

**MEDIATING EFFECTS OF SMALL MEDIUM
ENTERPRISE ORGANIZATIONAL CULTURE ON
THE RELATIONSHIP BETWEEN CIRCULAR
ECONOMY PROCESSES AND ECONOMIC
SUSTAINABILITY CONSTRUCTION PROJECTS IN
NIGERIA**

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NIGERIA**

by

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**Thesis submitted in fulfilment of the requirements
for the degree of
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DEDICATION

This research is dedicated to;

- The loving memory of my late father, Dr A. B. Mohammad whose indelible influence on me is immeasurable. May Allah SWT grant him eternal rest.
- My mother(s), Hajjah and Mama Hauwa for the unconditional love and care over the years.
- My beloved wife; Maryam Abubakar Umar, Children; Aisha (Imaan) and Abubakar (Ayman), for the love, sacrifice and support during my study period.

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LIST OF ABBREVIATIONS

AVE	Average Variance Extracted
C2C	Cradle to Cradle
CAC	Corporate Affairs Commission
CAD	Computer Aided Design
CC	Construction Constraints
CDW	Construction and Demolition Waste
CE	Circular Economy
CR	Composite Reliability
CS	Construction Strategies
CVF	Competing Values Framework
DC	Design Constraints
DfD	Design for Disassembly
DfX	Design for X (strategies)
DS	Design Strategies
DvC	Development Culture
EMF	Ellen MacArthur Foundation
EoL	End-of-Life
ES	Economic Sustainability
ESCP	Economic Sustainability of Construction Projects
GC	Group Culture
GDP	Gross Domestic Product
GNP	Gross National Product
HC	Hierarchical Culture
HCM	Hierarchical Component Model
HOC	Higher Order Construct
HTMT	Heterotrait-Monotrait Ratio
IBS	Industrialized Building System

IE	Industrial Ecology
KMS	Knowledge Management System
LC	Lean Construction
LCA	Life Cycle Assessment
MC	Modular Construction/Material Constraints
MDA	Ministries Departments and Agencies
MFA	Material Flow Assessment
MS	Material Strategies
NBC	National Building Code
NCI	Nigerian Construction Industry
NIA	Nigerian Institute of Architects
NIESV	Nigerian Institute of Estate Surveyors and Valuers
NIOB	Nigerian Institute of Builders
NIQS	Nigerian Institute of Quantity Surveyors
NIS	Nigerian Institute of Surveyors
NITP	Nigerian Institute of Town Planners
NSE	Nigerian Society of Engineers
OC	Organizational Culture
OSC	Off Site Construction
PLS	Partial Least Squares
POC	Point of Consumption
PPP	Public Private Partnership
PSS	Product Service Systems
RC	Rational Culture
SDG	Sustainable Development Goals
SC	Sustainable Construction
SCM	Supply Chain Management
SEM	Structural Equation Modelling
SME	Small and Medium Enterprise
SMEs	Small and Medium Enterprises

SMM	Sustainable Material Management
SPSS	Statistical Package for Social Sciences
TBL	Triple Bottom Line
TQM	Total Quality Management
UK	United Kingdom
UKGBC	United Kingdom Green Building Council
UN	United Nations
VE	Value Engineering

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**KESAN PENGANTARA BUDAYA ORGANISASI PERUSAHAAN KECIL DAN
SEDERHANA TERHADAP HUBUNGAN ANTARA PROSES EKONOMI
SIRKULAR DAN KELESTARIAN EKONOMI BAGI PROJEK PEMBINAAN DI
NIGERIA**

ABSTRAK

Mutakhir ini, ada permintaan di dalam industri binaan untuk menggunakan model sirkular sebagai cara untuk mempertingkatkan kelestarian. Asas kajian ini adalah keperluan untuk memasukkan sirkulariti ke dalam industri binaan Nigeria yang mana penggunaan linear bahan binaan sedia ada bersifat tidak lestari. Ini ditambah pula dengan dilema kewangan di Nigeria yang menyebabkan kepada kekurangan dana untuk menjalankan projek pembinaan. Kajian ini dibuat untuk mengkaji kesan pengantara budaya organisasi firma pembinaan yang boleh menjelaskan kelestarian ekonomi projek-projek pembinaan di dalam industri binaan Nigeria. Ada tiga proses utama ekonomi sirkular; rekabentuk sirkular, pembinaan sirkular dan kelestarian bahan binaan. Kajian ini menjadikan budaya organisasi sebagai konstruk pengantara dengan empat dimensi; kumpulan, pembangunan, rasional dan budaya hirarki. Penyelidikan kuantitatif digunakan untuk menjalankan kajian. Data telah dikutip dengan menggunakan soalan soal selidik daripada syarikat pembinaan dan perundingan binaan di dalam tiga zon geopolitik di Nigeria Utara. Teknik persampelan bebas berkadar telah digunakan di dalam memilih responden kajian untuk setiap kategori. Responden-responden merangkumi rakan prinsipal, rakan niaga, staf pengurusan, pengurus projek, dan staf biasa organisasi berkaitan. Kaedah PLS-SEM, dengan bantuan perisian SmartPLS 3.3.3 telah dipilih untuk menganalisa data. Keputusan kajian menunjukkan

proses sirkular ekonomi memberikan impak besar kepada kelestarian ekonomi projek pembinaan di Nigeria. Sama juga, budaya organisasi besar pengaruhnya kepada kelestarian ekonomi projek pembinaan. Keputusan analisa pengantara juga menunjukkan konstruk pengantara (budaya organisasi) banyak mengurangkan kesan kepada kesan-kesan proses ekonomi sirkular terhadap kelestarian ekonomi. Dapatan empirikal menghasilkan satu hala tuju untuk organisasi menerima pakai strategi terbaik untuk mencapai hasil ekonomi terbaik di dalam projek. Kerangka konsepsual penyelidikan berserta dengan hasilnya boleh dijadikan sebagai panduan di dalam membantu syarikat-syarikat pembinaan untuk memahami kesan budaya di dalam aplikasi ideologi sirkular bagi mencapai kelestarian ekonomi di dalam projek pembinaan.

**MEDIATING EFFECTS OF SMALL MEDIUM ENTERPRISE
ORGANIZATIONAL CULTURE ON THE RELATIONSHIP BETWEEN
CIRCULAR ECONOMY PROCESSES AND ECONOMIC SUSTAINABILITY
CONSTRUCTION PROJECTS IN NIGERIA**

ABSTRACT

Recently, there have been clamors for the construction industry to adopt circular models as a means of enhancing sustainability. The need to incorporate circularity into the Nigerian construction industry where the current linear consumption of construction materials is considered unsustainable, forms the basis of this study. This is further exacerbated by the financial dilemma in Nigeria, where shortage of funds to execute construction projects is often highlighted. This study was aimed at investigating the mediating effects of construction firms' organizational culture on circular economy processes that affects the economic sustainability of construction projects in the Nigerian construction industry. Three main circular economy processes that affects economic sustainability of construction projects were identified; they include circular design, circular construction and material sustainability. The study introduced organizational culture as a mediating construct with four dimensions; they include group, development, rational and hierarchical cultures. A quantitative research approach was used in carrying out the research, data was collected using well-structured survey questionnaires from contracting and consulting construction companies within three geopolitical zones of northern

Nigerian. A proportionate stratified simple random sampling technique was used in selecting the study respondents in each category. The respondents comprised of Principal partners, Partners, Management staff, Project Managers and Regular staff of these organizations. The PLS-SEM method with the aid of SmartPLS 3.3.3 software was carefully chosen to analyze the research model. Out of the 390 returned questionnaires, 359 were carefully selected and utilized for analysis. The study results indicate that circular economy processes significantly impact the economic sustainability of construction projects in Nigeria. Similarly, organizational culture significantly influences the outcome of economic sustainability of construction projects in Nigeria. Also, results of the mediation analysis show that, the mediating construct (organizational culture) when tested has significantly reduced the effects of the circular economy processes on economic sustainability of construction projects. The empirical result and discoveries deliver a pathway for organizations to effectively adopt the appropriate strategy for attaining the much-required economic output for their projects. The research conceptual framework along with the resulting output can be used as a guide in assisting Nigerian construction organizations in understanding the impact of their respective organizational cultures in the application of circular ideologies for the attainment of economic sustainability of their projects.

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Contemporary and impending trends aims toward the need for an essential shift in the way resources are used up to avoid ecological breakdown, substantial interruption to production lines and other business hazards (Chen et al., 2020). Universally, the rate at which the human population consistently rises with corresponding increase in purchasing power of the populace translates to the depletion of more material resources. Yin et al., (2018) related how the world's population is rapidly urbanizing, predicted to reach about 70% by the year 2050. Being undoubtedly one of the rapidly urbanizing countries in sub-Saharan Africa, almost 50% of Nigeria's population now reside in urban settlements indicating the need for more infrastructure (Isa et al., 2013).

Consequently, a lot of material resources are expected to become scarcer and hence expensive to use and a considerable number of these resources may not even be available for future utilization. According to WRAP (2016), 37% of the entire number of materials used annually in the United Kingdom—or an estimated 158 metric tons—are lost. The linear use of products is depleting finite resources and aggravating the world's waste issues (Van Der Laan & Aurisicchio, 2019). Economically, given the cost incurred in extracting, refining and producing materials, it is crucially beneficial to prolong the value of the material by ensuring it is kept (function-and-service-wise) in circulation for as long as can be endured. When compared to the usual linear extract-produce-use-dump model of the present global economic system, this frequently translates to environmental benefits

(Korhonen et al., 2018). An inverted material flow notion is more likely to provide a solution to the issue of an unsustainable universal linear flow economy (Korhonen et al., 2018).

The growing concern on population growth and resource scarcity has resulted in the concept of sustainability becoming more imperative over the past decades (Santoro, 2019). Being the foundation for most economic activities, the construction industry is hence plunged into the key role of ensuring sustainability. The current level of sustainability awareness is undoubtedly a crucial factor influencing the architectural tendencies and high resource consumption observed in developing countries (Kukah et al., 2022). This consumes a lot of energy and adds a lot of money to the construction process because it necessitates the importation of supplies and specialized labor. Recently, the Covid-19 pandemic crises have further complicated these challenges by creating additional unprecedented socio-economic pressures on the industry. This implies that sustaining the construction industry and its' products is of paramount importance. It is therefore imperative that projects' design, construction and professionals consider the whole-life cycle costs throughout the span of projects (Sarhan & Pretlove, 2021).

For a more workable economic system to be attained, a trending approach that is more recurrently discussed for overcoming the existing predicament of product lifecycles is the idea of the Circular Economy (CE). A circular economy is recommended where material resources are in carefully designed flows (Van Der Laan & Aurisicchio, 2019). Basically, the CE advocates preserving the materials available instead of discarding them, and in the process close the circle of materials within the product lifespan, in order to lessen resource handling and energy requirement. Any significant advancement in the CE logic

involves not just producing more items but also keeping them around for a longer length of time, such as by maintaining them rather than altering them (Witjes & Lozano, 2016). Even with these emerging concepts, the CE principles are seldom applied. In circumstances where they are applied, it is done only partly. (Ritzén & Sandström, 2017).

By and large over the last decade the CE has gained growing interest, undoubtedly since the launch of the Ellen MacArthur Foundation (EMF) in 2010 whom have made it their chief focus (Anastasiades et al., 2020; Bao et al., 2019; Ezeudu & Ezeudu, 2019). The foremost explanation of CE was defined as “an industrial economy that is restorative or regenerative by intention and design” (Ellen MacArthur Foundation, 2013). The shift away from production and consumption remaining dependent on the status quo in favor of curling the circle of an industrial ecosystem and circular flows is essential to the concept of CE (Larsson, 2018; Stahel, 2016), with the aim of reducing material consumption, minimizing wastages and providing socio-economic benefits (Dumlao-Tan et al., 2017; Ghisellini et al., 2018; Stahel, 2016).

According to Bao et al., (2019), the 3R principles—reduce, reuse, and recycle—can be used to achieve the main objectives of the CE and boost both the efficiency of resource consumption and the efficiency of projects. Additionally, it is anticipated to have positive economic effects, such as an increase in Gross Domestic Product (GDP), net material savings, job opportunities, and no danger of material price volatility and provision. Higher competitiveness, resource security, adaptability, and a variety of business models to enable value creation are possible commercial advantages. Adams et al., (2017) noted that CE policies were being advanced by the European Commission, national, and regional authorities to produce benefits for the environment and the economy.

The concept of Sustainability, which has been floating for quite a while now is aimed at attending to the ecological, social and economic problems of the current and future generations. Similar to this, the CE is offered as a solution to address ecological, social and economic challenges by repurposing waste and linking production and consuming activities. The circularity attitude is being further boosted by the already predominant subject of sustainable development, which has captured global awareness and implementation (Ezeudu & Ezeudu, 2019a). Technical modernization, new business models, and most critically, unwavering stakeholder cooperation are all required for the transition to a working CE regulation (Witjes & Lozano, 2016).

China, one of the world's top consumers of natural resources, is currently dealing with a complex set of changes as a result of its extensive five-decade economic boom. The Chinese government published the first set of guidelines for circularity in the nation in 2005 as a result of a lack of virgin resources, excessive energy consumption, and ecological damage. After that, the introduction of "The Circular Economy Promotion Law" in 2009 supported the growth of the CE through national regulation (Bao et al., 2019; Kirchherr et al., 2018). These initiatives have helped to reduce energy consumption in the building sector and promote green innovation (Li et al., 2023). On a global scale, the United Nations (UN) adopted the ambitious Agenda for 2030 in September 2015, outlining sustainable development objectives for economic growth, social inclusion, and environmental protection (Kiss et al., 2019).

Politicians, stakeholders, academics, real estate developers, and the general public have recently shown a growing interest in the development of a circular economy model in the building industry (Chen et al., 2020; Mahpour, 2018). The UK Green Building Council

(UKGBC, 2019) is of the opinion that for economic prospects to be realized, CE must be seen as a commercial strategy, not just a sustainability thought. Previous studies, (Alsanad, 2015; Ifije & Aigbavboa, 2020) reported that around the globe, the construction industry exhausts 40% of processed timber and represents 16% of total water energy yielded, 40% of all raw materials and 25% of all resources extracted in industrialized countries. This very significant statistics underlines the degree to which the construction industry is involved in the depletion of an already scarce pool of resources. Even though construction is vastly looked upon as the pillar industry for shaping up the built environment, it is also a foremost facilitator in causing ecological dilapidation.(Bao et al., 2019)

The development of any country's economy and culture has a close affiliation with its construction industry (Yin et al., 2018). The construction and demolition activity has been identified as one of the main priority areas in the shift to a CE (Jones & Comfort, 2018). The construction process, mostly referred to as the construction project has been acknowledged as being very multifaceted, disjointed and exclusive in nature, as it comprises of the contributions of several types of experts and artisans specializing in various stages of the project (Babalola et al., 2019).

Shifting towards CE and other sustainability-driven business models entails an ultimate change that flows through the whole construction company and also involves its staff. This change requires innovative solutions where existing methods are replaced with more circular oriented ones. It is however, imperative for organizations to direct these innovations, a need that is generally expected of companies seeking to become part of the sustainable development strategy. Ritzén and Sandström, (2017) argued that in order to

discover ways for organizations to control this disruptive change, it is imperative to begin from within the organization to comprehend the trials and barriers they cope with.

Both Veleva et al., (2017) and Mahpour, (2018) reported that firms' attempts for transition to CE are inadequate. Laumann and Tambo, (2018) concluded that for a complete application of a CE, its fundamental concept must reach every level of any firm willing to function according to its standards. Central to this assertion is the universally acknowledged concept of Organizational Culture (OC) of these firms. The effect of OC on a firm's operation and productivity has since been documented in literature (e.g Zu et al., 2010; Naranjo-Valencia et al., 2011; Abd ullah Kaid Al-Swidi, 2012; Valmohammadi & Roshanzamir, 2015; Pakdil & Leonard, 2015; Ardit et al., 2017; Y. S. Chen et al., 2020; McClellan, 2020 etc).

At the same time, previous studies have demonstrated that OC can be viewed as a background feature or social setting that shapes a firm's learning processes in attaining and using specific knowledge (Teräväinen et al., 2018). In practical terms, OC conveys the environment in which people operate and the impact it has on their thought, behavior, and professional practice. OC differs appreciably within and amongst organizations. OC has the potential to convey the best in workers and create a conducive environment for them as well or on the contrary bring out the worst in the workers and create a difficult setting ripe with pressure and anxiety (Warrick, 2017).

1.2 Problem Statement

The construction sector, like many other industries around the world, is going through profound changes simply to meet the demands of the twenty-first century. This is coming at a period when the business environment within which construction firms or companies

themselves function, continue to change rapidly (Adamu et al., 2015; Osuizugbo, 2020). By 2050, the urban construction stock in Europe is expected to increase by about 13% in comparison to 2015 in order to meet the demands of the growing urban population. Construction materials are becoming increasingly difficult to find in many parts of the world. In order to significantly enhance resource efficiency of urban growth and adhere to the Sustainable Development Goals (SDGs), immediate action is needed (Chen et al., 2020). Similarly, the number of construction projects in the developing world has widely increased due to the rapid economic development and consequent urbanization in those countries (Isa et al., 2013; Yin et al., 2018; Zeeuw Van Der Laan & Aurisicchio, 2019), which has also adversely contributed to the current ecological and socio-economic predicaments (Durdyev, Ismail, et al., 2018).

In economic terms, the classical linear economy is unsustainable from a financial, environmental and energetic perspective (Molina-Moreno et al., 2017). Global resources are finite and generally not used to their full potential in a linear economy because they always move in one direction i.e. raw materials to waste. Already, there is a shift towards modern methods of construction across developed countries including the UK (Ogunmakinde et al., 2019), but many developing countries like Nigeria are lagging behind (Rahimian et al., 2017). Despite growing knowledge of the benefits of circular thinking and encouragement to do so, many professionals in the construction and real estate industries are still struggling to incorporate it into their models, services, and products (Jones & Comfort, 2018). The consequence is the continuing trend of high resource consumption (Kukah et al., 2022) leading to more money committed to the construction industry. This is a problem given the ever increasing financial dilemma in Nigeria, where shortage of

funds to execute construction projects (Taiwo & Misnan, 2020; Muogbo & Chuka, 2019) is often highlighted. The World Bank recently predicted that Nigeria will require \$3 trillion in investments to address the country's infrastructure deficit. (Administration & Commerce, 2020). Hence, the adoption and application of sustainable practices could not have come at a better time.

Even with the numerous changes that have swept construction industries globally, in terms of its practices and procedures, the composition of the Nigerian construction sector has largely stayed unaltered. As a consequence, firms that snub the chance to adapt and react to the complexities of these new trends are very much likely to experience survival issues (Odediran et al., 2012; Adamu et al., 2015; Osuizugbo, 2020). The comprehensive and multifaceted nature of a CE requires adjustment both at a firm level and also the entire construction sector level. This simply means that decision-making and interaction between firms can help as much as production and design innovations to attain the shift towards a CE in the construction sector. As reiterated by Pomponi & Moncaster, (2017), shifting to a circular built environment will require extensive research across economic, ecological, socio-cultural, technical and legislative dimensions (Stephan & Athanassiadis, 2018).

It has been judiciously argued that the success of any construction process depends to a large extent on the executing firm's performance, because, it is the firm that translates designs into reality and consequently leads to client satisfaction which ultimately translates to the projects being economically sustainable through attainment of value. It then follows that Construction firms should be capable of improving their performances consistently in order to be able to respond to the ever-changing dynamics of the industry in which they operate (Osuizugbo, 2020). Owolabi et al., (2019) identified OC along with three other

factors (financial system, regulations, and organizational structure) as the main barriers hindering innovative applications in the Nigerian construction industry. According to Ezeudu & Ezeudu, (2019), other critical factors hindering adoption of CE on the Africa continent are the deficiency of knowledge on the application processes and the dearth of information. OC has already been identified by Mcdermott & O'Dell, (2001) as a barrier to knowledge sharing, which makes this issue much worse.

Varied cultures at the intra-organizational, organizational and trans-organizational levels may work concurrently, and thus result in a cultural complexity. The majority of the time, cultural factors also have an impact on employees' resistance to change, enthusiasm for imparting new knowledge, and managerial commitment (Islam et al., 2015). Even though OC has been the constituent variable of some mediation and moderation models that correlate individual and managerial variables (Paz et al., 2020), it was not given critical attention in the construction industry until the last decade (Teräväinen et al., 2018) . The social behavioral feature of the construction industry still appears to be ignored based on the comparatively rare number of academic researches over the subject (Teräväinen et al., 2018; Cheung et al., 2011).

A limited number of researches from the past have delved into the CE concept in the construction industry. Esa et al., (2017) assessed the potentials of integrating the CE concept as a method to minimize Construction and Demolition Waste (C&DW) in Malaysia. Across the continent in Europe, Jones & Comfort, (2018) reviewed how companies within the construction sector are addressing the concept CE. Also, a few studies were conducted across the same continent to assess the barriers hindering the adoption of CE in C&DW (Mahpour, 2018; Kirchherr et al., 2018; Ghisellini et al., 2018). In Nigeria,

Ezeudu & Ezeudu, (2019) and Ogunmakinde, (2019b) also focussed on the implementation of CE in C&DW. The general supposed benefit of CE from these studies is that CE increases organizations' environmental sustainability. Most participants from the above-mentioned studies view sustainability more in terms of environmental sustainability. This perhaps, may not be unconnected with how environmental sustainability is currently more emphasized globally than the other two dimensions of sustainability; social and economic sustainability (Tunji-Olayeni et al., 2018).

The successful application of CE in the construction industry would naturally involve the adoption of specific strategies to enable building materials undergo design, construction use , deconstruction, reuse, recycle and back to construction materials again (Bullen, 2007). Given that small and medium-sized enterprises (SMEs) in developing countries such as Nigeria are regarded as being more vital and crucial to the economy (Saka et al., 2020), the application of these CE related strategies within SMEs would bring forth the much needed transition. This is due to their sheer number and involvement in construction activities. Researches conducted in relations to CE adoption in Nigeria (Ogunmakinde et al., 2019; Ezeudu & Ezeudu, 2019b; A. Ogunsanwo & Ayo-Balogun, 2020; Omeiza-Michael, 2021; Oyelola et al., 2017b; Toriola-Coker et al., 2021) clearly attest to either these strategies partially practiced or not practiced at all. Accordingly, a number of constraints or barriers have been exposed as reasons for the lackluster or non-implementation of circular related strategies in construction (Durdyev et al., 2018; Akhimien et al., 2021). These barriers range from those related to design (Akinade et al., 2017; Chan et al., 2019), to construction (Ahn et al., 2013; Ogunsanwo & Ayo-Balogun, 2020) and projects' end-of-life stages (Stephan & Athanassiadis, 2018; Ogunmakinde et

al., 2019). The need for identifying construction firms' current affinity to these strategies as well as the encumbering factors is crucial to placing Nigeria on the pedestal to achieving sustainable pecuniary benefits.

The researches to date have tended to focus mainly on the environmental dimension of sustainability rather than the economic dimension. Recent research outputs in the Nigerian construction space indicate a dearth of literature on the implementation of CE principles towards attaining economic sustainability of construction projects in Nigeria. As highlighted above, a number of studies have correlated the relationship between CE implementation and environmental sustainability in Nigeria. This study therefore, will attempt to fill the gap identified above, by assessing the relationship between CE processes and the economic sustainability of construction projects within construction organizations in Nigeria. The study also identifies CE processes and proposes the Competing Values Framework (CVF) of OC (Group, Development, Rational and Hierarchical cultures) as mediating variables that influences the effects of the CE processes on the economic sustainability of construction projects in Nigeria.

As a solution to the stated problem, this study will present a mediation model for the relationship between CE processes and economic sustainability of construction projects in Nigeria. The model will be based on the mediation effects of the CVF of OC on CE processes that influences economic sustainability of construction project in Nigeria. The identification of the most prevalent strategies and constraints of circular economy processes among SMEs in Nigeria as well as the dynamics of the relationship between these processes and economic sustainability is crucial to solving this problem. The attainment of economic sustainability in Nigerian construction projects is crucial to ensure that stakeholders get

value for invested capital by using the CE principle to benefit from saved resources, money generation and sustainable consumption practices (Witjes & Lozano, 2016). It is possible to implement principles of circularity on construction sites, but this requires at present some effort on the part of Stakeholders (Maerckx et al., 2019).

1.3 Research Questions

From the foregoing background and the identified research problem above, the following research questions are outlined;

- i. What are the most prevalent strategies of circular economy processes among small and medium enterprise construction firms in Nigeria?
- ii. What are the most prevalent constraints of circular economy processes among small and medium enterprise construction firms in Nigeria?
- iii. What is the relationship between circular economy processes and the organizational culture of small and medium enterprise construction firms in the Nigerian construction industry?
- iv. What is the relationship between circular economy processes and economic sustainability of construction projects in the Nigerian construction industry?
- v. How does the organizational culture of a small and medium enterprise construction firm mediate the effect of circular economy processes on the economic sustainability of construction projects in Nigeria?

1.4 Aim and Objectives of the Study

1.4.1 Aim of the Study

This study is aimed at investigating the mediating effects of construction firms' organizational culture on circular economy processes that affects the economic sustainability of construction projects in the Nigerian construction industry, with a view to preferring solutions to the classical unsustainable linear economy in the industry.

1.4.2 Objectives of the Study

- i. To identify and rank strategies of circular economy processes among small and medium enterprise construction firms in Nigeria.
- ii. To identify and rank constraints of circular economy processes among small and medium enterprise construction firms in Nigeria.
- iii. To investigate the relationship between circular economy processes and construction firms' organizational culture in Nigeria.
- iv. To investigate the relationship between circular economy processes and economic sustainability of construction projects in Nigeria.
- v. To examine the mediating effects of small and medium enterprise organizational culture between circular economy processes and economic sustainability of construction projects in Nigeria.

1.5 Scope of the Study

This study is limited to small and medium enterprise construction firms in Nigeria (consulting and contracting). The fact that these companies are entirely in charge of designing and carrying out construction activities in the Nigerian construction industry

(NCI) influenced this decision. The study focused on the mediating effects of organizational culture on circular economy processes that influences the economic sustainability of construction projects in Nigeria. The theme of the study is sustainability in the NCI with particular emphasis on the economic dimension of sustainability for construction projects. This becomes imperative given the importance of the sustainability discourse and especially since existing literature has revealed the dearth of studies on this particular dimension. Construction stakeholders need to be confident that using CE will be both environmentally and financially sustainable. The study made use of a structured questionnaire survey instrument to collect primary data from industry professional working within small and medium enterprise construction consulting and contracting firms in Nigeria.

1.6 Significance of the Study

In order to achieve value retention and to create new opportunities, the current unprofitable long-established methods of the widely used "take-make-use-dispose" linear economy model must be reconsidered. A CE must be implemented in conjunction with innovation to address climate change and resource scarcity (Chen et al., 2020). In a CE, it is assured that materials derived values are kept in the economy for an extended period to reduce the amount of waste being moved to landfills, thereby improving the sustainability of the environment and the firm (Akanbi et al., 2019).

There are many claims made about the possible economic and environmental benefits of making the switch to a CE. According to the World Economic Forum (2014, p.13), for example, the CE has the potential to deliver a net economic benefit of 1.8 trillion

Euros worldwide by 2030 because of its "trillion-dollar opportunity with great potential for innovation, job creation, and economic growth." (Jones & Comfort, 2018). The practical advantages of CE implementation have been extensively reported at numerous levels and even in the economic sectors in the countries where it is being practiced (Ezeudu & Ezeudu, 2019a).

1.7 Organization of the Thesis

This study is divided into six (6) chapters, with Chapter One serving as the introduction and providing background information. It includes the study's context, a statement of the research problem, and a discussion of the research gaps, purpose, objectives, research questions and scope.

The second chapter provided a literature review pertinent to the study area. This chapter provided an overview of several research-related topics, including definitions. In addition, an overview of the Nigerian building industry is provided. The chapter next describes the research framework and hypotheses.

The methodology is covered in Chapter Three. It presented and defined the study population, sampling procedure, pilot study validity and reliability tests, operationalization and evaluation of the study variables, data collecting and analysis.

The results and study findings are presented in Chapter Four. The fifth chapter discusses the study findings as well as the correlations, parallels, and differences between the study findings and earlier findings. This chapter also discusses the study's implications.

The study is concluded in Chapter Six, which describes the study's main contribution to the body of knowledge and to practice. The chapter also discusses the study's limitations and makes recommendations for future research. This chapter presents the overall conclusions.

1.8 Summary of Chapter

The chapter presented the background of the research in relation to circular economy and economic sustainability. It also discussed the construction firms' organizational culture as a mediating construct in the transition of linear economy to circular economy in the construction industry. The chapter stated the main problem of the study, the research questions, specific aim and objectives, scope of the study and significance of the research. Finally, the chapter discussed the organizational structure of the thesis.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter reviews existing literature specifically related to the main constructs of the study. The chapter is therefore divided into eleven sections, with the first section introducing the main contents of the chapter. The second section provides definitions of the key operational terms of the study. The third section provides a comprehensive review of the Nigerian Construction Industry, highlighting on issues ranging from government roles, materials firms, workforce, challenges and regulatory frameworks.

The next three sections (4-6) provide insights into the phases of CE implementation; from concepts to pathway to the actual implementation process. The third section dwells on the concept of CE highlighting its' origins, principles, benefits, drivers, challenges and limitations. Section four discusses the pathway to CE in the construction industry focusing on enablers, approaches, techniques, policies and implementation. Section five discusses the study's independent variable; highlighting processes like Circular Design, Circular Construction and Material Sustainability.

The seventh section explains the role of Organizational Culture of a firm in the adoption and implementation of CE processes as the mediating variable. Section eight presents Economic Sustainability of Construction projects in Nigeria as the dependent variable which is ultimately attained. The conceptual framework of the study is highlighted

in section nine while the proposed hypothesis is presented in section ten. The chapter concludes by summarizing the contents of the whole chapter in section eleven.

2.2 Definitions of Key Operational Terms

- a) **Circular Economy** (CE) refers to an economic structure that is rehabilitative or regenerative by intention and design. The primary objective of this type of economy is to maintain the highest possible level of utility and value for all products, parts, and materials at all periods.
- b) **Organizational culture** (OC) refers to the experiences, philosophy, and values that an organization upholds in order to influence member behavior, internal operations, interactions with the external world, and future projections. It is founded on commonly held attitudes, beliefs, customs, as well as written and unwritten rules, which have been developed over the course of time and are regarded as being legitimate.
- c) **Economic Sustainability** (ES) refers to "practices that promote long-term economic expansion without negatively impacting the community's social, environmental, and cultural aspects." Economic factors in construction refer to all costs and benefits associated with construction-related functions, ranging from the initial capital invested to operations and maintenance gains and final payback proceeds.
- d) **Circular design** refers to advancements in product design, standardization, component modularization, cleaner material flows, and design for simpler disassembly.

- e) **Circular construction** refers to the integration of the circular economy to the construction industry, which aims to end the traditional take-make-consume-dispose cycle by closing building material loops through reuse, sharing, leasing, restoring, refurbishing, and recycling.
- f) **Material Sustainability** or Sustainable materials management (SMM) is a methodical approach towards using and reuse of materials more effectively throughout their entire life cycles. It reflects a shift in how our society views the utilization of natural resources.

2.3 The Nigerian Construction Industry (NCI)

Globally, the construction industry accounts for 6-9% of many countries' GDP (Alaloul et al., 2021; Luo et al., 2022). The construction industry has been a driver of societal growth for many generations. Factually, the industry is always associated with the process of urbanization and industrial development, and it has been discovered that there is a relationship between construction investment and economic development (Osuizugbo, 2020). It is vital to the national economy, regardless of the country's level of economic growth, because it employs between 2% and 10% of the total workforce in most countries (Ishaq et al., 2019). The NCI contributes significantly to the Gross National Product (GNP) and accounts for roughly half of total government expenditures (Ali, 2021; Osam et al., 2022; Osuizugbo & Ojelabi, 2020a; Umar et al., 2020). The link between the NCI and Nigeria's real GDP was discovered to be significantly and convincingly positive (Osuizugbo & Ojelabi, 2020b). In 2015, GDP was 2.79% (National Bureau of Statistics, 2017) and the construction industry accounted for 4.18% of the GDP. The NCI also serves as a current and probable employer for the vibrant out of work youths in the country.

Ogunsanya et al., (2019) revealed that the NCI has provided over 6 million construction associated employment prospects to both Nigerian professionals and expatriates. The NCI is the sole provider of the basic infrastructure needed for the effective working of the society. It also has the potential of improving its range, commercial opportunities and viability, with innovation holding the key to attaining the potentials of the industry (Owolabi et al., 2019).

Formal construction practices commenced in the 1930s in Nigeria, regulated by the Nigerian Army Engineers and Public Works Department (Kehinde et al., 2023). In the 1940s construction contracting also commenced with a few foreign firms coming into business in Nigeria (Osuizugbo, 2020). Since Nigeria's independence in late 1960 and the oil boom in the seventies, the nation saw an increase in construction activity that lasted until the termination of the second Republic in 1983. The NCI has since witnessed an overwhelming upsurge in construction contracting activities (Kehinde et al., 2023). Within the last decade, the Nigerian economy improved effectively, with the help all sectors of the economy, especially the NCI (Ishaq et al., 2019).

The NCI basically comprises of organizations and individuals involved with the means by which building and structural engineering projects are designed, created, rehabilitated, refurbished, sustained and demolished. These include companies and professionals working as consultants, contractors and subcontractors, material manufacturers, equipment dealers and builders (Ogunsanya et al., 2019). The NCI operates in harmony with consumers, investors and other stakeholders. The NCI has as its main components the construction firms ranging from the small to the multi-national construction firms. The Nigerian Government is the principal client of the NCI, although

recent years have witnessed a rising benefaction from private investors (Emoh et al., 2017). The emergence of indigenous construction firms is principally motivated by the public infrastructure deficit created by the ever-rising human population in the country. It is against this backdrop that a substantial number of firms were set up to tap into the rising prospects (Ogunsanya et al., 2019).

The NCI is structurally quite complex with an assortment of clients, consultants, contractors and a wide range of construction experts who are involved in the industry (Ali, 2021; Emoh et al., 2017; Osam et al., 2022; Umar et al., 2020; Osuizugbo, 2020). The building construction division and the civil or heavy engineering construction division are the two primary subcategories that can be found within the industry (Umar et al., 2020). Studies (Fagbenle et al., 2018; Umar et al., 2020) have shown that the federal government of Nigeria is the most involved in the industry (64.9%) followed by state governments (22.7%). Obviously, the NCI cannot endure without its major investors. Patrons of the vast majority of construction projects in Nigeria can be found at all three levels of government (Federal, State, and Local) and can be contacted through any number of the government's Ministries, Departments, and Agencies (MDAs). Other customers include private individuals, companies, and other businesses. However, because the majority of private projects are on a smaller scale (mostly family home units), only a select few private individuals are able to finance capital projects. Despite this, private projects continue to make significant contributions to the industry (Ogunmakinde et al., 2019).

The individuals who make up the NCI's specialists are always put together in provisional and practical teams. These teams may consist of individuals such as architects, quantity surveyors, engineers, estate surveyors, project managers, and others. They are saddled with the responsibilities and are fully presumed to have the pertinent skills, experience, instruments and methods to attain the project objectives (Fagbenle et al., 2018). With so many players involved, several challenges are bound to manifest (Ogunmakinde et al., 2019). The composition of the NCI is made up of both local and external construction firms. This is substantiated by the (National Bureau of Statistics, 2017). In a comparative study, Osam et al., (2022) suggested that if training establishments are enhanced, expatriates involved, domestic and foreign firms cooperate, government guidelines enforced, and political atmosphere is steadied, the difference in the apt conclusion of construction projects between external and domestic firms will be settled.

With a GDP valued at around US1.221 trillion, the Nigerian economy is undoubtedly the biggest in Africa (Orji et al., 2021; Salakhedtinov & Agyeno, 2022). However, the country is still a low income country transitioning from the low income to the middle-income class (Okoye, 2016). This implies that the country is at a threshold of massive growth and development (Olanipekun & Saka, 2019; Okoye, 2016). To harness this growth, the NCI must overcome traditional linear model of resource consumption (Ezeudu & Ezeudu, 2019b). Faced with the global dilemma of sustainability amidst incremental dwindling materials necessary for construction, numerous researchers have attempted to address the problem recently. Ezeudu and Ezeudu, (2019) proposed the application of circular economy principles in managing industrial waste in Nigeria. They

proposed a safe, organized and efficient waste system to boost socio-economic benefits in the country.

Oyelola et al., (2017) also provided an insight into a CE based waste management system in Lagos state of Nigeria. In their study, Ogunmakinde et al., (2019) went a step further by specifically focusing on material waste disposal methods in the NCI. The study culminated with the development of a CE-based construction waste minimization framework for the industry. Ogunsanwo and Ayo-Balogun, (2019) on their part, concentrated on the entrepreneurial aspect of the CE concept in Nigeria. They suggested that technical skills in circular activities enables youth empowerment, job creation and economic sustenance. Okere et al., (2019) looked into a CE-based tool in mitigating climate change in south-eastern Nigeria by converting waste to energy. Nigeria's waste management crises, population growth, material use culture and the obvious circularity gap prompted Omeiza-Michael, (2021) to expose the key factors in the transition of Nigeria from linear to circular economy.

It can be surmised from these studies that, with the exception of Ogunmakinde et al., (2019), most emphasis hinge on other industries (solid waste, manufacturing etc.) besides the construction industry. Meanwhile, the construction industry is notorious for generating huge amounts of waste, inadvertently impacting the environment and depleting an already limited pool of resources (Aremu et al., 2019). Consequently, this study sought to address the waste question from a different vantage point by critically unfolding the CE processes (design, construction and material sustainability) within a typical construction setting to identify the efforts applies and the resistance experienced by stakeholders. The NCI is crucially important and indispensable to the economic development of Nigeria;

(Osuizugbo & Ojelabi, 2020a; Umar et al., 2020). It is on this premise therefore, that this study seeks to contribute by ensuring that whatever growth expected can be sustained by the findings of the study.

2.3.1 The Role of Government in the NCI

The prominence of the construction industry is a product of its strong linkages with other sectors of the economy (Osam et al., 2022) . Mhlanga, (2021) noted that the yield of the industry is critical in providing the infrastructure needed for the expansion of various sectors of a country's economy. Given the documented importance of the sector to fiscal growth, construction has been used broadly by policy makers as an instrument, and changes to the percentage of budgetary allocations going in the direction of construction has been a vital feature of various governments' fiscal policy measures (Mhlanga, 2021).

In the NCI, the government plays a huge role. Apart from the overall obligation of creating human investment through the delivery of education, other obligations that correlate directly to the construction industry include: easing companies' access to money, expertise and inputs; inspiring the formation of specialist societies; challenging collaborations between foreign and resident companies; and restructuring construction procurement methods. Nonetheless, these administrative concerns are hardly evident in the industry. For instance, when it comes to the delivery of projects, collaboration between resident and foreign companies is minimal at best. This is because the former prefer to use their own workforce. Kehinde et al., (2023). Babatunde & Low, (2013) cited an example of Chinese construction whose majority of the labor force is Chinese as well.