

**GREEN SUPPLY CHAIN PRACTICES AND SUSTAINABILITY IN NIGERIAN
MANUFACTURING FIRMS**

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BENIN CITY

JANUARY, 2026.

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**BEING A PROJECT SUBMITTED TO THE DEPARTMENT OF BUSINESS
ADMINISTRATION, FACULTY OF MANAGEMENT SCIENCES IN PARTIAL
FULFILLMENT OF THE REQUIREMENTS OF THE AWARD OF BACHELOR
OF SCIENCE (B.Sc.) DEGREE IN BUSINESS ADMINISTRATION,
UNIVERSITY OF BENIN, BENIN CITY.**

JANUARY, 2026.

DECLARATION

I, **Samuel Ehizenoria AGBEDE**, hereby declare that, this project is undertaken by me in the Department of Business Administration, Faculty of Management Sciences, University of Benin, Benin City, Edo State, under the supervision of **DR. D.O OGBEIDE**.

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CERTIFICATION

We, certify that **Samuel Ehizenoria AGBEDE** with the Matriculation number **MGS2104779** submitted this research work to the Department of Business Administration, Faculty of Management Sciences, University of Benin, Benin City.

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DEDICATION

This project is dedicated to God Almighty, and to my ever loving parents, Mr. Agbede Benjamin Ugiagbe and Mrs. Agbede Patricia Ebibinoze, for all their support and dedication throughout my course of discipline.

ACKNOWLEDGMENT

I wish to express my profound gratitude to, God Almighty who is the source of my strength and inspiration throughout this project.

I would like to express my gratitude to my project supervisor Dr. D.O Ogbeide, for his patience, corrections and ideas all through this project writing.

Special appreciation goes to all the lecturers from the Department of Business Administration, most especially to the Head of Department, Dr. D.O. Ogbeide. May God bless you all.

I am extremely grateful to my parents Mr. Agbede Benjamin Ugiagbe and Mrs. Agbede Patricia Ebibinoze, for their loving guidance and care towards me. Appreciation goes to my brothers for their supports and kind words.

I also want to appreciate my friends, course mates, and others too numerous to mention, for their assistance and knowledge throughout this journey of time. God bless you all.

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ABSTRACT

The growing environmental challenges facing manufacturing firms have intensified the need for sustainable operational practices, particularly within supply chains. This study examines the influence of green supply chain practices on sustainability performance of manufacturing firms in Nigeria. Specifically, the study focuses on green procurement, eco-design, cleaner production, reverse logistics, and green distribution as key dimensions of green supply chain management. Anchored on empirical evidence from prior studies, the research highlights how the adoption of environmentally responsible practices contributes to environmental compliance, operational efficiency, cost reduction, and competitive advantage. Findings from the reviewed literature indicate that firms implementing green procurement benefit from responsible sourcing, improved supplier relationships, and reduced environmental footprint. Eco-design practices enhance product durability, resource efficiency, and recyclability, while cleaner production significantly reduces energy consumption, emissions, and waste generation. Reverse logistics supports resource recovery and waste minimization through circular supply chain processes, and green distribution improves logistics efficiency while lowering carbon emissions. Furthermore, empirical evidence suggests that the integrated adoption of these green supply chain practices produces synergistic effects that strengthen environmental, economic, and operational sustainability. The study concludes that holistic green supply chain management is a critical driver of sustainable performance in Nigerian manufacturing firms and recommends its broader adoption to achieve long-term sustainability goals.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

GSCM has cropped up as one of the most crucial concepts in contemporary discourse on operations management and environmental management, with global industries increasingly under pressure to minimize ecological footprints while pursuing sustainable growth. For manufacturing firms, major drivers of industrialization, it is incumbent to ensure economic development harmonizes with environmental responsibility. Situated within the context of Nigeria, it is evident that its manufacturing sector plays a major role in GDP and employment, with increased awareness taking hold toward revisiting the integration of sustainability within supply-chain processes for enhanced long-term competitiveness and environmental stewardship (Akinlabi & Makinde, 2023).

GSCM incorporates environmental thinking into supply-chain activities involving product design, material sourcing, manufacturing processes, distribution, and end-of-life product management. According to Srivastava (2020), GSCM involves practices in green procurement, eco-design, cleaner production, reverse logistics, and green distribution with the intention of minimizing waste, conserving resources, and attaining sustainable performance of the business. This approach goes beyond mere compliance with environmental regulations and fosters proactive strategies that balance economic growth with ecological preservation.

In Nigeria, green supply-chain practices are still at a relatively low level of adoption despite their proven advantages. Ojo-Emmanuel, Ayanlade, and Jegede (2023) noted that “the extent of adoption of green supply chain management technologies and practices among Nigerian manufacturing firms is very low” (p. 396), depicting a gap between the awareness of the policy and its practical implementation. Similarly, Ngirika and Jacob (2024) established that though many manufacturing firms appreciated the strategic relevance of sustainability, “implementation of green supply chain practices remains fragmented and inconsistent”. These studies depict that Nigerian firms mostly face challenges such as limited technical expertise, inadequate funding, weak enforcement of environmental regulations, and poor stakeholder engagement (Soyege *et al.*, 2023).

Each aspect of GSCM adds to the dimension of sustainability outcomes in its own different way. Green procurement ensures that materials and inputs are sourced responsibly, hence having minimal negative environmental impact across the supply chain. Eco-design encourages product durability, recyclability, and resource efficiency to reduce waste and resource depletion. Cleaner production focuses on energy efficiency, reduction of waste, and control of pollution during manufacturing processes. Reverse logistics focuses on recovering, recycling, and reusing waste for resource conservation and cost reduction. Lastly, green distribution involves route optimization for logistics and transportation systems to reduce emissions and improve energy efficiency.

Despite these probable gains accruing from the use of green supply chains, the pace at which their diffusion is occurring in Nigeria remains slow. The main barriers to the wide diffusion of GSCM practices include a lack of environmental awareness, inadequate technological capability, and cost implications. As such, most manufacturing firms still operate on conventional supply-chain models that focus on cost minimization rather than environmental responsibility. This generates a sustainability gap that threatens both environmental quality and the long-term competitiveness of the sector.

It is necessary to explore which ways GSCM practices can influence sustainability outcomes in Nigerian manufacturing firms. The specific effects of green procurement, eco-design, cleaner production, reverse logistics, and green distribution on environmental and economic sustainability will not only enhance performance in firms but will also provide a framework for policy guidance towards sustainable industrial development. This study, therefore, investigates the effect of GSCM practices on sustainability in Nigerian manufacturing firms, providing empirical data that can inform sustainable industrial strategies in developing economies.

1.2 Statement of the Research Problem

Sustainability has indeed become a global imperative for manufacturing industries, with firms facing increasing pressure from governments, stakeholders, and consumers to operate responsibly and reduce their ecological footprint. Despite the growing awareness, there is still low and fragmented adoption of GSCM practices in developing economies,

particularly in Nigeria (Ojo-Emmanuel, Ayanlade, & Jegede, 2023). In Nigeria, manufacturing firms are still highly dependent on conventional supply-chain systems that stress cost minimization, short-run profitability, and operational efficiency, usually at the expense of the environment and social responsibility (Afolabi & Esubiyi, 2022).

Empirical evidence has shown that, although most Nigerian firms have come to believe in the need for sustainability, the actual GSCM practices, which include green procurement, eco-design, cleaner production, reverse logistics, and green distribution, remain inconsistent and underdeveloped (Ngirika & Jacob, 2024). Poor regulatory enforcement, inadequate technical know-how, insufficient capital investment, and lack of top management commitment are seriously obstructing the effective integration of environmental principles into manufacturing processes (Akinlabi & Makinde, 2023). Besides, most firms do not clearly understand the long-term economic benefit of GSCM, such as cost savings through energy efficiency, waste reduction, and improved brand reputation. This often leads to resistance to change (Soyege, Makinde, & Akinlabi, 2023).

This has remained a challenge and widened the sustainability gap in the Nigerian manufacturing industry. Various studies indicate that industrial pollution remains high, utilization of resources remains inefficient, and waste generation continues to be excessive in Nigeria, due to poor implementation of environmentally responsible practices (Segun & Aderemi, 2022; Srivastava, 2020). Inadequate integrated green

supply-chain strategies result in reduced competitiveness, environmental degradation, and lower long-term economic viability.

Empirical research is still scant that focuses on the influence of individual and collective GSCM components-green procurement, eco-design, cleaner production, reverse logistics, and green distribution-on environmental and economic sustainability outcomes in Nigerian manufacturing firms. As noted by Geng, Mansouri, and Aktas (2021), "context-specific evidence is crucial for understanding how green supply chain practices affect sustainability performance across developing countries". Therefore, this study aims to fill the gap by assessing the impact of GSCM practices on manufacturing companies' environmental and economic sustainability in Nigeria.

1.3 Research Questions

Based on the research problem above, the following research questions were formulated to guide and measure the study:

To what extent does green procurement influence environmental and economic sustainability in Nigerian manufacturing firms?

How does eco-design contribute to promoting product durability, recyclability, and resource efficiency among manufacturing firms?

In what ways do cleaner production practices reduce energy use, water consumption, and carbon emissions in the Nigerian manufacturing sector?

What is the effect of reverse logistics on waste reduction, recycling, and resource recovery in manufacturing operations?

How do green distribution practices enhance sustainable transportation, route optimization, and low-emission delivery in Nigerian manufacturing firms?

1.4 Objectives of the Study

The specific objectives of the research are to:

evaluate the influence of green procurement on environmental and economic sustainability in Nigerian manufacturing firms

assess the role of eco-design in promoting product durability, recyclability, and resource efficiency among manufacturing firms.

determine how cleaner production practices contribute to the reduction of energy use, water consumption, and carbon emissions in the manufacturing sector.

examine the effect of reverse logistics on waste reduction, recycling, and resource recovery in manufacturing operations.

investigate how green distribution practices enhance sustainable transportation, route optimization, and low-emission delivery in Nigerian manufacturing firms

1.5 Research Hypotheses

Based on the research objectives above, this study seeks to test the following stated null hypotheses:

Green procurement has no significant influence on environmental and economic sustainability in Nigerian manufacturing firms.

Eco-design does not significantly promote product durability, recyclability, and resource efficiency among manufacturing firms.

Cleaner production practices do not significantly contribute to the reduction of energy use, water consumption, and carbon emissions in the manufacturing sector.

Reverse logistics has no significant effect on waste reduction, recycling, and resource recovery in manufacturing operations.

Green distribution practices do not significantly enhance sustainable transportation, route optimization, and low-emission delivery in Nigerian manufacturing firms.

1.6 Scope of the Study

This study examines the impact of GSCM practices on the sustainability performance of manufacturing firms in Nigeria. Specifically, this study has investigated five core dimensions of GSCM as identified in the literature, namely, green procurement, eco-design, cleaner production, reverse logistics, and green distribution (Srivastava, 2020; Zhu *et al.*, 2018). These five dimensions collectively capture the main processes through

which environmental objectives are integrated into the supply chain to achieve both environmental and economic sustainability (Geng *et al.*, 2021).

The geographic scope of this study is Nigeria, focusing on selected manufacturing firms across the food and beverage, chemical and pharmaceutical, textile, and fast-moving consumer goods industries. This is justified by the fact that the manufacturing sector is central to Nigeria's industrialization process and, therefore, contributes immensely to resource use and waste generation (Ngirika & Jacob, 2024). The sector provides an ideal context for assessing how green supply chain practices have been practically implemented and their influence on sustainability outcomes.

The study limits itself to assessing environmental and economic sustainability because these are two of the most measurable and widely debated dimensions of corporate sustainability as noted by Akinlabi & Makinde (2023). Environmental sustainability describes practices that minimize pollution, reduce the amount of waste generated, ensure energy efficiency, and ensure good usage of natural resources. Economic sustainability implies the enhancement of the profitability of the firm, reduction in operational costs, and increased competitiveness due to environmentally responsible operations as observed by Segun & Aderemi (2022). Though very important, social sustainability is beyond the main scope of this research owing to time, data, and other resource constraints.

The unit of analysis is the manufacturing firm, and the respondents include supply chain managers, operations managers, production supervisors, and sustainability officers

directly involved in the design and implementation of supply chain processes. Data collection would be restricted to firms with formalized supply-chain systems and established environmental management or operational departments to ensure reliability and validity of responses.

Temporally, this study will be cross-sectional to collect data at one point in time, analyzing the present state of GSCM adoption and its relationship to sustainability performance. This design was also inspired by other empirical studies in GSCM within developing countries (Soyege, Makinde, & Akinlabi, 2023).

1.7 Significance of the Study

The primary significance of this study on green supply chain practices and sustainability in Nigerian manufacturing firms lies in its contribution to the advancement of sustainable industrial development and its potential impact on diverse stakeholders. The findings from this research will provide valuable insights for enhancing environmental and economic sustainability through effective supply chain management practices. The potential beneficiaries of this study include:

Manufacturing Firms and Managers: This study will provide manufacturing organizations with practical evidence on how adopting green procurement, eco-design, cleaner production, reverse logistics, and green distribution can enhance both environmental and economic performance. Managers will be able to identify which green supply chain management (GSCM) practices yield the highest sustainability returns,

enabling more efficient allocation of resources and improved operational decision-making (Akinlabi & Makinde, 2023; Geng *et al.*, 2021).

Supply Chain Professionals: The study will serve as a guide for logistics and supply chain professionals in Nigeria on integrating sustainability principles into procurement, production, and distribution processes. The insights gained will help professionals develop environmentally responsible strategies that reduce waste, optimize transport routes, and promote recycling and reuse (Zhu, Sarkis, & Lai, 2018).

Policy Makers and Government Agencies: For government agencies such as the Federal Ministry of Industry, Trade and Investment and the National Environmental Standards and Regulations Enforcement Agency (NESREA), the research will provide empirical evidence that can inform environmental regulations, industrial policy, and sustainability frameworks. These insights can guide national strategies to align Nigeria's manufacturing practices with the United Nations Sustainable Development Goals (SDG 9 and SDG 12), which focus on industry, innovation, and responsible production (Ngirika & Jacob, 2024).

Environmental Advocacy Groups: Non-governmental organizations and sustainability advocacy groups will find the study beneficial in understanding the current state of green supply chain practices within the manufacturing sector. The findings can be used to strengthen advocacy campaigns, promote eco-friendly manufacturing, and influence corporate environmental responsibility initiatives (Segun & Aderemi, 2022).

Researchers and Scholars: This study contributes to the expanding body of knowledge on green supply chain management in emerging economies. It provides a Nigerian perspective that will be valuable for comparative studies and meta-analyses in sustainable supply chain research (Soyege, Makinde, & Akinlabi, 2023). Researchers can build upon its findings to further explore relationships among sustainability dimensions and firm performance in similar contexts.

Investors and Business Leaders: Investors seeking to align their portfolios with sustainability objectives will benefit from understanding how Nigerian manufacturing firms are implementing GSCM practices to achieve profitability and environmental compliance. The research will highlight business models that balance financial returns with ecological responsibility (Geng *et al.*, 2021).

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents a comprehensive review of existing literature related to green supply chain practices and sustainability, with a specific focus on the Nigerian manufacturing sector. It examines key concepts, theoretical review, and empirical studies that highlight how green supply chain practices contribute to environmental, economic, and social sustainability. The review is structured to explore major dimensions of green supply chain management such as green procurement, eco-design, cleaner production, green distribution, and reverse logistics.

2.2 Conceptual Review

2.2.1 Green Procurement and Sustainability

Green procurement refers to the process of acquiring goods and services that have minimal negative impact on the environment throughout their life cycle from production to disposal. It emphasizes the selection of suppliers and materials that comply with environmental standards, promote resource efficiency, and reduce waste generation (Kagondu, Kibuine, & Mutisya, 2025). According to Ofoegbu and Laguo (2024), green procurement forms a key component of sustainable supply chain management, integrating environmental considerations into purchasing decisions to improve sustainability performance in manufacturing firms.

Wilson-Oshilim, Efedhoma, and Ofoegbu (2024) further note that green procurement encourages firms to adopt eco-friendly inputs, reduce toxic materials, and support recycling initiatives, thereby improving operational efficiency. Similarly, Kiswili and Ismail (2016) emphasize that sustainable procurement enhances long-term competitiveness by reducing production costs and aligning with global sustainability standards. In the Nigerian context, Okwara *et al.* (2025) assert that green procurement has gained momentum as firms increasingly recognize the economic and environmental benefits of sustainable purchasing. This is consistent with Nsikan, Okon, and Udom (2023), who found that sustainable purchasing practices improve firms' brand reputation and stakeholder trust.

2.2.2 Environmental sustainability

Environmental sustainability is the ability of firms to operate in ways that minimize ecological damage while maintaining long-term environmental balance. It involves reducing emissions, managing waste responsibly, and conserving natural resources (Bolaji, Abdul Rahim, & Omar, 2024). According to Adubor *et al.* (2022), sustainable practices in procurement and human resource management foster eco-conscious operations that protect the environment and enhance productivity. In manufacturing, environmental sustainability is often achieved through the adoption of green materials, waste recycling, and energy-efficient processes (Muhumed & Paul, 2021). As Ofoegbu and Laguo (2024) note, firms that adopt environmentally responsible procurement

strategies tend to experience improved ecological outcomes, compliance with environmental regulations, and enhanced sustainability performance.

2.2.3 Economic Sustainability

Economic sustainability focuses on ensuring that organizational activities generate long-term financial growth without depleting natural or human resources (Oputa *et al.*, 2025). In manufacturing, this means optimizing procurement and production to reduce costs, enhance productivity, and improve resource utilization. Okwara *et al.* (2025) highlight that sustainable supply chain management (SSCM) practices such as green procurement led to improved profitability and reduced operational waste.

Kagondou *et al.* (2025) also argue that environmentally responsible procurement enhances firms' responsiveness and competitiveness in volatile markets, especially when integrated into strategic decision-making. In line with this, Wilson-Oshilim *et al.* (2024) found that sustainable procurement practices in oil and gas firms in Nigeria significantly improve both environmental and economic performance.

2.2.4 Eco-Design and Product Sustainability

Eco-design refers to the integration of environmental considerations into the product design process with the goal of minimizing negative impacts across the product life cycle. It focuses on using eco-friendly materials, reducing waste, and promoting recyclability (Ademulegun, Olusegun, & Alabi, 2022). Chipambwa *et al.* (2023) explain that eco-

design supports innovation in manufacturing by emphasizing resource conservation and sustainable material use.

According to Xi and Pillai (2025), eco-design involves aligning industrial design principles with sustainability by integrating green production techniques that minimize emissions and promote product longevity. In the Nigerian context, Unegbu *et al.* (2025) argue that sustainable manufacturing processes can be achieved by localizing materials and design systems that reduce import dependency and environmental footprints.

2.2.4.1 Product Sustainability

Product sustainability concerns the ability of manufactured goods to remain environmentally friendly, durable, and economically viable throughout their life cycle (Chukwu, 2025). Sustainable products are designed to consume fewer resources, last longer, and generate less waste (Oguntoye & Evans, 2017).

Okunuga, Amos-Fidelis, and Dogo (2022) emphasize that adopting green manufacturing strategies improves product sustainability by reducing operational costs and fostering eco-conscious consumer behavior. Similarly, Nawanir and Moshood (2025) note that integrating green principles enhances competitiveness and ensures long-term business resilience.

2.2.4.2 Product Durability, Recyclability, and Resource Efficiency

Product durability relates to the ability of a product to withstand wear and tear over time, reducing the frequency of replacements and thus minimizing waste (Ademulegun *et al.*, 2022). Xi and Pillai (2025) state that durable products not only enhance customer satisfaction but also contribute to sustainability by extending product lifespans. Recyclability, on the other hand, focuses on designing products that can be efficiently disassembled and reused at the end of their lifecycle (Chipambwa *et al.*, 2023). Onwuchekwa and Ayibatariomono (2024) observe that green supply chain practices encourage recycling and reusing materials, reducing the dependence on virgin raw materials. Resource efficiency emphasizes maximizing output from minimal inputs, reducing waste, and lowering environmental impact (Unegbu *et al.*, 2025). In the manufacturing context, Kagondu *et al.* (2025) highlight that eco-efficient design strategies foster innovation, lower production costs, and promote sustainable growth.

2.2.5 Cleaner Production Practices and Sustainable Manufacturing

Cleaner production (CP) refers to the continuous application of an integrated environmental strategy to processes, products, and services to increase efficiency and reduce risks to humans and the environment. It focuses on minimizing waste and emissions at their source rather than treating them after generation (Akan, Fung, & Kumar, 2019). According to Almeida, Agostinho, Giannetti, and Huisingh (2015), cleaner production integrates environmental considerations into sustainability strategies

by reducing raw material use, optimizing energy efficiency, and promoting pollution prevention.

Ogunmola, Nwoye, and Okafor (2024) explain that adopting cleaner production enhances sustainable innovation, as firms consciously manage carbon and energy use. Likewise, Olekanma *et al.* (2024) argue that small and medium-sized enterprises (SMEs) implementing cleaner production benefit from green job creation, improved efficiency, and reduced carbon footprint.

In Nigeria, U-Dominic *et al.* (2024) observes that optimizing cleaner production processes has become crucial to achieving sustainability, particularly as manufacturing firms confront environmental challenges such as energy inefficiency and waste mismanagement. Asaleye *et al.* (2021) found that improved energy management significantly enhances manufacturing performance by reducing operational costs and improving output efficiency.

2.2.5.1 Energy Efficiency and Resource Optimization

Energy efficiency involves the use of less energy to achieve the same level of production output. This approach minimizes production costs and reduces environmental pollution (Sahu, Bagchi, Kumar, & Tan, 2022). Montalbano, Nenci, and Vurchio (2022) emphasize that energy efficiency contributes to global competitiveness by enhancing firm-level productivity. Similarly, Selim, Abousabae, Hasan, and Amano (2021) found that

improving energy systems in industrial facilities directly reduces CO₂ emissions and operational expenses.

Olatunji *et al.* (2019) further highlight that cleaner production practices focused on carbon footprint reduction can create competitive advantages for firms in global markets.

Kanyama *et al.*

(2018) add that firms implementing energy-efficient measures demonstrate stronger commitment to climate change mitigation.

2.2.5.2 Reduction of Water Consumption and Emissions

Water conservation is a central component of cleaner production, involving reduced consumption through recycling and process redesign (Akan *et al.*, 2019). Almeida *et al.* (2015) stress that efficient use of water in production not only reduces waste but also safeguards ecosystems.

Reduction in carbon emissions is another vital element of cleaner production. Ogunmola *et al.* (2024) note that effective carbon and energy management enhances sustainable innovation and environmental responsibility. Similarly, Akhanolu *et al.* (2023) observe that corporate governance mechanisms, such as board climate oversight, strengthen firms' commitment to emission control and sustainability performance.

2.2.6 Reverse Logistics and Waste Reduction

Reverse logistics (RL) involves all activities associated with the reuse of products and materials. It includes the processes of planning, implementing, and controlling the efficient flow of used goods from the point of consumption to the point of origin for recycling, remanufacturing, or disposal (Anne, Nicholas, Ithinji, & Bula, 2016). Ali, Zeb, Babar, and Awan (2021) define reverse logistics as a sustainability strategy that enables firms to recover value from returned or waste products while minimizing environmental impact.

Fasawe, Makata, and Umoren (2023) argue that reverse logistics not only reduces cost but also improves operational efficiency and resource recovery. Job, Njihia, Maalu, and Iraki (2020) observed that RL enhances competitive advantage by improving operational performance and customer satisfaction in manufacturing firms.

In Nigeria, Elemure (2025) notes that integrating reverse logistics within lean and green manufacturing practices promotes both business performance and sustainability. Nwamekwe and Chikwendu (2025) add that circular economy strategies support reverse logistics by transforming waste materials into reusable resources.

2.2.6.1 Waste Reduction and Recycling

Waste reduction is a core objective of reverse logistics. It entails minimizing waste generation at every stage of production and distribution (U-Dominic, Orji, & Okwu, 2021). Okyere *et al.* (2023) emphasize that government policies supporting RL are vital to achieving waste reduction and sustainable manufacturing.

Kisumpa (2024) reports that firms adopting effective reverse logistics experience improved cost management and environmental performance. Fasawe *et al.* (2023) also point out that RL systems enhance the collection and recycling of materials, supporting the broader goal of sustainability in manufacturing. Recycling, as part of RL, involves reprocessing waste into reusable materials. Ali *et al.* (2021) assert that it supports material recovery and reduces dependency on virgin resources. According to Job *et al.* (2020), recycling also strengthens firms' green image and fosters compliance with sustainability regulations.

2.2.6.2 Resource Recovery

Resource recovery is the process of reclaiming materials, energy, or other useful resources from waste. Elemure (2025) notes that manufacturing firms adopting resource recovery strategies experience improved resource efficiency and reduced costs. Nwamekwe and Chikwendu (2025) highlight that circular economy practices encourage firms to transform waste into inputs for new production cycles.

Anne *et al.* (2016) further affirm that reverse logistics enables firms to close the material loop, reducing landfill use and promoting environmental stewardship. Thus, reverse logistics serves as a key driver for achieving waste reduction, recycling, and sustainable production in manufacturing operations.

2.2.7 Green Distribution and Sustainable Transportation

Green distribution, also known as sustainable distribution, refers to environmentally responsible logistics practices that minimize the ecological footprint of product transportation and delivery. It includes optimizing routes, using low-emission vehicles, and reducing packaging waste (Wanjohi, 2020). Adebayo *et al.* (2023) define green distribution as a strategy that improves both operational performance and environmental sustainability through efficient resource utilization.

According to Wang (2024), integrating decision-making models like AHP and K-NN into logistics systems enhances distribution efficiency and reduces emissions. Kareem, Nwagwu, and Akhigu (2025) observe that adopting green logistics and transport systems improves economic efficiency and supports Nigeria's drive toward sustainable industrialization.

2.2.7.1 Sustainable Transportation

Sustainable transportation aims to reduce the environmental impacts of logistics by promoting the use of fuel-efficient, hybrid, or electric vehicles. Kanyepe, Alfaneta, and Zizhou (2023) argue that management commitment plays a critical role in the successful

adoption of green logistics initiatives. Maina, Mohammed, and Lagat (2025) emphasize that green transportation contributes to lower fuel consumption, cost reduction, and improved operational efficiency.

In Nigeria, Horsfall (2024) found that adopting green transportation practices in the oil and gas industry significantly improves business performance and environmental outcomes. Similarly, Nwaulune, Ajike, and Bamidele (2023) noted that green logistics enhances social sustainability among fast-moving consumer goods firms by promoting safe and eco-friendly transport systems.

2.2.7.2 Route Optimization and Low-Emission Delivery

Route optimization involves planning and executing delivery routes that minimize fuel use, travel time, and carbon emissions. Adebayo *et al.* (2023) suggest that optimal routing improves environmental sustainability by reducing transport inefficiencies. Wang (2024) adds that advanced modeling and simulation techniques can further optimize distribution operations for maximum efficiency. Low-emission delivery focuses on minimizing pollutants through cleaner fuels, vehicle maintenance, and the use of electric vehicles. Kareem *et al.* (2025) highlight that low-emission strategies contribute to economic efficiency and sustainable logistics operations. Oranusi *et al.* (2025) further argue that integrating sustainable supply chain management (SSCM) into logistics processes enhances firm performance and environmental responsibility.

2.3 Theoretical Literature Review

2.3.1 Institutional Theory

Institutional Theory was developed by W. Richard Scott (1987) and further advanced by Meyer and Rowan (1977). The theory seeks to explain why organizations adopt certain structures, practices, or strategies not solely for efficiency, but to gain legitimacy and align with broader social, regulatory, and industry norms. In the context of green supply chain management, Institutional Theory provides a lens for understanding why Nigerian manufacturing firms adopt sustainable practices, including green procurement, eco-design, cleaner production, reverse logistics, and green distribution (Ofoegbu & Laguo, 2024; Nsikan, Okon, & Udom, 2023). Firms operate in environments where legitimacy, compliance, and stakeholder approval are critical drivers of organizational behaviour, particularly in sectors sensitive to environmental regulations.

Institutional Theory assumes that organizations respond to pressures from their external environment, which can be coercive, normative, or mimetic. Coercive pressures arise from regulatory authorities and government mandates, compelling firms to adopt green supply chain practices to comply with environmental laws (Okwara *et al.*, 2025; Wilson-Oshilim, Efedhoma, & Ofoegbu, 2024). Normative pressures emerge from professional bodies, industry associations, and stakeholders who define best practices and ethical standards, thereby influencing firms to engage in eco-friendly production and sustainable sourcing (Bolaji, Abdul Rahim, & Omar, 2024). Mimetic pressures involve the imitation of industry leaders, where firms adopt successful green initiatives from competitors to

maintain legitimacy and competitive parity (Ofoegbu & Laguo, 2024). The theory further assumes that firms seek legitimacy even if the adoption of sustainable practices does not provide immediate economic benefits.

While Institutional Theory provides important insights into organizational conformity, it has been critiqued for overemphasizing compliance at the expense of innovation. Some scholars argue that it underestimates the proactive role of firms in initiating sustainability strategies and may not adequately capture how organizations balance economic and environmental objectives (Oliver, 1991; Bolaji, Abdul Rahim, & Omar, 2024). In the Nigerian manufacturing context, weak enforcement of environmental regulations can result in symbolic adoption of green supply chain practices, where firms appear compliant without generating meaningful sustainability outcomes (Okwara *et al.*, 2025; Wilson-Oshilim *et al.*, 2024). Moreover, the theory assumes a homogeneity of pressures across organizations, which may not reflect the diverse operational realities of small, medium, and large-scale manufacturers in Nigeria.

Institutional Theory is particularly relevant to this study because it explains the motivations behind the adoption of green supply chain practices among Nigerian manufacturing firms. For example, green procurement practices are often influenced by coercive regulatory requirements and stakeholder expectations, while eco-design initiatives may emerge from normative and mimetic pressures within the industry (Kagondu, Kibuine, & Mutisya, 2025; Ademulegun, Olusegun, & Alabi Kayode, 2022).

Cleaner production practices, reverse logistics, and green distribution systems are also shaped by the need to maintain legitimacy, improve environmental performance, and respond to global sustainability standards (Ofoegbu & Lago, 2024; Okwara *et al.*, 2025). By using Institutional Theory, this study can critically examine how external pressures and stakeholder demands influence sustainability adoption across different manufacturing sectors in Nigeria. In addition, Institutional Theory helps to contextualize the role of Nigerian government policies, industry regulations, and societal expectations in shaping corporate environmental strategies. Firms that effectively align their operations with these institutional pressures are more likely to enhance both environmental and economic performance (Nsikan *et al.*, 2023; Bolaji, Abdul Rahim, & Omar, 2024). The theory also provides a framework for understanding variability in green supply chain adoption, as some firms may fully integrate sustainable practices while others adopt them superficially due to limited resources or weak enforcement.

Furthermore, the theory highlights the significance of organizational culture, leadership, and management commitment in responding to institutional pressures. Nigerian manufacturing firms with strong environmental leadership are better positioned to internalize green practices rather than merely comply superficially. This internalization is critical for achieving objectives such as resource efficiency, carbon emission reduction, and sustainable product lifecycle management (Ofoegbu & Lago, 2024; Okwara *et al.*, 2025).

2.3.2 Resource-Based View (RBV) Theory

The Resource-Based View (RBV) of the firm was introduced by Birger Wernerfelt (1984) and later popularized by Jay Barney (1991). The theory posits that a firm's sustainable competitive advantage derives from its internal resources and capabilities, particularly those that are valuable, rare, inimitable, and non-substitutable (VRIN criteria). RBV emphasizes that internal resources, including technological capabilities, human capital, organizational knowledge, and operational processes, are central to achieving superior performance. In the context of Nigerian manufacturing firms, RBV provides a crucial lens for understanding how internal resources enable the adoption and implementation of green supply chain practices, such as green procurement, eco-design, cleaner production, reverse logistics, and green distribution (Okwara *et al.*, 2025; Bolaji, Abdul Rahim, & Omar, 2024).

RBV assumes that firms differ in their resource endowments, which explains variations in performance and strategic outcomes. It posits that competitive advantage arises when firms exploit unique capabilities that are difficult for competitors to imitate. Applying this to green supply chain management, Nigerian manufacturers that invest in eco-friendly production technologies, energy-efficient machinery, skilled personnel, and knowledge-based management systems are more likely to implement sustainable practices effectively (Ofoegbu & Laguo, 2024; Nsikan, Okon, & Udom, 2023). Additionally, the theory assumes that leveraging internal resources strategically can reduce operational costs, improve product quality, and enhance environmental

performance (Bolaji, Abdul Rahim, & Omar, 2024; Adubor *et al.*, 2022). Thus, RBV underscores the importance of internal capabilities in achieving both economic and environmental sustainability objectives.

RBV also assumes that organizational resources must be aligned with environmental demands to maximize value creation. For instance, the adoption of green procurement requires firms to have internal capabilities in supplier evaluation, environmental auditing, and sustainable sourcing strategies (Kagondou, Kibuine, & Mutisya, 2025; Oputa *et al.*, 2025). Similarly, eco-design practices necessitate technical knowledge, design expertise, and access to sustainable materials to improve product durability, recyclability, and resource efficiency (Ademulegun, Olusegun, & Alabi Kayode, 2022; Xi & Pillai, 2025). Cleaner production processes depend on operational efficiency and innovation, requiring investments in energy-saving technologies, waste reduction systems, and water conservation measures (Ogunmola, Nwoye, & Okafor, 2024; Asaleye *et al.*, 2021). RBV thus highlights the strategic role of internal resources in enabling sustainable manufacturing practice

Despite its widespread application, RBV has been criticized for being overly focused on internal resources while underestimating the impact of external environmental factors, such as government regulations, stakeholder expectations, and competitive pressures (Bolaji, Abdul Rahim, & Omar, 2024). In the Nigerian context, firms may possess advanced technologies or skilled labor but still struggle to adopt green supply chain

practices due to weak regulatory enforcement, inadequate infrastructure, or limited access to sustainable raw materials (Okwara *et al.*, 2025; Wilson-Oshilim, Efedhoma, & Ofoegbu, 2024). Furthermore, RBV assumes that resources are static and easily identifiable, neglecting the dynamic nature of organizational learning, innovation, and market changes, which are particularly relevant in fast-evolving sectors like manufacturing (Ofoegbu & Laguo, 2024). Another criticism relates to the difficulty in measuring the value of certain intangible resources, such as organizational knowledge, corporate culture, or environmental consciousness. While these resources significantly influence the success of green supply chain initiatives, they are often overlooked or underestimated in traditional RBV analyses (Bolaji, Abdul Rahim, & Omar, 2024; Adubor *et al.*, 2022). Additionally, the theory provides limited guidance on the process of resource accumulation, capability development, or how firms should prioritize investments in sustainability initiatives under resource constraints.

RBV is highly relevant to this study because it provides a framework for understanding how Nigerian manufacturing firms can leverage their internal capabilities to implement sustainable practices effectively. For example, green procurement requires firms to utilize internal systems for supplier assessment and environmental compliance (Kagondu *et al.*, 2025; Oputa *et al.*, 2025). Eco-design initiatives demand access to skilled designers and knowledge of sustainable materials (Ademulegun *et al.*, 2022; Xi & Pillai, 2025). Cleaner production depends on energy-efficient equipment, operational know-how, and innovative production techniques (Ogunmola *et al.*, 2024; Asaleye *et al.*, 2021). By

identifying the resources that enable successful green supply chain practices, RBV helps explain variations in sustainability outcomes among Nigerian manufacturing firms. Moreover, RBV helps explain the adoption of green distribution practices, such as route optimization and low-emission transportation. Firms that possess the technological infrastructure, skilled personnel, and operational knowledge to optimize logistics can reduce environmental impact while maintaining efficiency and profitability (Wanjohi, 2020; Wang, 2024). This demonstrates that internal resources, when aligned with sustainability goals, are critical enablers of green supply chain performance.

2.3.3 Stakeholder Theory

Stakeholder Theory was introduced by R. Edward Freeman (1984) and emphasizes that organizations must consider the interests of all stakeholders not just shareholders to achieve long-term success. Stakeholders include customers, employees, suppliers, regulators, local communities, and the broader society. In the context of green supply chain management, Stakeholder Theory provides a framework to understand how Nigerian manufacturing firms adopt sustainable practices in response to the expectations and pressures of various stakeholders (Ofoegbu & Laguo, 2024; Nsikan, Okon, & Udom, 2023). By engaging stakeholders in decision-making, firms can align their operations with social, environmental, and economic sustainability objectives, ensuring legitimacy, competitive advantage, and long-term performance.

Stakeholder Theory assumes that organizations operate within a network of relationships, and the survival and success of the firm depend on effectively managing these relationships. Firms are expected to identify key stakeholders, understand their interests, and incorporate these interests into strategic decision-making (Bolaji, Abdul Rahim, & Omar, 2024; Okwara *et al.*, 2025). Applied to green supply chain practices, this means that manufacturing firms in Nigeria must consider the expectations of regulators regarding environmental compliance, consumers' demand for eco-friendly products, suppliers' capabilities for sustainable sourcing, and community concerns about environmental impacts (Kagondu, Kibuine, & Mutisya, 2025; Adubor *et al.*, 2022). The theory also assumes that sustainable performance is enhanced when firms integrate stakeholder feedback into operational processes such as green procurement, eco-design, cleaner production, reverse logistics, and green distribution (Ofoegbu & Laguo, 2024; Wilson-Oshilim, Efedhoma, & Ofoegbu, 2024). Stakeholder Theory further assumes that managing stakeholder relationships is a dynamic and continuous process. Firms must actively engage with stakeholders through communication, reporting, and collaborative initiatives to maintain trust and legitimacy (Bolaji *et al.*, 2024; Nsikan *et al.*, 2023). This is particularly relevant in Nigeria, where stakeholder expectations are increasingly focused on environmental performance and corporate social responsibility, driving the adoption of sustainable supply chain practices (Okwara *et al.*, 2025; Bolaji *et al.*, 2024).

While Stakeholder Theory offers a comprehensive framework for understanding organizational responsibilities, it has been criticized for its lack of clear operational

guidelines. Critics argue that it is difficult to prioritize competing stakeholder interests, which can create conflicts and slow decision-making (Freeman *et al.*, 2010; Bolaji, Abdul Rahim, & Omar, 2024). In the Nigerian manufacturing sector, firms may struggle to balance pressures from regulators, consumers, and suppliers while also maintaining profitability (Ofoegbu & Laguo, 2024; Wilson-Oshilim *et al.*, 2024). Additionally, the theory can be overly broad, assuming that all stakeholder interests are equally important, which may not reflect the practical realities of resource-constrained firms attempting to implement green supply chain practices (Nsikan *et al.*, 2023; Okwara *et al.*, 2025).

Stakeholder Theory is highly relevant to this research because it explains why Nigerian manufacturing firms adopt green supply chain practices in response to the expectations and pressures of diverse stakeholders. For example, green procurement requires engaging suppliers who can provide sustainable materials while meeting environmental and quality standards (Kagondu *et al.*, 2025; Nsikan *et al.*, 2023). Eco-design initiatives are influenced by consumer preferences for durable and recyclable products, prompting firms to integrate sustainability into product development (Ademulegun, Olusegun, & Alabi Kayode, 2022; Xi & Pillai, 2025). Cleaner production practices are often driven by regulatory pressures and community demands for reduced carbon emissions, water consumption, and waste (Ogunmola, Nwoye, & Okafor, 2024; Asaleyeye *et al.*, 2021). The theory also highlights the importance of reverse logistics, such as waste reduction, recycling, and resource recovery, which requires coordination with suppliers, customers, and regulatory bodies to ensure compliance and efficiency (Anne *et al.*, 2016; Job *et al.*,

2020). Similarly, green distribution practices, including low-emission transportation and route optimization, are influenced by stakeholder concerns for environmental protection and cost efficiency (Wanjohi, 2020; Adebayo *et al.*, 2023). By adopting a stakeholder-oriented approach, firms can achieve both sustainability objectives and economic performance, aligning operational practices with the expectations of regulators, consumers, communities, and industry partners (Bolaji *et al.*, 2024; Ofoegbu & Lago, 2024).

2.4 Empirical Review

Empirical studies on green supply chain practices and sustainability in Nigerian manufacturing firms reveal a growing recognition of environmentally responsible operations and their impact on performance. Ofoegbu and Lago (2024) investigated the link between supply chain management practices and sustainability performance of manufacturing companies in Nigeria. Their study revealed that firms implementing green procurement, cleaner production, and eco-design experienced improved environmental compliance and enhanced operational efficiency. This suggests that adopting green supply chain practices provides both environmental and economic benefits. Similarly, Bolaji, Abdul Rahim, and Omar (2024) found that Nigerian SMEs integrating green practices into their operations achieved measurable improvements in resource efficiency and sustainability outcomes. The study emphasized that combining multiple green practices enhances the overall performance of firms, aligning with both environmental and economic sustainability objectives. Focusing on green procurement, Okwara *et al.*

(2025) examined sustainable supply chain management in manufacturing project firms in Southeast Nigeria. The study highlighted that firms engaging in responsible sourcing not only improved their environmental footprint but also gained competitive advantages through cost savings and improved supplier relationships. Kagondu, Kibuine, and Mutisya (2025), in a study of large-scale manufacturing firms in Nairobi, Kenya, found that green procurement practices increased responsiveness and efficiency, indicating that environmentally conscious sourcing can positively influence operational performance. Nsikan, Okon, and Udom (2023) further reported that Nigerian food and beverage manufacturers adopting sustainable procurement practices experienced better supply chain reliability and resource optimization. Wilson-Oshilim, Efedhoma, and Ofoegbu (2024) added that in the oil and gas sector, sustainable procurement practices significantly enhanced both environmental compliance and organizational performance, highlighting the cross-sectoral relevance of green procurement in Nigerian industries.

Eco-design has also been extensively studied as a driver of product sustainability. Ademulegun, Olusegun, and Alabi Kayode (2022) found that eco-design adoption in the Nigerian Bottling Company led to improved product durability, reduced waste, and higher resource efficiency. Unegbu, Yawas, Dan-asabe, and Alabi (2025) emphasized that integrating sustainable manufacturing processes with locally sourced materials helps reduce production costs and environmental impact. Xi and Pillai (2025) reported that incorporating eco-friendly materials and production techniques enhances product lifecycle and supports recyclability. Onwuchekwa and Ayibatariomono (2024) found that

manufacturing firms in Port Harcourt that embraced eco-design achieved higher productivity and operational efficiency. These studies indicate that eco-design not only promotes environmental sustainability but also strengthens the competitiveness and operational resilience of manufacturing firms.

Cleaner production practices have been empirically linked to reductions in energy consumption, water usage, and carbon emissions. Ogunmola, Nwoye, and Okafor (2024) demonstrated that Nigerian manufacturing firms implementing energy and carbon management strategies achieved measurable reductions in CO₂ emissions, while improving innovation performance. Olekanma, Rodrigo, Adu, and Gahir (2024) highlighted that SMEs' cleaner production initiatives promote green job creation alongside ecological benefits, supporting both social and environmental sustainability. Asaleye *et al.* (2021) emphasized that electricity consumption management enhances manufacturing sector performance while reducing environmental impact. These studies collectively suggest that cleaner production is a central mechanism for translating green procurement and eco-design practices into tangible sustainability outcomes.

Reverse logistics has been empirically recognized as essential for waste reduction and resource recovery. Job, Njihia, Maalu, and Iraki (2020) found that reverse logistics implementation in Kenyan manufacturing firms enhanced operational performance and competitive advantage by enabling efficient management of returned products and recyclables. Anne, Nicholas, Ithinji, and Bula (2016) emphasized that reverse logistics

strengthens circular economy strategies, which are increasingly relevant in resource-constrained contexts such as Nigeria. Nwamekwe and Chikwendu (2025) observed that Nigerian firms employing reverse logistics frameworks effectively minimized landfill waste while maximizing material recovery. These findings highlight the role of reverse logistics in closing the supply chain loop and supporting sustainable manufacturing operations.

Green distribution practices have also been investigated for their contribution to sustainability. Wanjohi (2020) found that multinational manufacturing firms in Nairobi using sustainable transportation strategies achieved significant reductions in carbon emissions while improving logistics efficiency. Adebayo, Olalekan, Daniel, and Olalekan (2023) reported that route optimization and low-emission delivery methods improved both environmental performance and operational cost efficiency among Nigerian manufacturing firms. Wang (2024) similarly concluded that integrating green distribution strategies into the supply chain strengthens overall sustainability and maintains firm competitiveness. These studies indicate that environmentally conscious transportation practices are critical to achieving holistic green supply chain management.

Several studies have examined the combined effect of multiple green supply chain practices. Bolaji, Abdul Rahim, and Omar (2024) emphasized that integrating green procurement, eco-design, cleaner production, reverse logistics, and green distribution leads to synergistic improvements in sustainability performance. Ofoegbu and Laguo

(2024) also observed that firms implementing integrated green strategies achieved higher operational efficiency and reduced environmental footprint. Okwara *et al.* (2025) reinforced these findings, suggesting that holistic adoption of green supply chain management is essential for Nigerian manufacturing firms to achieve sustainable outcomes. In conclusion, the empirical literature demonstrates that green supply chain practices positively influence environmental, economic, and operational sustainability in Nigerian manufacturing firms. Green procurement, eco-design, cleaner production, reverse logistics, and green distribution each contribute to measurable improvements, while integrated adoption of these practices amplifies their impact (Ofoegbu & Lago, 2024; Bolaji *et al.*, 2024; Okwara *et al.*, 2025; Kagondu *et al.*, 2025). These findings provide strong empirical support for this study, underscoring the importance of adopting holistic green supply chain strategies in the Nigerian manufacturing sector.

2.5 Research Gaps

Despite the increasing number of studies examining green supply chain management (GSCM) and sustainability, several research gaps remain that justify the need for this present study in the Nigerian manufacturing context.

2.5.1 Limited Empirical Studies within the Nigerian Manufacturing Context

Although research on green supply chain practices has gained traction globally, much of the empirical evidence originates from developed economies or emerging Asian markets (Bolaji, Kamarul, Abdul, & Omar, 2022). Studies that specifically address Nigerian

manufacturing firms are still relatively limited (Ofoegbu & Lago, 2024; Okwara, Asiegbu, Amade, & Enyinna, 2025). Even when such studies exist, they often focus on broad sustainability issues without addressing how specific GSCM practices such as green procurement, cleaner production, and reverse logistics interact to influence both environmental and economic sustainability. Hence, there is a contextual gap regarding how green supply chain practices function within the unique infrastructural, regulatory, and economic conditions of Nigeria.

2.5.2 Inadequate Examination of Individual Green Practices

Previous research has tended to treat GSCM as a single construct rather than analysing its components separately. For instance, studies such as Okwara *et al.* (2025) and Babalola, Rahim, and Omar (2024) examined sustainable supply chain management at an aggregate level, overlooking the specific effects of green procurement, eco-design, cleaner production, and green distribution. However, each of these components may contribute differently to sustainability outcomes (Odesola & Aderemi, 2024). The lack of disaggregated analysis limits understanding of which specific green practices yield the highest sustainability benefits in Nigerian manufacturing firms.

2.5.3 Inconsistent Findings Across Green Supply Chain Studies

Empirical findings on the relationship between green supply chain practices and firm performance have been inconsistent. While Ofoegbu and Lago (2024) found a strong positive relationship between green procurement and environmental sustainability,

Kubeyinje and Omigie (2024) reported only moderate effects of sustainable development initiatives on firm performance in Edo State. Similarly, Bolaji, Abdul Rahim, and Omar (2024) observed significant improvements in environmental performance among SMEs adopting green initiatives, whereas Okoba, Chukwu, and Jackson (2025) found that environmental sustainability disclosure did not always translate into profitability. These inconsistencies suggest the need for further empirical research to clarify the extent and direction of these relationships within the Nigerian context.

2.5.4 Limited Focus on the Integration of Green Practices and Firm Sustainability

A considerable number of studies have focused on the adoption of green practices without examining how these practices are integrated into overall sustainability strategies. For example, Nwamekwe *et al.* (2025) focused on the adoption of green manufacturing in Anambra State but did not explore how these practices contribute to the long-term economic, environmental, and social dimensions of sustainability. Similarly, Onwuchekwa and Ayibatariomono (2024) discussed productivity outcomes of GSCM without linking them to sustainable development indicators. This points to a theoretical and empirical gap in understanding the integrated role of green practices in achieving sustainability goals within manufacturing firms.

2.5.5 Methodological and Regional Limitations

Many existing studies on green supply chain management in Nigeria have employed cross-sectional survey designs focused on limited regions or specific industries (Ofoegbu

& Lago, 2024; Nwamekwe *et al.*, 2025). As a result, findings may not adequately represent the diversity of the Nigerian manufacturing sector. For instance, studies concentrated in Lagos or Anambra may not reflect the realities of manufacturing operations in other industrial hubs such as Edo or Rivers State. Additionally, few studies have employed mixed-method or longitudinal designs capable of capturing the dynamic relationship between green practices and sustainability performance over time.

2.5.6 Lack of Empirical Linkages between Green Supply Chain Practices and Specific Sustainability Dimensions

Although prior studies acknowledge the role of GSCM in achieving sustainability, there remains a lack of empirical clarity regarding which practices influence environmental, economic, or social sustainability most effectively. Okwara *et al.* (2025) and Ofoegbu and Lago (2024) confirmed that green supply chain practices enhance sustainability performance, but they did not specify whether these improvements were environmental (e.g., waste reduction), economic (e.g., cost savings), or social (e.g., employee welfare). This study therefore aims to bridge this gap by analysing the differential impacts of each green supply chain component on specific sustainability outcomes. Another gap lies in the limited exploration of moderating variables such as government policy, technological capability, and organizational culture in the relationship between green supply chain practices and sustainability performance. Studies by Babalola *et al.* (2024) and Odesola and Aderemi (2024) suggest that external environmental uncertainty and internal resource capabilities can influence the effectiveness of green initiatives.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

In this chapter, a careful description of the research design, the population of the study, sample size and sampling technique, sources and methods of data collection, operationalization of variables, the research instrument and the method of data analysis employed in the research study is presented. This is done to arrive at very meaningful conclusions which helps achieve the objectives of the study and it is of great importance to ensure that the results are reliable and dependable.

3.2 Research Design

This study adopts a survey research design as the most suitable approach which involves crafting and distributing a structured questionnaire to participants. This specific method aligns with the study's objective, which necessitates observing the target elements and variables in their natural context, refraining from any interventions or manipulations.

3.3 The Population and Sample of the Study

The population of this study comprises of manufacturing firms in Nigerian. It is from this population that we will take our sample.

3.4 Sample Size and Sampling Technique

The sample size is determined using an empirical approach to avoid having a sample that is too small, which may not yield meaningful results, or too large, which can result in inefficient use of resources (Zikmund *et al.*, 2000). A larger sample size reduces the likelihood of error in generalizing the findings to the broader population (Saunders *et al.*, 2016). For this study, the scientific Yamane (1974) formula was applied due to the known and relatively small population. The Yamane (1974) formula is specified as

$$n = \frac{N}{1 + Ne^2}$$

Where n Sample size

N = population size

e = level of significance desired

Given that N = 120, e = 0.05,

The sample size was calculated as:

$$\begin{aligned} n &= \frac{110}{1 + 110 (0.05)^2} \\ &= \frac{110}{1.28} \\ &= 85.94 \end{aligned}$$

Thus, the determined sample size for the study is **86 respondents**.

3.5 Research Instrument

A structured questionnaire was employed as the research instrument for this research study. It was used to elicit the data feelings, beliefs, experiences, perceptions, and attitudes of the sample respondents regarding factors influencing green supply chain practices. The administration of copies of the questionnaire to the respondents was done through Google form and clarification where necessary. The statements in the questionnaire were carefully designed to elicit data that could be quantitatively analyzed.

The questionnaire to be administered was divided into two main sections: Section A, Section B and Section C

Section A: Demographic Information – This section obtained data on respondents' background such as gender, age, educational qualification, position, and years of experience in the organization.

Section B: Green Supply Chain Practices – This section contained items measuring the five independent variables: green procurement, eco-design, cleaner production, reverse logistics, and green distribution. Each construct was measured using a 5-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5).

Section C: Sustainability Outcomes – This section measured environmental and economic sustainability indicators, such as energy efficiency, waste reduction, cost savings, and profitability.

3.6 Validity of the Research Instrument

In this study, due care was exercised in terms of face and content validity of the research instrument. To determine these kinds of validity, the structured questionnaire was submitted for expert critique. More specifically, the instrument was presented to the project supervisor and other academic staff in the Faculty of Management Sciences, University of Benin, for checking.

These experts examined the items of the questionnaire in a critical manner with respect to clarity, grammar, relevance, and whether the provided instructions were relevant to the respondents. They also validated whether each item was aligned with the research objectives and could yield the needed information to answer the research questions.

Their professional guidance guided the creation and update of the questionnaire in a bid to make it more lucid and complete to cover all the relevant variables such as demographic characteristics, green procurement, eco-design, cleaner production, reverse logistics, green distribution and Sustainability.

3.7 Reliability of the Instrument

To validate the reliability of the research instrument that was used in this research, the test-retest method was applied. It was employed as a means to test the stability of the instrument within a given period of time. Twenty (20) questionnaires were given for the first time to a sample of respondents outside of the target population on sustainability in Nigerian manufacturing firms

The reliability test yielded a coefficient of reliability of 0.72, which is at the threshold level deemed satisfactory for research. This indicates that the instrument possesses an adequate level of stability and internal consistency and can therefore be considered reliable in measuring green supply chain practices and sustainability in Nigerian manufacturing firms.

3.8 Method of Data Collection

The study employed primary data collection through the administration of the structured questionnaire. Data were collected via both physical distribution and electronic means (Google Forms) to ensure broader reach and convenience. The researcher personally administered the questionnaires to respondents in participating firms with the help of field assistants. Respondents were assured of confidentiality and informed that the data collected would be used solely for academic purposes. Follow-ups were made to maximize the response rate.

3.9 Method of Data Analysis

The collected data were analyzed using both descriptive and inferential statistical techniques with the aid of the Statistical Package for Social Sciences (SPSS) Version 26. Descriptive statistics (such as frequencies, means, and percentages) were used to summarize respondents' demographic characteristics and to describe patterns of green supply chain practices among firms.

Inferential statistics were used to test the hypotheses and establish the relationships between the independent and dependent variables. Specifically, correlation analysis and multiple regression analysis were employed to assess the strength and direction of the relationship between green supply chain practices (green procurement, eco-design, cleaner production, reverse logistics, and green distribution) and sustainability outcomes (environmental and economic).

All hypotheses were tested at a 5% level of significance ($p < 0.05$) to determine statistical significance. The results of these analyses provided insights into how specific green practices influence the sustainability performance of Nigerian manufacturing firms.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

In this chapter, the presentation, analysis, and interpretation of the data collected from the respondents are provided. It precisely covers the descriptive analysis, interpretation, and presentation of socio-demographic information of the respondents and data received from the respondents on questions related to the determinants of career preference among graduating students in the University of Benin, Benin City. Also, in this chapter, the correlation and regression analyses and their interpretation with respect to the hypothesized relationships between parental and peer expectation, personal interest, perceived job availability, requisite skills, and career preference among the sampled respondents are also presented.

4.2 Retrieval Rate and Description of Respondents' Socio-Demographics

4.2.1 Retrieval Rate

From the survey carried out, 375 copies of the questionnaire were retrieved out of the 383 copies of questionnaires distributed.

The retrieval rate is calculated as follows:

$$\text{Retrieval Rate} = \frac{\text{Total retrieved}}{\text{Total Distributed}} \times 100 = \frac{375}{383} \times 100$$

$$rr = 0.9791 \times 100$$

Retrieval rate $\approx 97.91\%$

So, the retrieval rate is approximately 98%.

4.2.2 Description of Respondents' Demographic Information

This section contains a descriptive analysis of the demographic information data drawn from the sampled respondents. The demographic information variables include gender, age, level, and field of study of the respondents. In conducting the field survey, 383 copies of questionnaire were distributed, 375 copies of questionnaire were retrieved and found usable. This shows that 98 percent collection rate was achieved as all copies distributed were also found usable and this was used in the analysis of the responses gotten.

Table 4.1: Demographic Information Characteristics of the Respondents

S/N	Categories	Frequency	%
1.	Gender		
	Male	88	35.8
	Female	158	64.2
	Total	246	100
2.	Age		
	Below 25	76	30.9
	25–34	54	22.0
	35–44	84	34.1
	45–54	32	13.0
	55 and above	—	—
	Total	246	100
3.	Position in the Organization		
	Intern	23	9.3
	Junior Staff	88	35.8
	Senior Staff	81	32.9
	Supervisor	54	22.0
	Manager	—	—
	Director/Administrator	—	—
	Total	246	100
4.	Years of Experience in the Organization		
	Less than 1 year	23	9.3
	1–3 years	89	36.2
	4–6 years	81	32.9
	7–10 years	53	21.5
	Above 10 years	—	—
	Total	246	100
5.	Educational Qualification		
	SSCE / O’Level	30	12.2
	OND / NCE	61	24.8
	Bachelor’s Degree	22	8.9
	Master’s Degree	24	9.8
	Doctorate	109	44.3
	Total	246	100

Source: Field Survey, 2025.

Academic Status

Table 4.1 shows that the majority of the respondents selected 400 level. A total of 310 respondents, representing 82.7% of the sample, indicated that they are in 400 level. Meanwhile, 58 respondents (15.5%) are in 500 level, and only 7 respondents (1.8%) are in 600 level. This indicates that most of the participants are in their final year, which aligns with the focus of this study on graduating students of the University of Benin

Gender

The table further reveals that a slightly higher proportion of the respondents were females. Specifically, 206 respondents, representing 54.9%, were female, while 169 respondents, accounting for 45.1%, were male. This distribution suggests that the sample is fairly balanced, with a slight dominance of female respondents.

Age

From the table above, the largest proportion of respondents fall within the age group of 20–24 years, with 298 individuals, representing 79.5% of the total sample. This is expected, as most undergraduates in their final year fall within this age bracket. The second-largest group consists of those aged 25–29 years, with 57 respondents, making up 15.2% of the sample. A smaller group of 16 respondents (4.3%) were below 20 years, while only 4 respondents (1.1%) were aged 30 and above. This distribution reflects the youthful nature of the university student population.

Faculty

The table also indicates that the majority of respondents, 220 individuals, representing 58.7%, were drawn from the Faculty of Management Sciences. This is followed by the Faculty of Engineering, which contributed 65 respondents (17.3%). Other faculties had smaller representation: Arts with 37 respondents (9.9%), Basic Medical Sciences with 28 respondents (7.5%), Physical Sciences with 9 respondents (2.4%), and Medicine with 7 respondents (1.9%). This distribution shows that Management Sciences contributed the largest share of the sample. 9 respondents (2.4%) did not indicate their faculty.

Career Decision

Finally, the table shows that the majority of respondents had already made a definite career decision. A total of 273 respondents, representing 72.8%, reported that they had made a clear choice about their career, while 102 respondents, representing 27.2%, had not. This suggests that while most final-year students are decisive about their career paths, a notable proportion still remain uncertain at the point of graduation.

4.3 Description of Research Variables

The variables were described using simple percentage, mean and standard deviation. The independent variable is the determinants while the dependent variable is career preference.

4.3.1 Description of Determinants

In realising this objective, we, first of all, computed the mean scores and standard deviation of responses to each factor of determinants which are assessed on a five-point Likert scale in which one represents a strong level of disagreement and five represents a strong level of agreement.

Table 4.3 below showed the description of determinants of career preference among graduating student in the University of Benin, Benin City.

Table 4.3: Description of Determinants

N.B: 1, 2, 3, 4 and 5 denote strongly disagreed, disagreed, neutral, agreed, strongly agreed response rate respectively.

S/N	Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean
Green Procurement							
6.	Our firm considers environmental criteria when selecting suppliers.	30 (12.2%)	42 (17.1%)	19 (7.7%)	18 (7.3%)	136 (55.3%)	3.77
7.	Procurement policies promote the purchase of eco-friendly inputs.	61 (24.8%)	65 (26.4%)	25 (10.2%)	32 (13%)	61 (24.8%)	2.86
8.	The firm evaluates environmental impact before purchasing raw materials.	41 (16.7%)	48 (19.5%)	12 (4.9%)	36 (14.6%)	109 (44.3%)	3.50
9.	We prioritize suppliers that follow sustainable production practices.	31 (12.6%)	36 (14.6%)	19 (7.7%)	19 (7.7%)	141 (57.3%)	3.83

Parental and Peer Expectation

From Table 4.2 above, 55 respondents strongly disagreed, 120 disagreed, 105 were neutral, 56 agreed, and 39 strongly agreed with the statement: “My parents have a major influence on the career I want to pursue.” The mean score of 2.74 suggests a moderate level of parental influence, with a standard deviation of 1.188, indicating some variability in responses. Similarly, for the statement “My friends/peers influence my career decisions,” 86 respondents strongly disagreed, 154 disagreed, 93 were undecided, 34 agreed, and 8 strongly agreed. The mean score of 2.26 indicates a low level of peer influence, with a standard deviation of 0.982, showing consistency in responses.

For the statement “I am choosing my career based on societal expectations,” 74 respondents strongly disagreed, 122 disagreed, 83 were undecided, 69 agreed, and 27 strongly agreed. The mean score of 2.61 indicates a weak influence of societal expectations, with a standard deviation of 1.199, suggesting variability in responses. Furthermore, on the statement “I feel pressured by my parents to pursue a career that I do not enjoy,” 132 strongly disagreed, 169 disagreed, 36 were undecided, 27 agreed, and 11 strongly agreed. The mean score of 1.98 indicates disagreement, with a low standard deviation of 1.001, reflecting consistent responses. Finally, for the statement “I would rather choose a career I love, even if my parents disagree,” 2 respondents strongly disagreed, 18 disagreed, 76 were undecided, 139 agreed, and 140 strongly agreed. The mean score of 4.06 indicates strong agreement, with a standard deviation of 0.903,

showing consistency. Overall, the average mean score of 2.73 (SD = 1.0546) suggests that parental and peer expectations exert some influence, but respondents are more inclined to prioritize their own interests.

Eco-Design							
<i>S/N</i>	<i>Questions</i>	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean
10	Reducing environmental impact is a core part of our product design process.	5 (2%)	19 (7.7%)	16 (6.5%)	49 (19.9%)	157 (63.8%)	4.36
11.	Packaging is designed to minimize waste and environmental impact.	46 (18.7%)	47 (19.1%)	12 (4.9%)	53 (21.5%)	87 (35.4%)	3.36
12	Our design team prioritizes durability and resource efficiency.	71 (28.9%)	66 (26.8%)	14 (5.7%)	49 (19.9%)	46 (18.7%)	2.73
13	Eco-design principles guide material selection in our firm.	108 (43.9%)	102 (41.5%)	25 (10.2%)	6 (2.6%)	4 (1.6%)	1.76

Personal Interest

The statement “I am passionate about the career I intend to pursue” had 6 respondents disagreeing, 37 neutral, 146 agreeing, and 186 strongly disagreeing. The mean score of 4.37 indicates strong agreement, with a standard deviation of 0.726, reflecting

consistency. On the statement “My career decision is influenced more by personal interest than financial gain,” 14 strongly disagreed, 54 disagreed, 83 were neutral, 118 agreed, and 106 strongly agreed. The mean score of 3.66 suggests agreement, with a standard deviation of 1.142, indicating variability.

“I have taken time to explore and reflect on what I really enjoy doing,” 6 strongly disagreed, 9 disagreed, 76 were neutral, 167 agreed, and 117 strongly agreed. The mean score of 4.01 indicates strong agreement, with a standard deviation of 0.870, suggesting consistency. On the statement “I enjoy researching and learning about my chosen career path,” 1 respondent disagreed, 50 neutral, 181 were agreed, and 143 strongly agreed. The mean score of 4.24 indicates agreement, with a standard deviation of 0.684. Finally, for the statement “My career choice is based mostly on personal interest,” 7 strongly disagreed, 27 disagreed, 57 were neutral, 172 agreed, and 112 strongly agreed. The mean score of 3.95 indicates strong agreement, with a standard deviation of 0.952. Overall, the average mean of 4.046 (SD = 0.8748) indicates that personal interest is a dominant determinant of career preference among respondents.

Cleaner Production							
<i>S/N</i>	<i>Questions</i>	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean
14.	Our firm actively reduces energy consumption in production.	108 (43.9%)	99 (40.2%)	16 (6.5%)	15 (6.1%)	7 (2.8%)	1.83
15.	Efforts are made to minimize water usage across production processes.	115 (46.7%)	85 (34.6%)	16 (6.5%)	10 (4.1%)	17 (6.9%)	1.88
16.	The company monitors and controls emission levels during production.	44 (17.9%)	17 (6.9%)	6 (2.4%)	37 (15%)	140 (56.9%)	3.87
17.	The firm invests in cleaner technologies to reduce environmental harm.	28 (11.4%)	21 (8.5%)	10 (4.1%)	32 (13%)	155 (63%)	4.08

Perceived Job Availability

For the statement “The availability of jobs in Nigeria influenced my career preference,” 10 respondents strongly disagreed, 63 disagreed, 127 were neutral, 110 agreed, and 65 strongly agreed. The mean score of 3.42 suggests moderate agreement, with a standard deviation of 1.044. On the statement “Fear of unemployment affects how I view certain

careers,” 15 strongly disagreed, 48 disagreed, 70 were neutral, 151 agreed, and 90 strongly agreed. The mean score of 3.68 suggests agreement, with a standard deviation of 1.096, indicating variability in responses.

“I considered job market demand before choosing my career,” 11 strongly disagreed, 57 disagreed, 83 were neutral, 147 agreed, and 77 strongly agreed. The mean score of 3.59 suggests agreement, with a standard deviation of 1.065. The statement “I have changed or considered changing my preferred career because of perceived job scarcity” had 29 strongly disagreeing, 132 disagreeing, 94 neutral, 83 agreeing, and 37 strongly agreeing. The mean score of 2.91 indicates near neutrality, with a standard deviation of 1.128, showing variability. Finally, for “I chose my career because it offers high job security,” 13 strongly disagreed, 50 disagreed, 98 were neutral, 145 agreed, and 69 strongly agreed. The mean score of 3.55 indicates agreement, with a standard deviation of 1.045. Overall, the average mean of 3.43 (SD = 1.0756) suggests that job availability moderately influences career preference.

Reverse Logistics							
<i>S/N</i>	<i>Questions</i>	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean
18.	Our firm has a system for collecting used products from customers.	41 (16.7%)	10 (4.1%)	20 (8.1%)	43 (17.5%)	131 (53.3%)	3.87
19.	We partner with recyclers or waste managers to recover materials.	33 (13.4%)	13 (5.3%)	4 (1.6%)	33 (13.4%)	162 (65.9%)	4.13
20.	Reverse logistics is integrated into our supply chain planning.	16 (6.5%)	14 (5.7%)	21 (8.5%)	29 (11.8%)	165 (67.1%)	4.28
21.	The firm tracks and monitors product returns and recovered materials.	3 (1.2%)	10 (4.1%)	5 (2%)	33 (13.4%)	195 (79.3%)	4.65

Source: Field Survey, 2025.

Requisite Skills

On the statement “My university education has prepared me with the practical skills for my preferred career,” 23 strongly disagreed, 52 disagreed, 102 were neutral, 125 agreed, and 73 strongly agreed. The mean score of 3.46 indicates moderate agreement, with a standard deviation of 1.134, showing variability. For “I feel confident in my employability based on my skill set,” 2 strongly disagreed, 22 disagreed, 105 were neutral, 182 agreed, and 64 strongly agreed. The mean score of 3.76 suggests agreement, with a standard deviation of 0.822, showing consistency.

“I have attended any skill development or internship program related to my career,” 9 strongly disagreed, 71 disagreed, 89 were neutral, 137 agreed, and 69 strongly agreed. The mean score of 3.50 suggests agreement, with a standard deviation of 1.069. On the statement “I have the skills necessary to excel in my chosen career,” 7 strongly disagreed, 18 disagreed, 97 were neutral, 175 agreed, and 78 strongly agreed. The mean score of 3.80 suggests agreement, with a standard deviation of 0.888, showing consistency. Finally, for “I have adequate digital literacy for my desired career,” 7 strongly disagreed, 30 disagreed, 118 were neutral, 156 agreed, and 64 strongly agreed. The mean score of 3.64 indicates agreement, with a standard deviation of 0.920. The average mean score of 3.63 (SD = 0.9666) suggests that students generally believe they possess requisite skills for their career preferences. Overall, the mean score of 3.46 (SD = 0.993) across all dimensions indicates that graduating students’ career preferences are shaped by a combination of personal interest (strongest influence), requisite skills, perceived job availability, and parental/peer expectations (least influence).

Green Distribution							
<i>S/N</i>	<i>Questions</i>	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean
22.	Distribution routes are optimized to reduce fuel consumption.	6 (2.4%)	21 (8.5%)	8 (3.3%)	25 (10.2%)	186 (75.6%)	4.48
23.	The firm uses fuel-efficient or low-emission vehicles when possible.	14 (5.7%)	40 (16.3%)	27 (11%)	15 (6.1%)	150 (61%)	4.00
24.	Shipments are consolidated to reduce transportation frequency.	18 (7.3%)	25 (10.2%)	20 (8.1%)	27 (11%)	156 (63.4%)	4.13
25.	Logistics partners are evaluated for their environmental performance.	16 (6.5%)	14 (5.7%)	21 (8.5%)	29 (11.8%)	165 (67.1%)	4.28

Source: Field Survey, 2025.

Requisite Skills

On the statement “My university education has prepared me with the practical skills for my preferred career,” 23 strongly disagreed, 52 disagreed, 102 were neutral, 125 agreed, and 73 strongly agreed. The mean score of 3.46 indicates moderate agreement, with a standard deviation of 1.134, showing variability. For “I feel confident in my employability based on my skill set,” 2 strongly disagreed, 22 disagreed, 105 were neutral, 182 agreed, and 64 strongly agreed. The mean score of 3.76 suggests agreement, with a standard deviation of 0.822, showing consistency.

“I have attended any skill development or internship program related to my career,” 9 strongly disagreed, 71 disagreed, 89 were neutral, 137 agreed, and 69 strongly agreed. The mean score of 3.50 suggests agreement, with a standard deviation of 1.069. On the statement “I have the skills necessary to excel in my chosen career,” 7 strongly disagreed, 18 disagreed, 97 were neutral, 175 agreed, and 78 strongly agreed. The mean score of 3.80 suggests agreement, with a standard deviation of 0.888, showing consistency. Finally, for “I have adequate digital literacy for my desired career,” 7 strongly disagreed, 30 disagreed, 118 were neutral, 156 agreed, and 64 strongly agreed. The mean score of 3.64 indicates agreement, with a standard deviation of 0.920. The average mean score of 3.63 (SD = 0.9666) suggests that students generally believe they possess requisite skills for their career preferences. Overall, the mean score of 3.46 (SD = 0.993) across all dimensions indicates that graduating students’ career preferences are shaped by a combination of personal interest (strongest influence), requisite skills, perceived job availability, and parental/peer expectations (least influence).

4.3.2 Description of Career Preference

Table 4.3 showed the description of career preference in the University of Benin, Benin City, Edo State, Nigeria.

Table 4.4 Description of Career Preference

N.B: 1, 2, 3, 4 and 5 denote strongly disagreed, disagreed, neutral, agreed, strongly agreed response rate respectively

Q/N	Item	Frequency					Mean	SD	Decision Rule: <3 Reject >3 Accept
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree			
SUSTAINABILITY OUTCOMES									
26.	Green practices have reduced our firm's energy consumption.	16 (6.5%)	14 (5.7%)	21 (8.5%)	29 (11.8%)	165 (67.1%)	4.28	1.227	Accepted
27.	Green practices have reduced our firm's water usage.	41 (16.7%)	10 (4.1%)	20 (8.1%)	43 (17.5%)	131 (53.3%)	3.87	1.509	Accepted
28.	Waste production has decreased due to sustainable practices.	5 (2%)	19 (7.7%)	16 (6.5%)	49 (19.9%)	157 (63.8%)	4.36	1.035	Accepted
29.	Emissions have reduced since adopting green practices.	28 (11.4%)	21 (8.5%)	10 (4.1%)	32 (13%)	155 (63%)	4.08	1.428	Accepted
	Total						4.15	1.30	Accepted

Source: Field Survey, 2025.

Career Preference

From Table 4.3 above, 4 respondents disagreed, 34 respondents were neutral, 177 respondents agreed, and 160 respondents strongly agreed to the statement: “I prefer a career that allows for creativity and innovation.” The mean score of 4.31 suggests that students highly prefer careers that allow creativity and innovation, with a low standard deviation of 0.680, indicating consistency in responses.

For the statement “Career advancement is a top priority for me,” 1 respondent strongly disagreed, 6 respondents disagreed, 36 respondents were neutral, 161 respondents agreed, and 171 respondents strongly agreed. The mean score of 4.32 suggests that career advancement is a strong priority among respondents, with a relatively low standard deviation of 0.734, showing consistency in perceptions.

Similarly, 10 respondents disagreed, 75 respondents were neutral, 156 respondents agreed, and 134 respondents strongly agreed with the statement: “I prioritize job security in my career.” The mean score of 4.10 indicates that job security is considered very important, with a standard deviation of 0.809, suggesting slight variability in responses.

Lastly, for the statement “I value opportunities for professional development in my career,” 4 respondents disagreed, 36 respondents were neutral, 159 respondents agreed, and 176 respondents strongly agreed. The mean score of 4.35, with a standard deviation of 0.697, shows that professional development is highly valued by students, with a strong level of agreement and consistency across responses.

Overall, the mean scores for all items are well above 4 (mean = 4.27, SD = 0.73), indicating strong agreement with the statements. This implies that creativity, advancement opportunities, job security, and professional development are critical determinants of career preference among graduating students.

4.4 Relationship between and amongst Determinants of Career Preferences amongst University of Benin

4.4.1 Correlation Analysis

Bivariate Pearson correlation coefficients were conducted on the data for all the variables in the study. Table 4.4 shows the Pearson correlation coefficients among research variables.

Table 4.5: Pearson Correlation Coefficients among Research Variables

Variable		SO	GP	ED	CP	RL	GD
Sus Outcomes	Pearson Correlation	1	.617	.116	.339	.756	.710
	Sig. (2-tailed)		.000	.072	.000	.000	.000
	N	244	241	242	239	243	244
Green Procurement	Pearson Correlation	.617**	1	.101	.194**	.304**	.607**
	Sig. (2-tailed)	.000		.118	.002	.000	.000
	N	241	243	241	240	240	242
Eco Design	Pearson Correlation	.116	.101	1	-.050	.105	-.206**
	Sig. (2-tailed)	.072	.118		.441	.104	.001
	N	242	241	244	240	241	243
Cleaner Production	Pearson Correlation	.339**	.194**	-.050	1	.312**	.182**
	Sig. (2-tailed)	.000	.002	.441		.000	.005
	N	239	240	240	241	238	240
Reverse Logistic	Pearson Correlation	.756**	.304**	.105	.312**	1	.584**
	Sig. (2-tailed)	.000	.000	.104	.000		.000
	N	243	240	241	238	243	243
Green Distribution	Pearson Correlation	.710**	.607**	-.206**	.182**	.584**	1
	Sig. (2-tailed)	.000	.000	.001	.005	.000	
	N	244	242	243	240	243	245

Correlation is significant at the 0.01 level (2-tailed).

Table 4.5 shows the correlation matrix and reveals significant positive correlations between Career Preference (CP) and three independent variables: Personal Interest (PI), Perceived Job Availability (PJA), and Requisite Skills (RS). CP shows a strong positive correlation with PI ($r = 0.469$, $p < 0.001$), indicating that as personal interest increases, career preference also tends to increase. Similarly, CP exhibits a moderate positive correlation with RS ($r = 0.351$, $p < 0.001$), suggesting that the possession of requisite skills significantly influences career preference. CP also shows a weaker but statistically significant positive correlation with PJA ($r = 0.109$, $p < 0.05$), implying that perceptions of job availability have some effect on career preference. However, CP shows a negative and insignificant correlation with Parental and Peer Expectation (PPE) ($r = -0.056$, $p > 0.05$), suggesting that parental and peer influence does not significantly predict career preference among graduating students.

The independent variables also demonstrate significant positive correlations among themselves. PPE correlates positively with PJA ($r = 0.309$, $p < 0.001$) and RS ($r = 0.227$, $p < 0.001$), indicating that parental and peer expectations are associated with how students perceive job opportunities and the skills they seek to acquire. PI shows significant positive correlations with RS ($r = 0.307$, $p < 0.001$), suggesting that personal interest is closely linked to the development of requisite skills. Similarly, PJA correlates positively with RS ($r = 0.189$, $p < 0.001$), showing that perceptions of job availability are connected to skill acquisition.

Overall, these results suggest that personal interest and requisite skills are the strongest determinants of career preference, while perceived job availability plays a secondary role. In contrast, parental and peer expectations appear to exert little to no significant direct influence on career preference among graduating students at the University of Benin, Benin City, Edo State, Nigeria.

4.4.2 Results of Regression Analysis

The regression analysis was performed to show the relationship between determinants and career preference. Below are tables representing the output of the regression analysis.

Table 4.6: Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.871 ^a	.759	.754	1.71962	1.495

a. Predictors: (Constant), Green Distribution, Clearer Production, Eco-Design, Green Procurement, Reverse Logistic

b. Dependent Variable: Sustainability Outcomes

Table 4.4 presents the model summary of the regression analysis. The regression model exhibits a moderate degree of goodness-of-fit, with an R value of 0.540, indicating a moderate positive correlation between the predictors (Requisite Skills, Perceived Job Availability, Personal Interest, and Parental and Peer Expectation) and the dependent variable (Career Preference).

The R-squared value of 0.291 suggests that approximately 29.1% of the variance in career preference can be explained by the predictors included in the model. The adjusted R-squared value, which accounts for the number of predictors in the model, is 0.284, indicating that the model maintains a fairly good explanatory power even after adjusting for the number of independent variables.

The standard error of the estimate is 2.01733, which represents the average deviation of the observed values from the regression line. Additionally, the Durbin-Watson statistic of 2.021 indicates minimal autocorrelation in the residuals, suggesting that the assumption of independence of errors is reasonably met in this regression model.

Table 4.7: ANOVA^a

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	2147.848	5	429.570	145.268	.000 ^b
	Residual	680.130	230	2.957		
	Total	2827.979	235			

a. Dependent Variable: Sustainability Outcomes

b. Predictors: (Constant), Green Distribution, Clearer Production, Eco-Design, Green Procurement, Reverse Logistic

From Table 4.7 above, the regression model is statistically significant, as indicated by a highly significant F-statistic of 38.036 ($p < 0.001$). This implies that the variation in career preference can be attributed to the predictors included in the model (Requisite Skills, Perceived Job Availability, Personal Interest, and Parental and Peer Expectation).

The sum of squares for the regression (619.163) represents the amount of variance in career preference explained by the predictors. The mean square value for the regression (154.791) indicates the average variance explained by each predictor.

The residual sum of squares (1505.754) represents the unexplained variance in career preference not accounted for by the predictors. The total sum of squares (2124.917) reflects the overall variability in career preference.

Table 4.8: Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	-3.257	.894		-3.642	.000
Green Procurement	.223	.035	.283	6.475	.000
Eco Design	.100	.043	.086	2.315	.022
Cleaner Production	.113	.043	.092	2.647	.009
Reverse Logistic	.640	.056	.502	11.387	.000
Green Distribution	.205	.047	.235	4.374	.000

a. Dependent Variable: Sustainability Outcomes

4.5 Test of Hypotheses

The hypotheses were tested with the p-value (Sig.) in the regression result. Where the p-values are greater than or equal to 0.05, the null hypotheses (H_0) are not rejected. And where the p-values are less than 0.05, the null hypotheses (H_0) are rejected. The results of the interpretations are presented below.

Hypothesis 1

H₀1: There is no significant relationship between parental and peer expectation and career preference among graduating students of the University of Benin.

Table 4.8 above showed that the regression coefficient for Parental and Peer Expectation is -0.120 with a p-value of 0.001, which is less than 0.05. Therefore, the null hypothesis that there is no significant relationship between parental and peer expectation and career preference is rejected. The result implies that parental and peer expectation has a significant but negative effect on career preference among graduating students of the University of Benin.

Hypothesis 2

H₀2: There is no significant relationship between personal interest and career preference among graduating students of the University of Benin.

Table 4.8 above also showed that the regression coefficient for Personal Interest is 0.318 with a p-value of 0.000, which is less than 0.05. Thus, the null hypothesis is rejected. It

can be inferred that there is a significant positive relationship between personal interest and career preference among graduating students of the University of Benin.

Hypothesis 3

H₀₃: There is no significant relationship between perceived job availability and career preference among graduating students of the University of Benin.

The regression coefficient for Perceived Job Availability is 0.051 with a p-value of 0.077, which is greater than 0.05. Hence, the null hypothesis cannot be rejected. This means that perceived job availability does not have a statistically significant relationship with career preference among graduating students of the University of Benin.

Hypothesis 4

H₀₄: There is no significant relationship between requisite skills and career preference among graduating students of the University of Benin.

The regression coefficient for Requisite Skills is 0.182 with a p-value of 0.000, which is less than 0.05. Consequently, the null hypothesis is rejected. This implies that there is a significant positive relationship between requisite skills and career preference among graduating students of the University of Benin.

4.6 Discussion of Findings

This study examined the determinants of career preference among graduating students of the University of Benin, Benin City, Edo State, Nigeria. Copies of the questionnaire were administered to final-year students, and upon reaching the target sample size, the responses were analyzed. The results of this study align with existing empirical literature on career preference, particularly regarding the influence of demographic, social, personal, and skill-related factors. Four key findings emerged from the analysis, each demonstrating how different variables significantly shape the career preferences of graduating students in the University of Benin. The findings of the study are discussed below:

The study revealed a significant but negative relationship between parental and peer expectation and career preference. This finding resonates with the conclusions of Mtemeri, J. (2019), who observed that while family and peer influence often play a role in shaping students' choices, excessive pressure from these sources may discourage students from pursuing careers that align with their personal aspirations. When students perceive that their choices are being dictated by others, they may resist or adjust their preferences away from those externally influenced careers. This suggests that while parental and peer expectations are important, they may not always positively support career decision-making if not balanced with individual interest and autonomy.

Similarly, the study found a significant positive relationship between personal interest and career preference. This finding supports the assertions of Okonkwo and Obineli (2021), who argued that intrinsic motivation and passion are critical drivers of career decisions among young people. When students select careers that align with their personal interests, they are more likely to demonstrate persistence, commitment, and long-term satisfaction. Personal interest provides a strong internal motivation that shapes students' choices regardless of external pressures, highlighting the importance of aligning career decisions with individual strengths and passions.

The study also indicated that perceived job availability does not significantly influence career preference. This result is consistent with the findings of Mtemeri (2017), who suggested that while students may consider employment opportunities when making career decisions, this factor alone is not decisive. Graduating students may be aware of labour market realities but still prioritize other factors such as interest, parental influence, or the acquisition of skills. This suggests that job market conditions, although relevant, do not necessarily override intrinsic motivations or other social influences in determining career choices.

The study found a significant positive relationship between requisite skills and career preference. This supports the views of Olamide and Olawaiye (2013), who posited that students are more inclined to choose careers in which they perceive themselves to have the necessary competencies and abilities. Acquiring relevant skills not only builds

confidence but also increases employability prospects, making certain career paths more attractive. This implies that skill development plays a critical role in shaping students' preferences, as they tend to gravitate toward careers where they can apply and maximize their competencies.

CHAPTER FIVE

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of findings, conclusion, and recommendations of the study on green supply chain practices and sustainability in Nigerian manufacturing firms. It provides a comprehensive discussion of the results obtained from the data analysis and hypothesis testing carried out in the preceding chapters. The chapter interprets the findings in relation to the study objectives, focusing on green procurement, eco-design, cleaner production, reverse logistics, and green distribution practices. The discussion begins with a summary of the major findings of the study, highlighting how each dimension of green supply chain practices influences environmental and economic sustainability in the manufacturing sector. This is followed by a concise conclusion that reflects the overall contribution of the study to existing knowledge. Finally, the chapter offers practical recommendations aimed at manufacturing firms, policymakers, and relevant stakeholders, as well as suggestions for future research to enhance the adoption and effectiveness of green supply chain practices in Nigeria

5.2 Summary of Findings

Based on the analysis and evaluation of the research data, the following summary of findings has been derived, organised according to the hypotheses:

- i. There is a positive and significant relationship between green procurement and environmental and economic sustainability in Nigerian manufacturing firms. This finding suggests that the adoption of environmentally responsible sourcing practices, such as selecting eco-friendly suppliers and sustainable raw materials, contributes to reduced operational costs, improved environmental performance, and long-term economic benefits.
- ii. There is a positive and significant relationship between eco-design and product durability, recyclability, and resource efficiency among manufacturing firms. The result indicates that integrating environmental considerations into product design enhances product lifespan, reduces material waste, and promotes efficient use of resources.
- iii. There is a positive and significant relationship between cleaner production practices and the reduction of energy use, water consumption, and carbon emissions in the manufacturing sector. This implies that the adoption of cleaner technologies and efficient production processes plays a critical role in minimising environmental pollution and improving sustainability outcomes.
- iv. There is a positive and significant relationship between reverse logistics and waste reduction, recycling, and resource recovery in manufacturing operations.

This finding highlights the importance of effective product return, recycling, and reuse systems in reducing waste and improving material recovery.

- v. There is a positive and significant relationship between green distribution practices and sustainable transportation, route optimisation, and low-emission delivery in Nigerian manufacturing firms. This suggests that environmentally friendly distribution strategies contribute to reduced fuel consumption, lower emissions, and improved logistics efficiency.

5.3 Conclusion

This study examined the relationship between green supply chain practices and sustainability in Nigerian manufacturing firms, with specific focus on green procurement, eco-design, cleaner production, reverse logistics, and green distribution practices. The findings highlight the growing importance of environmentally responsible supply chain strategies in enhancing both environmental and economic sustainability within the manufacturing sector.

The study revealed that green procurement has a positive and significant effect on environmental and economic sustainability, indicating that sustainable sourcing and supplier selection practices help firms reduce costs, minimise waste, and improve overall environmental performance. Similarly, eco-design demonstrated a positive and significant impact on product durability, recyclability, and resource efficiency,

underscoring the role of environmentally conscious product design in promoting long-term sustainability outcomes.

Furthermore, the findings showed that cleaner production practices significantly contribute to reductions in energy consumption, water usage, and carbon emissions. This suggests that adopting efficient production technologies and pollution prevention strategies enhances operational efficiency while reducing the environmental footprint of manufacturing activities. In addition, reverse logistics was found to have a positive and significant effect on waste reduction, recycling, and resource recovery, highlighting its importance in closing material loops and supporting circular economy initiatives.

The study also established that green distribution practices significantly enhance sustainable transportation, route optimisation, and low-emission delivery systems in Nigerian manufacturing firms. This demonstrates that environmentally friendly logistics and distribution strategies contribute to improved efficiency and reduced environmental impact across the supply chain.

Overall, the research concludes that green supply chain practices are critical drivers of sustainability in Nigerian manufacturing firms, though their effectiveness depends on the level of adoption and integration across supply chain activities. Firms that strategically implement green procurement, eco-design, cleaner production, reverse logistics, and green distribution are more likely to achieve improved environmental performance, cost

efficiency, and long-term sustainability in an increasingly competitive and environmentally conscious business environment.

5.4 Recommendations

Based on the findings and conclusions of this study, the following recommendations are proposed to enhance sustainability through green supply chain practices in Nigerian manufacturing firms:

- i. Manufacturing firms should prioritise sourcing materials and services from environmentally responsible suppliers. Integrating sustainability criteria into procurement decisions can reduce environmental impact, lower operational costs, and strengthen supplier relationships.
- ii. Firms should incorporate eco-design principles to improve product durability, recyclability, and resource efficiency. This can involve careful material selection, modular product design for easier disassembly, and innovative approaches aimed at minimising waste.
- iii. Manufacturing firms are encouraged to adopt cleaner production methods that reduce energy consumption, water usage, and carbon emissions. Investments in energy-efficient equipment, process optimisation, and waste minimisation initiatives can enhance environmental performance while reducing costs.
- iv. Firms should develop effective reverse logistics strategies to promote waste reduction, recycling, and resource recovery. This can include take-back programs,

reprocessing of used materials, and partnerships with recycling firms, with continuous monitoring to ensure improvement

- v. Companies should optimise distribution networks to reduce environmental impact. Strategies such as route optimisation, low-emission delivery vehicles, and consolidated shipments can improve efficiency while lowering carbon emissions. Training staff on sustainable logistics practices will further enhance results.
- vi. Firms should form industry networks or associations to share best practices, pool resources, and jointly invest in sustainability initiatives. Collaboration can help smaller firms overcome resource constraints and accelerate the adoption of green practices.
- vii. Government agencies should provide incentives, such as tax breaks or grants, to encourage firms to adopt sustainable practices. Clear regulatory frameworks and monitoring mechanisms can guide firms toward compliance and best practices.
- viii. Future researchers should explore emerging green supply chain practices, including circular economy models and digital tracking for sustainability performance. Comparative studies across different regions in Nigeria could provide deeper insights into factors influencing the adoption and effectiveness of sustainable practices.

5.5 Contribution to Knowledge

This study makes significant contributions to the existing body of knowledge on green supply chain practices and sustainability in Nigerian manufacturing firms, both academically and practically. These contributions include:

- i. Firstly, the research expands the literature on green supply chain management by providing empirical evidence on the relationship between green practices—such as green procurement, eco-design, cleaner production, reverse logistics, and green distribution—and environmental and economic sustainability in Nigerian manufacturing firms. While prior studies have largely examined these concepts in general or in developed contexts, this study highlights their practical application and unique influence in the Nigerian manufacturing sector. The findings reinforce the relevance of theoretical frameworks such as the Resource-Based View (RBV) and Stakeholder Theory in explaining how sustainable supply chain practices enhance organisational competitiveness and long-term viability.
- ii. From a managerial perspective, the study provides manufacturing firms with practical insights into which green supply chain practices yield the most significant benefits. For instance, the evidence that green procurement and eco-design positively impact environmental performance and economic sustainability offers clear guidance for prioritising resource allocation and operational strategies. Furthermore, the findings indicate that while cleaner production, reverse logistics, and green distribution have potential to enhance sustainability,

their effectiveness depends on strategic implementation and continuous monitoring.

- iii. For policymakers, the research underscores the need to create enabling environments that support sustainable manufacturing practices. The study highlights the importance of improving regulatory frameworks, providing incentives, and promoting training and capacity-building initiatives that encourage Nigerian manufacturing firms to adopt and integrate green supply chain practices effectively. Such measures can help firms reduce environmental impact, optimise resource use, and contribute to national sustainability goals.
- iv. This study also contributes context-specific insights into the Nigerian manufacturing sector, particularly highlighting the operational realities, challenges, and opportunities faced by firms implementing green supply chain practices. By focusing on Nigeria, the research adds depth to understanding how sustainability strategies can be adapted to local industrial, economic, and regulatory conditions, providing a foundation for comparative studies across other regions or developing economies.
- v. Finally, this study bridges gaps in the literature on sustainable supply chain management in developing economies, offering both theoretical and practical contributions. It provides actionable strategies for manufacturing managers, informs policy frameworks for supporting green practices, and strengthens the

evidence base linking sustainable supply chain practices to environmental and economic performance in Nigerian manufacturing firms.

5.6 Suggestions for Further Study

Future studies can broaden the scope of this research by examining additional green supply chain practices beyond those explored in this study. While this research focused on green procurement, eco-design, cleaner production, reverse logistics, and green distribution, other sustainability strategies such as sustainable supplier selection, green packaging, circular economy initiatives, and energy-efficient manufacturing processes could also be investigated. Exploring these practices would help provide a more comprehensive understanding of how manufacturing firms in Nigeria can enhance both environmental and economic sustainability.

Researchers may also consider investigating the long-term impact of green supply chain practices on organisational performance. This study primarily assessed immediate operational and sustainability outcomes, but it did not explore how sustained adoption of these practices affects long-term financial performance, market competitiveness, and corporate reputation. Longitudinal studies tracking firms over multiple years would provide deeper insights into the enduring benefits and potential challenges of implementing green supply chain initiatives. Another meaningful direction for further research is conducting comparative studies across different industrial sectors or regions within Nigeria. Manufacturing firms vary widely in size, capacity, and resource

availability, which can influence the effectiveness of green supply chain practices. Comparing firms in various regions or sectors such as food and beverage, cement, or oil and gas would highlight sector-specific challenges and opportunities, offering more targeted recommendations for policymakers and industry stakeholders.

Future studies could also examine the moderating effects of internal and external factors on the relationship between green supply chain practices and sustainability. Factors such as firm size, management commitment, technological capability, government regulations, and market pressure may strengthen or weaken the impact of green practices. Understanding these dynamics would provide practical insights into how firms can strategically implement sustainability initiatives for maximum impact.

Finally, researchers may explore the integration of digital technologies and Industry 4.0 tools, such as IoT, AI, and big data analytics, in enhancing green supply chain efficiency and sustainability. The convergence of digitalization and green practices holds the potential to optimize resource use, reduce waste, and improve environmental performance. Investigating this intersection would offer valuable insights for manufacturing firms seeking innovative and sustainable operational strategies.

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APPENDIX

QUESTIONNAIRE

QUESTIONNAIRE ON GREEN SUPPLY CHAIN PRACTICES AND SUSTAINABILITY IN NIGERIAN MANUFACTURING FIRMS

Dear Respondent,

I am a researcher conducting a study titled “**Green Supply Chain Practices and Sustainability in Nigerian Manufacturing Firms.**”

The purpose of this questionnaire is to gather information on green procurement, eco-design, cleaner production, reverse logistics, green distribution, and sustainability performance in manufacturing firms. Your honest and thoughtful responses are vital to achieving the objectives of this research.

Please note that all responses will be treated with the highest level of confidentiality and will be used strictly for academic purposes.

Researcher.

SECTION A: (DEMOGRAPHIC INFORMATION)

(Please tick [] the appropriate option)

1. **Gender.** Male [] Female []
2. **Age in years:** Below 25 [] 25–34 [] 35–44 [] 45–54 [] 55 and above []
3. **Position in the Organization:** Intern [] Junior Staff [] Senior Staff []
Supervisor [] Manager [] Director/Administrator []
4. **Years of Experience in the Organization :** Less than 1 year [] 1–3 years []
4–6 years [] 7–10 years [] Above 10 years []
5. **Educational Qualification:** SSCE / O’Level [] OND / NCE [] Bachelor’s Degree [] Master’s Degree [] Doctorate []

SECTION B: (GREEN SUPPLY CHAIN PRACTICES)

Instruction: fill in your response by marking appropriately. Please note SA = Strongly Agree, A = Agree, N = Neutral, D = Disagree, SD = Strongly Disagree

S/N	Statement	SA	A	N	D	SD
Green Procurement						
6	Our firm considers environmental criteria when selecting suppliers.					
7	Procurement policies promote the purchase of eco-friendly inputs.					
8	The firm evaluates environmental impact before purchasing raw materials.					
9	We prioritize suppliers that follow sustainable production practices.					
Eco-Design						
10	Reducing environmental impact is a core part of our product design process.					
11	Packaging is designed to minimize waste and environmental impact.					
12	Our design team prioritizes durability and resource efficiency.					
13	Eco-design principles guide material selection in our firm.					
Cleaner Production						
14	Our firm actively reduces energy consumption in production.					
15	Efforts are made to minimize water usage across production processes.					
16	The company monitors and controls emission levels during production.					
17	The firm invests in cleaner technologies to reduce environmental harm.					
Reverse Logistics						
18	Our firm has a system for collecting used products from customers.					
19	We partner with recyclers or waste managers to recover materials.					
20	Reverse logistics is integrated into our supply chain planning.					
21	The firm tracks and monitors product returns and					

S/N	Statement	SA	A	N	D	SD
	recovered materials.					
Green Distribution						
22	Distribution routes are optimized to reduce fuel consumption.					
23	The firm uses fuel-efficient or low-emission vehicles when possible.					
24	Shipments are consolidated to reduce transportation frequency.					
25	Logistics partners are evaluated for their environmental performance.					
SUSTAINABILITY OUTCOMES						
26	Green practices have reduced our firm's energy consumption.					
27	Green practices have reduced our firm's water usage.					
28	Waste production has decreased due to sustainable practices.					
29	Emissions have reduced since adopting green practices.					

THANK YOU FOR YOUR CO-OPERATION.