shaped by the historical antecedents in the NCS.

Competing priorities

This study also gives an insight into what the firms and other actors perceive as priority areas for strategic intervention. As du Plessis (2001) argues, an understanding of developmental priorities as well as the cultural context is a precursor to the engagement of the SC agenda in developing countries. An emergent finding from the study is that the main construction stakeholders in the NCS do not view SC as top of their strategic engagements. This finding is discussed on two broad fronts: from the priorities of the case study firms and their perspectives of the priorities of the other stakeholders.

As business entities, the priorities identified by the case study firms are dependent on the characteristics of the NCS and also differs with the size and ownership structure of each firm. Multibrix prioritizes logistical efficiency in ensuring timeliness and quality delivery of projects for a wide array of high value clients, in addition to innovation which underscores its market leadership position; Dynamix prioritizes quality, innovation and an indigenous firm identity but for a slightly different class of clientele. Sheltarc's priority was in delivering quality housing which involved complex arrangements with securing land tenures for its developments and also efficient management of subcontractors on its developments. The very

difficult operating conditions for the firms mean that their strategic priorities lie elsewhere and so far, have been able to remain competitive without needing to focus on sustainability.

The case study firms also perceive that the other stakeholders equally show little or no interest in sustainability. This is explained by several factors which includes the level of awareness of other stakeholders, particularly clients (Pitt et al., 2009). As construction is a client driven activity, the low demand for sustainable buildings can be traced to factors previously suggested in literature such as low levels of education, poverty and inequality (du Plessis, 2007; Ofori, 1998; Ofori, 2007). Development statistics indicate that up to 60 percent of Nigerians live in abject poverty and up to 18 million households lack proper modern housing (Oxford Business Group, 2015). This would have implications for the population of those who can afford proper basic building needs, let alone those who would clamour for 'higher performing', sustainable buildings. This is despite the fact that sustainable buildings are often argued to be cheaper over the life cycle of the building. However, it often requires investments in newer, more expensive technologies and systems which may involve a costlier initial capital outlay (Brennan and Cotgrave, 2014) which may not be affordable or top priority for the client as yet.

Other examples which reflect differing priorities within the Nigerian context are the environmental issues in the oil producing Niger Delta region have been receiving most of the attention from a regulatory and advocacy point of view. Thus, there are very few regulatory interventions relating to construction in general and sustainability. Everyday building users and businesses in general are concerned with meeting energy shortfalls from the grid by running unsustainable fossil-fuel electric generators. Another intriguing example is the reuse of timber shuttering as wood fuels for cooking amongst the poorer population of the country. All these have negative implications for selling the sustainability agenda to businesses whose immediate needs do not resonate with the long-term focus of the sustainability agenda.

6.7 Chapter summary

The chapter discussed the findings of this research and its contributions to the existing body of knowledge. The implications for the firm-level adoption and implementation of SC in the NCS were explored. The conclusions and implications for further studies are presented in the next chapter. The study recognises that sustainability is a fluid and dynamic agenda which is only just taking shape in the NCS. However, it requires much more efforts in terms of awareness, legislation and incentives to maintain and develop this currently limited adoption of SC against the consideration that the current construction market in Nigeria is not ripe for a full-scale adoption and implementation of SC. While SC offers some benefits to some of the contextual challenges in Nigeria, the lack of awareness and fears of the short term additional costs of a new system discourage any significant action.

CHAPTER SEVEN

CONCLUSIONS AND
RECOMMENDATIONS

Chapter 7: CONCLUSIONS AND RECOMMENDATIONS

7.1 Introduction

The concluding chapter of this thesis explains how the research aim was met in the course of this research (Figure 7.1). It also presents the closing arguments and implications of this research.

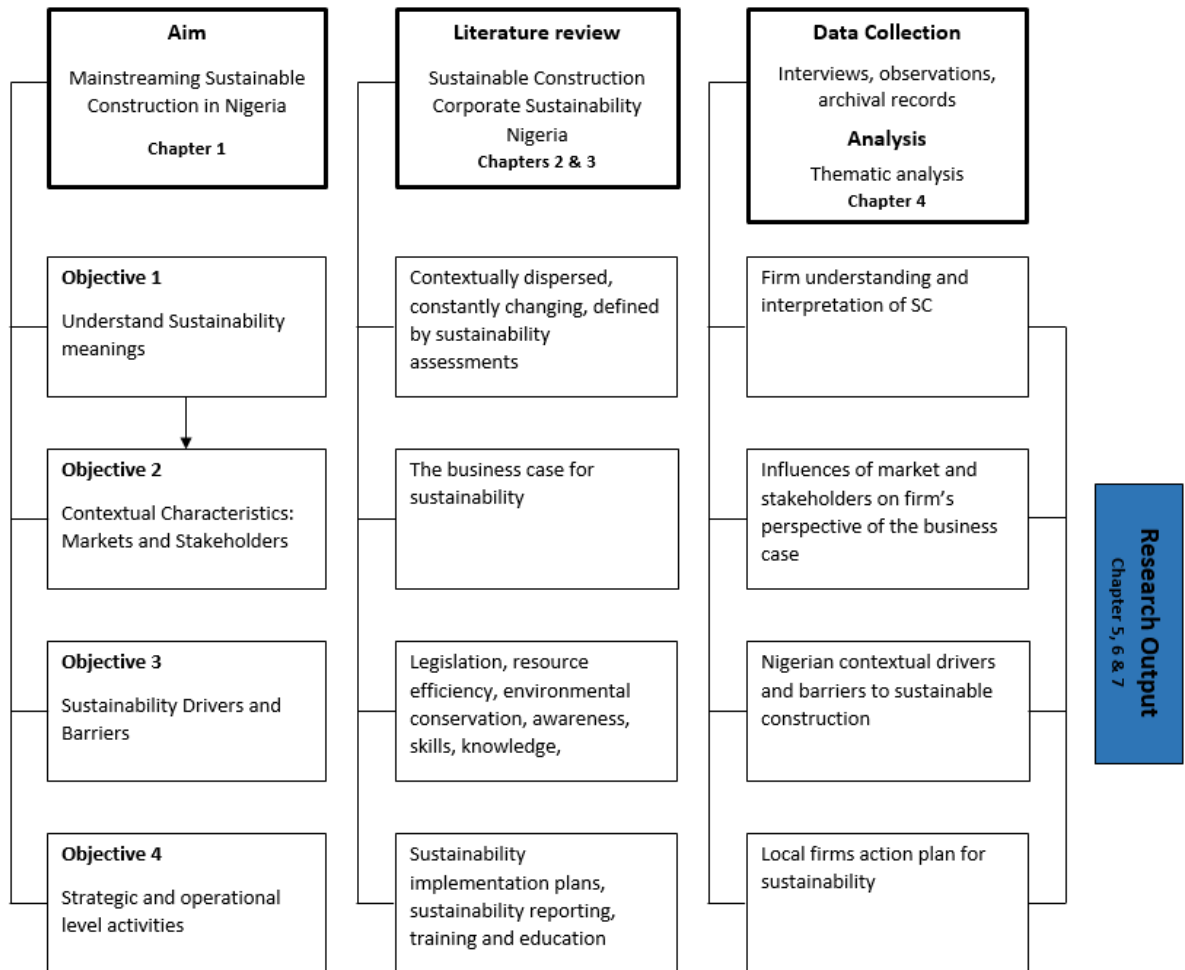


Figure 7.1: Synthesis of the Research Output

As a recap, the aim of this research was to explore the mainstreaming of sustainable construction in the business operations of contracting firms in Nigeria. The objectives are restated below;

1. To understand context specific meanings and understandings Nigerian construction firms attach to sustainability in construction.
2. To explore the specific local market and stakeholder characteristics that present a business case for firm-level sustainable construction in the Nigerian construction sector.
3. To explore the contextual drivers and barriers construction firms face and how they implement sustainable construction.
4. To examine the strategic and operational level provisions the firms put in place in mainstreaming sustainable construction.

The chapter highlights the contribution to knowledge, the conclusions and also identifies areas for further research along with the limitations of the study.

7.2 Contribution to Knowledge

This research identifies three main areas where it has contributed to the existing body of knowledge on sustainability adoption and implementation in Nigeria;

7.2.1 Meanings and interpretation of sustainability

This research joins in the debate of conceptualising what sustainability means to construction firms as this is known to influence their approach to sustainability. This study contributes by demonstrating that the case study firms develop an understanding of SC based on sustainability assessment criteria. Foreign assessment criteria present sustainability as a foreign concept but some of the firms' observed practices highlight local ideas of sustainability. This reinforces the argument for context-specific sustainability assessment criteria that appeals to the realities and needs of the Nigerian context. This argument is based on the finding that there are contextual misfits with the provisions of imported assessments.

7.2.2 Readiness of the Nigerian construction market

The research has also been able to demonstrate that currently, the Nigerian market does not present an adequate business case for construction firms, nor does it adequately support the implementation of sustainability. It also explains why this is the case and what the current priorities are for the participating case study firms. The role of international clients is emphasised as a driver in this context while poor awareness, legislation and competing priorities are the major barriers to SC. This contribution is important in the sense that it explains why despite numerous suggestions of generic strategies for SC developing countries, there has been very little evidence of adoption particularly in Nigeria.

7.2.3 Sustainability strategy and implementation

This study has also been able to show that sustainability does occur in Nigeria construction with a mix of foreign and local strategies and implementation. This gives a definitive position on sustainability adoption in Nigeria previously not captured in literature. This research identifies the strategies that have guided this implementation and some of the positives and challenges that have arisen as a result. This is important to initiate a debate on the effective strategies that firms can adopt for sustainability implementation in the future. It also underscores the importance of sustainability assessments and the compliance approach brought about by relevant enabling laws and regulations.

7.3 Conclusions

This research has provided practical insights into the thinking of 3 different firms engaged in the Nigerian construction sector on the adoption and implementation of sustainable construction. Prior to this study, not much research with empirical evidence had been done on developing countries in Africa. From the evidence emanating from the findings of this

research, it is apparent that SC still has all the colourations of a foreign external import which is yet to be grounded in local contexts. This is evidenced by the fact that all the drivers the case study firms encountered as of the time of the research have come from outside of the country. This has been by way of SC conceptualization, definitions and constructs, global sustainability initiatives, clients and firms bringing foreign external knowledge into Nigeria or from practising professionals bringing external experience and expertise into the country.

From the evidence of the findings, it becomes obvious that schemes like the A21 SCDC have proved inadequate in the quest to provide guidance and a research agenda for such developing countries. There is also little evidence to show that built environment education has much to generate research, improve awareness and develop local capabilities of SC in Nigeria. The availability of reliable, relevant data such as population statistics, water or energy consumption for instance also makes it difficult for the message of SC to be fully understood by stakeholders. This research purports that until attempts are made by local stakeholders to domesticate SC in Nigeria by emphasizing contextual underlying concerns, identifying local drivers and benefits of SC, equipping local stakeholders with proper guidance and instituting the proper dialogues, it is unlikely that SC would gain any further traction in the country.

It is concluded that in the absence of institutional guidance/drivers of SC, the status quo of relying on market led drivers would continue. The consequence is that SC would only be adopted by firms only if clients request such buildings. At the moment, it appears that there are very limited numbers of clients who have the interest of procuring sustainable buildings within Nigeria. The firms all attribute the limited SC initiatives to the external influence of large foreign clients and expertise. The weak socio economic structure prevalent in Nigeria would also mean that priorities for sustainable building would continue to remain low on the list of potential future clients. This justifies another call for institutional drivers and incentives if Nigeria is to derive some benefit from the purported gains of SC. This is coming at a time

where Nigeria is still plagued with huge energy deficits and reduced government income due to falling oil prices which ordinarily should be a call for sustainable change.

7.4 Recommendations

This research is exploratory and one of the first in-depth studies on the adoption and implementation of sustainable construction in the Nigerian construction sector. As such, the recommendation applies to a host of stakeholders; Governments, clients, construction professionals, professional bodies and academics. Also important are designers and consultants. As the world transits from the Millennium Development Goals to the Sustainable Development Goals in 2015, an active sustainability drive needs to be injected into the NCS to ensure the achievement of goals on water and sanitation, energy, infrastructure, and human settlements (goals 6, 7, 9 and 11) directly and a few of the other goals indirectly.

7.5 Limitations

Focussing the research on SC has the implication of conducting a study on a field that has grown to encompass so many aspects so much so that its understanding is muddled and its adoption is difficult to track. Thus, this research was only able to touch aspects of SC from the perspective of contracting firms. This now provides the opportunity for future research on SC in Nigeria and similar developing countries to explore other construction stakeholders in particular, clients and designers. Also, due to the limited adoption of SC by the case study firms, it was difficult to generate multiple sources of data other than the transcripts of the interviews with the interviewees, available firm documentation and reports and some ethnographic accounts of the researcher's immersion into the Nigerian context. In similar kinds of research, the policies and sustainability reporting documents of the firm provide

another layer of data which could be analysed to ascertain the firm's position on SC. These types of policies and sustainability reporting were very limited in availability in this research.

The choice of case multiple case study design is not without its own weaknesses. The three case study firms differ greatly in size, core function and scale of operations. However, the purpose of the study was not to compare 'apple' and 'pears', but to generate rich insights across different types of firms in Nigeria. In the course of the interviews, only high level personnel were engaged. This was due to the fact that as SC was new to most of the firms, the views of this cadre provided the most valuable insights into the mind-set of the firms, the business case for SC, the mode of implementation and the strategic decisions behind them. The fact that the research was conducted on Nigerian firms in Nigeria meant that the researcher could not always return to the firms to follow up on leads emanating from the data after the conclusion of the interviews. While this study has made significant contributions to the body of knowledge, the following represent areas for future research.

7.6 Areas for further research

This research represents a comprehensive exploratory study on arguably the most central stakeholder in the NCS; the contracting firm and its implementation of SC. With very limited existing research in this subject area, this research opens a floodgate of potential researches that can be undertaken in that sector. This research recommends further researches in the following areas:

7.6.1 Institutional drivers for SC

This study showed that the current implementation of sustainability in the NCS is driven by the client's demand thus far. It is argued in literature that construction markets cannot become sustainable by the intervention of 'bottom-up' market drivers only. Future research

endeavours can explore existing institutional interventions which could ramp up the compliance approach of firms to adopting and implementing SC in the NCS.

7.6.2 SC awareness and literacy

Based on the finding that SC awareness is low in the NCS, further studies are required to understand how new knowledge such as SC is created and diffused within construction stakeholders, in particular firms and clients/client's organisations in the Nigerian context. Also, Murray and Cotgrave (2007) argue for the integration of sustainability in construction education. Thus, further studies are encouraged to complement the efforts of Ameh et al. (2010) on pedagogies for SC literacy education in Nigerian tertiary institutions.

7.6.3 Stakeholder capacity and development

The stakeholder under scrutiny in this research is the contracting firm and they were observed to have limited capacities for SC. Local client demand for SC is currently low and further research is required to understand the dichotomies of international indigenous clients and their requirements for sustainable buildings. Also, future research can be directed at the other stakeholders, particularly designers and material manufacturers in order to gain insights into their own perspectives. For instance, an understanding of the role design organisations play in enhancing SC is important as they are one of the first points of contact with the client in the construction procurement process. Also, as sustainability is argued in this thesis from the point of a 'becoming ontology', i.e. an on-going process, future research on stakeholders can involve longitudinal or action research types of studies which involve longer term embeddedness with the stakeholder or context being investigated.

7.6.4 Local contexts for SC

The findings of this research provide an insight and understanding into the adoption of sustainability by contracting firms in the NCS. These findings can help to shape future sustainability interventions in the NCS. However, other areas worthy of investigation are the priorities for sustainable intervention in the NCS such as community engagement or energy or water management. Understanding these priorities in this context would further inform the potential development of a local sustainability standard for the Nigerian construction market. Lastly, given the evidence of the construction of a few LEED standard buildings and talks of designs of similar types of sustainable buildings in Nigeria, it is recommended that these buildings be subjected to the interest of further studies to determine how they perform, if they have met design expectations or offer any other significant benefits to the clients/owners. Such studies would go a long way in informing client decisions on sustainability in the future.

7.7 Concluding thoughts

Although the world is faced with the enormous challenges of climate change, resource depletion, population expansion and increased expectations, the construction sector has to accept its share of the responsibility for change, which it is trying to do with the sustainable construction agenda. The Nigerian construction sector has its own very substantial problems to cope with. However, with the entrepreneurship, fortitude and vision demonstrated by the Nigerian firms and international partnerships, the sector clearly has what it takes to rise to the challenge and provide a leading example to other developing countries. This research and the future directions outlined in Section 7.6 can contribute a small part to that change.

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School of Construction Management and Engineering

Semi-structured interview protocol:

First of all, can I put on a tape recorder?

A. Introductory questions:

1. Can you please describe your education and work experience?
2. Please describe your current specific role
3. How many years at your current firm and/or role?
4. Can you tell me about your company's organizational structure?
5. Could you tell me about a typical day within your role?

B. Research question 1: Does this company see a business case for sustainable construction in the Nigerian Construction Industry? (this section is designed to understand firm's the firms grasp and thinking regarding sustainability of its operations)

(Some areas of interest for possible discussion with interviewees)

Auditing and reporting

Enabling environment (drivers)

Disincentives (barriers)

Learning

Social issues- workers, labour, material sourcing, supply chain, corporate social responsibility

Environmental – water conservation, energy efficiency, renewable energies, embodied energy of construction materials, indoor air quality, waste, noise and pollution

Economic – remuneration

6. Does your firm have a clear policy on sustainability?
7. What are the main aim, objectives and drivers?
8. Do they fit with the core values, goals and business strategy of the firm?
9. If not, why do you think there is not any?
10. How does the company approach social issues such as integrating with the local population, selection of local labour and materials, corporate social responsibility?
11. What considerations are given to sourcing of labour?
12. What welfare incentives do the workers have?
13. What aspects of sustainability does the company emphasize on?
14. What notable projects undertaken can you say have embraced sustainable concepts the most?
15. Are there client driven requests for sustainable products?
16. How do legislation/regulations regulate the operations of your organization?
17. Does your firm carry out any form of environmental reporting?
18. Do you limit the choices of building materials to only those in conformity to any known environmental standards?
19. How does your company source water for its construction activities?
20. What types of shuttering do you employ?

21. What is the company attitude to waste?
22. Is there coordination between design and construction on your projects?
23. Are there any global or local sustainability schemes your firm adheres to?
24. How does your firm learn about sustainability?
25. Are you aware of any Government's initiative on sustainability?
26. Do you foresee regulatory changes in the next few years?
27. Are you aware of any other firm's innovations on sustainability?
28. Are you aware of any global schemes/guidelines/metrics or technologies promoting sustainability in the construction sector?
29. How can your firm's performance improve?

C. Research question 2: Is there any competitive advantage from being sustainable in the Nigerian construction sector? (This section identifies the firm's thinking in relation to possible competition and whatever advantages it derives from its current or planned strategies.

(Some areas of interest for possible discussion with interviewees)

Corporate Identity – process, products, materials

Corporate Strategy

VRIN attributes

Firm Policy

Market Dynamism

Adaptive capacity

Absorptive capacity

Innovative capacity

Firm specific processes: Integration, reconfiguration, renewal, recreation

Firm strategy

Capability development

Firm performance

30. In your opinion, what distinguishes your firm from others?
31. How do you rate the company's strengths amongst other construction firms?
32. How do you 'maintain' these strengths over time?
33. Are there 'firm-specific' formalized processes for approaching projects?
34. How have these processes changed over time and why?
35. Are there key performance indicators for projects?
36. What are the main project challenges faced?
37. What notable changes have you observed in the construction sector over the last 10 years?
38. How has client demand affected company strategy in the last few years of operation?
39. Has client demand pushed changes to the way your firm operates?
40. In what areas have these changes manifested in your organization?
41. How do operations in your parent company affect company policy in Nigeria?

D. Closeout questions: (5 minutes)

42. Is there any other Department/staff that can add to what we have discussed?
43. Is there anything else that you would like to add?

Thank you for your time. Please do not hesitate to contact me if you have any future questions, contributions or concerns.

Appendix B: Example of Interview Transcript

File: 712_0010

Duration: 33:14

Date: 15-01-2014

Company: Multibrix Nigeria

Position: Director of Operations

AAD: Just for introduction I just like to know a bit about you, your role, your qualifications, you training and an idea of what your everyday responsibilities are:

DOO: Okay, I am director of operations; that is an executive director position in Multibrix. I'm on the main board, I am a civil engineer. I graduated from Sydney university, many years ago, I think 1979 if I am right. So my duties are: I'm in charge of all the operations of Multibrix so all the operational divisions report to me.

AAD: What kind of corporate structure does Multibrix operate?

DOO: We have the board of directors which is made up of non-executive and executive directors. There are 4 executive directors responsible for day to day operations. So the organization structure of Multibrix: we have the main board which is made up of non-executive directors and executive directors. The executive directors; there are four of us: the managing director, financial director, director of operations and director of administration. Each of the divisions or departments of Multibrix reports to an executive director. We have four operational divisions which are division west, in Lagos; division central-north which is in Abuja; division east which is based in Uyo, in Akwa Ibom state and then division industries,

gas and oil which looks after all the work in private industry gas and oil across it. It's in a sense, a borderless division in the country. Then we have the mechanical plant department that takes care of internal plant and equipment; we have a couple of sub divisions like the foundation department that does our piling and sub soil investigations. So all that reports to me. Then we have the financial director and all of the financial operations report to Mr Kollerman, and the managing director is the managing director of the company but he is also responsible for expatriate personnel and acquisition of major acquisition. And then the director of administration looks after administrative matters, corporate issues and some of the subsidiaries like Multibrix services, importation and so forth. So that is the overall corporate structure. We also have then the corporate QA/QC department, the corporate HSE department, and the corporate communications which oversee those issues for the group.

AAD: To my focus of interest one of which is: Multibrix has been in the country for 50 years and apparently has had some transition. It started with an engineering project in Lagos and over the years diversified into the oil and gas. What has been the drive behind this change?

DOO: The drive behind the change is that Multibrix is the eminent construction company in Nigeria and it has grown with the market and the needs of the country. So as the projects have become available and been awarded to us, the company has grown in size and stature and the ability to perform.

AAD: How do you sense the next area to concentrate on and what kind of structures do you have within Multibrix's management that kind of senses where the next direction to diversify to?

DOO: Well, we are constantly looking at new opportunities. We have various subsidiary companies that we have set up over the years to take advantage of market segments that not only do we as Multibrix need to service, but the market as a whole needs a service. So for

instance we have Multimet that produces aluminium windows, doors and facia and all that sort of stuff. We have the furniture division which produces high quality, European quality furniture, office furniture and also household furniture. We have Multibrix services which does importation through the port in Warri. We have Multibrix medical which runs medical services not only for in-house but external people. And then recently we have set up Multitech which is a design company that would work internally and externally because there is a need in the country for greater, in Nigeria, engineering expertise. As a company, we are always looking for new things to invest in, new areas. Recently we have looked at pipe mills, actually producing plastic pipes, some of these we have decided not to go ahead with, but we are constantly looking at areas to expand into. Of course, the big current emphasis is in the PPP projects in Nigeria because that would be the area of major expansion in the infrastructure and we intend to be a major player in the PPP market.

AAD: So what I am still trying to get at is how do you keep ahead of the game what structures do you have in place within management that keeps your sensors out there feeling the pulse and seeing where these changes are coming from.

DOO: Well we have for instance, the division called SPD, strategic projects department. Their main role is to look at where the company can go what opportunities are available so they are looking at mining opportunities, looking at manufacturing opportunities. So their role is to identify areas and to investigate them and see if they are feasible and make proposals. We have our business development people that are also constantly in the market looking at what is required. And then management as a whole, we have a responsibility to keep the company progressive so that they grow, to keep it profitable which means doing things better.

AAD: So what is Multibrix's main strength as a player in the Nigerian construction industry?

DOO: There are various answers to that. We believe our main strength is our ability to deliver on time and to the quality that the client requires. We also are probably the only company in Nigeria that is most logistically capable of solving all issues clients have, and the company that can manage all the hurdles that Nigeria can throw in front of you most effectively by having the full supply chain in the construction market; by having our own quarries; by having our own sand mines; by having our own importation facilities; all our own equipment and so forth. That allows us to provide a service that nobody else can. And what we always try and do in our projects is to introduce the latest technology and to do technology transfer into the country. Hence such things as you know the first cable stay bridge in Lagos, the first large pipe jacking project in Akwa Ibom. So we constantly try and bring the latest technology into the country and introduce that.

AAD: Are there some client driven innovation that comes to Multibrix or is Multibrix the one always introducing innovation to its clients?

DOO: It is a bit of both. Normally, the innovation comes from clients that come to us with a particular problem that requires innovation to solve the problem. Hence for instance, the big pipe jacking tunnel in Uyo: How to get the water out of the middle of Uyo which was causing major flooding. These sorts of issues lead to new technologies being introduced. But clients do; in the field that you are in for instance, Clientoil came to us and he wanted his head office to be state of the art and to contain the first 'in the sense, real LEED features' in a commercial building in Nigeria. So we had the abilities to fulfil that demand. So it is driven either internally by the company, by the client or by the client having a problem that we need to use innovation to solve.

AAD: When faced with certain innovation that is currently not available within Multibrix, how does management go about procuring or managing that process to meet up to standards required?

DOO: Okay, well, we have a technical support company, the company we own in (somewhere in Europe), Multibrix international. So they have access to a lot of the technologies in Europe. The internet is a wonderful thing; you can find a lot of information on the internet and you can get contacts on the internet to approach companies that have the technology. We have a large diverse staff and there is a lot of knowledge in those staff, not just from what the company does, but from what is able to be done in the rest of the world. So you just utilize those resources.

AAD: How do you maintain your strengths over time?

DOO: By recognizing that the company's viability exists because of those strengths and we have to be acutely aware in management to maintain our standards. We do not let our quality drop; we do not let our safety drop; we do not let our innovation drop. What I mean by drop, by lowering our standards. We constantly try and satisfy our client's needs to the best of our abilities in terms of innovation and so forth. We are not a company that clients would come to to do a small local building or something because obviously, we are not competitive in doing that. When clients have large projects, or have a special project or whatever they come to us for, we have to maintain the standards for them to do that.

AAD: You mentioned competitive. Do you find yourselves looking sideways to see competition coming around the corner?

DOO: I hope so, because if you get too confident, the competition would trample you. Nigeria is now a very attractive market, a growth market and it is identified by a lot of the major

construction groups in the world as being a viable market. You can notice from the companies that are coming in; new markets, new companies appearing on projects all around the place. Of course, the Chinese are big movers into the country and you know 10 to 15 years ago, the Chinese were, I would not say the laughing stock, but not taken overly serious in the international construction market. But they have learnt a lot and there are some very very competent Chinese companies that do very good work. The problem is there are some that do not. And you can see some of the projects in Nigeria are the consequence of that. You have the ones that have done good work; you have ones that have done very shoddy work. But we have to be acutely aware of what our competitors are doing. We have to make sure that we are a step ahead. We consider ourselves to be the eminent company, so we have to provide a better service than anybody else. We have to be the one producing the best projects with the latest technology, the latest ideas. We do not want to lose our position.

AAD: What are the challenges of operating in a climate like Nigeria?

DOO: How much capacity do you have in your tape? Problems! We often say it is the Nigerian factor because Nigeria can create problems from nowhere. Logistics is probably the single biggest issue for Nigeria. The industrial base; there is a lot of government effort to grow the industrial base and to make Nigeria more sufficient or more self-sufficient in production facilities of materials and so forth. When you have fast track projects and you have to import a lot of the major equipment, major materials and so forth because they are not available in Nigeria, or the quality is not available in Nigeria, there are often logistical issues with that. That is why we run our own port in Warri to try and overcome some of that. But you still get problems: you still get things stuck in customs. We run 1600 trucks moving material round the country. There is a lot of the country that the road infrastructure network and so forth is deteriorated or not developed. That has a huge impact in just the cost of tyres. We go through thousands of truck tyres a year, to the extent where we now run our own tyre

refurbishment factory, the only one in Nigeria I believe. That is purely because of the issue of having so many tyres. It is one that nobody likes to talk about, but fuel theft, diesel theft is an enormous problem in Nigeria, to the extent that every one of our vehicles, every one of our major pieces of equipment is controlled with GPS. We have through the satellite, through the GPS system, we know where it is, how much fuel it is using, if the fuel is being taken off quickly, if it has stopped, if it is moving, at any time. So we try and control fuel loss, whether it is theft or loss. That is a huge problem here. It is a huge cost but people do not realize. Security is always a problem in here especially with the insurgency that goes on and is moving around. We have recently had our trucks attacks by armed robbers and so forth on our personnel moving. Two weeks ago they shot a vehicle coming out of Edo state. We have had drivers transporting material pulled up in road blocks and shot. It is always difficult to deal with all these issues.

Some of the difficulties in Nigeria! Projects are never funded for the duration of the project. They are just funded on a yearly basis based on budgetary allocations so if this year, the government have got other priorities, then the project is just not funded and the construction stops. (Project) has stopped, (project) has stopped. It is untenable in terms of the number of projects around Nigeria that are partially constructed. The enormous sums of government money that is being spent but never finished so they do not go into operation because a minister changes or government priority changes or that they are just not funded anymore.

AAD: How do you see public vs private clients in all of this? Do you have similar problems with private clients?

DOO: Not really, because private clients do not waste their investments. So it is rare that a private funded project is not completed. It is also more likely that private clients are interested, especially one who is building the project for himself rather than a developer who

is building a real estate development for returns. The oil companies, the industrial clients, are interested in running costs, especially the international clients that are coming in. For instance, we are just in the process of finishing a project for Gambo and co in Lagos. There were environmental sustainability policies on that project. So the international clients generally bring their international policies with them; they do not say 'Okay Nigeria, we just ignore what we do elsewhere and just build a cheap scheme'. Nigerian clients themselves, the private clients (if there is) it is an attitude that people have to get past. I would say as a general comment, most Nigerians do not understand the benefits of preventative maintenance. You fix something when it is broken. You do not spend on something when it is not broken. The same applies to sustainability. Spending money on a benefit that is intangible. Why should I spend my money on when everybody else does what they want. That is wasting my money. So it is hard to get past that. Some people are interested; the whole? Not really. But I do not think that there is any country in the world that has been able to do this without direction by the Government. The government must give direction, the government must give incentives. The government is responsible for administering the country as a whole. That is the role of government. They have to set the policies for the country.

AAD: Would you say just only incentives?

DOO: No incentives are just one way. For instance in solar power, a lot of the governments around the world introduced incentives for people to invest in solar, where you got paid at a high rate to inject that power into the system. For instance, my house in Australia, we sell our power to the Government. And in a lot of places too, there were incentives put in place so instead of building new power stations, houses put photovoltaic cells on the roofs of the houses and it goes into the grid and if there is a net or loss, you get the money.

It is a long flogged topic of the power. All the damage being done to the environment and so forth in Nigeria by everybody running diesel generators to produce their own electricity, it is a bit of a crazy thing to work out the amount of money you can save on your building in terms of environmental protection and then destroy the whole concept with a diesel powered generator churning away. And there are a few of those things; an acceptable sewage collection system. It does not exist; everybody is permanently putting away their sewage in septic tanks in the ground, French drains and polluting the ground water supply with all the run-off; garbage collection systems don't really exist, so all the rubbish just goes down the river. So to me something that has to be addressed in Nigeria as a whole is not only the sustainability of construction, but sustainability of the whole environment. How long is everybody going to sit back and allow the whole population to throw their rubbish into the local river? These are areas that have to be addressed and up till now, the government does not seem to be interested in addressing them.

AAD: Do you see some competitive advantage from being sustainable at Multibrix, in terms of construction?

DOO: We definitely have a competitive advantage when a client wants to do sustainable construction for instance because we have the experience and the ability to provide him what he wants. We are probably the only contractor in the country doing full LEED construction. That also creates in a sense good advertising; there has been articles written about it and so forth which keeps the company's name in the public about what we are doing. It gives us, maintains our reputation of bringing innovation into the country. There are certain elements that also give us a competitive edge. Currently we are looking at utilizing our large, what we call Idu yard, our large precast yard in Abuja. We have very extensive roof areas and we are looking at actually covering those with photovoltaic cells to produce electricity for the yard. It is a big resource just sitting there just unused so we have done the feasibility on the

economics of that and it seems to be very feasible which would lower our costs which again would help us to be competitive. So you have to utilize or let me say: sustainable construction is not a big thing in Nigeria yet. It is in the early stages. So it is not a huge advantage to the company to have that ability but we would like to be first and we would like to innovate and introduce it. So we are there and we would grow with the market in that area as it grows.

AAD: You said you have had some reviews probably in the press or in the media. Can you give examples of such and is that in Nigeria?

DOO: Yeah in Nigeria for instance, Clientoil is very proud of building their head office as a LEED building so there was large articles in the press on what they had done; on the LEED that they were doing, the environmental benefits and so forth that they were building. So those articles are out there.

AAD: Is there a clear policy on sustainability in Multibrix?

DOO: Clear policy! I do not think yet, to be honest. I think the answer is we do not have a sustainability policy. We try in terms of our environmental responsibilities. We have an environmental policy. That is a clear policy. So all issues in terms of treatment of oil and waste products and so forth, there is clear policy in our company on that. In terms of sustainable construction, probably not a clear policy, no.

AAD: When you get project in different locations, how do you integrate the company, its mission and its vision, with the people where that project is situated.

DOO: Unless you know in Nigeria, if you go to a remote location where you are not known, if you do not integrate with the local community, if you do not involve them, if you do not make opportunities available, you do not get anywhere. You get blocked, you get stopped. If it is a major project like for instance, second Niger Bridge which we are currently negotiating in

Onitsha and Asaba, the company management goes and makes itself known to the paramount rulers. There are community liaison officers introduced, the project is explained, and there are community policies put in place; for employment of people from the communities, taking material from the communities and so forth. So we recognise that if you do not work with the local communities, you are not successful.

AAD: Are there any regulations within the country that you are aware of that modifies how Multibrix operates, or is Multibrix always somehow ahead of whatever legislative provisions put in place?

DOO: You know there are regulations for virtually everything in Nigeria. The problem with Nigeria is that the regulations are unenforced. You know, it does not matter if it is traffic, if it is recycling, if it is pollution, there is no real enforcement of the regulations. What I think separates Multibrix out from a lot of the society here is that we self-police ourselves in terms of those regulations. We, to a certain extent, exceed the regulations. We recycle for instance; one of the things with all our waste oil, we have 10000 pieces of equipment that produces a lot of waste oil. There are no real facilities in the country for dealing with that waste oil. So what we have done is to develop the system to use that waste oil to fuel our asphalt plants so we can dispose of the waste oil and get the benefit out at the same time by heating or by mixing it into the heating oil in the asphalt plant. There is lots of recycling done in the company to try and improve the environment that we live in without creating in ourselves, a competitive disadvantage. And trying to use the photovoltaic cells to create electricity, gas to power generators, recycling of fuel, recycling of asphalt when we mill asphalt roads instead of just wasting it, we put it back through the plant and recycle it and make new roads out of old roads. All these things, we try in a sense, if you look at the regulations, the regulations exist but nobody enforces them, but we enforce them on ourselves.

AAD: Why is that?

DOO: There are: 1. It gives you an advantage. If heat your asphalt and your bitumen with waste fuel oil, you save money. It takes more work, you have to collect all your oil, but you have to do that anyway if you want to do that responsibly. So to use it in the process, there is a cost benefit. There is also a corporate social responsibility: it is very important to Multibrix, to be seen in the community to be doing the right thing. It is not good for the company, a company as Multibrix is, to be seen to doing the wrong thing. We want to be seen as a company that has the good of Nigeria. You know we are a Nigerian company and we want to better the country. A lot of people say 'blah, blah....'. It is not 'blah, blah....'. You know, there is a lot of things we do that we do not have to do that we do do to try and improve things.

AAD: So how do you source water for most of your projects?

DOO: It varies from where we are. Typically deep wells; we have recycled water; we have water treatment plants. All our major projects have water treatment plants on them. So water is treated whether it is waste water or local dirty water or river water or whatever. So we look at what the water sources are available and then we look at how best to utilize it.

AAD: Do you have any closing statements to make concerning all we have discussed on sustainable construction?

DOO: No, I think we have covered most issues here. As I have said, sustainable construction is new to Nigeria; we believe we are at the forefront of it. It is not new in other parts of the world, so we have got the skills and the logistics to be able to call on what is available and to do our best to introduce it here. But we have to be careful that we do not, in a sense, overstep the market tolerance at this stage. Nigeria has a long way to go to introduce environment

controls in the country. Too many people are still taking their rubbish to the local river and throwing it into the river. We have to make sure that we try and improve the country with our practices. The main thing, we do not damage the country with our practices and we keep ourselves commercially viable.

AAD: Do you have any material selection policies that might impact on sustainability?

DOO: We have a lot of material selection policies. Yes, most of it revolves around the quality that is required and you can look at that as being sustainable. If you use good quality materials in the product, the product lasts longer. If the product lasts longer, it puts less demand on the environment and it is therefore sustainable. For instance, the roads we build around the country, it is universally recognised that Multibrix builds the best roads. Now, what is the effect of that? One, they only have to be built once. So there is less use of environment and so forth in building those roads; that the roads stay in good condition for longer so the vehicles can move quicker on it, there are fewer blockages, less potholes, and so forth, less fuel used. You know, in building quality, in building a product that lasts, you are doing sustainable construction because you are doing it less and therefore there is less demand: less demand for materials less demand for fuel and everything else.

Appendix C: Consent form and information sheet



Afolabi Dania
University of Reading
School of Construction Management and
Engineering
PO Box 219
Reading, Berks
RG6 6AW
Email: a.dania@pgr.reading.ac.uk

Consent Form

Understanding Firm-Level Enactment of Sustainable Construction by Construction firms in
Nigeria

Please indicate your agreement to the following:

- I understand that my participation is entirely voluntary and that I have the right to withdraw from the project at any time and that this will be without detriment.
- I understand that my personal information will remain confidential to the researcher and his supervisors at the University of Reading unless my explicit consent is given.
- I understand that my interview will be recorded and transcribed and my organisation or I will not be identified either directly or indirectly without my consent.
- I have read and had explained to me by Afolabi Dania the information sheet relating to this project and agree to my participation.

Name of Participant:

Signature: _____

Date: __/__/____

Information Sheet

My name is Afolabi Dania and I am a Doctoral Student in the School of Construction Management and Engineering at the University of Reading, United Kingdom.

I am undertaking a research on *Understanding Firm-Level enactment of Sustainable Construction (SC) by construction firms in Nigeria*. I am particularly interested in how firms make sense of the discourse of SC and the process by which SC is enacted in its operations. The research hopes to contribute to the understanding of how the Nigerian construction climate shapes how firms interpret SC and also the contextual barriers to its implementation. I believe your firm as an active player in the Nigerian construction market will be able to provide valuable inputs and insights for this research project.

If you are willing to participate in this research, it would involve an interview of about 1 hour at a time and place of your choice. The particular area of interests include how you have engaged in Sustainability in your role at JBN, what projects, strategies and future plans JBN have for sustainability and your perceptions on any competitive advantages of being sustainable in the Nigerian Construction Sector. You can choose not to answer any questions, and are free to withdraw from the study at any time. At every stage of this research, your identity will remain confidential. Your name and all identifying information will be removed from the written transcript and any published material. My supervisors and I will be the only people who will have access to this data.

With your permission, I would like to tape the interview and for later transcription. Copies of the transcript will be available on request and any changes which you ask for will be made. The data will be kept securely and destroyed when the study has ended, which will be a maximum of 12 months from the completion of the research. The data will be used for academic purposes only.

Copies of the completed dissertation will be available on request. If you have any further questions about the study, please feel free to contact me at the above address.

This project has been subject to ethical review, according to the procedures specified by the University Research Ethics Committee, and has been given a favourable ethical opinion for conduct.

I look forward to your participation in the study.

Name of Researcher: Afolabi Dania

Signature: _____

Appendix D: Ethics form

Application for Approval of Research Ethics



School of the Built Environment

Researcher / Student: email completed form to your Supervisor/PI

Supervisor / PI: check and email to: *sbe-ethics@reading.ac.uk*

Section 1 – Application Summary

Project Title: (2 lines)

Applicant

Name:

Email address:

Status (Staff, PhD, MSc, MArch or BSc):

Supervisor / Principal Investigator

Name:

Email address:

Is this a Nil Return? (YES / NO):

If YES:

- Read Section 3 and email it to your Supervisor / PI from your university email address.
- **Supervisor / PI:** Please read Section 3, then check this is a 'Nil Return', and authorize by emailing from your university email address to: *sbe-ethics@reading.ac.uk*
- No further action is required

If **NO**, please provide a few more details:

Further Information

A research project is classified as a 'Nil Return' if it does NOT involve: direct contact with human subjects, human samples, human personal data, access to company documents/records, questionnaires, surveys or interviews. Usually this means research using secondary data that is publically available.

For Research Ethics Committee use only

Comments:

Approved by:

Date:

**Describe BRIEFLY what is being investigated, and how?
(10 lines)**

The research is an interpretive study which explores the enactment of sustainable construction by three selected case study firms operating in the Nigerian construction sector. The proposed methods are the use of semi-structured interviews, archival records and observations.

**How will you store your data (including signed Consent Forms)?
(6 lines)**

The soft copies of the data obtained would be stored securely on a passworded computer in a secure office, 2N16. Physical copies of signed off consent forms and any printed transcripts of interviews would be stored in secured lockers in the same office.

**For how long will you retain your data?
(2 lines)**

The data would be retained for the maximum of one (1) calendar year after the completion of the research.

Is this a Questionnaire or Survey with no identifying information and no issues of confidentiality? (YES / NO):

If YES:

- When you email this completed form, **attach a one page sample of the questions to be asked.** See Section 5 (Attachments)
- Read Section 3, then email it to your Supervisor / PI from your university email address.
- **Supervisor / PI:** Please check the attachment. If you are satisfied, read Section 3 and authorize by emailing from your university email address to: *sbe-ethics@reading.ac.uk*
- No further action is required

If NO, please provide more details in Section 2:

This should be a very short summary of a few sentences (10 lines MAXIMUM) in everyday language, describing your topic and your basic research methods.

All data, including signed consent forms, must be stored securely (e.g. on a password protected laptop; in a locked office etc.) and is ultimately retained by the University. All data must be removed from personal storage and returned to SBE (usually to the PI) if/when the researcher leaves SBE.

BSc / MSc dissertation data should usually be destroyed after 1 year. PhD / Staff research data should be retained for 3 years post-research by default. Research Council funded research requires you to submit a data management plan, specifying your period and means of data retention. Other funders may have specific requirements.

Questionnaires or Surveys MUST include an opening paragraph clarifying: voluntary participation; confidentiality; anonymity; data management; informed consent. See example in Appendix A.

Using your university email is sufficient to confirm your identity and means we do not require a signature

Section 2 – Application Detail

Describe your research methods
(30 lines MAX)

This research is undertaken by the use of qualitative data collection methods. The major source of data is semi-structured interviews which have been designed to solicit information on how the firms make sense of sustainability in construction. The interviews would be recorded using a portable recording device.

Does your research include interviews? (YES / NO):

If YES:

- include a one page sample of the interview questions – See Section 5 (Attachments)

Will you use adverts/leaflets/letters etc. to access or recruit participants? (YES / NO):

If YES:

- include a copy - See Section 5 (Attachments)

Do you need an Information Sheet and Consent Form? (YES / NO):

If YES:

- include a copy - See Section 5 (Attachments)

Further Information

Include details such as: what type of data you will gather, how many participants will be involved, how they were chosen, what they will do etc.

Remember this is about the practical activities you plan, this is NOT the place for you to justify your choice of method, describe theoretical underpinnings etc.

30 lines MAXIMUM – fewer is ok. Do not give any more detail than required.

Where reasonably possible, you MUST provide every person you contact in your research with an Information Sheet, and obtain from them a signed Consent Form. If for ANY REASON you are unable to do this, you should contact your Supervisor / PI for advice and ensure the SBE Ethics Committee is fully informed.

Does your research include any of the following?

(YES / NO):

No

- Medical procedures or samples?
- Patients or clients of the NHS?
- Psychological research using human participants?
- People unable to give informed consent?
- Educational research?
- Food research?
- The use of personal data?
- Participants who are in a 'Special Relationship' with you
- Deception

Outline your ethical issues, and how you intend to deal with them, including any issues raised above

(30 lines)

The following ethical issues have been identified for this study and would be dealt with in the following ways:

1. Informed consent: the participants would be issued consent forms advising that they can withdraw at any time.
2. Integrity: the participating firms would be issued information sheets clearly expressing that the research is confidential, anonymous and strictly for academic purposes.
3. Protection from harm:
4. Confidentiality
5. Data Protection:

These are the triggers that usually raise the application from School level to University level. If an application to the University Research Ethics Committee is required, you will be contacted by the SBE Ethics Committee. If you are unsure, please contact the SBE Ethics Committee before submitting your application.

People 'unable to give informed consent' are usually children or vulnerable adults. It is a legal requirement that staff and students undergo a Disclosure and Barring Service check before engaging in research when in a position of trust. If you are unsure, then you must contact the SBE Ethics Committee

'Special Relationship' includes for example: spouse/partner; employer/employee; teacher/student etc.

Issues might include: confidentiality, privacy, anonymity, payment to participants, controversial or sensitive research topic, proprietary technical information, involvement of young or vulnerable people, existing relationships with participants (student, spouse etc.), cultural or language differences, coercion or deception, place of interaction (public place, workplace, hazardous environment etc.), revelation of criminality, uncovering health issues, exposure to pain or distress, physical contact generally, consumption of food or drink, risk to personal safety of the researcher and the participants, inconvenience or intrusion, environmental impact.

THIS LIST IS BY NO MEANS EXHAUSTIVE - YOU MUST IDENTIFY ALL ISSUES RELEVANT TO YOUR OWN PROJECT AND EXPLAIN HOW YOU WILL DEAL WITH THEM

Section 3 – Confirmation

Applicant:

- To the best of my knowledge I have made known all relevant information to the Research Ethics Committee, and I undertake to conduct this research in line with the information provided. I will inform the committee of any such information that subsequently becomes available, whether before or after the research has begun.
- **To confirm this statement, please email the completed form to your Supervisor / PI (from your university email address)**
- No further action is required.

Supervisor / PI:

- I have checked the content of this form and the attachments, and to the best of my knowledge I have made known all relevant information to the Research Ethics Committee, and I undertake to inform the committee of any such information that subsequently becomes available, whether before or after the research has begun.
- **To confirm this statement, please email the form (from your university email address) to:**
sbe-ethics@reading.ac.uk
- No further action is required.

Further Information

It is important that if you have any queries, you contact the SBE Ethics Committee before submitting this form.

Using your university email is sufficient to confirm your identity and means we do not require a signature.

Using your university email is sufficient to confirm your identity and means we do not require a signature.

Section 4 - Appendices

Appendix A:

Example opening paragraphs for Questionnaires / Surveys

This survey is part of a study on *Green Supply Chains* [REPLACE WITH YOUR PROJECT DETAILS] which is being conducted by *Joe Doe* [REPLACE WITH YOUR NAME], an *undergraduate BSc student* [REPLACE WITH YOUR DETAILS] in the School of the Built Environment at the University of Reading. As a *project manager involved in procurement* [REPLACE WITH YOUR PARTICIPANT DETAILS] you are invited to participate in this study.

Could you please complete this form *and return it to the following address by 10 September 2014* [REPLACE WITH YOUR REQUIREMENTS].

Participation is voluntary. You do not have to complete all of the questions and you can stop at any time. Responses are confidential. The only persons to see the completed questionnaire will be myself and my supervisor. Your identity and place of employment will not be mentioned within any publication or presentation resulting from this survey.

By completing and returning this survey you understand that you are giving consent for your responses to be used for the purposes of this research project.

If you have any questions, you can contact me at [YOUR EMAIL ADDRESS] or my supervisor at [YOUR SUPERVISOR / PI 's EMAIL ADDRESS]

Further Information

Surveys often do not allow for the distribution of information sheets and signed consent forms. To obtain informed consent, researchers should begin the survey with a short paragraph informing participants of the nature and topic of the project and indicating that by completing the survey, they are consenting to participate.

THIS IS ONLY AN EXAMPLE. All of the relevant information must be modified to suit your project.

Appendix B:

Example Content for an Information Sheet

My name is [YOUR NAME HERE] and I am a [YOUR STATUS HERE e.g. BSc Undergraduate Student] in the School of The Built Environment at the University of Reading.

I am carrying out research on [YOUR PROJECT TITLE WITH A BRIEF DESCRIPTION OF THE RESEARCH]

[EXPLAIN WHAT THE PARTICIPANTS WILL BE ASKED TO DO] *If you are willing to be interviewed you will be asked to participate in an interview of about 45 minutes, at a time and place of your choice. During the interview I will ask you questions on your experience with green supply chains. With your permission, I would like to tape the interview and transcribe section later. Copies of the transcript will be available on request and any changes which you ask for will be made* [REPLACE WITH YOUR RESEARCH METHODS]. You can choose not to answer any questions. You are free to withdraw from the study at any time.

At every stage, your identity will remain confidential. Your name and all identifying information will be removed from the written transcript. My supervisor and I will be the only people who will have access to this data. The data will be kept securely and *destroyed when the study has ended, which will be a maximum of 12 months from the completion of the research* [REPLACE WITH YOUR DATA MANAGEMENT DETAILS]. The data will be used for academic purposes only.

Copies of any outputs, such as articles or presentation slides, will be available on request. If you have any further questions about the study, please feel free to contact me or my supervisor.

[YOUR NAME AND EMAIL ADDRESS]

[THE NAME AND EMAIL ADDRESS OF YOUR SUPERVISOR / PI]

This project has been subject to ethical review, according to the procedures specified by the University Research Ethics Committee, and has been given a favourable ethical opinion for conduct.

Signed: [YOUR SIGNATURE]

Date

Further Information

For face-to-face meetings (e.g. interviewing, observations, focus groups etc.) each participant should be informed of the purpose and methods of the research, on an Information Sheet. This should be on University of Reading headed paper (copy & paste from Appendix D if needed), and **MUST** include contact details for the researcher and supervisor / PI.

Provide an outline of the project in plain English.

Advise the participants what they will be asked to do, and make it clear they can withdraw at any time.

Provide details of data management (removal of identifying details, method and length of storage, access to data etc.) Make sure this is the same as you have written in Section 1.

THIS IS ONLY AN EXAMPLE. All of the relevant information must be modified to suit your project.

Leave a signed copy of the Information Sheet with the participant.

Appendix C:

Example Content for a Consent Form

1. I have read and had explained to me by [YOUR NAME] the Information Sheet relating to this project and any questions have been answered to my satisfaction.
2. I understand that my participation is entirely voluntary and that I have the right to withdraw from the project any time, and that this will be without detriment.
3. I understand that my personal information will remain confidential to the researcher and his/her supervisor at the University of Reading, unless my explicit consent is given.
4. I understand that my organisation will not be identified either directly or indirectly without my consent.
5. I agree to the arrangements described in the Information Sheet in so far as they relate to my participation.

Name: [NAME OF THE PARTICIPANT]

Signature: [SIGNATURE OF THE PARTICIPANT]

Date:

Appendix D:

University Logo and SBE Address



School of the Built Environment
University of Reading
Whiteknights
Reading
RG6 6AW

Further Information

If the participant is happy to be part of your research project, they need to confirm this by signing a Consent Form.

THIS IS ONLY AN EXAMPLE. All of the relevant information must be modified to suit your project.

ALL CONSENT FORMS MUST BE RETAINED ALONGSIDE THE COLLECTED DATA, AND SUBJECT TO THE SAME DATA MANAGEMENT PLAN. You should have outlined this in Section 1.

Copy and Paste if required when writing your Information Sheet

Section 5 – Attachments

Use this list to check you have attached all necessary additional information:

Questionnaire / Survey: Sample questions (1 page max)

Information Sheet: (2 pages max)

Consent Form: (1 page max.)

Sample interview questions: (1 page max)

Adverts

Further Information

Any of this information that is required should be attached to the same email as your completed form.

Your questionnaire/survey **MUST** include an opening paragraph informing participants of the nature and topic of the project and indicating that by completing the survey, they are consenting to participate. (See Appendix A)

If your research **ONLY** includes a simple and uncontentious survey, then it **MAY** be approved by your Supervisor / PI. (See Section 1 for more information)

Required for any research that involves contact beyond questionnaires/surveys (e.g. interviewing, focus groups etc.) This should be written according to the guidelines given in Appendix B.

Leave a signed copy of the Information Sheet with your participants

Goes with the Information Sheet. Use the example in Appendix C as a guide.

Signed by the participants and retained securely with your data, as per the arrangements described in Section 1.

Include a list of the questions you intend to ask. This can be a draft version, but must be representative. Avoid unnecessary questions (e.g. gender if that is not part of your research question), or personal questions (e.g. about age or health) unless they are necessary for the research.

Include a copy of any adverts, letters, leaflets etc. used in recruiting or informing

Appendix E: Coding Examples from Data Analysis

Nodes

Name	Sources	References	Created On
Action	4	29	13/05/2015 11:06
Experience	1	1	13/05/2015 11:07
Feedback	0	0	13/05/2015 11:08
Implementation	3	16	13/05/2015 11:08
Learning	1	2	31/05/2015 17:43
Projects	2	4	31/05/2015 07:51
Roles	2	3	29/05/2015 21:07
Training	2	4	29/05/2015 21:09
Strategy	4	12	26/05/2015 09:12
Accreditation	1	1	03/06/2015 19:25
Environmental ass	4	5	26/05/2015 10:03
Recruitment	1	1	03/06/2015 19:26
Reuse	1	1	29/05/2015 21:39
Technology	1	1	29/05/2015 21:37
Waste	1	1	29/05/2015 21:41
Water	1	2	29/05/2015 21:34
Context	4	121	13/05/2015 11:06
Barriers	4	20	13/05/2015 11:09
Attitudes	1	1	29/05/2015 21:15
Awareness	3	5	18/05/2015 15:16
Dated methods	1	1	27/05/2015 19:14
High costs	3	7	25/05/2015 19:31
Local materials	1	2	27/05/2015 19:08
Need	2	2	03/06/2015 16:46
Priorities	2	2	25/05/2015 19:32
Capability	2	2	01/06/2015 09:47
Contextual variation	1	5	03/06/2015 14:45
Financing	1	1	03/06/2015 17:17
Mechanization	1	1	03/06/2015 14:47
Poverty	1	1	03/06/2015 17:17
Process oriented	1	1	03/06/2015 14:45
Project size	1	1	03/06/2015 14:48
Contract documentatio	1	1	25/05/2015 19:11
Drivers	4	14	13/05/2015 11:09
Best practice	2	2	29/05/2015 21:22
Clients	3	7	31/05/2015 07:55
Competition	1	1	31/05/2015 19:11
Cost savings	1	1	29/05/2015 21:44
Image	1	1	29/05/2015 21:24
International contra	1	1	29/05/2015 21:21
Technology	0	0	31/05/2015 08:54
Value	1	1	31/05/2015 19:12

