GREEN LOGISTICS AND PERFORMANCE OF BUILDING AND CONSTRUCTION MANUFACTURING FIRMS IN KENYA

PETER KIAMA GIKONYO

DOCTOR OF PHILOSOPHY

(Supply Chain Management)

JOMO KENYATTA UNIVERSITY

OF

AGRICULTURE AND TECHNOLOGY

2023

Green Logistics and Performance of Building and Construction Manufacturing Firms in Kenya

Peter Kiama Gikonyo

A Thesis Submitted in Partial Fulfilment of the Requirements for the Degree of Doctor of Philosophy in Supply Chain Management of the Jomo Kenyatta University of Agriculture and Technology

2023

DECLARATION

This thesis is my original work and has not been presented for a degree in any other University.

Signature……Date……

Peter Kiama Gikonyo

This thesis has been submitted for examination with our approval as the University Supervisors.

Signature……Date……

Prof. Patrick Karanja Ngugi, PhD

JKUAT, Kenya

Signature……Date……

Dr. Samson Nyang'au Paul, PhD

JKUAT, Kenya

DEDICATION

I dedicate this work to my wife Anastsia and family members for their unwavering support and concern for my studies.

ACKNOWLEDGEMENT

My special gratitude is extended to the almighty God for enabling me to reach this far. I would like to acknowledge the instructions, guidance and mentorship of my supervisors Prof. Patrick Karanja Ngugi and Dr. Samson Nyang'au Paul who has been instrumental in my undertaking of this thesis. Their professional guidance, insightful suggestions and immense cooperation was of immeasurable benefit in this project. I am humbled by the selfless support of my wife Anastasia and my children and thank them for their love, patience and understanding. I would also like to acknowledge the support given to me by my classmates to carry on during this study period.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATIONS AND ACRONYMS

BRICS:	Brazil, Russia, India, China, South Africa
CIPS	Chartered Institute of Procurement and Supply
CO2	Carbon Dioxide
CSE	Centre for Sustainable Enterprise
CSR	Corporate Social Responsibility
DC	Distribution Centre
DJSI	Dow Jones Sustainability Index
EIA	Energy Information Administration
EMAS	Eco-Management and Audit Scheme
GHG	Green House Gases
GLM	Green Logistics Management
GSCM:	Green Supply Chain Management
ISO	International Organization for Standardization
ISO	International Organization for Standardization
KIPPRA	Kenya Institute for Public Policy Research and Analysis
NCA	National Construction Authority
NEMA	National Environmental Management Authority
OECD	Organization for Economic Co-operation and Development

SCP	Supply Chain Performance
SPSS	Statistical Package for Social Sciences
SSCM	Sustainable Supply Chain Management
TBL	Triple-Bottom Line
TCE	Transaction Cost Economics
UNDP	United Nations Development Programme
VFM	Value for Money
WBCSD	World Business Council for Sustainable Development
WRI	World Resources Institute

OPERATIONAL DEFINITION OF TERMS

Building and construction manufacturing firms These are firms dealing with the production and fabrication of various materials, components, and equipment used in the construction industry. They encompass the firms dealing with the process of creating products that are essential for building structures, such as residential homes, commercial buildings, infrastructure projects, and more (KAM, 2022).

Firm Characteristics These are the features in an organization that define how the company carries out its internal processes and operations (Balasubramanian et al., 2021). While the main firm characteristics considered in other contexts include age of the firm, firm size and the overall management of the firm, this study considered characteristics that would determine the company's ability to embrace green logistics which include material sourcing, supply chain agility and supply chain risks.

Green Distribution Systems These are the processes and practices aimed at ensuring the movement of goods and services is environmental friendly by minimizing pollutions such as carbon emissions and the overall conservation of energy used in the process (Sauer & Seuring, 2018). In the context of this study, the green distribution systems were assessed through the vehicle loadings, electric forklifts and route management systems.

Green Logistics This is the process of ensuring that the movement of goods from suppliers to the firm and from the firm to

	the end users is done in a sustainable manner that observes green energy and conserves the natural resources (Gligor, Russo, & Maloni, 2022). Green logistics are aimed at preventing the environment pollution as well as saving on costs so as to enhance firm performance and effectiveness (Le & Ikram, 2022).
Green Packaging	This is the process of wrapping the products using materials, designs, and practices that prioritizing environmental sustainability and minimizing their impact on the environment throughout their lifecycle. It aims at reducing waste generation, conserving resources, and promoting ecological balance (Perdius, 2023). In this study, it was assessed through biodegradable packaging, packaging reduction and reusable containers.
Green Purchasing	This refers to the procurement of products and services that have a lesser or reduced effect on the environment and more sustainable in terms of reusability, disposal and biodegradability (Sarkis, Zhu, & Lai, 2019).
Logistics Innovation	It refers to the new ideas implemented to enhance the effectiveness of logistics (Gligor, Russo & Maloni, 2022). It comprises of the new technologies, processes and systems adopted to ensure that the movement of merchandise in and out of the company is done in a sustainable manner. In this context of this study, it was assessed using fuel-saving strategies, bio-fuel vehicles and solar technology.
Logistics Management	This is part of supply chain management practices that allows transport and logistics, implements, and controls

the efficient, effective transport, and reverses flow and warehousing of goods, services to meet customer's requirements (Eltayeb, 2019).

Performance The accomplishment of a given task measured against preset known standards of accuracy, completeness, cost, and speed. In a contract, performance is deemed to be the fulfillment of an obligation, in a manner that releases the performer from all liabilities under the contract (Sestell, 2021).

Performance of Building and construction manufacturing firms It is the process by which the building and construction manufacturing firms manage their performance in line with their functional and tactical strategies and objectives. Performance may entail tactical and functional strategies being deployed to all construction processes, activities, tasks and personnel, and feedback is obtained through the performance measurement system to enable appropriate management decisions (Rajjah, 2021).

Reverse Logistics This is the process of recapturing the product after it has been dispensed to the final consumer to ensure its lifecycle is ended in a more sustainable manner. It involves taking back the product to the manufacturer for more sustainable recycling or remanufacturing to recapture the value of the product (Wijewickrama et al., 2021).

Supply Chain Management It is defined as the management upstream and downstream relationships with suppliers and customers to deliver superior customer value at less **(**Gaganpreet & Neeraj, 2019).

ABSTRACT

Green logistics involves strategies that reduce the environmental and energy footprint of freight distribution, which focuses on material handling, waste management, packaging and transport. It consists of all activities related to the eco-efficient management of the forward and reverse flows of products and information between the point of origin and the point of consumption whose purpose is to meet or exceed customer demand green logistics activities include measuring the environmental impact of different distribution strategies, reducing the energy usage in logistics activities. The general objective of the study was to establish the effect of green logistics on performance of the building and construction manufacturing firms in Kenya. The study was guided by the specific objectives which include; to establish the effect of reverse logistics management, the effect of green packaging, to assess the effect of logistics innovation, the effect of green distribution systems on performance of the building and construction manufacturing firms in Kenya and to determine the moderating influence of firm characteristics on the relationship between green logistics and performance of building and construction manufacturing firms in Kenya. To achieve this, the study reviewed both theoretical and empirical literature and proposed the research methodology that addressed the gaps identified in literature as well as answer the stipulated research questions. This study adopted a cross-sectional research design. This method is preferred because it allows an in-depth study of the subject. The study population was 900 employees drawn from the 54 building and construction manufacturing firms in Kenya. The sample size was 270 respondents which was determined through purposive sampling targeting departments (production, quality assurance, procurement and supply chain, transport and logistics, and administration) in the 54 companies. Primary data was collected using a questionnaire. Quantitative data was analyzed through descriptive statistics (mean, standard deviation, frequency and percentages) and inferential statistics (ANOVA, P-value, t-test). The findings were presented in tables, pie-charts and bar-graphs. The results revealed that green logistics through reverse logistics, green packaging, logistics innovation and green distribution systems significantly influenced the performance of the building and construction manufacturing firms in Kenya. The study concluded that through embrace of green logistics, performance of the manufacturing firms was obtained. It is recommended that the management of the building and construction manufacturing firms embraces green logistics though which they can save on costs, enhance sustainability and promote performance.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The study aimed at establishing the effect of green logistics on performance of building and construction manufacturing firms in Kenya. This chapter provides information to back the study problem and point out the drive towards the study. Specifically the chapter provides information on global perspective of green logistics, regional perspective and then narrows down to the Kenyan issues on green logistics issues that the study was to address. It highlights on the background information, statement of the problem, objectives, and research questions, justification of the study and the scope of the study.

According to Boichuk and Kauf (2019), green logistics management is effective movement of raw and finished products from the supplier to site of construction as well the forward and reverse flow of products and information between the point of origin and the point of consumption whose purpose is to meet or exceed customer demand (Henryk, Nataliia, & Aleksy, 2021). Logistics is the term now widely used to describe the transport, storage and handling of products as they move from raw material source, through the production system to their final point of sale or consumption.

1.1.1 Green Logistics

Green logistics management are strategies that reduce the environmental and energy footprint of freight distribution, which focuses on material handling, waste management, packaging and transport (Yingfei, Mengze, Zeyu, Ki-Hyung, Avotra, & Nawaz, 2022). Green logistics consists of all activities related to the eco-efficient management of the forward and reverse flows of products and information between the point of origin and the point of consumption whose purpose is to meet or exceed customer demand (Handfield, 2018).

According to Abazov (2021), in building and construction, many people are involved in the creation of levels of non-uniformity that is non-existence in the production of the output. An example is the construction company where it becomes difficult to maintain the same performance level as the players in the industry are many.

According to Yingfei et al. (2022) as global suppliers of manufactured products, manufacturing enterprises in China are implementing sustainable solutions such as green logistics management (GLM) for the movement of the goods both to manufacturing industries and customers. The focus is on profitable growth without inflicting environmental damages through pollution to other countries through managing the logistics cycle of their merchandises spanning sourcing, channel deliveries, general distribution and disposal of the waste and default products (Barut et al., 2023). Such a solution are able to key green logistics initiatives enable to improve business performance, while preserving the local environment, as well as the global environment image on the environmental preservation. Chinese manufacturing exporters and key road and housing construction industries are encountering international pressure to maximise on green transport and reduce their environmental consequences the circular economy law in China, which promotes conservation of resources, reflects organizational responsibility towards achieving the green logistics goal (Liu & Ma, 2022).

Green logistics activities include measuring the environmental impact of different distribution strategies, reducing the energy usage in logistics activities, reducing waste and managing its treatment by producing and distributing goods in a sustainable way taking account of environmental and social factors. Supply chain management practices and strategies that reduce the environmental and energy footprint of freight distribution (Tian et al., 2023). Green logistics are the activities or practices that aim to reduce the environmental effects of logistics practices by introducing the eco-efficient management. Green logistics practices can also be implemented to achieve more sustainable business practices (Wai, 2021).

In measuring the environmental effects of logistics, it is important to distinguish first-order and second-order impacts (Henryk et al., 2021). The first-order environmental impacts are those directly associated with freight transport, warehousing and materials handling operations. Second-order impacts result indirectly from these logistics operations and take various forms with the growing awareness of the importance of the environment condition; many governments have rules and legislations concerning the implementation of green logistics. Pressure that comes from the regulations and legislations considered to be one of the most crucial among reasons for practicing green supply chain (Jinru et al., 2022).

Freight transport and logistics operations are key to the quality of life and vital for the European Union competitiveness in performance and general environment management basically been influenced by the management green logistics. It is the backbone of the economy making the links between the different stages of production chains and allowing service delivered with consideration of environmental preservation through the green logistics initiatives. Road freight transport is the dominant mode of goods movement across the European Union it represents cost effective and flexible mode (Handfield, 2018). Its dominance especially in South East Europe (SEE) countries may also be attributed to the lower requirements for infrastructure, standards, and legal framework. However, road transport exhibits significant weaknesses contributing to considerable carbon dioxide emissions, due to the logistics technology been used and reverse logistic management (United Nations, 2022).

Transport and logistics companies in South Africa, regardless of their size, are confronted with rising regulatory pressure, which force companies to put strategies in place in order to adhere to future environmental regulations and enhance environmental sustainability, thereby promoting green logistics and green transport practices (Meehan & Bryde, 2020). The large supply chain and logistics enterprises are fully aware of the environmental impact their services have on the environment. Large supply chain management enterprises integrate green practices in the supply chain to reduce CO_2 emissions, effluents and waste by automating the enterprises

warehouse management system, minimising inventories, recycling pallets and consolidating freight (Gimenez & Tachizawa, 2021).

The demand for environmentally friendly products has increased over the years and so is the shifting of loyalty of consumers. The ever increasing costs of energy and inputs have forced business to find new ways to reduce energy use in order to reduce costs (Arefieva, Polous, Arefiev, Tytykalo, & Kwilinski, 2021). Supply chain management has been identified to have a significant impact on the natural environment as a result, businesses are deeply trying to green their supply chain by introducing green strategies in their organizations and in the supply chain. This has resulted in a growing need for integrating environmental thinking into supply chain management and processes

In Ghana, Pierre, Francesco and Theo (2019) opine that green logistics entails integrating environmental thinking into a supply chain management, including product design, material resourcing and selection, manufacturing processes, delivery of the final product to the consumer as well as end-of-life management of the product after its useful life. 'Greenness' has become a code-word for a range of environmental concerns, and is usually considered positively (Kurbatova, Aisner & Mazurov, 2020). It is normally used to suggest environmental friendliness and thus, like 'logistics' it is something that is beneficial. When put together the two words suggest an environmentally friendly and efficient transport and distribution system.

In West Africa, Agyemang, Zhu, Adzanyo, Antarciuc, and Zhao (2018) argue that green logistics is a branch of logistics which aims to co-ordinate the movement of products through the supply chain in a way that meets customer requirements at minimum cost. In the past, this cost has been defined in purely monetary terms. However, as concern for the environment rises, companies have taken more account of the external costs of logistics associated with climate change, air pollution, noise, vibration and accidents. Green Logistics analyzes the environmental consequences of logistics and how to address them (Khan, Dong, SongBo, Zaman, & Zhang, 2017).

Green products are being manufactured and designed in such a way that it saves energy consumption. Every aspect of the supply chain is scrutinised to see whether changes can be made to save energy and water and to create biodiversity (Machio & Keitany, 2018). These enterprises are preparing to adhere to the laws and regulations of carbon tax by incorporating green logistics practices in their supply chain management practice. The Kenya National climate change action plan further emphasizes the need for the green logistics implementation to enhance the environmental conservation (Chrisostom & Monari, 2018).

The closed loop strategic approach enables the retailers enables producing and distributing in various outlets goods in a sustainable way through consignment consolidation with efficient fleet management taking into account of environmental and social factors (Chen et al., 2022). Thus the strategist reverse logistics are not only concerned with the economic impact of logistics policies on the organization carrying them out, but also with the wider effects on society, such as the effects of pollution on the environment. Reverse logistics activities include measuring the environmental impact of different distribution strategies, reducing the energy usage in logistics activities, reducing waste and managing its treatment (Sarhaye & Marendi, 2017).

Increased global warming and environmental degradation, has caused concern for governments, societies and business organizations even in Kenya. Kenya's, manufacturing industry is one of the main contributors to economic growth. Unfortunately, it has also caused environmental deterioration through unmanaged transport systems contributing to environmental pollution (Machio & Keitany, 2018). Consequently, business agencies and building and construction manufacturing firms have increasingly begun to realize the need to be environmentally accountable for their activities transferring goods as well the reverse transport in consideration to the packaging and material handling. Reverse logistics is a green supply chain management practice that enables companies to manage wastes and improve their competitiveness as their environmental efficiency is enhanced (Zawadi, 2018).

1.1.2 Firm Performance

The value chain of many business enterprises is increasingly required to demonstrate the profitability of their logistics primary activities, which involves the inbound logistics to operations, outbound logistics and the distribution management by ensuring that effective maintenance of fleet and as well automation of the transport systems for operational optimization (Yingfei et al., 2022). The adoption of Green Logistics Management (GLM) presents an opportunity for manufacturing and construction industries to competently respond to the escalating expectation of the international community for resources conservation and to achieve environmental performance profitably by meeting the customer lead time using the right transport technology. Environmental performance, which is related to reduction in emission, waste, and pollution incurred from logistic activities, and operational performance, is concerned with improvement in product development and delivery (Ilgin & Gupta, 2018). Other than internal activities such as product development and manufacturing processes, managing physical product flows is considered essential for environmental protection from the logistics and international business perspectives (de Souza et al., 2022).

A green image is favourable for transport performance in construction industries, particularly those with export and local orientation, to gain acceptance in the global market. By adopting green logistics management there can spill-over effects nurturing customer preference for related products and services with avoidance for environmental incidents and the consequential legal costs and fines (Bigliardi, Ferraro, Filippelli & Galati, 2020). While Green Logistics Management facilitates and promotes such actions as product return and recycling services for their products can be managed through the organisation reverse logistics initiatives. Green logistics management implementation improves environmental reputation of building and construction manufacturing firms through reduced landfills, oil spillages and maximization on distribution routes and as well the green packaging routes cultivating a positive publicity and corporate image to attract environmentally conscious customers (Ayoub & Abdallah, 2019).

1.1.3 Building and Construction Manufacturing Firms in Kenya

The Kenya Association of Manufacturers (2019) classifies companies that deal with the manufacture and production of building and construction materials under building and construction manufacturing companies. The companies deal with

products such as cement manufacturing, manufacture of steel and iron, manufacture of paints and assembling of building materials among other products. Regulation of building construction in Kenya is done through a statutory authority known as the National Construction Authority (NCA), whose function is to establish and oversee the building and construction manufacturing firms and coordinate its development. The NCA is mandated to encourage the standardization and improvement of construction techniques and materials, provide, promote, review, and coordinate training programs for skilled construction workers and construction site supervisors, accredit and register contractors and regulate their professional undertakings, accredit and certify skilled construction workers and construction site supervisors, develop and publish a code of conduct for the building and construction manufacturing firms (GOK, 2019).

However, safety and safeguarding of life have been lacking in Kenya's real estate and building and construction manufacturing firms (Amina, 2019). An underlying belief is that most accidents are not caused by careless workers but by failures in control which ultimately is the responsibility of management. Improved health and safety management systems are assumed to make good financial sense and should be part of the cost-conscious culture of companies dedicated to efficiency and profitability. It has been recognized that a reduction in the level of accidents would be the principal quantifiable benefit of new construction design and management regulations.

Generally in every country, construction regulation authorities are established to harmonize construction laws found in statutes which may contradict each other, curb uncontrolled and unchecked physical planning of buildings and construction, control and enforce the mechanisms on the application of the building code in the building and construction manufacturing firms, prevent easy entry and penetration of unqualified contractors, and improve on the bureaucratic requirements and procedures in approval of building plans. Further, construction regulation authorities eliminate corruption cases in the building industry, emphasize both material quality and contractor performance, and revise the building codes to ensure relevance (Pierre, Francesco, & Theo, 2019).

1.2 Statement of the Problem

Building and construction manufacturing firms in Kenya have been known to be critical economic pillars with immense contributions to the GDP and overall job creation (GOK, 2018). With the current government goals (Big-Four agenda), the building and construction manufacturing sector stands at the core of meeting these goals through the provision of housing materials as well as contribution to the manufacturing sector which are among the four (4) agendas by the Kenyan Government (GOK, 2018). However, despite the merit surrounding the building and construction manufacturing firms in Kenya, the firms have continually recorded a surge decline in performance over the past five years (KAM, 2020). According to the KAM report (2021), most of the manufacturing companies in the building and construction sector recorded over 15% decline in their annual turnover while the sector lost over 2.8% of its market share between 2013 and 2017. According to the Competition Authority of Kenya (CAK) (2018), building and construction manufacturing companies in Kenya have been facing tough times in the market a matter that has seen most of the companies retrench to save their operational costs. This is despite the continued growth of urban centres and demand for housing and related infrastructure in the country. Moreover, as noted by the National Constructions Authority (NCA) (2019), while there has been an increase in the number of construction projects in the country, over 35% of the construction companies have not been surviving for more than two years in the market. Kaungeria (2020) notes that the growth in the building and construction manufacturing firms may not replicate the performance of construction manufacturing companies, since the clients and the companies that manufacture the construction materials are two distinct parties. NCA (2020) report on the registered construction companies concurs with this where over 28% of the companies registered in 2019 had exited the market in 2020, while the companies manufacturing building and construction materials recorded over 30% decline in annual sales and profits. According to KAM (2020), in the period between 2015 and 2019, close to 45% of the building and construction manufacturing firms recorded over 26% increase in their annual operational costs, with costs related to supply chain and logistics practices taking up to 48% of these costs. The available evidence therefore shows that despite the surge in high-rise

buildings and other mega construction projects in the country, the construction and building manufacturing companies have been poorly performing in the recent past.

Green logistics has been considered a major approach in promoting sustainability of the supply chain management through which organizational performance is enhanced as well as meeting the environment conditions of the modern-day World (UNEP, 2018). Empirical studies have revealed mixed results on the relationship between green logistics and firm performance. An Razzaq, Nawaz, Noman, and Khan (2021) found that green logistics is an aspect of the green supply chain that has a significant influence on the firm performance through cost-saving and enhancing efficiency and effectiveness. On the contrary, Gopal and Thakkar (2015) and Jaafar and Tajuddin (2016) found that green logistics had no significance influence on the firm performance but instead increased the operational costs hence minimizing the profit margins.

From the review herein, therefore, it is clear that the performance of building and construction manufacturing firms in Kenya is crucial but remains an untapped area as far as research is concerned. The evidence shows that little has been done to establish the relationship between green logistics and the performance of the sector while the available literature shows conflicting results. It is on this merit that the study seeks to establish the influence of green logistics on the performance of building and construction manufacturing companies in Kenya.

1.3 Objectives of the Study

1.3.1 General Objective

The general objective of the study was to assess the effect of green logistics on the performance of the building and construction manufacturing firms in Kenya.

1.3.2 Specific Objectives

i. To establish the effect of reverse logistics on the performance of building and construction manufacturing firms in Kenya

ii. To determine the effect of green packaging on the performance of building and construction manufacturing firms in Kenya
iii. To determine the effect of logistics innovation on the performance of building and construction manufacturing firms in Kenya
iv. To examine the effect of green distribution systems on the performance of building and construction manufacturing firms in Kenya.
v. To examine the moderating effect of firm characteristics on the relationship between green logistics and the performance of building and construction manufacturing firms in Kenya.

1.4 Research Hypotheses

The study was guided by the following alternative hypotheses:

i. H_{A1}: Reverse logistics has a significant effect on the performance of building and construction manufacturing firms in Kenya
ii. H_{A2}: Green packaging has a significant effect on the performance of building and construction manufacturing firms in Kenya
iii. H_{A3}: Logistics innovation has a significant effect on the performance of building and construction manufacturing firms in Kenya
iv. H_{A4}: Green distribution systems have a significant effect on the performance of building and construction manufacturing firms in Kenya
v. H_{A5}: Firm characteristics have a moderating effect on the relationship between green logistics and the performance of building and construction manufacturing firms in Kenya

1.5 Justification of the Study

The study findings will be important to the building and construction manufacturing firms across the country. The findings have shed light on the use of green logistics management and the accompanying better performance in building and construction manufacturing firms. The findings will also be important to the following quarters:

1.5.1 Building and Construction Manufacturing Firms

The study may be of significance to building and construction manufacturing firms which would use the green chain practices will be brought out and will be of importance to firms that have not yet implemented them. The study will be of importance to procurement personnel in the building and construction manufacturing firms sector as it will help them to develop benchmarks of best practices in the sector. The study is of significant importance to the agents in the clearing and forwarding industry. The firms will be able to know for certain what factors influence a greater role in managing green logistics operations and to know the right procedures to use in order to eliminate carbon emotions and environmental landfills

1.5.2 Procurement Departments

The study hopes to provide them with useful information like the recommended techniques of green logistics so as to meet their customer's and organization's needs. The recommendations of the study may enable them to design green logistics policies to improve the smooth running of the firm, thereby satisfying customers and generally minimizing costs. The findings of this study will provide firms with useful references for improving overall firm performance, gaining competitive advantages, and market leadership. The results will also contribute to the understanding of green logistics and environmental considerations since this concept is both an environmental challenge

1.5.3 Stakeholders and Other Interested Parties

This includes procurement professionals, private building and construction manufacturing firms, and suppliers among others. The study will provide relevant information on the obstacles faced and provide viable recommendations for green logistics in both the public and private sectors. This Study will be beneficial to all stakeholders in the logistics business, private and public sectors by providing the knowledge on strategies to apply to develop sustainable logistics operations for their firms The study findings are of assistance in identifying the extent to which various challenges faced by building and construction manufacturing firms in supply and

logistics management performance and hence facilitate the formulation of environmental remedial policies. The study will provide a framework or guide to the line managers on their role in addressing issues related to green logistics providers in supply chain management performance.

1.5.4 Researchers and Academicians

Studies on green logistics management would help academicians and researchers expand their research to other issues outside the environmental Future scholars may use the results of this study as a reference. The findings of this study can be compared with competitive advantages in other sectors to draw conclusions on various ways an institution can respond to forces within its environment. It will also benefit consultants who endeavor to assist with sustainable logistics operations Again, there is very little literature, if any, in the field of green logistics in developing countries. The forerunners in this area have written in depth about green supply chain management and the various policies that should guide parties involved in such green operations

1.6 Scope of the Study

The study aimed to assess the influence of green logistics on the performance of building and construction manufacturing firms in Kenya. The study addressed green logistics through four fundamental logistics processes which are: green logistics which are; reverse logistics, green packaging, logistics innovation, and green distribution systems. To factor-in the varied firm characteristics that could affect the extent to which green logistics is embraced, the firm characteristic was used as a moderator. The study focused on the building and construction manufacturing firms in Kenya. This is a category of the manufacturing sector that deals with the manufacturing and production of goods and materials used in the construction industry. The materials include cement, construction steel, and iron materials, painting and chemical allied building materials, and construction glassware among other materials for building and construction. According to KAM (2020), there are 54 building and construction manufacturing firms in Kenya, registered under the Kenya Association of Manufacturers. Most of these companies are located in Nairobi

County with others in surrounding counties such as Machakos County, Kiambu County, and a handful in Mombasa County. The study therefore was carried out in these four counties. The heads of key departments that deal with logistics processes including packaging, distribution, and designing products to ensure customer satisfaction were surveyed. The departments include the production department, quality assurance department, procurement and supply chain department, transport and logistics department, and administration department.

1.7 Limitations of the Study

The researcher faced several limitations as some respondents were reluctant to provide the information due to fears that the information, they provided could be used against them or bear some adverse effects on the manufacturing firms and therefore they did not wish to participate in the study. This limitation was overcome by the introductory letter from the University reassuring them that the information was strictly for academic purposes and would be treated with confidentiality.

Another limitation was the delayed response to the questionnaires by some respondents and even some lost them in the process. To mitigate this limitation, the researcher frequently provided additional questionnaires. Lastly, the extensive coverage of the sampled manufacturing firms which covered essentially the entire country necessitated that the researcher make elaborate logistic arrangements to cover all of them to guarantee an acceptable response rate

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter deals with theoretical and empirical analysis of the literature on green logistics on the performance of the building and construction manufacturing firms in Kenya. It discusses the theoretical framework, conceptual framework, and green logistics that include reverse logistics management, green packaging, logistics innovation, green distribution systems, and government regulations finally; it discusses the critique of existing literature on green logistics of the building and construction manufacturing firms in Kenya research gaps and summary of the literature. A good and full literature search will provide the context within which to place your study.

2.2 Theoretical Review

This consists of concepts together with their definitions and reference to relevant scholarly literature (Browne et al., 2019), and existing theory that is used for a particular study. Here a demonstration of understanding of theories and concepts that are relevant to the topic of the research paper and that relate to the broader areas of knowledge being considered (Beyene, 2015). Thus, it is a collection of interrelated statements or principles that explain the major theories concerning the influence of green Logistics management on the performance of building and construction manufacturing firms in Kenya.

2.2.1 Theory of Technology Acceptance Model (TAM)

The Theory of Technology Acceptance Model (TAM) assisted the study in determining the influence of reverse logistics management on the performance of the building and construction manufacturing firms In Kenya. The TAM was first proposed by Davis (1986). The theory indicates that an individual considers the ramifications of his/her activity before choosing whether to take part in certain

conduct. It additionally states that the primary determinant of a person's conduct is the goal.

The reason for TAM is that individuals conduct expectations to acknowledge and utilize a specific innovation dictated by two builds in particular; saw handiness and saw usability (Davis, 1989). User′s frame of mind and conviction as proposed by TAM is seen to be a (Yu & Ramanathan, 2015) where Procurement Information Systems is a business-to-business (B2B) purchasing practice that utilizes electronic procurement to identify potential sources of supply, to purchase goods and services, to transfer payment, and to interact with suppliers. The authors believe that this definition provides the scope to investigate the basic level of procurement information systems in the Irish ICT manufacturing sector (Gupta & Dandekar, 2012).

The Unified theory of acceptance and use of technology (UTAUT) speaks to a move from the divided perspective on IT selection or acknowledgment to a bound together incorporated single hypothesis (Abu Shanab et al., 2010). Gupta and Dandekar (2012) adjusted the worth segment (from saw convenience) and included two segments: trust and saw simplicity of reception. In an investigation by Seroka-Stolka (2014), the frames of mind build were expelled for rearrangements. Pietro, Huge-Brodin, Isaksson, and Sweeney (2012) are of the conclusion that TAM ought not to be limited exclusively to the selection of mechanical point of view and that other non-PC-based innovative appropriation ought to be urged to add a showcasing flavor to the discoveries and to be increasingly explicit. The scientist reasoned that the greater part of the innovation acknowledgment models were widely tried in the created nations.

Usually, companies adopt procurement information systems to manage the purchase of low-critical products and services (Min and Galle, 2002). In summation, it is noted that the extent of procurement information systems adoption remains in a formative stage, falling short of the type of e-sourcing and e-contracts suggested by (Perotti, Zorzini, Cagno, and Micheli, 2012). Common Procurement Information Systems tools are online catalogues and direct auctions, where reverse auctions remain

unpopular with sellers (Basheka and Bisangabasaija, 2010). Procurement information systems implementation is characterized by the direct and indirect procurement divide, where firms tend to use online systems for non-critical items (Min and Galle, 2001). The transition to modern procurement information systems calls for strategic adaptation. It is one strategy, though, that requires much organizational change (Rugayah, 2012). TAM was adopted to inform the study on the best ways to enhance green logistics through logistics systems that are intended to steer better distribution systems and technologies.

2.2.2 The Institutional Theory

The Institutional theory assisted the study in determining the influence of green packaging on the performance of the building and construction manufacturing firms in Kenya. Proposed by Meyer and Rowan (1977), the institutional theory emphasizes the role of social and cultural pressures subjected to organizations that influence management practices. DiMaggio (2008) argues that managerial decisions are strongly influenced by three institutional mechanisms namely; coercive, mimetic, and normative isomorphism - that create and diffuse a common set of values, norms, and rules to produce similar practices and structures across organizations that share a common organizational field.

Institutional theory examines how external pressures influence a company to adopt an organizational practice (Hirsch, 1975; Lai et al., 2006). Within the institutional theory, there are three forms of isomorphic drivers namely, coercive, normative, and mimetic (DiMaggio and Powell, 1983). Coercive isomorphic drivers occur from influences exerted by those in power. The institutional theory can be used to study how a company addresses green issues due to external pressures (Jennings and Zandbergen, 1995), and thus the institutional theory has become a major research direction to explain environmental-related practices (Lounsbury, 1997).

Government agencies are an example of powerful institutions that may coercively influence the actions of an organization through, for example, fines and trade barriers (Rivera, 2004). Normative isomorphic drivers cause enterprises to conform in order to be perceived as having legitimate organizational activities. Social normative

pressures can explain environmental management practices among enterprises (Ball and Craig, 2010). Mimetic isomorphic drivers occur when enterprises imitate the actions of successful competitors in the industry, in an attempt to replicate the path of their success (Aerts et al., 2006).

Coercive pressures are crucial to drive environmental management (Kilbourne et al., 2002). Previous studies show that governments are key groups to promote voluntary environmental management practices (Rivera, 2004). In developed countries such as the U.S.A., coercive pressures through laws and regulations were demonstrated to improve environmental awareness, and thus drive environmental management practices. Coercive pressures by governments were shown to drive enterprises to adopt voluntary green initiatives, while such pressures become weaker for those rich in organizational resources for environmental strategies (Clemens and Douglas, 2006). Regulations in developed countries have also caused an increase in institutional pressures for improved environmental management by enterprises in developing countries, many typically surpassing local requirements. For example, the European Community Directive on Waste Electrical and Electronic Equipment (WEEE) now requires all manufacturers in developing countries to take back used products or pay premiums when these manufacturers export electrical and electronic equipment to Europe (Yu et al., 2006). At the same time, developing countries such as China have enacted increasingly strict environmental regulations, which drive manufacturers to implement green logistics practices (Zhu and Sarkis, 2007).

Socially related requirements such as those from the customer and the market and their increasing environmental expectation form the core normative pressure for manufacturers to implement green logistics. In developed countries, consumers have increasing environmental awareness. For example, it is estimated that 75% of U.S. consumers made their purchasing decisions with the enterprises' environmental reputation in mind and 80% of the consumers were willing to pay more for environmentally friendly products (Carter et al., 2000). Thus, normative social pressures in developed countries such as England and Canada are found to mainly originated from consumers' ethical values and ecological thinking (Ball and Craig, 2010).

Previous studies show that consumers in developing countries have increasingly heightened environmental awareness and are starting to opt for green products (Harris, 2006). In addition to normative pressures from consumers, exports and sales to foreign customers are two more important drivers that prompt manufacturers to adopt green logistics practices for developing countries such as China (Christmann and Taylor, 2001).

Enterprises may follow or 'mimic' competitors merely because of their success, where such behavior in operations and manufacturing is typically defined as competitive benchmarking. The rationale is simply to follow the actions of successful competitors to replicate their successful paths. Imitation plays a significant role for enterprises in developed countries such as Canada, France, and Germany to implement green logistics-related practices (Aerts et al., 2006). Globalization has created opportunities for manufacturers in developing countries such as China to learn from their foreign competitors to implement environmental management practices (Christmann and Taylor, 2001). Joint ventures in a developing country may implement GSCM practices such as eco-design by imitating their parent companies, and then diffuse their experiences to other enterprises in the developing country (Zhu and Liu, 2010).

Institutional theory may explain how external drivers promote green logistics practices. However, there are still some remaining questions. First, it was shown that both external drivers and internal resources drive environmental management practices (Clemens and Douglas, 2006), but it is unclear how external and internal factors interactively promote green logistics practices. Second, it is demonstrated that the motivation of a core company in a supply chain is key to green its suppliers and customers (Hall, 2001). Governmental regulations can be key drivers for enterprises to implement environmental management practices (Rivera, 2004). However, what kinds of enterprises can be considered to be core companies in supply chains, and what kinds of mechanisms should be established to motivate such core companies still need further studies.

Third, a previous study on developed countries such as Canada and England shows that normative pressures drive enterprises to be more environmentally aware, but the study also argues that new institutional theory, integrating new perspectives such as ethical values and ecological thinking, is needed to understand organizational response to environmental issues (Ball and Craig, 2010). With the development of global supply chains, mimetism provides opportunities for encouraging cooperation among enterprises from different countries operating under the same supply chain (Daniels and Perez, 2007), but the diffusion mechanism for such cooperation needs further research. Finally, there are issues related to the linkage of external pressures from institutional theory to internal capabilities such as those proposed by the resource-based view that need to be further investigated in GSCM (Sarkis et al., 2010).

De Boer and Zandberg (2012) argue that because of coercive forces in the form of commitment, there has been the main impetus of environmental management practices such as green packaging. Firms that share the same organizational field are affected in similar ways by institutional forces that originate from them. Delmas and Toffel (2014) proposed an institutional perspective to analyze the drivers of green packaging and also came up with how distinct levels of coercive pressures are exerted upon different industries which may lead to different environmental strategies. Firms tend to adopt green logistics management practices in response to institutional pressure. They can be based on; natural methodologies of conformance that attention to consenting to guidelines and embracing standard industry practice, or to lessen the ecological effect of tasks past administrative necessities (Sharma, 2010). This includes areas such as recycling and refurbishment, returns policy, and remanufacturing.

Management can also include green packaging as a performance indicator in green logistics management (Nelson & Winter, 2012). Firms can create relationships with regulators and signal a proactive environmental stance by participating in government-sponsored voluntary programs (Delmas & Toffel, 2014). Construction companies can also work with their customers and suppliers to improve their green packaging through better green logistics management (Nelson & Winter, 2012). For

the construction firm to achieve the best in enhancing green packaging, it ought to collaborate with suppliers and regulators hence the essence of institutional theory. The theory was therefore used to inform the study on green packing as an aspect of green logistics.

2.2.3 Social Technical Systems Theory

The Socio-Technical Systems (STS) theory assisted the study in determining the influence of Logistics innovation on the performance of the building and construction manufacturing firms in Kenya. The STS theory was originally used to explain intra-organizational phenomena such as systematic relationships between employee behaviors and work design (Trist & Bamforth, 1951). According to the theory, an organization can be considered a socio-technical system consisting of technical and social subsystems (Cooper & Foster, 1971; Manz & Stewart, 1997). The technical subsystem consists of tools, techniques, devices, methods, procedures, and knowledge used by organizational members to acquire inputs, transform inputs into outputs, and provide outputs or services to clients or customers, whereas the social subsystem is comprised of the people who work in the organization and their social interactions with another (Shen, Ding, Chen, & Chan, 2017). Thus, system outputs are determined by the two subsystems (Green, Zelbst, Meacham & Bhadauria, 2012).

The literature extends the boundary of STS theory from intra-organizational to inter-organizational, e.g., a supply chain (Choi & Luo, 2019; Kull et al., 2013). Bellamy and Basole (2013) suggested that a supply chain is a complex socio-technical system and that scholars must consider both technical and social concerns. Additionally, STS theory has been used in the field of environmental management. Tang (2018) argued that in terms of reducing pollution, a socio-technical system outperforms a system solely consisting of technical components. Boiral (2009) revealed that combining socio-technical factors (activities, behaviors, and technical systems) produces environmental benefits for organizations. Furthermore, the role of human (behavioral) and technical aspects of environmental management in the relationship between green product development and performance has been discussed,

demonstrating that human dimensions must be strengthened and deserve more investment in companies (Jabbour et al., 2015).

Research on STS theory Green Supply Chain Management (GSCM) and green logistics practices suggests that technology utilization and organizational involvement are driving forces behind organizational change (Wu et al., 2012). Thus, green logistics studies have established the usefulness and appropriateness of using STS theory to understand green logistics practices. From the perspective of STS theory, behavioral green logistics practices are components of a social subsystem, whereas technical green logistics practices can be categorized as being from a technical subsystem. Behavioral green logistics practices highlight the involvement of supply chain members (top management, employees, suppliers, and customers), which is in line with a social subsystem that reflects people's awareness, attitudes, and behaviors (Manz & Stewart, 1997; Shen et al., 2015).

Similarly, the technical subsystem is intended to satisfy external environment-related needs through tangible inputs such as technology, processes, and tools. Technical green logistics practices involve eco-design procedures, manufacturing processes, reverse logistics, and harnessing environmental management tools to meet expectations related to the environment and economy. STS theory emphasizes the joint optimization of the two subsystems to improve system performance (Pasmore, 1988). The two subsystems should be implemented together rather than applied individually (Liu, Feng, Zhu, & Sarkis, 2018).

STS theory emphasizes the joint optimization of the two subsystems to improve system performance (Dubey, Gunasekaran, & Papadopoulos, 2017). The two subsystems should be implemented together rather than applied individually (Liu et al., 2018). Although the literature on STS theory usually puts more emphasis on the social subsystem, there exists a two-way direction between the two subsystems, suggesting that the social subsystem affects or changes the technical subsystem and vice versa (Kull et al., 2013). On the other hand, behavioral practices may cultivate a cooperative environment and culture to support the implementation of technical practices while technical practices can also facilitate the development of behavioral

practices. This supports the use of the theory in determining how logistics innovation enhances the performance of construction and manufacturing firms in Kenya.

2.2.4 Transaction Cost Economics Theory

The Transaction cost economics theory was used to expound on the role played by green distribution systems as an aspect of green logistics in enhancing firm performance. The theory focuses on how much effort and cost are required for two entities, buyer and seller, to complete an activity (economic exchange or transaction) (Williamson, 1979; 1981). Suppliers and buyers seek to minimize the cost of their transactions (Touboulic & Walker, 2015). Transaction costs are the costs of activities beyond the cost of a product or service that are required to exchange a product or service between the two entities. Transaction cost economists say entities are 'rationally bounded' and use an analysis of 'exchange hazards' to explain why buyers and suppliers choose particular governance structures for assets and practices (Sauer & Seuring, 2018). An example exchange hazard includes the lack of information access such that the full understanding of the transaction is not available to either side giving rise to self-interest-seeking behavior or opportunism.

Transactions, in general, include dimensions of uncertainty, transaction frequency, and asset specificity. Asset specificity includes site specificity, physical asset specificity, and human resource specificity (Eltayeb et al., 2011). Characteristics of a transaction will determine the responses to various activities by both sides of the transaction. Ample opportunity exists for investigation of the various dimensions of transaction cost economics in Green Supply Chain Management (GSCM) and green logistics studies. A direct example is evaluating the actual costs of decisions and practices on different types of transactions within a GSCM environment. A formal modeling study utilizing transaction costs and dynamics within mathematical programming and optimization model frameworks occurs in a number of environmental supply chain studies (Eltayeb et al., 2011). In addition, modeling transaction costs with game theoretic approaches for GSCM is one avenue that researchers view as fertile ground for investigation (Touboulic & Walker, 2015).

Another direct transaction cost evaluation may occur on whether voluntary environmental initiatives standards are more likely to diffuse across a supply chain if it improves the transaction costs of a relationship (Sauer & Seuring, 2018). One of the more traditional topics within SCM is the 'make or buy' decision. Essentially, if the internal transaction costs are greater than the relationship transaction costs, it would make economic sense to outsource functions and activities (Eltayeb et al., 2011). For example, firms may find that some processes are environmentally damaging, where outsourcing may reduce liability, clean-up, and image costs, but the monitoring and control costs for this type of outsourcing may increase. Whether or not certain environmental expertise exists within an enterprise may also play a role (where developing this expertise internally rather than outsourcing involves a transaction cost). These types of decisions can be modeled and evaluated both quantitatively and qualitatively.

The use of asset specificity and organizational actions related to GSCM is another explanatory dimension of transaction cost economics. For example, one such investigation argues that firms engaged in transactions involving highly asset-specific investments, and therefore greater dependency on their current customers than firms with lower asset specificity, are more likely to adopt an ISO 14001 (Centobelli et al. 2017). The integration of environmental technology across the supply chain may also be explained by the role of asset specificity and inter-organizational relationships (Eltayeb, Zailani, & Ramayah, 2011). The asset specificity issue can also be investigated from one of the three types of asset specificity. In addition to the direct relationships of GSCM implementation with the level of asset specificity, relationship-specific investments, and their potential moderations and mediations are also promising research topics. One such approach found a moderating effect of asset specificity between a supplier's environmental commitment and a customer's environmental performance requirements (Touboulic & Walker, 2015).

Exchange hazards investigation with GSCM may also be fertile ground for future studies. There are at least five forms of exchange hazards: expropriation, appropriability, measurement-related, intertemporal, and institutional weakness

hazards (Williamson, 1996). As an example, some of these hazards have been investigated using the case study approach to understand supply chain relationships that required suppliers to invest in design for environment and environmental management system practices (Sauer & Seuring, 2018). Whether or not these types of hazards are prevalent concerning other GSCM practices would be an interesting investigation. How to manage GSCM relationships with their existence and whether they are barriers to GSCM diffusion are also concerns that should warrant research attention. The existence of power and trust in GSCM relationships may also fit within the exchange hazards discussion. This theory will therefore be used to assess how green distribution systems enhance firm performance.

2.2.5 Economic Theory of Firm Characteristics

The economic theory explains that increasing firm size allows for incremental advantages because the size of the firm enables it to raise the barriers of entry to potential entrants as well as gain leverage on the economies of scale to attain higher profitability. As contended by Steven, Glenn, and Bruce (2008), larger firms have diverse capabilities, the abilities to exploit economies of scale and scope, and the formalization of procedures which therefore put them in a better position to be more competitive and attract higher rates of stock-buyers. These characteristics, by making the implementation of operations more effective, allow larger firms to generate superior performance relative to smaller firms (Amato and Wilder, 1990). Moreover, the size of a firm is correlated with market power, and along with market power inefficiencies are developed, leading to relatively inferior performance.

Arguably, asset pricing in larger firms in terms of asset base and customer base, is likely to attract more investors who may feel that the larger firms have lesser risks as compared to the smaller firms. According to Rajab and Handley-Schachler (2009), the motive surrounding any investor is to have his or her capital put in a place where higher returns are expected and this according to the economic theory is the essence part that bigger organizations hold an upper hand over the smaller ones. The theory is therefore fit to describe and patronage the fifth objective of the study which is to determine the moderating effect of firm characteristics on the relationship between

green logistics and the performance of building and construction manufacturing firms in Kenya.

2.2.6 Closed Loop Supply Chain Model (CLSC)

The Closed Loop Supply Chain (CLSC) model is a supply chain model that explains the processes of logistics including reverse logistics and sustainable logistics processes (Amin & Baki, 2017). A CLSC can be defined as a supply chain system entailing design and implementation for enhancing the useful value throughout the product life cycle while dynamically extracting value from different returned products (Lebreton, 2017). In the last decade, Closed-Loop Supply Chains (CLSC) and Reverse Logistics (RL) have attracted increasing attention in supply chain and operations management research. This attention has been also motivated by different governmental actions around the world devoted to forcing manufacturing companies and retailers to manage their End-of-Life products (Govindan et al., 2015).

CLSCs combine the conventional forward supply chain processes with reverse logistics processes, which range from product recovery, product remanufacturing, disassembly, and part reusing (Visich, Li, & Khumawala, 2019). The final aim is to capture the values of products being consumed and used by customers with the possibility of reducing the environmental impact on the whole supply chain. In general, a more complex system is obtained by closing the loop of the supply chain in comparison to the traditional linear supply chain (Visich, Li, & Khumawala, 2019). For instance, complexity arises in managing materials inventories, return flows, and transportation at different states, in planning the level of service orientation of resources, in managing manufacturing and remanufacturing at the same time in the same production facilities, and in coordinating the network as a whole.

Moreover, planning and controlling operations in this environment become more complex due to uncertainties in the information flows regarding return processes and the associated difficulties of the interface coordination between return flows and conventional forward flows (Wang, Zhao, & Wang, 2012). Moreover, the CLSC management responds to EU research priorities identified in the recent Horizon 2020

program that stresses the need for increased product lifespans, material reuse, recycling, resource recovery, and industrial symbiosis leading to closed-loop processes (Devika, Jafarian, & Nourbakhsh, 2014). A representational diagram of the CLSC model is shown in Figure 2.1 below. The figures show key stakeholders involved in the supply chain processes that are essential in making the process sustainable and environmentally friendly.

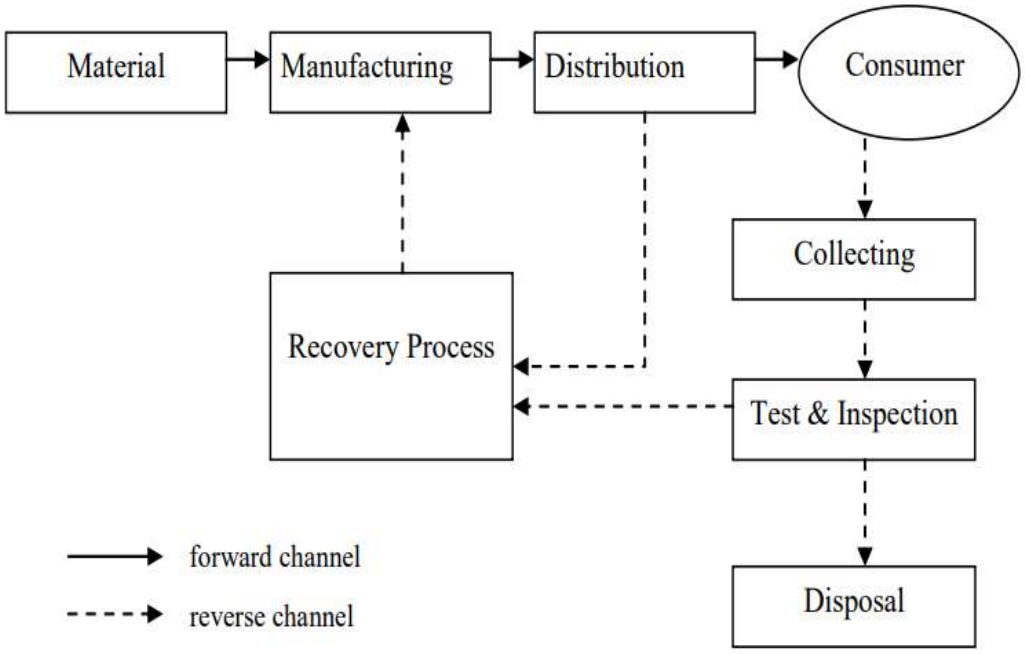

Figure 2.1: Closed-Loop Supply Chain Model

As shown in Figure 2.1 above, the parties involved are connected in a network that includes suppliers, manufacturers, distributors, retailers, and consumers in the chain to achieve progress, while the reverse chain parties involved are collectors (this role can be carried out by the retailer, or the manufacturer's third party), manufacturer in the role of the recovery process, a distributor who distributes products of the recovery, and retailers to market recovery. The model was therefore used in the study to expound on the need for green logistics in enhancing the supply chain performance and effectiveness in the context of manufacturing firms.

Table 2.1: Summary of the Theories and Postulations Related to the Study

Theory/Postulation	Authors	Focus/Argument	Application
Theory of Technology Acceptance Model (TAM)	(Davies, 1986), (Hu, et al., 2008). (Fishbein & Ajzen, 1975),	Focuses on how technology ought to be accepted across the entire organization for it to be effective in enhancing performance.	Reverse logistics would require intensive technology and its embrace would as well require effective acceptance among the users (suppliers, the customers and manufacturing firms).
The Institutional Theory	DiMaggio (2008) (Delmas & Toffel, 2014).	As an institution, every organization will act on the best interests of the social structures and to adapt certain behaviours such as green logistics they would require to be socially compelled by what is happening in the external world.	Manufacturing firms will be keen to integrate green packaging so as to meet and respond to the pressures from the customers, regulators and the competitors.
Social Technical Systems Theory	(Jovanovic, 2007). (Paulraj & Chen 2007).	An organization will require supportive social and technical inputs in order to embrace sustainable practices such as green logistics	Logistics innovation is driven by the technical capability of the organization, and how their social aspects support such innovations.
Transaction cost economics theory	Williamson, (1981)	To minimize on the transactional costs and enhance performance, firms tend to embrace green distribution systems..	Adopting eco-friendly distribution systems implies that more transaction costs are saved thus enhancing performance. ,
Economic Theory of Firm Characteristics	(Steven, Glenn and Bruce (2008).	Focuses on the role of firm characteristics on ability of the firm to perform	The firms are affected by their characteristics in making key decisions that support the adoption of green logistics towards enhancing performance.

2.3 Conceptual Framework

A conceptual framework is a detailed description of the phenomenon under the study accompanied by a graphical or visual depiction of the major variables of the study (Ngechu, 2009). According to Kothari (2014), a conceptual framework is a diagrammatical representation that shows the relationship between dependent variables. Kothari (2014) further described an independent variable as one that the researcher manipulates in order to determine the effect or the influence on the other variable. Figure 2.2 shows the conceptual framework for this study.

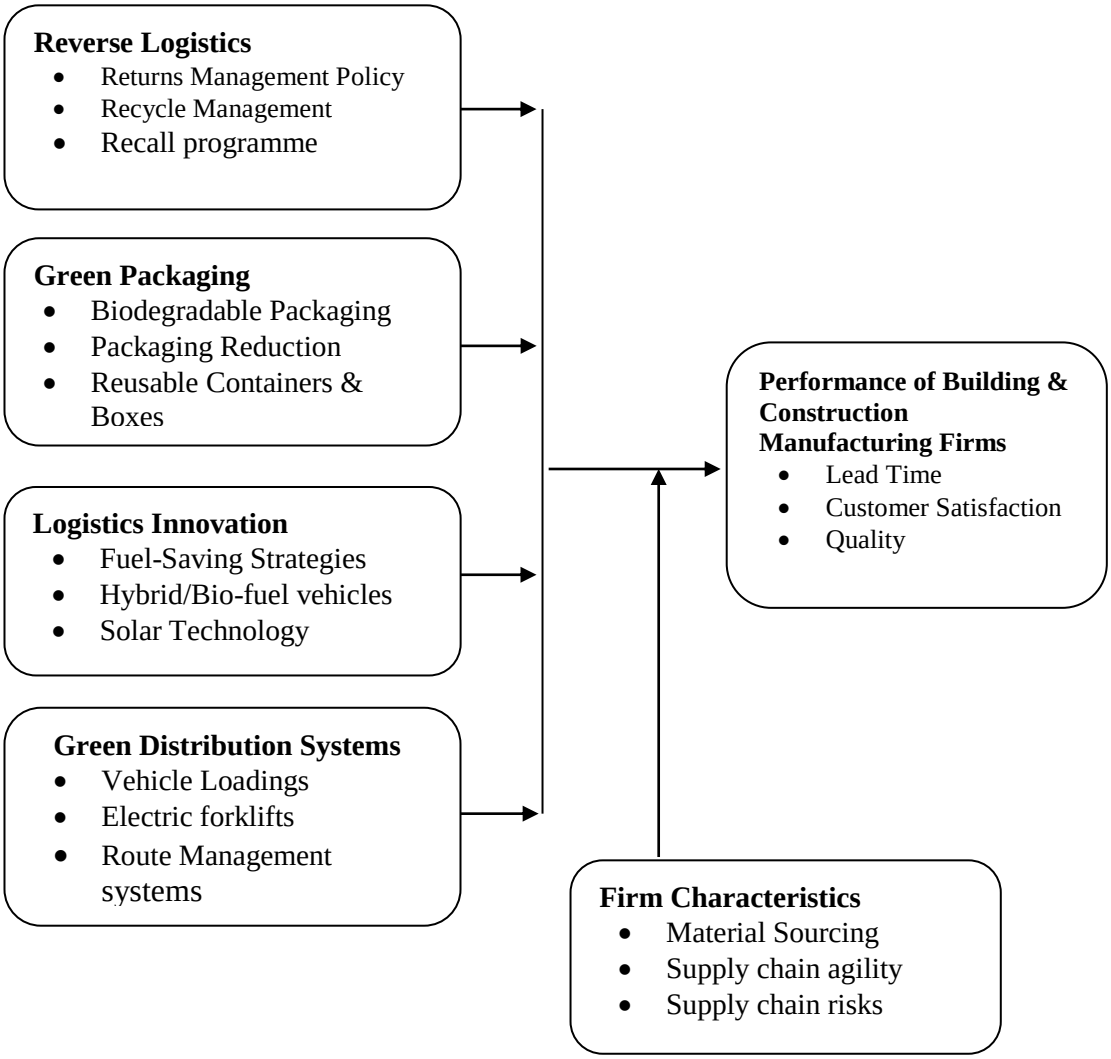

Figure 2.2: Conceptual Framework

2.3.1 Reverse Logistics Management

Ni, Chan, and Tan (2023) define reverse logistics as the process of moving goods from their final destination back to the manufacturer or a designated location for the purpose of returns, recycling, remanufacturing, or disposal. It is the opposite of traditional logistics, which involves the movement of goods from the manufacturer to the end consumer. Reverse logistics management therefore involves overseeing the

processes of returning goods from their final decision to the processing plant, a process that is aimed at ensuring that the disposal is done correctly while saving on the damages that the product would have to the environment (Wijewickrama et al., 2021). Reverse logistics is essential for businesses to manage the entire product lifecycle and minimize waste. It can also have financial and environmental benefits by reducing the disposal of products and materials in landfills and promoting recycling and sustainability (Wang et a., 2021). Properly handling reverse logistics can enhance customer satisfaction and loyalty by providing a hassle-free return process and promoting eco-friendly practices.

Paula et al. (2020) contend that returns management is the supply chain management process by which activities associated with returns, green packaging, gatekeeping, and avoidance are managed within the firm and across key members of the supply chain (Wilson, Paschen, & Pitt, 2022). The correct implementation of this process enables management not only to manage the reverse product flow efficiently but to identify opportunities to reduce unwanted returns and to control reusable assets such as containers.

Over the years, research interest in reverse logistics services has increased due to the value it provides for recovered materials as a tool focused on recycling waste and recovering value from used materials (Agrawal & Singh, 2019). Through recycling, parts of the product are recovered. Besides, it helps to educate consumers through legislation and directives about social responsibilities related to the environment, which are factors that increase the importance of RL. Therefore, every company that seeks to improve financial and environmental performance must pay attention to reverse logistics. For a more comprehensive performance, these models have become more comprehensive due to their interest in social, economic, and environmental aspects to reach a more complete picture of performance (Sarkis, Zhu, & Lai, 2019). According to Tseng *et al.* (2019), adopting a reverse logistics system in the supply chain is very important as it can enable the company to reuse and recycle materials and wastes to conserve the environment, and enhance return processing which is often necessary to maintain a certain level of customer satisfaction, enhance market growth by improving services, increasing customers and thus increasing revenues.

Through reverse logistics, companies increase the demand for the services of the parties specialized in return operations (Julianelli et al., 2020). So it is possible to achieve a competitive advantage to maintain the organization and satisfy the largest number of customers (Eshikumo, 2017).

Recycle management is the way toward changing waste materials into new materials and items. It is an option in contrast to regular waste transfer that can spare material and help lower ozone-depleting substance emanations (Wilson et al., 2022). Reusing can counteract the misuse of conceivably valuable materials and decrease the utilization of crisp crude materials, consequently lessening: vitality use, air contamination from burning, and water contamination (Richnák & Gubová, 2021). Reusing is a key segment of current waste decrease and is the third segment of the - diminish, reuse, and reuse squander pecking order. Along these lines reusing goes for natural manageability by substituting crude material contributions to and diverting waste yields out of the monetary system (Dutta et al., 2020).

Reverse logistics involves the process of planning, implementing, and controlling the efficient and cost-effective flow of raw materials, in-process inventory, finished goods, and related information from the point of consumption to the point of origin to recapture value or proper disposal. More precisely, reverse logistics is the process of moving goods from their typical final destination for the purpose of capturing value, or proper disposal (Kaumen, 2021). However, the potential neglect of the reverse logistics process can reduce the amount of value the firm may extract from the returned product, negatively impact customer relationships, and possibly increase reverse logistics costs due to inadequate management oversight of the process (Souzan, 2018).

Considering both upstream and downstream production operations, Guarnieri *et al.* (2020) suggested that reverse logistics can apply to different types of items such as used products, unused products, components, parts, and raw materials. On the other hand, Pekker (2017) categorized the returns into a number of groups based on the reasons for returning such as manufacturing returns, commercial returns, product recalls, warranty returns, service returns, end-of-use returns, and end-of-life returns.

Although reverse logistics deals with product returns, it presents one of the biggest operational challenges in the world of manufacturing since the activities involved are many and tend to be so varied. Some of these challenges include the problems of collecting returns, sorting the returned products; return abuse, customers having lost confidence in returns, credit approval and repair activities, lengthy processing cycle times of returns, and issues relating to environmental sustainability. So, it is important to perform reverse logistics efficiently and effectively to obtain the maximum benefits of its opportunities (Richnák & Gubová, 2021). Interestingly, effective reverse logistics is believed to result in direct benefits, including improved customer satisfaction, decreased resource investment levels, and reductions in storage and distribution costs.

2.3.2 Green Packaging

According to Gan *et al.* (2022), green packaging refers to any change made by a product manufacturer or service provider to lessen the environmental impact of the materials or processes involved in packaging the products and services during their deployment to the end-user. Implementing methods for green packaging include practices such as the use of biodegradable or recycled material, reducing the amount of material used for packing a product, or using refillable or reusable packaging containers (Hsueh, 2015).

According to Osmani and Zhang (2014) states that biodegradability refers to the ability of materials to break down and return to nature. In order for packaging products or materials to qualify as biodegradable, they must completely break down and decompose into natural elements within a short time after disposal typically a year or less. According to Dzwigol *et al.* (2021), the ability to biodegrade within landfills helps to reduce the buildup of waste, contributing to a safer, cleaner, and healthier environment. Biodegradable materials include corrugated cardboard and even some plastics

Packaging Reduction is a structure that doesn't utilize a lot of bundling material. Grasp effortlessness alongside innovativeness to concoct an alluring and moderate structure (Pietro, Huge-Brodin, Isaksson & Sweeney, 2012). Insignificant bundling

helps in decreasing material use, prompting diminished item cost. During transportation even devours less vitality to fabricate both the material and bundling and less fuel is utilized to transport things.

Reusable containers and boxes are shipping containers with strength suitable to withstand shipment, storage, and handling (Henryk et al., 2021). Shipping containers range from large reusable steel boxes used for intermodal shipments to the ubiquitous corrugated boxes which are designed to be moved from one mode of transport to another without unloading and reloading.

Manufacturing firms are under intense pressure to improve productivity and, at the same time, enhance environmental sustainability (Eltayeb, 2019). Adopting green energy, green processes, waste management, and minimization and reduction of pollution enables manufacturing enterprises to enhance performance objectives such as reducing cost, corporate image, and reduced discharge of hazardous substances to the environment. Green manufacturing practices help to optimize resources, improve reliability, and reduce pollution (Famiyeh et al., 2018). They also ensure waste reduction which translates to better consumption of resources through the use of fewer raw materials and maximizing energy efficiently. This has an effect on cost reduction and quality improvement (Sivapirakasam, Mathew & Surianayana, 2011).

Eshikumo (2017), and Orji and Wei (2016) carried out studies on green packaging and operational performance in a single manufacturing firm. The studies acknowledged that there is a need to expand research to cater to a number of industries since the results may not be generalizable to all industries. The initial capital required to purchase packaging equipment and machines is high, and most firms in developing countries are unable to upgrade the archaic methods used in production (Maruthia & Rashmi, 2015). Thus, the concern is reflected in the shift to green packaging and its ability to commensurate gains in cost reduction.

2.3.3 Logistics Innovation

Liu, Hu, Tong, and Zhu (2020) assert that logistics innovation seeks to reduce transport costs and improve delivery times through effective timetabling and route

management. In the context of green logistics, logistics innovation involves the development and implementation of innovative strategies, processes, and technologies to reduce the environmental impact of logistics operations while maintaining efficiency and effectiveness. Green logistics innovation, also known as sustainable or eco-friendly logistics innovation, involves the development and implementation of innovative strategies, practices, and technologies within the logistics and supply chain industry to reduce environmental impacts and promote sustainability (Khanra, Kaur, Joseph, Malik, & Dhir, 2022). The goal is to meet the demands of modern logistics while minimizing resource consumption, greenhouse gas emissions, and other adverse environmental effects. Organizations can ensure green logistics innovation through the adoption of alternative and cleaner fuels, such as electric, hydrogen, or natural gas-powered vehicles, to reduce emissions from transportation (Yingfei et al., 2022). The use of more eco-friendly transportation modes like rail and sea freight can also be part of the strategy. Integration of advanced route optimization software and GPS technologies to plan more fuel-efficient and eco-friendly delivery routes, minimizing mileage and emissions would be another integral approach of logistics innovation to enhance sustainable logistics processes.

According to Trivellas, Malindretos, and Reklitis (2020), organizations strengthen their green logistics innovation through the incorporation of fuel-efficient technologies, lightweight materials, aerodynamic designs, and emission-reduction systems into vehicles, such as hybrid and electric trucks. The companies also may consider the implementation of systems and tools to monitor and track carbon emissions throughout the supply chain, allowing for data-driven decisions and emissions reduction strategies (Dzwigol et al., 2021). Green logistics innovation is essential not only for reducing the environmental impact of supply chains but also for meeting the growing demand for eco-friendly products and services among consumers and stakeholders. It contributes to long-term business sustainability, enhances brand reputation, and helps organizations meet their environmental and corporate social responsibility goals.

Periodic re-evaluations and the development of alternative routes allow for timely changes to the transportation system in order to maintain efficiency. According to Beers (2014), a hybrid electric vehicle (HEV) is a type of vehicle that uses both an electric engine and a conventional internal combustion engine. The hybrid electric vehicles are considered to have better performance and fuel economy compared to a conventional one in terms of oil consumption is less than that of conventional vehicles Carbon-based emission is lower, which makes HEVs more eco-friendly (Chu, Park, & Kremer, 2020). This also helps conserve non-renewable resources like petroleum products. Maintenance costs are lower than those of conventional vehicles. With the electric motor taking charge of the engine during long travels, more mileage can be achieved with HEVs compared to other types of vehicles.

Qin *et al.* (2021) explain that biofuel is a fuel that is produced through contemporary biological processes, such as agriculture and anaerobic digestion, Biofuels can be derived directly from plants, or indirectly from agricultural, commercial, domestic, and industrial wastes (Hu et al., 2019). A natural gas vehicle (NGV) is an alternative fuel vehicle that uses compressed natural gas (CNG) or liquefied natural gas (LNG). Natural gas vehicles should be different from vehicles powered by LPG mainly propane, which is a fuel with a fundamentally different composition

2.3.4 Green Distribution Systems

Yingfei *et al.* (2022) define sustainable distribution practices as those that reduce carbon dioxide, are economically viable, and will bring about a better quality of life for the earth's future inhabitants. According to Dzwigol *et al.* (2021), green distribution practices range from changing the way distribution centres and vehicles are powered to implementing greater transparency regarding the environment and distribution practices. As environmental concerns increase, the integration of environmental issues into supply chain studies has become a thriving subfield

Fleet management system is a function that allows transportation companies to minimize the risks associated with vehicle investment, improve efficiency, and productivity, and reduce their overall transportation and staff costs (Vamshidhar, 2013). The fleet management system helps the company to remove any possibility

for drivers to misuse the company's fuel spend. Fleet management systems are of great use when it comes maintenance of your vehicle as they can enable you to set up custom maintenance alerts for regular tire or engine check-ups and low battery issues (Jinru et al., 2022).

Maintenance addresses the basic things that could cause a problem in vehicles if they are not properly maintained (Mudgal et al., 2017). The logistician or FM develops an inspection checklist to be used by all drivers as a guide. Each day, the first driver to use a vehicle will inspect the vehicle using the checklist. Periodically organize a test drive of each vehicle and report on its condition and also ensure that normal/regular service has been done for all vehicles;

Alexander and Martin (2013) indicate that a vehicle life-cycle assessment a master vehicle inspection and a servicing schedule are drawn up for one year a wall chart is recommended. This chart can show road tax renewal and annual inspection dates. Vehicle servicing is a compromise between inadequate attention, resulting in a progressive deterioration in condition and the ensuing serious consequences, and too much attention, which is costly and unnecessary.

According to Chen, Rojniruttikul, Kun, and Ullah (2022), one of the business activities with the greatest impact on the environment is the means of transport, especially through emissions, noise, and traffic congestion caused by road transport. Joint distribution and uniform delivery of materials can improve resource allocation, reduce the flow of materials, improve effectively, and ease traffic congestion conditions, especially on roads (de Souza, Kerber, Bouzon, & Rodriguez, 2022). Firms can use third-party logistics to improve the use and allocation of resources and avoid issues such as uneconomical transport operations, overdependence on their transport systems, and increased pollution. Firms can also deliver directly to the user site. Products can be transported together rather than in small batches using alternative fuel modes to reduce the number of trips and hence reduce emissions (Eltayeb, 2019).

According to Famiyeh, Adaku, Gyampha, Darko, and Teye (2018), factors like fuel, modes of transport, infrastructure, and operational practices are important factors to

consider in developing green transportation. Gan, Yao, and Huang (2022) discussed some trade-offs facing logistics. While waiting for freight to become a full load may lead to longer lead times, it is sometimes associated with cost savings and reduction of emissions to the environment. The selection of transportation modes is another factor. Different transport modes utilize different levels of energy and vary in efficiency. Others are also considered to be more flexible than others. Timing, speed, and flexibility are therefore very important factors to consider in choosing a transportation option. Another important trade-off is the career, the choice of career will depend on factors such as the nature of the products, whether they require special conditions, whether they have uniform shape, their size, etc.

2.3.5 Firm Characteristics

The firm characteristics have been defined as the distinct features that a firm possesses through which its internal operations and external capabilities are defined. These characteristics/features comprise key unique and distinct competencies and capabilities that tell the strength of the company towards meeting its obligations. In disciplines such as finance and accounting, firm characteristics have been considered in terms of the company size, the board composure and structure, as well as the age of the company. These characteristics as elaborated by Baryannis, Dani, and Antoniou (2019), often limit other disciplines from expounding on how the unique features of a company affect its effectiveness.

In the context of the supply chain, firm characteristics are the distinct features and setups in an organization that define its supply chain process and its effectiveness in embracing a well-aligned supply chain process for continued performance (Sauer & Seuring, 2018). These characteristics entail the different aspects and features that an organization will employ in deriving a framework for the supply chain process. These characteristics include material sourcing, supply chain agility, and supply chain risks. These characteristics of a firm are highly related to the supply chain process and can easily determine the extent to which the organization embraces green logistics to enhance its performance (Bosman, Hartman, & Sutherland, 2019).

Supply chain agility is the company's capacity to see changes, openings, and threats quickly, acquire necessary data rapidly, determine effectively how to act, quickly design those decisions, and adapt the variety of practices and operations as needed (Ayoub & Abdallah, 2019). If a company is agile as far as the supply chain is concerned, it can easily and efficiently embrace green logistics immediately after it realizes these are the new emerging drivers to organizational success. This will influence its performance in the long run and enable the firm to gain a competitive edge.

The other firm characteristic that this study focused on is material sourcing. This is the process of obtaining and tracking the materials that a company requires to produce the products and meet customer orders (Amoako-Gyampah, Boakye, Adaku, & Famiyeh, 2019). The process used in sourcing the materials for the company determines the ability to embrace key sustainable and green logistics practices. Once a company has the right suppliers who can deliver environmentally friendly materials, then it becomes viable to have green logistics in place.

Supply chain risks are other features/characteristics of a firm as far as supply chain management is concerned. The risks that a company is willing to take in the supply chain determine the ability of the firm to implement aspects such as green logistics (Balasubramanian, Shukla, Mangla, & Chanchaichujit, 2021). For a company to continue upholding certain strategies and ways of doing things, it must be assured that these strategies/changes will have a greater impact on its performance (Chu, Park & Kremer, 2020). The supply chain risks highly determine the ability of a company to try new things such as green logistics.

2.3.6 Firm Performance

The providers of fuel-efficient vehicles, electricity management systems, or other green Practices and technologies should make sure that the benefits of their services, such as reduced energy bills, are clearly stated and easy to understand (Govindan, Rajeev, Padhi & Pati, 2020). They should also ensure they are well suited to current logistics practices, such as making sure fuel-efficient vehicles have the same capabilities, such as load space, as older models.

Costs that are associated with projects are not just the costs of goods procured to complete the project (Sarkis, Zhu & Lai, 2018). The expense of the work might be one of the greatest costs of a task. The venture director must depend on time gauges to foresee the expense of the work to finish the task work. In addition, the cost of the equipment and materials needed to complete the project work must be factored into the project expenses thus cost management is vital for any project (Kourat, 2021).

It constitutes the management of project costs, how to predict them, account for them, and then, with a plan in hand, to control them. How costs are planned for and taken into consideration by the performing organization and how the size of the project affects the cost-estimating process is essential for any given project. According to Jawaad and Zafar (2020), quality is often used to satisfy the excellence of a product or service. If we have to define quality in a way that is useful in its management then we recognize the need to include in the assessment of quality the requirements of a customer quality. Quality has to be managed and it must involve everyone in the organization.

Time, with its related expenses, is essentially significant for every member in the development procedure including the bank, proprietor, modeler architects, contractual worker, and subcontractors, just as the individuals who give holding and protection inclusion. Powerful administration and the organization of the agreement time and change arrangements are fundamental to the evasion and moderation of broadened time and cost invades (Dovbischuk, 2021).

To upgrade the chances of a fruitful venture result, it is basic for members in the development procedure to have a fundamental comprehension of the critical way planning systems, the related booking details, and the product included, postponement and how it happens, the upsides and downsides of different timetable and defer philosophies being utilized by undertaking members and specialists and the primary standards for any effective calendar and postpone investigation philosophy (Thomson, 2019).

Time on the board for the opportune fruition of a venture can be costly, full of weight, and subject to much vulnerability. Some key variables having an effect on

fruitful undertaking conveyance incorporate the utilization of excessively complex booking details, development handling by the temporary worker, mistakes and oversights, contrasting site conditions, client changes, and deficient time expansions (Bag, Gupta & Luo, 2020). These can be exacerbated by reservation of rights for postponement, combined effects, and overlooking conceivable consummation date waivers.

As indicated by Nayal *et al.* (2022) there is still vulnerability and misconception about the remaining parts as far as what comprises satisfactory gauges of verification for understandable deferral and effects. While PCs and booking programming have significantly expanded the potential for upgraded planning capacities, they have additionally added to an assortment of client quality issues. The circumstance is regularly exacerbated by the disappointment of both the proprietor and contractual worker to perceive from the beginning the requirement for convenient goals of deferrals and staying up with the latest by reflecting real execution and postponements as they occur.

2.4 Empirical Review

There are a few studies illustrating the influence of green logistics management on the performance of building and construction manufacturing firms. Yusof and Abubakar (2012) observed that new firms in the building and construction manufacturing firms are faced with the challenge of meeting high-performance targets while using little resources to deliver effective and efficient buildings demanded by the proprietors.

2.4.1 Reverse Logistics and Firm Performance

A study by Ilgin and Gupta (2018) on Green Logistics: Improving the environmental sustainability of logistics, described the overlap between green logistics and green packaging. Specifically, the end-of-life product disposition activities that provide environmental-friendly outcomes such as recycling, a total of one hundred and thirty eight (138) papers both from sustainability and green Logistics literature published over a period of ten (10) years (2005-2014) were selected, shortlisted, categorized

and analysed. The study found out that there had been a consistent increase in the number of publications in green logistics management in the past decade, due to increased awareness and concern among companies and various stakeholders for the environmental protection and sustainability.

In a study by Saman, Seman, Zakuan, Jusoh, Shoki and Arif (2012) on impact of reverse logistics on hierarchical execution, there was proof that organizations that attention on manageability issues beat their partners in the long haul both in the securities exchange and bookkeeping execution. Saman *et al.,* (2012) in their investigation, gives a portion of the green logistics the executives rehearses that organizations may actualize to improve their presentation. These green logistics the board measurements and things have been founded on past writing that tended to different parts of green logistics the executives. A depiction of the green logistics the board practices and execution develops is given beneath: There is understanding inside the writing that natural administration rehearses in the association are a key to improve endeavor execution.

Gimenez and Tachizawa (2012) found that twenty five (25) percent of providers accomplished cost investment funds connected to the reusing and renovation programs which is one of the activities of green logistics. By driving out wasteful aspects from business procedures is great business practice and it decreases costs. For example, in the assembling area, presenting review and returns arrangement projects lessens vitality utilization and emanations related with generation, and builds efficiency meaning diminished expenses.

In a study in UK by Mentzer and Cook (2015), it was rstablished that clients discovered items from organizations which grasped switch logistics to be all the more engaging them. Eighty two (82) percent of the clients liked to purchase items from these organizations regardless of whether this alternative was increasingly costly. This implies by clients purchasing more it meant expanded deals for these organizations which affected on their bottom line directly.

Effective reverse logistics can result in direct benefits, including improved customer satisfaction, decreased inventory levels, and reductions in storage and distribution

costs (Eltayeb, 2019). Musau and Rucha (2021) noted that a well-managed reverse logistics program can result in savings in inventory carrying, transportation, and waste disposal costs as well as improving customer satisfaction. An, Razzaq, Nawaz, Noman, and Khan (2021) measured the performance of reverse logistics in terms of "improved customer relations, environmental regulatory compliance, cost containment, improved profitability, recovery of products, reduced inventory". Li and Zhang (2018) studied reverse logistics with both economic and service quality performances. They found that firms have been most effective in achieving compliance with mandatory environmental regulations and in using reverse logistics to improve customer relations. The respondents also indicated that their firms have been moderately effective in achieving reverse logistics objectives related to financial efficiencies, including recovery of assets, cost containment, improved profitability and reduced inventory investment.

2.4.2 Green Packaging Management and Firm Performance

Choi and Luo (2019) while analyzing the factors influencing the adoption of green practices within the logistics industry investigated green practices including the adoption of fuel efficient vehicles, electricity management systems and solar energy systems. The scholars analysed and surveyed three hundred and twenty two (322) logistics firms in China's Shanghai and Shenzhen areas.

The study also explored the roles of organizational factors such as the firms' size and the quality of their human-resources systems, for example. The business context, pressure from customers or the government and uncertainty in the business setting and technological factors were found to be among the key aspects influencing the adoption of green logistics (Govindan et al., 2020). Technological factors, such as the relative benefits of new technologies and innovations, how well suited they are to a firm's needs and how easy they are to understand and use, are a relatively new focus for research. Queuing models provide closed form results and approximations for certain congested service systems, although under assumptions that may differ substantially from actual operating conditions.

The studies further established that analysis of routing and assignment heuristics in idealized systems yields insight into asymptotic and worst-case performance, which may not be of direct relevance to actual operating conditions. Such conditions can be represented effectively in a computer simulation modelling framework, which provides the requisite flexibility of strategy representation and complex process emulation for the evaluation of dynamic green distribution systems. Carrier operations in response to demands for service can be examined over periods of varying duration, providing a test-bed for the design and performance evaluation of real-time operational strategies consisting of load acceptance, assignment, routing, and scheduling techniques. In addition to mean performance, evaluation through simulation readily can yield results regarding performance variability, reliability, robustness under stochastic events, and other measures.

2.4.3 Logistics innovation and Firm Performance

Ballot and Fontane (2010) did a study on reducing transportation Co_2 emissions through pooling of supply networks: perspectives from a case study in French retail chains. The study focused on the implementation of green purchasing for accomplishing green logistics management, by the use of supplier integration and supply disruption risk. A survey was conducted on two hundred and seventy two (272) respondents from supply and purchase managers and the findings supported the positive impact of integration with suppliers on adoption of environmental practices. However, the study showed a negative impact of supply disruption risk on the adoption of environmental practices.

The study found a diverse range of applications in manufacturing, real-time control systems, electronic commerce, network management, logistics innovation, information management, scientific computing, health care, and entertainment. The reason for the growing success of agent technology in these areas is that the inherent distribution allows for a natural decomposition of the system into multiple agents that interact with each other to achieve a desired global goal

Hakimi (2012) studied the environmental and economic issues arising from the pooling of SMEs' supply chains: case study of the food industry in Western France.

The logistics innovation is well suited to an agent-based approach because of its geographically distributed nature and its alternating busy-idle operating characteristics from the transportation management perspective, the most appealing characteristics of agents are autonomy, collaboration, and reactivity. Agents can operate without the direct intervention of humans or others. The study found that helps to implement automated traffic control and management systems agents are collaborative. In a multivalent system (MAS), agents communicate with other agents in a system to achieve a global goal.

2.4.4 Green Distribution Systems and Firm Performance

Daugherty (2011) in a review on logistics and supply chain literature found that dynamic green distribution systems enable carrier fleet operators to respond to changes in demand, driver and vehicle availability, and traffic network conditions. These systems are essential to take advantage of real-time information made possible by technological advances in location, communication, and geographic information systems, and to realize improvements in industry productivity and customer responsiveness.

The study established that the truckload carrier fleet operations, in which each assignment involves a vehicle moving a single load from the load origin to the load destination. The problem studied involves the management of a set of assets, namely a fleet of vehicles and a pool of drivers, to provide service to a set of customer load origins and destinations, distributed over a typically wide geographic region, on continued basis, over time. Ignoring the distinctions of company-owned and owner-operator fleets, it is assumed that the vehicle fleet (and driver pool) is under the operational control of a central authority, referred to as the dispatcher. The dynamic green distribution systems of interest are intended to support the decisions that must be made by the dispatcher, often under considerable time pressure

The study recommend that Shippers call a carrier requesting that a vehicle be available at a pickup location on a specific day and time to carry a load to a specific destination. The carrier (dispatcher) must decide quickly whether to accept a request

to move the load. Assuming the carrier has accepted the load, a vehicle and driver moves the load from its origin to its destination.

Mutisya, and Kinoti (2017) interrogated how GSC practices impacted chemical manufacturing firms performance in Nairobi. It adopted a descriptive approach, primary data, correlations and ordinary linear regressions to achieve the objective. Green packaging was specifically a significant determinant. It was encouraged among the firms. In a similar setting, Eltayeb, Zailani, and Ramayah (2017) interrogated whether GSCM practices including green eco-design practices impacted how firms performed. The study was conducted by mailing questionnaire to 551 ISO 14001 certified Malaysian manufacturing organizations. The study established that GSCM practices had influence on organizational performance outcome in which eco-design had a direct link to the firm's internal performance. Mwaura et al (2016) focused on Green distribution practices and how it would impact on the competitive advantage of manufacturing firms in the food sub sector. By cross sectional method, the major data was primary and with the use of various methods of analysis such as regressions, it was realized that indeed using green transportation means helped to cut costs and enhance competitive advantage. Zawadi (2018) linked green practices and whether they can influence performance but the focus was the context of automotive firms. The target was 230 companies. The study used questionnaires to capture primary data which revealed that green innovation and green practices such as green transportation has a positive outcome on the environmental performance. The adoption of green infrastructure helped the automotive practitioners to improve their green performance. Yan and Yazdanifard, (2014) established whether green marketing and storage was successful and how it related to the performance of firms. Through interviews, questionnaires and secondary information, the scholars realized that majority of the firms believed that such ideas of going green would be beneficial to the society and that those who implemented, performed better than those who did not. Muma, Nyaoga, Matwere and Nyambega (2014) conducted a study on green distribution using green storage and transportation. Various methods were used and the data was mixed, both secondary and primary. Correlations were conducted and a significant effect was established. At the end, the study recommended practice of the same to enhance more results.

2.4.5 Firm Characteristics

Gligor (2016) investigated the importance of supply chain agility in determining supply chain agility. The findings demonstrated a negative relationship between environmental unpredictability and Supply Chain agility as one of the firm characteristics, indicating that aligning a product's supply and demand parameters with its supply chain architecture becomes more difficult as environmental uncertainty increases. However, by introducing supply chain agility as a competency, the business is able to offset the unfavorable association between environmental unpredictability and Supply Chain agility, allowing it to improve its performance.

Li, Wu, Holsapple, and Goldsby (2017) conducted an empirical study of corporate financial performance along aspects of supply chain resilience and awareness. The study looked into supply chain alertness as a way to improve a company's financial results. This study creates measures for preparation, alertness, and agility based on survey data from 77 companies. The results reveal that alertness significantly impacts a firm’s financial performance. It is also discovered that proactive resilience capabilities such as supply chain preparedness have a greater impact on a firm's financial performance than reactive resilience capabilities such as alertness and agility, implying that companies should focus more on proactive approaches to supply chain resilience.

In a study on supply chain agility as a method for securing performance for Chinese firms, Yang (2014) discovered significant correlations between supply chain agility and performance. Cost efficiency has a significant mediating effect on a manufacturer's supply chain agility and performance, according to the research.

A study focusing on achieving competitive advantage through supply chain agility under uncertainty by Wu, Tseng, Chiu and Lim (2017) indicates that accessibility and flexibility significantly impacts process integration, information integration and strategic alliances for eco-design in supply chain. Then, process integration has the greatest impact on building a competitive advantage through innovation as well as considerably increasing business performance.

DeGroote and Marx (2013) conducted an empirical assessment to determine the impact supply chain risks as a characteristic of a firm on company performance. Using secondary data, the study looked into the impact of business' ability to management and mitigate risks associated with supply chain on firm performance. It was discovered that boosting the sufficiency, accuracy, accessibility, and timeliness of risks assessments in supply chain processes and managing these risks effectively enabled the companies to focus on essential parameters that stir their performance (Zhao, Mashruwala, Pandit, & Balakrishnan, 2019). It also established that through focus on management of supply chain risks and managing effective relationship with suppliers, the companies improves the supply chain's ability to respond to market changes by lowering the cost of generating and implementing synchronized plans to respond to market changes across the supply chain, as well as enhancing the quality and timeliness of these plans.

2.5 Critique of the Existing Literature

Logistics flexibility, as a response to uncertainty, is still little understood in terms of its economic impact let alone for its effect on green logistics. Therefore, the impact of transport providers' interactions and customer-transport providers' interactions should be established, since it could represent a very significant source of transport uncertainty, and as a consequence have a considerable impact on green logistics performance

Zulfiya (2017) researched the connection between green Logistics the board, partner weight, and money related execution. The investigation estimated the autonomous factors, which notwithstanding: economical inventory network the executives and asset reliance hypothesis; maintainable production network the board and partner weight; and supportable store network the executives and corporate manageability performance against financial performance as the dependent variable. Since this study focused on short-term financial performance of organizations, other studies should be carried out on long-term financial performance. The studies should be about focusing on the continued performance of the corporation and the environment (Lee, Kim, & Choi, 2012).

Olorunniwo and Li (2016) tested relative power and interdependence concepts by use of Kraljic portfolio matrix to explain purchasing capability, which would in turn help in pursuing economic, social and environmental objectives in combination- the triple bottom line- along the supply chain. However, Kraljic portfolio matrix is thought to be too simplistic in its analysis of purchasing context and its recommended procurement strategies to deal with the complexity of organisational decision-making. In addition, authors point to difficulties in deciding the operational meaning of purchase importance and supply complexity.

A study conducted by Murutu (2016) on sustainable procurement strategies and supply chain performance of five star hotels in Nairobi County, Kenya, found that the adoption of sustainable procurement strategies has been attributed to two factors: to respond to increased activism from NGOs and social media; and to promote environmental responsibility. However, little attention has been given to the role of reverse logistics in green supply chain management in building and construction manufacturing firms in Kenya.

Green procurement is tied in with taking social and natural elements into thought nearby monetary factors in settling on acquisition choices. It includes looking past the customary monetary parameters and settling on choices dependent overall life cost, the related dangers, proportions of progress and suggestions for society and the earth. Settling on choices thusly requires setting acquisition into the more extensive vital setting including an incentive for cash, execution the executives, corporate and network needs (CIPS 2014).

This view is not quite the same as Mudgal, Shankar, Talib, and Raj (2017) who recommended that supportable acquirement is synonymous to green inventory network the board and characterized green store network the executives as mix of natural suspecting into production network the executives. This investigation just centered around ecological measurement while financial and social measurements were forgotten.

2.6 Research Gap

The reviewed studies on green logistics and firm performance have shown mixed results on the role played by green logistics in enhancing firm performance. The available studies have shown varied results and this justified the need for this study. Mentzer and Cook (2015) for instance addressed the reverse logistics and how it influences firm performance but the study focused on industries in United Kingdom, which is a developed country and the context of reverse logistics may not be replicated in a Kenyan perspective. There has been little research on the impact of green logistics on firm performance. In particular, the impact of fundamental green logistics needs to be addressed. Where the body of knowledge on supply chains vis-à-vis transport exists, there has been a lack of explicit determination of the impact uncertainty, such as demand amplification, on transport performance, using either economic and/or environmental criteria. The impact of decision making, whether at strategic, planning or operational levels, needs due consideration with respect to balanced, or multi-objective, performance metrics that take environmental issues into account, in addition to economic costs and customer service levels.

A study by Gil-Saura and Ruiz-Molina (2011) observes the green logistics as a core constituent of the supply chain is essential in stirring firm performance. However, their study does not bring out the conceptualization of green logistics thus being too general for more specified conclusions and recommendations. The current study conceptualized green logistics in terms of reverse logistics, green packaging, logistics innovation and green distribution systems. Elsewhere, a study by McKinnon and Whiteing (2010) does not bring out the aspect of green logistics in a manufacturing industry perspective, thus the study leaves a contextual gap which the current study sought to fill.

2.7 Summary of Literature Reviewed

Logistics is seen as a key part to add to feasible improvement addressing what's to come ages' needs regarding low ozone harming substance discharges in a socially and financially mindful way. Green logistics includes all endeavors to diminish the biological effect of people groups' versatility, traffic frameworks and of transport in

territorial and worldwide supply chains including the turn-around stream of items and materials.

The activity of transport causes a high rate of negative effects on the environment, such as pollution, noise or congestion. Thus, an efficient use of transport resources, which aimed at the selection of vehicle types, the scheduling of deliveries, consolidation of freight flows and selection of type of fuel, among others, can help to mitigate these problems. Nevertheless, these decisions also represent company strategic responses to a set of factors such as external influences, company demographics size and nature of business, and internal policy and available technology.

On one hand, in the fuel-based approach, fuel consumption is multiplied by the Co_2 emission factor for each fuel type. On the other hand, in the distance-based method, emissions can be calculated by using distance-based emission factors. The fuel-based emission factor is developed based on the fuel's heat content, the fraction of carbon in the fuel that is oxidized, and the carbon content coefficient. Distance-based approach can be used when vehicle activity data is in form of distance travelled but fuel economy factors are not available. The decision on which approach to take depends mainly on data availability.

Warehousing of products also involves environmental impact. Although such an impact is not so obvious for production transport, the inventory carrying cost plays a great role in design of supply chain, and the most concentrative the storage is, the less the storage cost becomes .Warehousing and transport are two primary and important links of logistics, and reasonably planning warehousing management, reducing warehousing time of goods and improving turnover rate of freights are the effective means for an enterprise to improve its logistic efficiency and customer service level.

Environmental impact of most products is determined by the product designer. The environmental impact is generally divided into two types: general and specific. General activity is a reliable general standard and the best method for the environment, e.g. minimum utilization of energy resources; the specific activity

involves individual product, e.g. selection of special materials. As environmental problem is more and more prominent, DFE (design for environment) has become an important measure in advancing environmental friendliness of a product and solving pollution in the production.

The customers of traditional products may focus on quality, price and personal demand, but the product designers now not only try to meet primary demands of these customers but also improve environmental friendliness of the product. Such environmental friendliness is embodied in the whole design and manufacturing of the product. From the perspective of a manufacturing enterprise, a good design of green products can sufficiently utilize present resources, such as using economical and environmentally friendly raw materials, reasonably utilizing production equipment, considering usage of packaging materials and circulating development and recycling of products and so forth. In order to realize business goals and tasks, a company has to respond to increasing consumption demand for ‘‘green’’ products and an excellent corporation should observe environmental laws and regulations and implement the environmental responsibility plan.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter outlines the research methodology which offers an explanation into what type of research this study is all about. It also defines the population of the study and the specific sampling techniques used, methods of data collection and data analysis. This chapter is organized along the following subsection: research design, target population, sample size and sampling procedures, research instruments, data collection procedures and data design and data analysis.

3.2 Research Philosophy

There are three research philosophies that dominate the business and management research field. They include the paradigms of positivism, realism and interpretivist. This study adopted a positivism philosophy. Positivism clings to the view that solitary true learning increased through perception, including estimation is reliable (Busetto, Wick, & Gumbinger, 2020). According to Snyder (2019), a positivism philosophy uses brief, clear, concise discussion and does not use a descriptive story from human feelings or subjective interpretation. It does not allow any interpretation because of the value-free reason.

According to Dźwigoł and Dźwigoł (2018), as a research philosophy, positivism is as per the empiricist see that learning originates from human experience. It has an atomistic, ontological perspective on the world as containing discrete, discernible components and occasions that connect in a noticeable, decided and customary way. The positivism paradigm uses a quantitative approach which involves data collection and the analysis of numerical data (Rodriguez & Smith, 2018). It relies on numerical evidence to draw the results or to test hypotheses. The advantage of the paradigm in a quantitative research is that it is possible to measure the reactions of a large number of subjects as representative of some wider population to a limited set of questions, which facilitates comparison and statistical aggregation of the data.

3.2.1 Research Design

A research design is the game plan of conditions for accumulation and investigation of information in a way that expects to join pertinence to the exploration reason with economy in strategy. It is an outline for the gathering, estimation and investigation of information and contains an outline of what the study will do from writing the hypothesis and its operational implications to the final analysis of data (Kothari, 2014). The study used a cross-sectional research design. This design incorporates collection and analysis of cross-sectional data which according to Kothari (2014); enables intensive collection of in-depth data for the purpose of responding to the research questions. According to Browne, Coffey, Cook, Meiklejohn, and Palermo (2019), cross-sectional research design helps in assessing multiple characteristics of the population under a study, thus enabling better understanding of research problem. In a study with the hypotheses testing where several variables are to be compared, a cross-sectional research design is appropriate to use in that it enables in-depth comparison of the relationship between multiple variables (Mishra & Alok, 2022). The cross-sectional research design was therefore adopted to enable the use of a linear and multiple regression model to assess the relationship between green logistics and performance building and construction manufacturing firms in Kenya.

3.3 Target Population

The target population for the study comprised of the building and construction manufacturing firms registered with under the Kenyan Association of Manufacturers. According to Patron (2012) a population refers to the entire group of persons or elements that have at least one thing in common. As of December 2020, there were 54 building and construction manufacturing firms registered under KAM. The firms deal with manufacture of building and construction materials and accessories including cement, glassware, steel and iron materials, precast and ready-mix concrete, and quarry construction and building materials. The study focused on the employees from these companies as the unit of observation. Specifically, employees from key departments that deal with logistics processes and other related activities were surveyed. These departments include: production department, quality assurance

department, procurement and supply chain department, transport and logistics department and administration department.

3.4 Sampling Frame

This frame defines a study's population of interest. A sampling frame is a list of all items where a representative sample is drawn for the purpose of research (Hayes & Scharkow, 2013). In this study, the sampling frame was the 54 building and construction manufacturing firms in Kenya, as enlisted by the Kenya Association of Manufacturers. The unit of observation was the employees from the 54 building and construction manufacturing firms companies. According to KAM, the firms have employed over 6,000 employees. However, there are 900 senior management and administrative staff in the sector. These were the target population for the study from which the target population was obtained.

3.5 Sampling Technique and Sample Size

Pandey and Pandey (2021) consider sampling as a process that involves identifying an appropriate number of respondents from a population to be surveyed. The study used a census to identify the units of analysis. This is where all the 54 building and construction manufacturing companies were included in the study. However, as indicated by Dźwigoł and Dźwigoł (2018), there is need for identifying the key individuals who ought to be surveyed or observed out of the identified unit of analysis. These are the units of observation, who in this study are the employees in the 54 manufacturing companies. Therefore, the study used a purposive sampling to identify the units of observation. According to Kernelo (2016), purposive sampling is a sampling technique in which the researcher goes for the respondents who they deem to be more informed on the subject matter of the study, hence providing the accurate information required in the study.

In this study, the heads of the key departments involved the logistics processes and related activities were purposively selected. These departments include: production department, quality assurance department, procurement and supply chain department, transport and logistics department and administration department. This implies that

in every firm, 5 respondents were drawn, making the sample size to be 270 respondents which is 30% of the target population (900). According to Creswell (2013), a sample size of 30% and above of the study population is an adequate representation in a study. Table 3.1 shows the distribution of the sample size.

Table 3.1: Sample Size Distribution

Departments	Sample Size	Percentage
Production Department	54	20%
Quality Assurance Department	54	20%
Procurement and Supply Chain Department	54	20%
Transport and Logistics Department	54	20%
Administration Department	54	20%
Total	**270**	**100%**

3.6 Data Collection Instruments

This study used primary data which was collected using a structured questionnaire. Data collection instruments are the tools used to collect data from persons of interest. The major tools include: questionnaire, interviews, observation, focus groups, experiments and case study. According to Wan (2022), data collection is the means by which information is obtained from the selected subject of an investigation. Both open-ended questions and closed-ended questions were used in the questionnaire. The questionnaire was deemed appropriate due to its ability to collect a wide range of data and cover a high number of respondents within a reasonable period of time. The questionnaire also gives the respondents time to respond to the questions without interruptions and has minimal influence from the researcher.

3.7 Data Collection Procedures

This study utilized primary data collection collected through a questionnaire. The questionnaire was administered both manually (physically) and through online means. The researcher contracted field-work assistants who were responsible for dropping the questionnaires to the respondents and make follow-ups to pick them once the respondents had finished filling-up. The online questionnaire was uploaded

in Google-forms and sent to specific respondents who had limited access to the physical questionnaire. They were asked to fill and send it back for analysis. Extensive follow-ups and continued contact of the respondents ensured they timely, adequately and effectively responded to the questions, thus enhancing the response rate of the study.

3.8 Pilot Study

Before the actual study, it is crucial to conduct a pilot study. Kothari (2014) argued that piloting provides opportunity for studies to test their confidence in identifying shortcomings that may affect the actual collection of useful data. The pilot study evaluates the effectiveness and validity of the instruments (Harris, Holyfield, Jones, Ellis, & Neal, 2019). The purpose is not to collect data but to refine the process and instrument. It provides an opportunity to detect and remedy potential problems such as questions that respondents don't understand; questions that combine two or more issues in a single question (Rodriguez & Smith, 2018). According to Young (2014), a sample size of between 15 and 25 respondents is adequate for pilot test in an academic study or at least 10% of the sample size. The study used 10% of sample size for piloting which is 27 respondents. These respondents were picked from the companies not sampled in the study.

3.8.1 Reliability of Research Instruments

According to Wan (2022), the reliability of a research instrument is the variance by which an instrument (questionnaire or interview), produces results as to the required results. An instrument is, therefore, reliable if the results out of the pilot study near the expected results. Reliability is defined as the consistency in an object and its comparability with the required standards. In this regard, reliability can be tested by identifying if the response on a particular question by one respondent will be similar to the response by another respondent on the same question. Cronbach's Alpha (α) was used to test for the reliability. While Cronbach's alpha is a coefficient ranging from 0 – 1, the study used a threshold of 0.70, where the questions with an α were deemed reliable.

3.8.2 Validity of Research Instruments

Validity is the degree to which an exploration instrument performs what it is intended to do. Legitimacy in this way has to do with how precisely; the information got in the examination speak to the factors of the investigation (Pandey & Pandey, 2021). Validity of the instrument begins at the design stage. To enhance the content validity, expert opinions from Professionals in this field and the supervisor was sought. Their comments were incorporated to improve the instrument. The face validity was enhanced by the instruments review. According to Browne *et al.* (2019), face validity is concerned with the way the instrument appears to the participant. i.e. an instrument may appear insultingly simplistic, far too difficult, or too repetitive. Such flaws affect the respondent's willingness to complete the questionnaire. In the case of construct validity, a five point Likert scale was used. The Likert scale is where respondents give their opinions or views that will enable the researcher collect data.

3.9 Data Analysis and Presentation

The study mainly relied on both qualitative and quantitative data analysis. Data analysis is performed with the purpose of summarizing them in such a way that they answer related research questions. Qualitative approaches were used to gain a better understanding and possibly enable a better and more insightful interpretation of the results from the quantitative study. Descriptive statistics such as frequency distributions and percentages were used to summarize basic features of the data in the study. Inferential statistics were used in computation of: the confidence levels to be applied; Normality test, test for heteroscedasticity, correlation matrix; and the multiple regression process for testing of the hypothesis (Dźwigoł & Dźwigoł, 2018). The Statistical Package for Social Sciences (SPSS) version 26.0 was used to perform the analysis of quantitative data.

A regression model was developed to present the relationship, where every value of independent variable is associated with a value of the dependent variable (Rodriguez & Smith, 2018). The 5% level of significance was compared with the p-value and significance of the predictor variable(s) concluded if the latter is less than 5%. P-

value is the exact lowest probability of rejecting the null hypothesis when it is true (Araz et al., 2020).

The multiple regression model was:

$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$

Where:

Y = Performance of Building and construction manufacturing firms

A is the y-intercept or model coefficient;

$\beta_1 - \beta_4$ = the coefficients of the independent variables;

X_1 = Reverse Logistics Management,

X_2 = Green packaging

X_3 = Logistics innovation

X_4 = Green Distribution Systems

ε is the error term established from heteroscedasticity test;

3.9.1 Overall Independent Variable Regression model

In order to establish the combined influence of the independent variables on the dependent variable, a linear model was used. Therefore, the model for this study was consolidated as:

$Y = \beta o + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$ ……Equation (i)

3.9.2 Moderating Variable Regression Model

The moderating variable in this study will be firm characteristics. Aguinis and Gottfredson, (2010) argue that estimating interaction effects using moderated

multiple regression usually consists of creating an Ordinary Least Squares (OLS) model and a Moderated Multiple Regression (MMR) model equations involving scores for a continuous predictor variable Y, scores for a predictor variable X, and scores for a second predictor variable Z hypothesized to be a moderator. To determine the presence of moderating effect, the OLS model will be then compared with the MMR model. On equation (ii), the Ordinary Least Squares (OLS) regression equation model predicting Y scores from the first-order effects of X and Z observed scores. In this case, Z (the moderator) is introduced as an independent variable. This is meant to establish whether the moderating variable could shift grounds and have any direct relationship with the dependent variable. The model is of the form:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + Z + \varepsilon$$ …… Equation (ii)

On equation (iii), the Moderated Multiple Regression (MMR) model is formed by creating a new set of scores for the two predictors (i.e. X, Z), and including it as a third term in the equation, which yields the following model:

$$Y = \beta_0 + \beta_1 X_1 * Z + \beta_2 X_2 * Z + \beta_3 X_3 * Z + \beta_4 X_4 * Z + \varepsilon$$ …… Equation (iii)

3.10 Diagnostic Tests

Diagnostic tests were carried out prior to running the regression model analysis. This is done to confirm whether the data collection instruments are reliable and valid and whether the set questions are aimed at addressing the set of justice. Diagnostic tests included tests of normality, test for multicollinearity, test of heteroscedasticity and autocorrelation test.

3.10.1 Normality Test

In regression model analysis, it is assumed that the data is normally distributed such that the sample from which the data is obtained from has been appropriately identified. If the model is run with a data that is not normally distributed, the results

will therefore be unreliable and untrue. To check for normality this study the normality will be tested using the Shapiro-Wilk and Kolmogorov-Smirnov Tests for defining Skewness and Kurtosis to check for symmetry and peakedness of the distribution thereof. The values for asymmetry and kurtosis between -2 and +2 are considered acceptable in order to prove normal univariate distribution (Kothari, 2014).

3.10.2 Test for Multicollinearity

According to Ghauri, Grønhaug, and Strange (2020), multicollinearity test is an evaluation of the level of correlation of the independent variables. In the present study, the Variance Inflation Factor (VIF) will be used. Where VIF= 1/ (1-R^2); R^2= Coefficient of Determination. If any of the VIF is greater than 10, as a rule of thumb, multicollinearity is significantly large and consequently they are poorly estimated. Hence the variable will be dropped from the model. If 5<VIF<10, then multicollinearity is moderate, if 5<VIF, then multicollinearity is insignificant.

3.10.3 Test for Heteroscedasticity

Heteroscedasticity, which is a violation of homoscedasticity, makes it problematic to measure the true forecast errors' standard deviation, and too narrow or too wide are usually the result. Homoscedasticity assumes that there is constant variance of the errors. A plot of residuals versus predicted values were used to check for the convergence.

3.10.4 Test for Autocorrelation

Rodriguez and Smith (2018) define autocorrelation as the association of a time series with its future and own past values. The study used Durbin Watson measure to check on the existence of autocorrelation. Durbin Watson varies between 0 and 4 such that if d=2 then there is no problem of autocorrelation, if d< 2 then there is positive/persistent autocorrelation and if d>2 then the exits a negative autocorrelation.

Table 3:2: Summary of the Data Analysis

Variable	How Constructs will be Measured	Statistical Model	Main Tools of Analysis
To establish the effect of Reverse Logistics Management on the performance of the Building and construction manufacturing firms In Kenya	Returns Management Policy Recycle Management Recall programme	$Y=\beta_0+\beta_1X_1+\varepsilon$ Where: Y= Performance of Building and construction manufacturing firms β_0=Constant β_1 = Coefficient of X_1 X_1 = Reverse Logistics Management ε =Error term	Regression and Correlation Analysis; If P value is ≤0.05 research hypothesis is true
To determine the effect of Green packaging framework on the performance of the Building and construction manufacturing firms In Kenya	Biodegradable Packaging. Packaging Reduction Reusable Containers & Boxes	$Y = \alpha + \beta 2X2 + \varepsilon$ Where: Y= Performance of Building and construction manufacturing firms β0=constant β2= Coefficient of X2 X2 = Green packaging ε =Error term	Regression and Correlation Analysis; If P value is ≤0.05 research hypothesis is true
To assess the effect of Logistics innovation on the performance of the Building and construction manufacturing firms In Kenya	Techno-based logistics R&D Innovative designs	$Y = \alpha + \beta_3X_3 + \varepsilon$ Where: Y= Performance of Building and construction manufacturing firms β_0=constant β_3= Coefficient of X_3 X_3 = Logistics innovation ε =Error term	Regression and Correlation Analysis; If P value is ≤0.05 research hypothesis is true
To examine the effect of Green Distribution Systems on performance of the Building and construction manufacturing firms in Kenya.	Vehicle Loadings Multi-stage distribution Decentralized production	$Y = \alpha + \beta_4X_4 + \varepsilon$ Where: Y= Performance of Building and construction manufacturing firms β_0=constant β_4= Coefficient of X_4 X_4 = Green Distribution Systems ε =Error term	Regression and Correlation Analysis; If P value is ≤0.05 research hypothesis is true
To analyze the moderating effect of Firm Characteristics on Performance of the Building and construction manufacturing firms in Kenya	Material Sourcing Supply chain agility Supply chain risks	$Y = \alpha + \beta_4X_4 + \varepsilon$ Where: Y= Performance of Building and construction manufacturing firms β_0=constant β_4= Coefficient of X_5 X_4 = Firm Characteristics ε =Error term	Regression and Correlation Analysis; If P value is ≤0.05 research hypothesis is true

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSIONS

4.1 Introduction

The study aimed at establishing the influence of green logistics on the performance of building and construction manufacturing firms in Kenya. This chapter presents the findings of the study based on the data collected as outlined in the methodology. The chapter highlights the response rate of the study, the results of the pilot study and the analysis of the demographic data. The main findings will be captured using both descriptive and inferential statistics.

4.2 Response Rate

The study had a sample of targeted 270 respondents drawn from building and construction manufacturing firms in Kenya. A total of 270 questionnaires were issued to the respondents in their areas of work and others through online means. Out of the 270 issued questionnaires, 228 were dully filled and returned back for analysis. This represented a response rate of 84.4%. According to Saunders (2015), when a response in a social science study with a sample size of over 100 respondents is more than 60%, it means the study has obtained adequate number of respondents to draw conclusions and represent the views of the sampled population. Kothari (2014) and Creswell (2016) also applaud a response of above 60% and 70% respectively as an adequate representation of the study population and sample. The response of 84.4% was therefore concluded to be adequate in this study. Table 4.1 summarizes the response rate of the study.

Table 4.1: Response Rate for the Study

Sample Size		**Response**		**None-response**		**Verdict**
Frequency	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**	The response meets the 60% threshold
270	100%	228	84.4%	42	15.6%	

4.3 Results of the Pilot Study

The study used 10% of the sample size (10% of 270) equivalent to 27 respondents to carry out the pilot test. This helped in identifying any ambiguous and unclear questions. Feedback received was used to fine tune the questionnaire before embarking on the actual data collection.

4.3.1 Reliability of the Research Instruments

Reliability is the extent to which data collection techniques or analysis procedures will yield consistent findings (accuracy and precision of a measurement procedure) (Creswell, 2014). It establishes if the measure is able to yield the same results on other occasions, similar observations are reached by other observers and transparency in the raw data. Reliability will be used to check the internal consistency of the data measuring instrument.

Cronbach's coefficient alpha which determines the internal consistency or the average correlation of items within the test were used for collection of data to test the findings. Alpha values range from zero - no internal consistency to one - complete internal consistency. Patel and Patel (2019) suggested that if values were too low, either too few items were used or the items had little in common. Lim (2013) posits that reliability of over 0.70 is considered acceptable. This was the threshold applied in this study. The reliability results are as shown in Table 4.2.

On the first objective of the study which was to establish the influence of reverse logistics on the performance of building and construction manufacturing firms in Kenya, the reliability results are as shown. As the findings portray, the variable had a Cronbach’s alpha of 0.839 with nine (9) questions. This was concluded to be reliable since the coefficient met the threshold of 0.70. The study sought to find out the influence of green packaging on the performance of building and construction manufacturing firms in Kenya. As the reliability results portray, the Cronbach’s Alpha for the variable was 0.845. This is higher than the standard Cronbach’s Alpha of 0.70 hence the nine (9) items under green packaging were deemed to be reliable.

The study sought to establish the influence of logistics innovation on performance of building and construction manufacturing firms in Kenya. The reliability results revealed that the nine (9) items under logistics innovation had a Cronbach's Alpha coefficient of 0.827. This being higher than the standard Cronbach's Alpha of 0.70, the questions under logistics innovation in the instrument was ruled to be reliable. The fourth objective of the study was to establish the influence of green distribution systems on performance of building and construction manufacturing firms in Kenya. As the results indicate, the Cronbach's Alpha for the variable was 0.759. The variable had 9 questions. The Cronbach's Alpha was higher than the standard coefficient of 0.70 hence the conclusion that the items under green distribution systems were reliable.

The study sought to establish the moderating effect of firm characteristics on the relationship between green logistics and performance of building and construction manufacturing firms in Kenya. The reliability results revealed that the Cronbach's alpha for the variable was 0.748 with a total of nine questions. This was deemed reliable since it met the threshold of 0.70. The study sought to establish the performance of building and construction manufacturing firms in Kenya. As the results portray, the Cronbach's Alpha for the variable was 0.778 with nine (9) items. This was higher than the standard Cronbach's Alpha of 0.70 hence the instrument was deemed reliable and internally consistence to collect the primary data for the study.

Table 4.2: Reliability Results

Variable	Number of Items	Cronbach's Alpha
Reverse logistics	9	0.839
Green packaging	11	0.845
Logistics innovation	9	0.827
Green distribution systems	9	0.759
Firm Characteristics	9	0.748
Firm Performance	9	0.778

4.3.2 Validity of the Research Instrument

Validity is the ability of the research instrument to measure what it is supposed to measure (Privitera, 2022). There are several types of validity tests that can be conducted on an instrument namely construct, content, and face validity (Trochim, Donnelly & Arora, 2016). Content validity can be determined by pre-testing the questionnaire and using a Likert's. Face validity was ensured using experts' opinions.

Content validity was assessed through review and verification of the existing literature for the items contained in the questionnaire. The content validity was also tested through pilot testing the questionnaire in selected respondents to establish if the respondents can answer the questions without difficulty. The feedback received has been used to fine tune the questionnaire before embarking on the actual data collection.

Construct validity was tested by use of factor analysis using Principal Component Analysis (PCA). The items were run into the SPSS to come up with the extractions and the findings are as herein shown. According to Merlirt (2014), extractions of more than 0.40 are considered valid for the constructs to be adopted in the questionnaire. On the other hand, Colliver, Conlee, and Verhulst (2012) allude that for a variable to meet the construct validity, the average score for the extractions of its constructs (questions/factors) should be above 0.60. The average score for the extractions under each of the variables was established, and the results are as shown in Table 4.3. As the results portray, reverse logistics with 9 factors/items had an average factor loadings of 0.759 which is higher than the 0.60 threshold. Green packaging with 11 items had an average extraction score of 0.810>0.60, logistics innovation had 0.809>0.60, green distribution had a score of 0.836>0.60, firm characteristics with 9 items had an average extraction of 0.841>0.60, while firm performance with 9 items had an average score of 0.725>0.60. The instrument was therefore concluded to have met the construct validity.

Table 4.3: Average Extractions for Construct Validity

Variable	Number of Factors	Average Extraction Score	Decision
Reverse Logistics	9	0.759	Valid
Green Packaging	11	0.810	Valid
Logistics innovation	9	0.809	Valid
Green Distribution Systems	9	0.836	Valid
Firm Characteristics	9	0.841	Valid
Firm Performance	9	0.725	Valid

4.4 Results of the Demographic Information

The study sought to obtain background information from the respondents that were relevant to the study, and to give more insight to the study based on the respondents' characteristics. According to Salkind (2010), demographic information in a research is necessary for the determination of whether the individuals in a particular study are a representative sample of the target population for generalization purposes. The main demographic information sought in this study included; number of years the respondents had worked, the position held, number of years the firms had been operational, and number of products/services offered by the firms.

4.4.1 Number of Years Served

The study sought to establish the number of years that the respondents had worked in their respective organizations. The findings as shown in Figure 4.1 revealed that most of the respondents (49.6%) had been in their respective firms for less than five years, 23.2% had worked in their respective organizations for between 5 and 10 years, while 13.6% of the respondents had been in their respective firms for a period of more than 15 years. The findings imply that the retention is relatively low, an indication that the firms may not be doing well, thus having a high employee turnover.

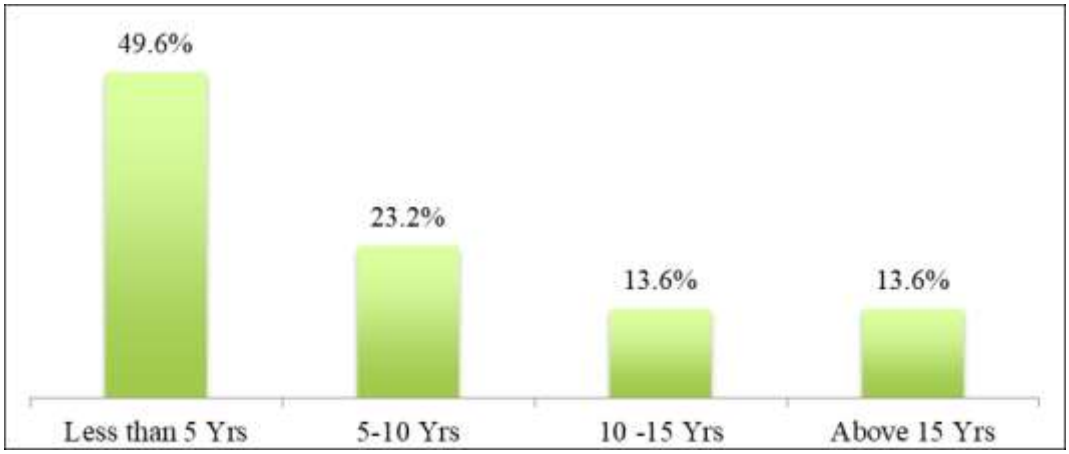

Figure 4.1: Distribution of the Respondents by the Period of Service

4.4.2 Position Held in the Firm

The study sought to establish the distribution of the respondents by their positions held in their respective firms. The findings as shown in Figure 4.2 revealed that 43.4% of the respondents were drawn from the procurement department as the procurement managers, 39.9% were heads of departments, while 16.7% of the respondents were supply chain personnel. The findings imply that the key decision makers in logistics and procurement, who are expected to be more informed in matters green logistics took part in the study.

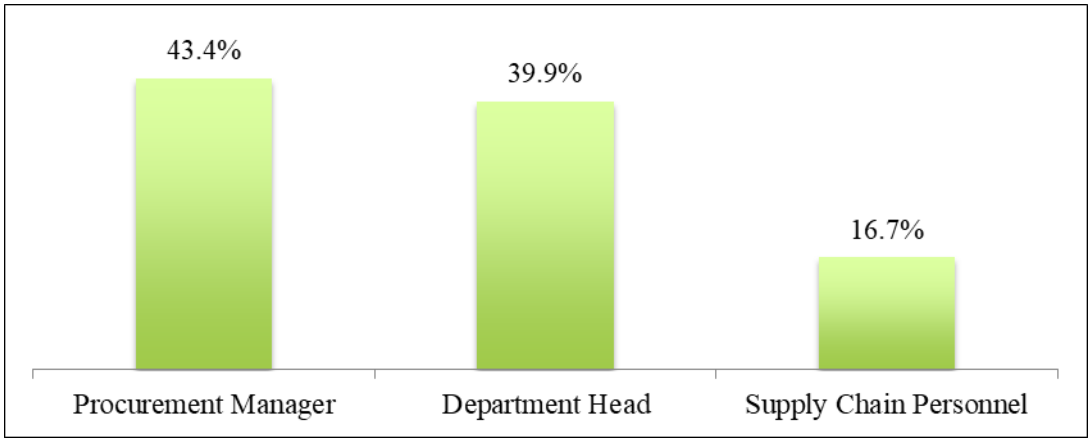

Figure 4.2: Distribution of the Respondents by Position Held

4.4.3 Period of Organizations' Operation in Kenya

The study sought to find out the period in years that the organizations had been operating in Kenya. The findings as shown in Figure 4.3 revealed that 33.3% of the firms had been operating for less than 5 years, 28.9% of the firms had been operational for a period of between 6 and 9 years, 15.4% of the surveyed firms had been operating in the country for a period of between 10 and 15 years while 22.4% of the firms had been operating in Kenya for a period of more than 15 years. The findings concur with previous findings that the firms have high exit rate in the market, thus most of them have been operating for lesser years.

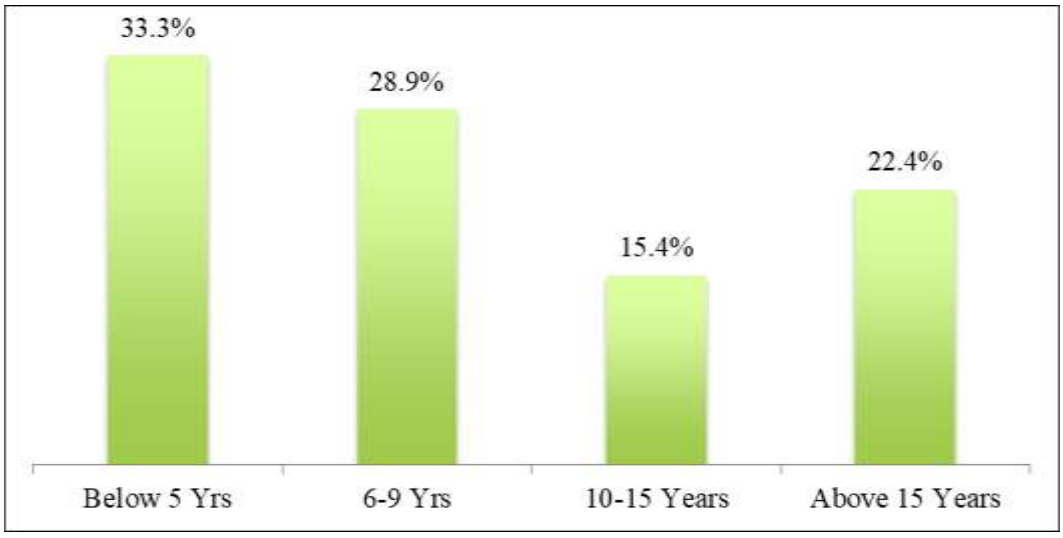

Figure 4.3: Distribution by the Period of Operation

4.4.4 Number of Products

The study sought to establish the number of products or services that the surveyed firms were dealing with. As the results on Figure 4.4 portray, 28.9% of the firms were dealing with between 1 and 3 products/services, 30.7% had between 4 and 6 products/services, 19.3% were dealing with between 7 and 10 products while 21.1% of the surveyed firms were dealing with more than 10 products or services. The results imply that the firms have varied products or services, which make them

appropriate for embracing expansive logistics process that would strongly determine the success of the firms.

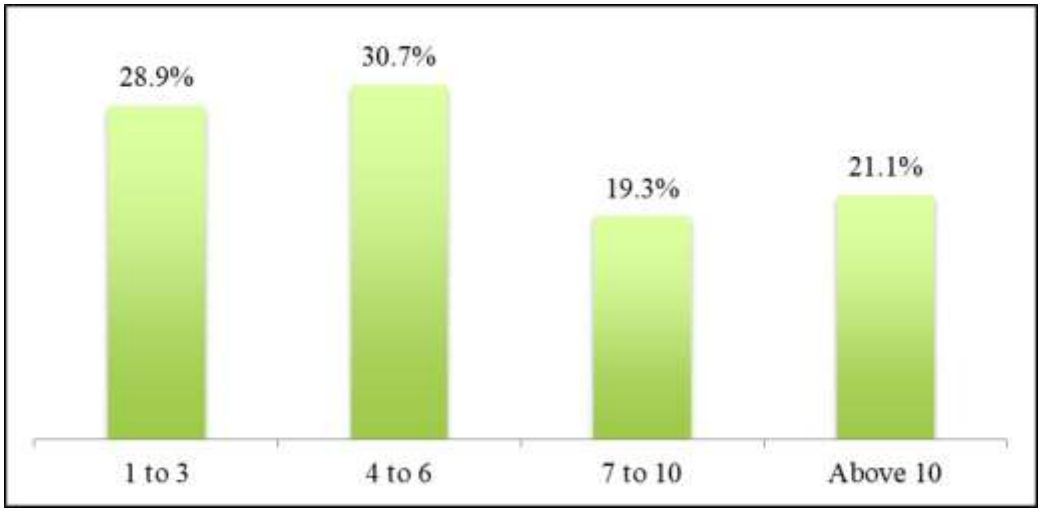

Figure 4.4: Distribution by the Number of Products

4.5 Descriptive Analysis of the Study Variables

The subsection covers the analysis of the main findings of the study based on the objective of the study. The main descriptive statistics captured include mean, standard deviation and percentages. The descriptive statistics helps to show what was established in the study, without giving any internal meaning of the results.

4.5.1 Descriptive Results Reverse Logistics

The first objective of the study was to assess the influence of reverse logistics on the performance of construction companies in Kenya. The study sought to assess how returns management policy, recycle management and recall programmes which are the key aspects of reverse logistics influenced the firm performance. A five-point Likert's scale was used where 1 represented strongly disagree (SD), 2 represented Disagree (D), 3 represented Neutral (N), 4 represented Agree (A) and 5 represented Strongly Agree (SA). Table 4.4 shows the findings.

As the results portray, most of the respondents disagreed that their respective firms had a returns policy and does remanufacturing which had role in cost reduction as

shown by a mean of 2.78 and a standard deviation of 1.26. The respondents further disagreed that their respective firms had recall programs and procedures which have a role in cost reduction as shown by a mean of 3.05 and a standard deviation of 1.24. It was established that most of the surveyed companies did not practice recycling and refurbishment and that the firms had no returns policy and did not remanufacture to enhance scope attainment (Mean = 3.06; 3.01).

The findings further revealed that most of the surveyed firms lacked recall programs and procedures for scope attainment (Mean = 2.96; standard deviation = 1.06) and that the firms did not effectively practice recycling and refurbishment intended to enhance scope attainment (Mean = 3.17; standard deviation = 0.89). The respondents disagreed that their respective firms were aiming at achieving timely deliveries by implementing returns policy and remanufacturing and that the companies did not embrace recall programs and procedures for attaining timely deliveries.

The findings imply that the aspects of reverse logistics have not been effectively upheld among the construction companies, and indication that cost saving, Eco friendliness and customer satisfaction may not be effectively attained by the companies. According to Eltayeb (2019), reverse logistics enhances the effectiveness of the process of planning, implementing, and controlling the efficient and cost effective flow of raw materials, in-process inventory, finished goods and related information from the point of consumption to the point of origin for the purpose of recapturing value or proper disposal. Through reverse logistics, more customer satisfaction is achieved thus enhancing organizational performance (Famiyeh et al, 2018).

Table 4.4: Descriptive Statistics on Reverse Logistics

Statements	SD	D	N	A	SA	Mean	Std. Dev.
The firm has a returns policy and does remanufacturing which has role in cost reduction	18.0 %	27.2 %	25.0 %	18.4 %	11.4 %	2.78	1.26
Our firm has recall programs and procedures which have a role in cost reduction	13.6 %	19.7 %	28.1 %	25.4 %	13.2 %	3.05	1.24
The organization practices recycling and refurbishment which has role in cost reduction	11.8 %	20.6 %	29.4 %	25.9 %	12.3 %	3.06	1.20
Our firm has a returns policy and does remanufacturing which has role in scope attainment	16.2 %	22.4 %	20.2 %	26.8 %	14.5 %	3.01	1.31
The firm has recall programs and procedures which have a role in scope attainment	10.5 %	22.4 %	32.0 %	31.1 %	3.9%	2.96	1.06
Our firm practices recycling and refurbishment which has role in scope attainment	4.4%	14.9 %	45.2 %	30.7 %	4.8%	3.17	0.89
Our firm has a returns policy and does remanufacturing which has role in attaining timely deliveries	3.1%	13.6 %	38.2 %	40.4 %	4.8%	3.30	0.88
The organization has recall programs and procedures which have a role in attaining timely deliveries	5.7%	22.8 %	34.6 %	28.5 %	8.3%	3.11	1.03
The firm practices recycling and refurbishment which has role in attaining timely deliveries	13.2 %	46.1 %	21.5 %	12.7 %	6.6%	2.54	1.08

4.5.2 Descriptive Results on Green Packaging

The second objective of the study was to establish the influence of green packaging on the performance of construction companies in Kenya. The study sought to establish the role played by use of biodegradable packaging, reduction of the

packaging materials and use of reusable containers and boxes in packaging on the performance of construction companies. The respondents were asked to indicate their level of agreement or disagreement with specific statements drawn from these aspects. A 5-points Likert's scale was used. The findings are as shown in Table 4.5.

As the results portray, the respondents disagreed that their respective organizations applied packaging made of recyclable materials to enhance quality of goods as shown by a mean of 2.58 and a standard deviation of 1.28. The respondents disagreed that their respective organizations used packaging materials that were bio-degradable (Mean = 2.59; standard deviation = 1.34), but agreed that their respective organizations used minimum transportation packaging materials to preserve the natural resources and reduce the cost of transportation (Mean = 3.39; standard deviation = 1.20). They however disagreed that post-consumer recycled polyethylene bags made from recycled waste were used in their respective firms.

The findings further revealed that majority of the respondents disagreed that the organisations used renewable resource-based packaging materials (Mean = 2.58; standard deviation = 1.43). The respondents further disagreed that their respective organization used minimum possible packaging materials to save on costs (Mean = 3.03; standard deviation = 1.46), and that the materials used in packaging helped to preserve the natural state of the products (Mean = 2.66; standard deviation = 1.47). The findings further revealed that the resources used in packaging did not enhance the delivery of goods in their original state in most of the organizations and that the organizations did not enhance packaging optimization by packaging reduction, while retaining product protection (Mean= 2.77; 2.67).

The findings further revealed that most of the surveyed organisations did not use packaging with additives added in order to make the packaging degradable ((Mean = 2.53; standard deviation = 1.36) and that the organizations did not effectively embraces use of eco-friendly packaging material - without sacrificing appearance and quality. The findings are in line with those by Liu and Li (2021) who established that through green packaging, the organization is able to bring a more environmentally friendly way of packaging their goods thus enhancing customer

satisfaction and reduced costs for enhanced performance. Green packaging enables organizations to attract customers and maintain loyalty. Consumers are increasingly seeking products from companies that prioritize sustainability. Green packaging can serve as a powerful marketing tool, attracting environmentally conscious consumers and building brand loyalty. When customers perceive a brand as environmentally responsible, it often leads to repeat business and positive word-of-mouth referrals.

The literature shows that through green packaging, firms save on costs. While initial investment in green packaging may require some upfront costs, it can result in long-term cost savings. Sustainable packaging materials can be lighter, require less energy during production, and may reduce transportation costs due to lower weight. Additionally, some eco-friendly packaging options are made from recycled materials, which can be more cost-effective.

Green packaging as described by Musau and Rucha (2021) is an essential way of ensuring that the products are more value-added thus promoting their effectiveness in gaining competitiveness in the market. This plays an integral role in promoting organizational performance through enhanced profitability (Al-Shubiri, 2017). Packaging should be designed to maximise logistics and productivity and it should ensure effective planning, implementing, and controlling a coordinated packaging system for preparing goods for safe, secure, efficient, and effective handling, transport, distribution, storage, retail, consumption, and recovery, reuse, or disposal, as well as related information, with the goal of maximising consumer value, sales, and thus profit (Gaganpreet & Neeraj, 2019).

Table 4.5: Descriptive Statistics on Green Packaging

Statements	SD	D	N	A	SA	Mean	Std. Dev.
The organization applies packaging made of recyclable materials enhancing quality of goods	22.4%	33.3%	18.9%	14.5%	11.0%	2.58	1.28
The organization packaging materials are bio-degradable	22.8%	36.4%	14.0%	12.7%	14.0%	2.59	1.34
The organization uses minimum transportation packaging materials	8.8%	15.4%	22.4%	35.1%	18.4%	3.39	1.20
We use Post-consumer recycled polyethylene bags made from recycled waste	33.8%	8.3%	12.3%	31.6%	14.0%	2.84	1.51
The organization uses renewable packaging materials	35.5%	15.4%	14.5%	24.6%	10.1%	2.58	1.43
The organization uses minimum possible packaging materials to save on costs	22.4%	19.3%	10.1%	29.4%	18.9%	3.03	1.46
The materials used in packaging preserves products' natural state	32.9%	19.7%	7.9%	27.6%	11.8%	2.66	1.47
The resources used in packaging enhances the delivery of goods in their original state	29.4%	19.7%	8.8%	28.9%	13.2%	2.77	1.46
The company has enhanced packaging optimization by packaging reduction	29.4%	21.9%	12.3%	25.4%	11.0%	2.67	1.41
Our organisation uses packaging that are enhanced to be degradable	30.7%	26.3%	11.8%	21.9%	9.2%	2.53	1.36
The company uses eco-friendly packaging material while upholding quality	11.0%	20.2%	24.1%	26.8%	18.0%	3.21	1.26

4.5.3 Descriptive Results on Logistics innovation

The third objective of the study was to establish the influence of logistics innovation on the performance of building and construction manufacturing firms in Kenya. The logistics innovation was addressed in terms of fuel saving strategies, hybrid or bio-fuel vehicles and use of solar technology. These are the common innovations used to enhance green logistics. The respondents were asked to indicate their level of

agreement or disagreement on specific statements drawn from these aspects based on a 5-points Likert's scale. Table 4.6 summarizes the findings.

As the findings portray, the respondents disagreed that their respective firms use vehicles and machineries that have low fuel/power consumption as shown by a mean of 2.75 and a standard deviation of 1.46. The respondents however agreed that their respective firms had come up with ways of minimizing gas emissions in its production processes (Mean = 3.54; standard deviation = 1.09). The findings revealed that most of the surveyed firms had not embraced technology in monitoring their logistics and truck movements and that they had not embraced Research and development through financing to save on production (Mean= 3.75). The respondents disagreed that training was done frequently on how to embrace green logistics in their respective organizations (Mean= 2.64; standard deviation= 1.40) and that the production systems of their respective firms were based on new ways established through research (Mean= 3.11; standard deviation= 1.18).

The findings further revealed that most of the firms surveyed did not effectively embrace new designs in their products that are more environmental friendly (Mean = 3.00) and that they did not adequately involve the suppliers in coming up with products that are aligned to green logistics (Mean = 2.91; standard deviation = 1.28). The respondents were of the opinion that the designs of products in their respective firms were not adequately based on the set regulations and standards. The findings compare with those by Hsueh (2015) who established that most of the firms in building and construction manufacturing firms fail to consider roper innovations in green logistics thus they do not save on costs of production. Jaafar and Tajuddin (2016) allude that because of low adoption of innovativeness in logistics, companies spend more to transport their goods thus recording declined performance. Logistics innovations have a substantial impact on a firm's performance, influencing various aspects of its operations and competitiveness. Logistics innovation enables optimizing transportation routes, using energy-efficient vehicles, and reducing fuel consumption. These initiatives can lead to significant cost savings in fuel and transportation expenses. Additionally, embracing sustainable practices may open up opportunities for tax incentives or grants that further contribute to cost reduction.

Logistics innovation also enables resource efficiency. According to Perkumienė et al. (2020), implementing green logistics practices helps in minimizing waste generation and resource consumption. For example, efficient route planning and load optimization reduce the number of trips and associated resource use, leading to improved resource efficiency and reduced operational costs. Logistics innovation also enables firms to create an eco-friendly brand image. Consumers are increasingly conscious of environmental issues and prefer products and services from companies that demonstrate a commitment to sustainability. By adopting green logistics practices, firms can enhance their eco-friendly brand image, attract environmentally conscious customers, and strengthen customer loyalty.

The findings also compare with previous literature where logistics innovation has been regarded as a plan, control, management and implementation of the logistics system through the advance logistics technology and environmental management which aim to reduce the pollutant emissions (Perkumienė et al., 2020). According to Kurbatova *et al.* (2020), using advanced technology and equipment resources as innovation in logistics such as web-based systems, GPS, GIS, and track and trace systems allows logistics processes innovatively conserve the environment while ensuring the logistics activities are effectively carried out. The findings are also in concurrence with those by Teixeira *et al.* (2018) who indicated that logistics innovation in sustainable supply chain perspective emphasize more on green logistics which is essential for achieving competitive advantage and sustainable logistics. Teixeira *et al.* (2018) further indicate that the green innovations in logistics are regarded as environmental-friendly activities or practical green technologies that help improve operational efficiency and customer satisfaction thus promoting organizational performance.

Table 4.6: Descriptive Statistics on Logistics innovation

Statements	SD	D	N	A	SA	Mean	Std. Dev.
Our firm uses vehicles and machineries that have low fuel/power consumption	28.1%	22.4%	11.0%	23.2%	15.4%	2.75	1.46
Our firm has come up with ways of minimizing gas emissions in its production processes	4.4%	14.9%	22.4%	39.5%	18.9%	3.54	1.09
We have embraced technology in monitoring our logistics and truck movements	30.7%	18.4%	12.3%	22.8%	15.8%	2.75	1.49
Research and development has been embraced through financing to establish how best we can save on production	38.6%	7.5%	11.8%	25.0%	17.1%	2.75	1.58
Training is done frequently on how to embrace green logistics	30.3%	20.2%	16.7%	21.5%	11.4%	2.64	1.40
Our production systems are based on new ways established through research	12.3%	18.4%	24.6%	35.5%	9.2%	3.11	1.18
We have adopted new designs of our products that are more environmentally friendly	15.8%	19.3%	21.9%	35.1%	7.9%	3.00	1.22
We adequately involve our suppliers in coming up with products that are aligned to green logistics	21.1%	16.2%	20.6%	34.6%	7.5%	2.91	1.28
The designs of our products are based on the set regulations and standards	14.9%	21.9%	18.4%	32.5%	12.3%	3.05	1.28

4.5.4 Descriptive Results on Green Distribution Systems

The fourth objective of the study was to assess the influence of green distribution systems on the performance of building and construction manufacturing firms in Kenya. Green distribution was assessed in terms of vehicle loadings, electrical forklifts and decentralized production. The respondents were asked to indicate their level of agreement or disagreement with specific statements drawn from these aspects, based on a 5-point Likert's scale. Strongly Disagree (SD) represented 1, Disagree (D) was 2, Neutral (N) = 3, Agree (A) = 4 and Strongly Agree (SA) = 5. Table 4.7 shows the findings.

The findings revealed that most of the surveyed companies did not consolidate loads to avoid sub-optimal use of transportation (Mean = 2.65; standard deviation = 1.26) and that the companies did not pool together Less-Than-Load (LTL) cargo when distributing to ensure maximum use of trucks (Mean = 3.02; standard deviation = 1.22). The respondents further disagreed that the vehicle loadings in their respective organizations were arranged based on the customer locations for easier delivery (Mean = 2.74; standard deviation = 1.25).

The respondents further disagreed that their respective firms had vehicle management systems to ensure optimal utilization of vehicle capacities (Mean = 2.81; standard deviation = 1.19). According to Zhang et al. (2018), appropriate loading of the vehicles helps the distribution of products to be lesser costly, and fully utilizes the spaces for efficiency and effectiveness. With most of the companies not upholding vehicle loadings, they incur more costs of distribution, while the processes contributing to more environmental pollution through increased routes.

The findings further revealed that most of the surveyed companies did not seek adequate certification on their delivery vehicles to ensure their compatibility with environmental policies (Mean = 2.96; standard deviation = 1.12) and that proper planning was not undertaken to ensure lesser congested routes were used when making deliveries to the customers (Mean = 2.87; standard deviation = 1.13). The respondents disagreed that the routes with sequence delivery stops were preferred for easier distribution as evidenced by a mean of 3.07 and a standard deviation of 1.15. Most of the companies surveyed lacked an effective demand responsive system where goods are delivered out of expressed demand (Mean = 2.81; standard deviation= 1.25).

The respondents disagreed that their respective companies did not have systems of sharing demand data with the suppliers to help synchronize supply with demand. The findings concur with those by Bechtsis *et al.* (2017) who established that among the major challenges that were facing building and construction manufacturing firms was lack of more effective distribution systems that were innovative and eco-friendly.

Agyemang *et al.* (2018) established that though adoption of distribution systems that are strategic and friendlier to the environment, customer satisfaction is enhanced, while achieving cheaper, effective and timely deliveries to the customers. According to Musau and Rucha (2021), green distribution systems uphold use of eco-friendly distribution processes such as hybrid and natural gas vehicles (NGV) and trucks. These green innovations such as hybrid vehicles play an essential role in promoting organizational competitiveness and performance. Green distribution systems emphasises on use of eco-friendly distribution thus saving costs for better performance.

Table 4.7: Descriptive Statistics on Green Distribution Systems

Statements	SD	D	N	A	SA	Mean	Std. Dev.
Our company consolidates loads to avoid sub-optimal use of transportation	24.6%	22.8%	21.5%	25.4%	5.7%	2.65	1.26
Our company pools together Less-Than-Load (LTL) cargo when distributing to ensure maximum use of trucks	15.4%	19.3%	21.9%	35.1%	8.3%	3.02	1.22
The vehicle loadings in our organization are arranged based on the customer locations for easier delivery	21.9%	20.6%	27.2%	22.4%	7.9%	2.74	1.25
The firm has vehicle management systems to ensure optimal utilization of vehicle capacities	19.3%	18.4%	29.8%	27.2%	5.3%	2.81	1.19
Our company has sought certification of its delivery vehicles to ensure their compatibility with environmental policies	11.8%	24.1%	24.1%	35.5%	4.4%	2.96	1.12
Less congested routes are preferred when making deliveries to our customers	15.8%	21.1%	25.4%	35.5%	2.2%	2.87	1.13
Routes with sequence delivery stops are preferred in our company for easier distribution	11.8%	17.5%	32.0%	29.4%	9.2%	3.07	1.15
Our company has a demand responsive system where goods are delivered out of expressed demand	21.1%	20.2%	21.9%	30.7%	6.1%	2.81	1.25
The company has systems of sharing demand data with the suppliers to help synchronize supply with demand	25.4%	21.1%	18.4%	26.3%	8.8%	2.72	1.33

4.5.5 Descriptive Results on Firm Characteristics

The fifth objective of the study was to assess the moderating effect of firm characteristics on the relationship between green logistics and performance of building and construction manufacturing companies in Kenya. The main firm characteristics focused on in the study included: supply chain agility, material sourcing and supply chain risks. Building and construction manufacturing firms as elaborated by Khan *et al.* (2017) has its own diversity, and the status, background and characteristics of the firm play an integral role in determining its market capabilities and competencies. The respondents were asked to indicate their level of agreement or disagreement with specific statements drawn from the main firm characteristics based on five-point Likert's scale. Table 4.8 summarizes the findings.

As the findings portray, the respondents disagreed that sourcing of materials in their respective was done with close involvement of suppliers to embrace green materials as evidenced by a mean of 2.75 and a standard deviation of 1.42. However the respondents agreed that their respective companies had embraced diverse sources of materials to ensure environmental friendly materials are obtained as shown by a mean of 3.51 and a standard deviation of 1.09. The respondents further disagreed that their respective companies gave priority to suppliers who were capable of supplying environmental friendly materials (Mean= 2.71; standard deviation = 1.18). They further disagreed that their respective companies had been keen on embracing supply chain agility for effectiveness of their supply chain processes (Mean = 3.15; standard deviation= 1.08).

The findings further revealed that the supply chain agility of most of the surveyed building and construction manufacturing companies was been instrumental in string adoption of green logistics as shown by a mean of 3.53 and a standard deviation of 1.06. The respondents disagreed that their respective firms were keen to integrate new changes in the supply chain processes such as the green logistics as shown by a mean of 2.72 and a standard deviation of 0.98. According to Vermeulen (2015), supply chain agility is the company's ability to strengthen its process to accommodate diverse supply chain operations and carry out the crucial supply chain

adjustments that ensure continued performance. Through supply chain agility, it becomes easier for firms to adapt to new changes such as green logistics, thus strengthening their performance.

The findings further revealed that majority of the respondents agreed that their respective companies frequently analysed and mitigated risks associated with supply chain processes and that their respective companies had a framework for managing supply chain risks (Mean = 3.50; 3.65). The respondents further agreed that the overall characteristics of their respective firms were streamlined towards enhancing the adoption of green logistics as sown by a mean of 3.78 and a standard deviation of 0.92. The findings are in line with those by Chrisostom and Monari (2018) who established that the ability of organization to adopt emerging trends such as green logistics is majorly determined by their internal and external characteristics such as market size, their internal management capacity and their reputation. According to Balasubramanian et al. (2021), the implementation of green logistics is influenced by various firm characteristics, as companies differ in their resources, capabilities, priorities, and environmental commitments.

The size of a company can affect its ability to implement green logistics. Larger firms may have more resources and economies of scale to invest in sustainable technologies, alternative fuels, and eco-friendly transportation options (Bosman et al., 2019). According to Dzwigol et al. (2021), the availability of financial resources and budget allocation for green initiatives impacts a firm's ability to invest in sustainable logistics practices. Companies with higher financial capabilities are more likely to afford green technologies and implement environmentally friendly solutions. Barut et al. (2023) noted that some industries inherently have a higher environmental impact due to their operations. Companies in industries with a strong environmental focus, such as food and beverage, retail, or automotive, may face more significant pressure to implement green logistics practices.

Table 4.8: Descriptive Statistics on Firm Characteristics

Statements	SD	D	N	A	SA	Mean	Std. Dev.
The sourcing of materials is done with close involvement of suppliers to embrace green materials	27.2%	22.4%	10.1%	28.9%	11.4%	2.75	1.42
The company had embraced diverse sources of materials to ensure environmental friendly materials are obtained	10.5%	11.8%	10.7%	39.5%	27.5%	3.51	1.09
Our company gives priority to suppliers who are capable of supplying environmental friendly materials	19.7%	22.4%	30.3%	21.5%	6.1%	2.72	1.18
The company has been keen on embracing supply chain agility for effectiveness of its supply chain processes	7.9%	18.4%	34.2%	29.8%	9.6%	3.15	1.08
The supply chain agility of our company has been instrumental in string adoption of green logistics	8.3%	17.5%	14.2%	32.5%	27.5%	3.53	1.06
The company is keen to integrate new changes in the supply chain processes such as the green logistics	37.7%	19.9%	11.6%	9.4%	21.4%	2.72	0.98
The company frequently analyses and mitigates risks associated with supply chain processes	9.2%	15.8%	10.7%	34.2%	30.1%	3.50	1.11
The company has a framework for managing supply chain risks	18.0%	4.6%	10.4%	38.3%	28.8%	3.65	0.93
The overall characteristics of our firm contributes to the adoption of green logistics to steer performance	12.9%	6.0%	11.4%	29.6%	40.1%	3.78	0.92

4.5.6 Descriptive Results on Firm Performance

The study sought to find out the opinions of the respondents regarding the performance of their respective organizations. They were asked to indicate their level of agreement or disagreement on specific statements on organizational performance based on a 5-points Likert's scale. As the findings on Table 4.9 portray, the

respondents disagreed that their respective companies had drastically reduced the rate of customer returns over the past five years (Mean = 2.68; standard deviation= 1.00) and that the cost of operations in their respective firms had reduced for the past five years (Mean = 2.50; standard deviation= 1.23). The respondents were also of the opinion that their respective companies had not seen an increase in the sales revenue for the past five years (mean = 2.89; standard deviation= 1.07). They however agreed that there was a decline in the number of customer complaints with regard to the products. The results imply that the performance of the construction companies has not been effective, thus raising the need for green logistics to boast their cost saving, enhancement of quality and meeting customer satisfaction.

Table 4.9: Descriptive Statistics on Firm Performance

Statements	SD	D	N	A	SA	Mean	Std. Dev.
Our company has drastically reduced the rate of customer returns over the past five years	9.6%	38.6%	29.8%	18.4%	3.5%	2.68	1.00
The cost of operations in our firm has reduced for the past five years	21.9%	38.2%	18.0%	12.3%	9.6%	2.50	1.23
Our company has seen an increase in the sales revenue for the past five years	7.9%	31.6%	32.5%	20.2%	7.9%	2.89	1.07
There are fewer customer complaints with regard to our products over the past five years	7.5%	18.9%	33.3%	28.5%	11.8%	3.18	1.10

The study further sought to establish the performance of the building and construction manufacturing firms in terms of lead time and customer satisfaction. As the findings on Figure 4.5 reveal, lead time reduction was rated at 23.3% while customer satisfaction was rated at 30.8%. This implies that the firms have relatively low customer satisfaction and lead time reduction, despite the two aspects being essential for firm performance and competitiveness.

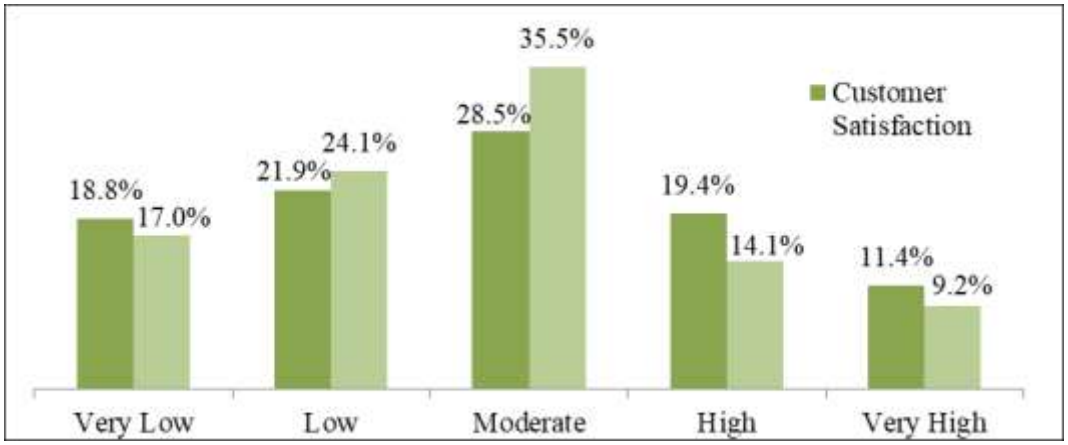

Figure 4.5: Lead-Time Reduction and Customer Satisfaction

4.5.6.1 Quality of the Products

It was established that the quality based on the number of defectives, number of returns and the total defectives was increasing in most of the firms, implying that the performance of the building and construction manufacturing sector was declining over the years as far as quality of their products is concerned. This implies that green logistics has not been effectively integrated as this is supposed to enhance the quality of the products for enhanced customers satisfaction and the overall firm performance.

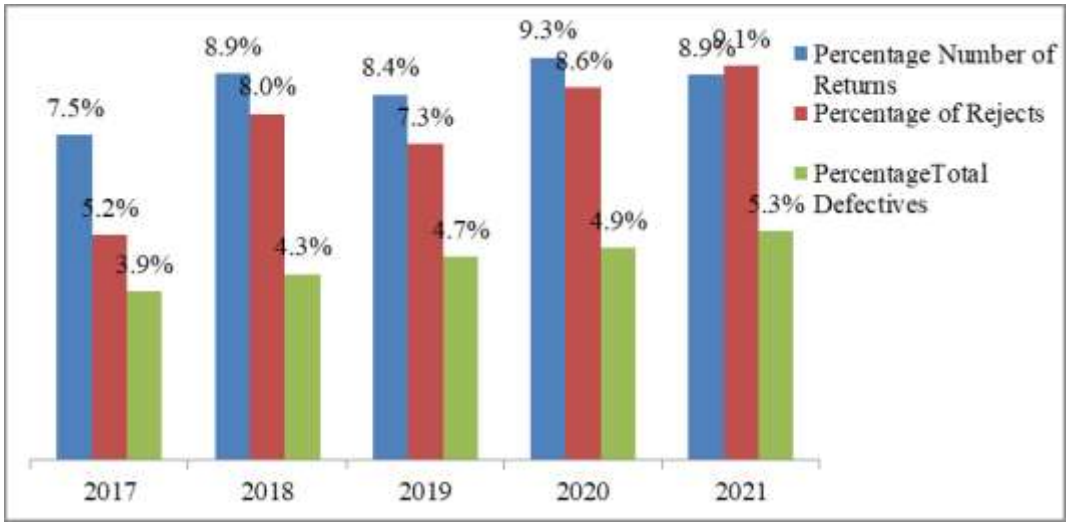

Figure 4.6: Quality of Products

4.6 Qualitative Data Analysis

This sub-section covers the analysis of qualitative data obtained through the open-ended questions. This data helped the researcher to gain more understanding in regard to the green logistics and their role in enhancing the performance of building and construction manufacturing firms in Kenya.

4.6.1 Reverse Logistics

The study sought to assess how returns management policy, recycle management and recall programmes, which are the key aspects of reverse logistics, influenced the firm performance. The results portray, most of the respondents indicated that their respective firms had a returns policy and does remanufacturing which had role in cost reduction. The respondents further disagreed that their respective firms had recall programs and procedures which have a role in cost reduction. It was established that most of the surveyed companies did not practice recycling and refurbishment and that the firms had no returns policy and did not remanufacture to enhance scope attainment. The respondents indicated that their respective firms were aiming at achieving timely deliveries by implementing returns policy and remanufacturing and that the companies did not embrace recall programs and procedures for attaining timely deliveries.

4.6.2 Green Packaging

The study sought to establish the influence of green packaging on the performance of construction companies in Kenya. The study sought to establish the role played by use of biodegradable packaging, reduction of the packaging materials and use of reusable containers and boxes in packaging on the performance of construction companies. The findings revealed that most of the respondents said that their respective organizations applied packaging made of recyclable materials to enhance quality of goods. The respondents disagreed that their respective organizations used packaging materials that were bio-degradable, but agreed that their respective organizations used minimum transportation packaging materials to preserve the

natural resources and reduce the cost of transportation. One of the respondents indicated the following:

"Our organization uses minimum possible packaging materials to save on costs and the materials used in packaging helped to preserve the natural state of the products. We also embrace green packaging resources whereby the resources used in packaging did not enhance the delivery of goods in their original state in most of the organizations and that the organizations did not enhance packaging optimization by packaging reduction, while retaining product protection."

It was also established that green packaging enables organizations to attract customers and maintain loyalty. Consumers are increasingly seeking products from companies that prioritize sustainability. Green packaging can serve as a powerful marketing tool, attracting environmentally conscious consumers and building brand loyalty.

4.6.3 Logistics Innovation

The study sought to establish the influence of logistics innovation on the performance of building and construction manufacturing firms in Kenya. The logistics innovation was addressed in terms of fuel saving strategies, hybrid or bio-fuel vehicles and use of solar technology. The qualitative findings revealed that most of the respondents were of the opinion that respective firms use vehicles and machineries that have low fuel/power consumption. The respondents indicated that their respective firms had come up with ways of minimizing gas emissions in its production processes. The findings revealed that most of the surveyed firms had not embraced technology in monitoring their logistics and truck movements and that they had not embraced research and development through financing to save on production. The respondents indicated that the training was done frequently on how to embrace green logistics in their respective organizations and that the production systems of their respective firms were based on new ways established through research. One of the respondents indicated that following:

“I agree that our firm has not effectively embraced new designs in their products that are more environmental friendly and does not adequately involve the suppliers in coming up with products that are aligned to green logistics. Our company however designs of products in their respective firms were not adequately based on the set regulations and standards”.

The findings compare with those by Perkumienė *et al.* (2020) who established that implementing green logistics practices helps in minimizing waste generation and resource consumption. Efficient route planning and load optimization reduce the number of trips and associated resource use, leading to improved resource efficiency and reduced operational costs. Logistics innovation also enables firms to create an eco-friendly brand image.

4.6.4 Green Distribution Systems

The study sought to assess the influence of green distribution systems on the performance of building and construction manufacturing firms in Kenya. Green distribution was assessed in terms of vehicle loadings, electrical forklifts and decentralized production. The respondents indicated that their firms were not effectively embracing vehicle loadings in their respective organizations were arranged based on the customer locations for easier delivery and that their respective firms had vehicle management systems to ensure optimal utilization of vehicle capacities. They further indicated that the most of the companies not upholding vehicle loadings, they incur more costs of distribution, while the processes contributing to more environmental pollution through increased routes. One of the respondents indicated that following:

“Our firm has not been effectively embracing green distribution systems, whereby we have not effectively created awareness among customers and ensure that they seek adequate certification on their delivery vehicles to ensure their compatibility with environmental policies. We have not been properly planning to ensure lesser congested routes were used when making deliveries to the customers.”

The findings compare with those by Agyemang *et al.* (2018) who established that though adoption of distribution systems that are strategic and friendlier to the environment, customer satisfaction is enhanced, while achieving cheaper, effective and timely deliveries to the customers.

4.7 Factor Analysis Results

Factor analysis is essential in enabling the reduction of the dimension for the variables so as to retain the aspects (factors) that have a strong variance (influence) on the main variable (Hatcher, & O'Rourke, 2019; Cattell, 2012). Hair *et al*. (2017) contends that factor analysis is a statistical approach that involves finding a way of condensing the information contained in a number of original variables into a smaller set of dimensions with a minimum loss of information. The study used factor analysis to define underlying structure of the variables in the analysis.

4.7.1 Factor Analysis on Reverse Logistics

Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett's Test of Sphericity were used to test for the sampling adequacy of the instrument. This determines whether the instrument is valid, and whether the data obtained from such an instrument is fit for factor analysis. The results as shown in Table 4.10 revealed that the KMO coefficient was 0.619 which is positive while the significance level under the Bartlett's Test of Sphericity was 0.000<0.05. This is an indication that the instrument obtained a sampling adequacy and the data was fit for factor analysis.

Table 4.10: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.619
Bartlett's Test of Sphericity	Approx. Chi-Square	346.223
	df	36
	Sig.	.000

The communalities for the reverse logistics are as shown in Table 4.11. The results revealed that all the factor loadings had coefficients higher than the standard factor loading of 0.30. The highest factor (Our firm has a returns policy and does remanufacturing which has role in attaining timely deliveries) had a factor loading of

0.939, while the lowest (Our firm has recall programs and procedures which have a role in scope attainment) had a factor loading of 0.310. This is an indication that the questions under the viable reverse logistics met the threshold hence they were retained for further analysis.

Table 4.11: Communalities for Reverse Logistics

Factors	Extraction
Our firm has a returns policy and does remanufacturing which has role in cost reduction	.592
Our firm has recall programs and procedures which have a role in cost reduction	.661
Our firm practices recycling and refurbishment which has role in cost reduction	.575
Our firm has a returns policy and does remanufacturing which has role in scope attainment	.416
Our firm has recall programs and procedures which have a role in scope attainment	.310
Our firm practices recycling and refurbishment which has role in scope attainment	.568
Our firm has a returns policy and does remanufacturing which has role in attaining timely deliveries	.525
Our firm has recall programs and procedures which have a role in attaining timely deliveries	.548
Our firm practices recycling and refurbishment which has role in attaining timely deliveries	.939

The total variance explained for each of the questions revealed that three components had eigenvalues of greater than 1 where the first component had Eigenvalue of 2.181, the second component had Eigenvalue of 1.904 and the third component had Eigenvalue of 1.050. The three components had a cumulative variance of 57.056%, thus implying that they will be computed to represent the variable reverse logistics. This is an implication that all the three sub-constructs of reverse logistics would be represented in subsequent analysis.

Table 4.12: Total Variance Explained on Reverse Logistics

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.181	24.231	24.231	2.181	24.231	24.231
2	1.904	21.156	45.387	1.904	21.156	45.387
3	1.050	11.669	57.056	1.050	11.669	57.056
4	.975	10.832	67.888			
5	.899	9.991	77.879			
6	.627	6.961	84.840			
7	.568	6.309	91.149			
8	.451	5.011	96.160			
9	.346	3.840	100.000			

Extraction Method: Principal Component Analysis.

The component matrix for reverse Logistics is as shown in Table 4.13. As the results portray, the first component had 4 factors with factor loadings above 0.50, while the second component had four factors as well, with factor loadings exceeding 0.50. The third component had 1 factor with a factor loading of 0.967>0.50. These factors were computed to represent reverse logistics in the subsequent analysis.

Table 4.13: Component Matrix on Reverse Logistics

Factors	Component		
	1	2	3
Our firm has a returns policy and does remanufacturing which has role in cost reduction	.754		
Our firm has recall programs and procedures which have a role in cost reduction	.807		
Our firm practices recycling and refurbishment which has role in cost reduction	.728		
Our firm has a returns policy and does remanufacturing which has role in scope attainment	.600		
Our firm has recall programs and procedures which have a role in scope attainment		.551	
Our firm practices recycling and refurbishment which has role in scope attainment		.707	
Our firm has a returns policy and does remanufacturing which has role in attaining timely deliveries		.724	
Our firm has recall programs and procedures which have a role in attaining timely deliveries		.739	
Our firm practices recycling and refurbishment which has role in attaining timely deliveries			.967

Extraction Method: Principal Component Analysis.
a. 3 components extracted.

4.7.2 Factor Analysis on Green Packaging

In order to establish the sampling adequacy and the ability of the data obtained through the instrument under green packaging to be suitable for factor analysis, Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett's Test of Sphericity tests were carried out. As the results in Table 4.14 reveal, the coefficient for KMO test was 0.914 which is positive while the Bartlett's Test of Sphericity had a significant level of 0.000<0.05. This is an implication that the data met the sampling adequacy and would be suitable for factor analysis.

Table 4.14: KMO and Bartlett's Test for Green Packaging

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.914
Bartlett's Test of Sphericity	Approx. Chi-Square	1513.668
	df	55
	Sig.	.000

The communalities for the questions under green packaging are as shown in Table 4.15. The results revealed that the factor 'Post-consumer recycled polyethylene bags made from recycled waste are used in our firm' had the highest factor loading of 0.820 while the factor 'The organization applies packaging made of recyclable materials enhancing quality of goods' had the lowest loading of 0.455. The findings imply that all the factor loadings were higher than the minimum threshold of 0.30 hence the questions under Green packaging were retained for further analysis.

Table 4.15: Communalities for Green Packaging

Factors	Extraction
The organization applies packaging made of recyclable materials enhancing quality of goods	.455
The organization packaging materials are bio-degradable	.674
The organization uses minimum transportation packaging materials to preserve the natural resources which has reduced the cost of transportation	.650
Post-consumer recycled polyethylene bags made from recycled waste are used in our firm	.820
The organisation uses renewable resource based packaging materials	.705
The organization uses minimum possible packaging materials to save on costs	.796
The materials used in packaging help to preserve the natural state of the products	.748
The resources used in packaging enhances the delivery of goods in their original state	.752
The company has enhanced packaging optimization by packaging reduction, while retaining product protection	.755
Our organisation uses packaging with additives added in order to make the packaging degradable	.717
Use of eco-friendly packaging material - without sacrificing appearance and quality is embraced in our organization	.756

The total variance explained for each of the questions under green packaging was established. This was so as to establish the extent to which each of the questions contributed to the overall weight of the variable. As the results in Table 4.16 portray, three components obtained Eigenvalues of more than 1.0. The first component had an Eigenvalue of 5.620; the second one had 1.183 while the third component had an Eigenvalue of 1.025. The three explained a cumulative variance of 71.162%. This is an indication that three sub-constructs under the green packaging variable would be

represented; hence a good representation of the aspects under green packaging would be obtained.

Table 4.16: Total Variance Explained for Green Packaging

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.620	51.090	51.090	5.620	51.090	51.090
2	1.183	10.754	61.844	1.183	10.754	61.844
3	1.025	9.318	71.162	1.025	9.318	71.162
4	.955	8.686	79.848			
5	.606	5.514	85.362			
6	.401	3.648	89.010			
7	.363	3.301	92.310			
8	.253	2.303	94.613			
9	.221	2.008	96.621			
10	.192	1.746	98.367			
11	.180	1.633	100.000			

Extraction Method: Principal Component Analysis.

The component matrix for the identified components is as shown in Table 4.17. As the results reveal, the first component had 8 components with factors exceeding the minimum threshold for factor loadings of 0.50. The second component had one factor with a factor loading above 0.50, while the third component had 2 factors with factor loadings higher than 0.50. The three components were computed to represent green packaging on the regression and correlation analysis.

Table 4.17: Component Matrix for Green Packaging

Factors	Component		
	1	2	3
The organization applies packaging made of recyclable materials enhancing quality of goods			.584
The organization packaging materials are bio-degradable			.796
The organization uses minimum transportation packaging materials to preserve the natural resources which has reduced the cost of transportation	.768		
Post-consumer recycled polyethylene bags made from recycled waste are used in our firm	.888		
The organisation uses renewable resource based packaging materials	.811		
The organization uses minimum possible packaging materials to save on costs	.877		
The materials used in packaging help to preserve the natural state of the products	.855		
The resources used in packaging enhances the delivery of goods in their original state	.863		
The company has enhanced packaging optimization by packaging reduction, while retaining product protection	.832		
Our organisation uses packaging with additives added in order to make the packaging degradable	.785		
Use of eco-friendly packaging material - without sacrificing appearance and quality is embraced in our organization		.856	

Extraction Method: Principal Component Analysis.
a. 3 components extracted.

4.7.3 Factor Analysis on Logistics innovation

On the third variable (logistics innovation), the KMO and Bartlett's Test were carried out. The results as shown in Table 4.18 revealed that the coefficient for the Kaiser-Meyer-Olkin Measure of Sampling Adequacy was 0.816 which is positive hence the data was concluded to be valid for carrying out factor analysis. The Bartlett's Test of Sphericity had a significance of 0.000 which is less than the standard significant level of 0.05 hence the data was ruled to be statistically significant for factor analysis.

Table 4.18: KMO and Bartlett's Test on Logistics innovation

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.816
Bartlett's Test of Sphericity	Approx. Chi-Square	1028.308
	df	36
	Sig.	.000

The factor loadings for the questions under logistics innovation are as shown in Table 4.19. As shown in the Table below, the factor "Our firm has come up with ways of minimizing gas emissions in its production processes" had the lowest factor loading of 0.433 while the factor "We have embraced technology in monitoring our logistics and truck movements" had the highest factor loading of 0.827. This is an indication that all the factor loadings for the questions under the variable met the 0.30 threshold hence the questions were retained for further analysis in the study.

Table 4.19: Communalities for Logistics innovation

Factors	**Extraction**
Our firm uses vehicles and machineries that have low fuel/power consumption	.757
Our firm has come up with ways of minimizing gas emissions in its production processes	.433
We have embraced technology in monitoring our logistics and truck movements	.827
Research and development has been embraced through financing to establish how best we can save on production	.817
Training is done frequently on how to embrace green logistics	.738
Our production systems are based on new ways established through research	.439
We have adopted new designs of our products that are more environmental friendly	.743
We adequately involve our suppliers in coming up with products that are aligned to green logistics	.703
The designs of our products are based on the set regulations and standards	.710

The total variance explained by the items under logistics innovation was also sought and the findings are as shown on Table 4.20. As the results portray, two components had eigenvalues of more than 1.0. The first component had an eigenvalue of 3.393; the second component had an eigenvalue of 2.575. The two components explained a cumulative variance of 66.314%. The results implied that all the sub-variables of

logistics innovation were represented in the instrument; hence the data obtained would cover opinions regarding the three aspects of logistics innovation.

Table 4.20: Total Variance Explained for Logistics innovation

Component	**Initial Eigenvalues**			**Extraction Sums of Squared Loadings**		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.393	37.705	37.705	3.393	37.705	37.705
2	2.575	28.609	66.314	2.575	28.609	66.314
3	.844	9.376	75.690			
4	.714	7.936	83.626			
5	.377	4.191	87.817			
6	.350	3.889	91.706			
7	.317	3.524	95.230			
8	.244	2.707	97.937			
9	.186	2.063	100.000			

Extraction Method: Principal Component Analysis.

The component matrix for the identified components under the logistics innovation is as shown in Table 4.21. As the results portray, the first component had 5 factors with factor loadings exceeding the threshold of 0.50. The second component had 4 factors with factor loadings ranging from 0.626 to 0.828. The two components were computed to represent logistics innovation in the regression and correlation analysis.

Table 4.21: Component Matrix for Logistics innovation

Factors	Component	
	1	2
Our firm uses vehicles and machineries that have low fuel/power consumption	.857	
Our firm has come up with ways of minimizing gas emissions in its production processes	.536	
We have embraced technology in monitoring our logistics and truck movements	.876	
Research and development has been embraced through financing to establish how best we can save on production	.900	
Training is done frequently on how to embrace green logistics	.841	
Our production systems are based on new ways established through research		.626
We have adopted new designs of our products that are more environmentally friendly		.828
We adequately involve our suppliers in coming up with products that are aligned to green logistics		.816
The designs of our products are based on the set regulations and standards		.817

Extraction Method: Principal Component Analysis.
a. 2 components extracted.

4.7.4 Factor Analysis on Green Distribution Systems

KMO and Bartlett's Test were carried out to assess the sampling adequacy for green distribution systems. The results as shown in Table 4.22 revealed that the coefficient for the Kaiser-Meyer-Olkin Measure of Sampling Adequacy was 0.882 which is positive; hence the data was concluded to be validity of carrying out factor analysis. The Bartlett's Test of Sphericity had a significance of 0.000 which is less than the standard significant level of 0.05 hence the data was ruled to be statistically significant for factor analysis.

Table 4.22: KMO and Bartlett's Test on Green Distribution Systems

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.882
Bartlett's Test of Sphericity	Approx. Chi-Square	780.062
	df	36
	Sig.	.000

The communalities for the green distribution systems are as shown in the Table 4.23 below. The findings indicate that the factor loadings for the questions under the variable met the 0.30 threshold with the lowest factor "Our company has sought certification of its delivery vehicles to ensure their compatibility with environmental policies" have a factor loading of 0.531 while the highest factor "Less congested routes are preferred when making deliveries to our customers" having a factor loading of 0.689. The factors were retained for further analysis in the study.

Table 4.23: Communalities on Green Distribution Systems

Factors	Extraction
Our company consolidates loads to avoid sub-optimal use of transportation	.540
Our company pools together Less-Than-Load (LTL) cargo when distributing to ensure maximum use of trucks	.679
The vehicle loadings in our organization are arranged based on the customer locations for easier delivery	.679
The firm has vehicle management systems to ensure optimal utilization of vehicle capacities	.570
Our company has sought certification of its delivery vehicles to ensure their compatibility with environmental policies	.531
Less congested routes are preferred when making deliveries to our customers	.689
Routes with sequence delivery stops are preferred in our company for easier distribution	.660
Our company has a demand responsive system where goods are delivered out of expressed demand	.570
Our company has systems of sharing demand data with the suppliers to help synchronize supply with demand	.553

The findings on the total variance explained for green distribution systems are as shown in Table 4.24. As the results portray, only two components had Eigenvalues greater than 1. The first component had an Eigenvalue of 4.366, while the second component had an Eigenvalue of 1.104. The two components had a cumulative variance of 60.78%. Thus, they were computed to represent the green distribution variable.

Table 4.24: Total Variance Explained on Green Distribution Systems

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.366	48.516	48.516	4.366	48.516	48.516
2	1.104	12.264	60.780	1.104	12.264	60.780
3	.743	8.254	69.034			
4	.676	7.509	76.542			
5	.527	5.853	82.396			
6	.479	5.328	87.723			
7	.400	4.445	92.168			
8	.363	4.036	96.203			
9	.342	3.797	100.000			

Extraction Method: Principal Component Analysis.

The component matrix for the retained components under green distribution systems is as shown in Table 4.25. As the results portray, the first component had 6 factors with factor loadings exceeding the 0.50 threshold. The second components had two factors with factor loadings above 0.50. These factors were computed to represent green distribution systems.

Table 4.25: Component Matrix on Green Distribution Systems

Factors	Component	
	1	2
Our company consolidates loads to avoid sub-optimal use of transportation	.659	
Our company pools together Less-Than-Load (LTL) cargo when distributing to ensure maximum use of trucks	.755	
The vehicle loadings in our organization are arranged based on the customer locations for easier delivery	.726	
The firm has vehicle management systems to ensure optimal utilization of vehicle capacities	.676	
Our company has sought certification of its delivery vehicles to ensure their compatibility with environmental policies		.637
Less congested routes are preferred when making deliveries to our customers	.776	
Routes with sequence delivery stops are preferred in our company for easier distribution		.560
Our company has a demand responsive system where goods are delivered out of expressed demand	.754	
Our company has systems of sharing demand data with the suppliers to help synchronize supply with demand	.666	

Extraction Method: Principal Component Analysis.
a. 2 components extracted.

4.7.5 Factor Analysis on Firm Characteristics

On the moderating variable (firm characteristics), the KMO and Bartlett's Test were carried out. The results are as shown in Table 4.26. The findings revealed that the coefficient for the Kaiser-Meyer-Olkin Measure of Sampling Adequacy was 0.633 which is positive, hence the data was concluded to be valid of carrying out factor analysis. The Bartlett's Test of Sphericity had a significance of 0.000 which is less than the standard significant level of 0.05 hence the data was ruled to be statistically significant for factor analysis.

Table 4.26: KMO and Bartlett's Test on Firm Characteristics

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.633
Bartlett's Test of Sphericity	Approx. Chi-Square	264.474
	df	36
	Sig.	.000

Factor loadings for the firm characteristics items (questions) are as shown in Table 4.27. The threshold for the factor loadings as indicated by Carreon et al. (2011), should be over 0.30. Any item/factor (question) that has a factor loading of below 0.30 should be deleted from the research instrument or rephrased for clarity purpose. In this study, the 0.30 threshold was used and any item that had a factor loading of less than the 0.30 threshold was deleted from the data. As the results portray, it was established that the items under the variable had factor loadings ranging from 0.468 to 0.672. This implies that all the items met the threshold; hence they were retained for further analysis.

Table 4.27: Communalities on Firm Characteristics

Factors	Extraction
The sourcing of materials is done with close involvement of suppliers to embrace green materials	.508
The company had embraced diverse sources of materials to ensure environmental friendly materials are obtained	.672
Our company gives priority to suppliers who are capable of supplying environmental friendly materials	.490
The company has been keen on embracing supply chain agility for effectiveness of its supply chain processes	.494
The supply chain agility of our company has been instrumental in string adoption of green logistics	.589
The company is keen to integrate new changes in the supply chain processes such as the green logistics	.579
The company frequently analyses and mitigates risks associated with supply chain processes	.468
The company has a framework for managing supply chain risks	.666
The overall characteristics of our firm is streamlined towards enhancing the adoption of green logistics to steer performance	.572

The total variance explained results as shown in Table 4.28 revealed that three components had Eigenvalues of above 1. The first component had an Eigenvalue of 2.140, the second one had an Eigenvalue of 1.637, while the third on had an Eigenvalue of 1.261. The three components had a total variance of 55.97%. This implied that the three main sub-variables of firm characteristics were represented under the questionnaire.

Table 4.28: Total Variance Explained on Firm Characteristics

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.140	23.779	23.779	2.140	23.779	23.779
2	1.637	18.186	41.965	1.637	18.186	41.965
3	1.261	14.007	55.972	1.261	14.007	55.972
4	.934	10.383	66.355			
5	.791	8.793	75.148			
6	.692	7.685	82.833			
7	.571	6.347	89.180			
8	.498	5.529	94.709			
9	.476	5.291	100.000			

Extraction Method: Principal Component Analysis.

The factor loadings for the factors under the extracted components on firm characteristics were derived. As the results on Table 4.29 reveal, the first component had 4 factors with factor loadings exceeding the minimum acceptable threshold of 0.50. The factor loadings under this component ranged from 0.758 for the highest to 0.667 for the lowest. The second component had 3 factors with factor loadings higher than the threshold. The factors had factor loadings of 0.697, 0.784 and 0.699. The third component had two factors with factor loadings exceeding the threshold. These three components were computed to represent firm characteristics in the regression and correlation analysis.

Table 4.29: Component Matrix on Firm Characteristics

Factors	**Component**		
	1	2	3
The sourcing of materials is done with close involvement of suppliers to embrace green materials		.697	
The company had embraced diverse sources of materials to ensure environmental friendly materials are obtained		.784	
Our company gives priority to suppliers who are capable of supplying environmental friendly materials		.699	
We stand a better ground to steer green logistics than our peers	.667		
The board of management in our organization has divers members in terms of experience, background and educational level to enhance adoption of green logistics	.758		
The board in our firm has enough board members to effectively make critical decisions on green logistics	.754		
Our company deals with a wide range of products that could affect its green logistics efforts	.676		
Our company's market diversity has affected its efforts to adopt green logistics			.807
The overall characteristics of our firm is streamlined towards enhancing the adoption of green logistics to steer performance			.740

Extraction Method: Principal Component Analysis.
a. 3 components extracted.

4.7.6 Factor Analysis on Firm Performance

The KMO and Bartlett's tests revealed that the KMO coefficient was positive at 0.711 while the Bartlett's Test of Sphericity had a significant level of 0.000<0.005. To this effect, the data under the dependent variable (performance of building and

construction manufacturing firms) was concluded to have met the sampling adequacy and suitable for factor analysis.

Table 4.30: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.711
Bartlett's Test of Sphericity	Approx. Chi-Square	147.511
	df	15
	Sig.	.000

Factor analysis was carried out to minimize the number of items and retain only those that had greater variance on the variable. The findings as shown in Table 4.31 revealed that the factor loadings ranged from 0.634 to 0.419. This means that all the items met the 0.30 threshold; hence they had the minimum required contribution to the variance of variable (performance of building and construction manufacturing firms).

Table 4.31: Communalities for Firm Performance

Factors	**Extraction**
Our company has drastically reduced the rate of customer returns over the past five years	.533
The cost of operations in our firm has reduced for the past five years	.591
Our company has seen an increase in the sales revenue for the past five years	.419
There are fewer customer complaints with regard to our products over the past five years	.634
How would you rate the level of satisfaction among your customers?	.560
To what extent has your company been reducing lead-time over the past five years?	.427

Total variance explained by each of the items under the variable was further used to assess which factor could be retained and those to be deleted. As the results in Table 4.32 reveal, two components had the Eigenvalues of greater than 1. The Eigenvalue for the first component was 2.101; while the second component had an eigenvalue of 1.062. The two components explained a cumulative variance of 52.727%. The items were used to represent firm performance in the subsequent analysis.

Table 4.32: Total Variance Explained for Firm Performance

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.101	35.019	35.019	2.101	35.019	35.019
2	1.062	17.708	52.727	1.062	17.708	52.727
3	.881	14.682	67.409			
4	.754	12.574	79.982			
5	.708	11.802	91.784			
6	.493	8.216	100.000			

Extraction Method: Principal Component Analysis.

The component matrix for the factor analysis under performance of the building and construction manufacturing firms is as shown in Table 4.33. As the results portray, the first components had 4 factors ranging from 0.646 to 0.778. The second component had two factors with factor loadings ranging from 0.660 to 0.736. These items were computed to represent performance of construction companies variable.

Table 4.33: Component Matrix for Firm Performance

Factors	Component	
	1	2
Our company has drastically reduced the rate of customer returns over the past five years		.660
The cost of operations in our firm has reduced for the past five years		.736
Our company has seen an increase in the sales revenue for the past five years	.646	
There are fewer customer complaints with regard to our products over the past five years	.778	
How would you rate the level of satisfaction among your customers?	.716	
To what extent has your company been reducing lead-time over the past five years?	.648	

Extraction Method: Principal Component Analysis.
a. 2 components extracted.

4.8 Diagnostic Tests Results

The study performed tests on statistical assumptions of regression and statistics used. These included tests of normality, linearity, independence, and homogeneity and multi-co linearity. When the assumptions of the linear regression model are correct,

ordinary least squares (OLS) provide efficient and unbiased estimates of the parameters (Kaiser, 1974).

4.8.1 Autocorrelation Test

While autocorrelation is mainly applied in sequence/time series data, it can also be applied in primary data, like the one used in this study. In primary data, it is assumed that the responses on questions with closer intervals or meanings should not differ with high values. Durbin-Watson (DW) statistic was used to test for autocorrelation in line with Field (2009). Based on the recommendation by Field (2009), null hypothesis is that there is no autocorrelation. The general rule of the thump is that the DW test should have values between 1.5 and 2.5, for there to be no autocorrelation. Findings as shown in Table 4.34 showed DW coefficient ranging from 1.574 to 1.795 which indicate that autocorrelation was not presence in the data.

Table 4.34: Auto Correlation

Variables	DW Coefficient
Reverse Logistics	1.683
Green Packaging	1.574
Logistics innovation	1.597
Green Distribution systems	1.693
Firm Characteristics	1.795

4.8.2 Test for Heteroscedasticity

Test for heteroscedasticity was done using Breush-pagan/Cook-Weisberg Test. The null hypothesis in the test is that the error terms have a constant variance. The error terms are said to be Homoscedastic, if the P-value is greater than the conventional P-value 0.05, otherwise the error terms are said to be heteroscedastic. In regression analysis for instance, heteroscedasticity can void statistical tests of significance that assume that data set errors are normally distributed and uncorrelated and whose variance do not vary after being modelled. Ghauri *et al.* (2020) reiterated the fact that any residual table and correlation results generated through SPSS that are to be used for testing for collinearity can also be used to check the existence or absence of heteroscedasticity. In this study, the assumption of heteroscedasticity was apparent

that there was no violation. The findings as shown in Table 4.35 have small chi-square value and insignificant p-value meaning that heteroscedasticity did not pose a problem.

Table 4.35: Heteroscedasticity Test

Variable	Chi Square	P-value
Reverse Logistics	1.23	0.762
Green Packaging	0.67	0.567
Logistics innovation	2.34	0.089
Green Distribution systems	1.56	0.093
Firm Characteristics	0.53	0.123

4.8.3 Multi-Collinearity Test

Multi-collinearity is the presence of correlations between the predictor (independent) variables. When the correlations between predictor variables are high, it means that there is multi-collinearity, and this can imply that a distinctive least squares solution to a regression analysis cannot be computed. When a data has the presence of multi-collinearity, the standard error is inflated, and unstable levels of confidence are achieved, thus affecting the truthfulness in the regression model results. Collinearity test through Variance Inflation Factor (VIF) was used to test for multi-collinearity. The rule of the thumb is that the lower the VIF, the lesser the correlation between independent variables, hence no presence of multicollinearity. Acceptable limits for VIF is between 1 and 10, but VIFs less than 4 are considered more indicative of absence of multicollinearty. As the results in the table below reveal, The VIF for all the variables are between 1.275 and 1.533, an indication that there is absence of multicollinearity, hence the data was ruled to be fit for regression model analysis.

Table 4.36: Multi-Collinearity Test

Model		**Collinearity Statistics**	
		Tolerance	**VIF**
1	(Constant)		
	Reverse Logistics	**.612**	**1.635**
	Green Packaging	**.558**	**1.792**
	Green Logistics	**.479**	**2.088**
	Green Distribution	**.648**	**1.544**

a. Dependent Variable: Firm Performance

4.8.4 Normality Test

A test for normality was carried out in the study. It is the test on whether a sample in study has been drawn from a normally distributed population (Daniels, 2016). In regression model analysis, it is assumed that the data is normally distributed such that the sample from which the data is obtained from has been appropriately identified. If the model is run with a data that is not normally distributed, the results will therefore be unreliable and untrue. In testing for normality, Shapiro-Wilk and Kolmogorov-Smirnov tests were used. The two tests generates P-values an in case the P-values are insignificant (above the standard P-value of 0.05), the data is ruled to be normally distributed. The results for the normality test are as shown in Table 4.37. As the results portray, the K-S test revealed that all the variables and significance levels above 0.05 the same case to Shapiro-Wilk test results. This implies that the data was normally distributed hence met the assumptions of the regression model.

Table 4.37: Normality Test Results

Variables	**Kolmogorov-Smirnov[a]**			**Shapiro-Wilk**		
	Statistic	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
Reverse Logistics	.068	228	.012	.990	228	.121
Green Packaging	.051	228	.200	.988	228	.062
Green Logistics	.084	228	.121	.989	228	.074
Green Distribution	.067	228	.085	.985	228	.079
Firm Characteristics	.063	228	.061	.993	228	.409
Firm Performance	.053	228	.200	.991	228	.147

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

The Q-Q plot was also used to test for the normality of the population distribution. From the results as shown in the Figure 4.6 below, all the variables had most of their plots falling along the straight line, an indication that normality was obtained.

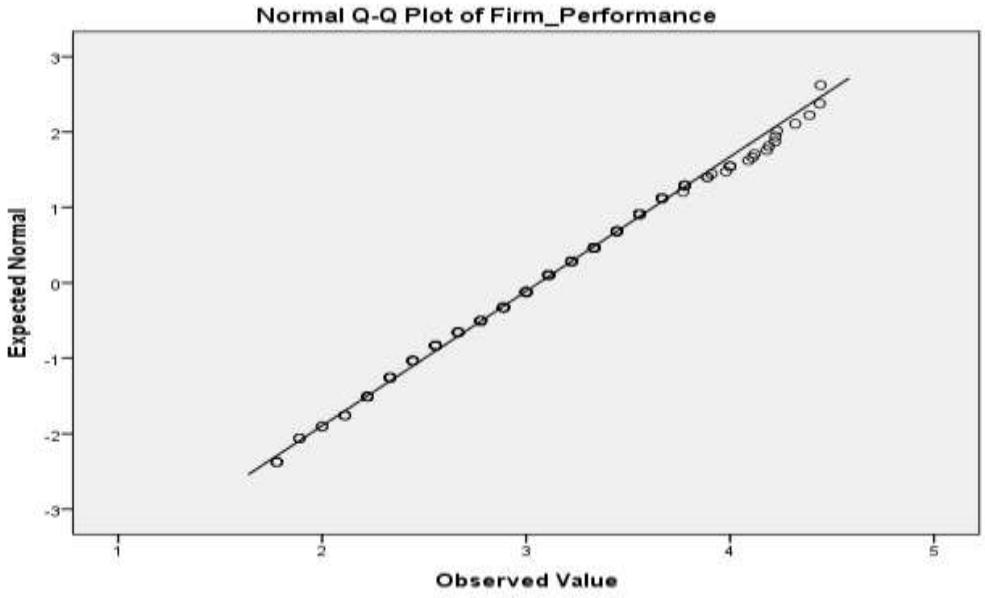

Figure 4.6: Q-Q Plot for Normality Test

4.9 Correlation Analysis

Correlation analysis was carried out to establish the relationship between the independent variables and the dependent variable. Correlation analysis tells whether the independent variables have a strong correlation with the dependent variable, thus informing the study on the direction the hypotheses testing may take. The correlation analysis in this study has been carried out as per the variable.

4.9.1 Correlation Analysis on Reverse Logistics and Firm Performance

On the first objective which was to assess the effect of reverse logistics on the performance or building and construction manufacturing firms in Kenya, the correlation analysis was carried out to establish the relationship between reverse logistics and firm performance. As the findings on Table 4.38 portray, the Pearson Correlation coefficient for reverse logistics was 0.644 at a significant level of 0.000<0.05. The results imply that reverse logistics has a strong and significant correlation with the performance building and construction manufacturing firms in Kenya.

Table 4.38: Correlation Analysis on Reverse Logistics

		Firm Performance	Reverse Logistics
Firm Performance	Pearson Correlation	1	.644**
	Sig. (2-tailed)		.000
	N	228	228
Reverse Logistics	Pearson Correlation	.644**	1
	Sig. (2-tailed)	.000	
	N	228	228

4.9.2 Correlation Analysis on Green Packaging and Firm Performance

The study sought to establish the correlation between green packaging and performance of building and construction manufacturing firms in Kenya. The results as shown in Table 4.39 revealed that the Pearson Correlation (r) on the relationship between green packaging and firm performance was 0.667, at a significant level of 0.000<0.05. The findings imply that green packaging has a significant and strong correlation with the performance of building and construction manufacturing firms in Kenya.

Table 4.39: Correlation Results between Green Packaging and Performance

		Firm Performance	Green Packaging
Firm Performance	Pearson Correlation	1	.667**
	Sig. (2-tailed)		.000
	N	228	228
Green Packaging	Pearson Correlation	.667**	1
	Sig. (2-tailed)	.000	
	N	228	228

4.9.3 Correlation Analysis on Logistics innovation and Firm Performance

A correlation between logistics innovation and performance of the building and construction manufacturing firms in Kenya was sought. As the results on Table 4.40 portray, it was established that the Pearson correlation between logistics innovation and firm performance was 0.762, while the level of significant was 0.000<0.05. The results implied that the logistics innovation had a strong correlation with the performance of building and construction manufacturing firms in Kenya.

Table 4.40: Correlation between Logistics innovation and Firm Performance

		Firm Performance	Logistics innovation
Firm Performance	Pearson Correlation	1	.762**
	Sig. (2-tailed)		.000
	N	228	228
Logistics innovation	Pearson Correlation	.762**	1
	Sig. (2-tailed)	.000	
	N	228	228

4.9.4 Correlation Analysis on Green Distribution Systems and Firm Performance

The study was set to establish the relationship between green distribution systems and the performance of building and construction manufacturing firms in Kenya, using correlation analysis. As the results on Table 4.41 reveal, the Pearson Correlation for the variable was 0.649, at a significant level of 0.000<0.05. The results imply that the correlation between distribution systems and performance of building and construction manufacturing firms in Kenya is strong and significant.

Table 4.41: Correlation between Green Distribution Systems and Firm Performance

		Firm Performance	Green Distribution Systems
Firm Performance	Pearson Correlation	1	.649**
	Sig. (2-tailed)		.000
	N	228	228
Green Distribution Systems	Pearson Correlation	.649**	1
	Sig. (2-tailed)	.000	
	N	228	228

4.10 Simple Linear Regression Analysis

The study adopted alternative hypotheses, which were tested using regression model. Both multivariate and univariate regression analysis has been carried out to test the hypotheses. According to Wilcox (2011), testing hypothesis is essential in a study in that in gives a direction in which the conclusions of the study takes.

4.10.1 Reverse Logistics

H_{A1}: Reverse logistics has a significant effect on the performance of building and construction manufacturing firms in Kenya

The study sought to establish the effect of reverse logistics on the performance of building and construction manufacturing firms in Kenya. The model summary as shown in Table 4.42 revealed that the R-square (R^2) for the model was 0.415. This implies that 41.5% of the variation in firm performance will be as a result of reverse logistics.

The Analysis of Variance (ANOVA) test was carried out and the results are as shown in Table 4.43 revealed that the F-statistic for the variable was 160.185 at a significant level of 0.000<0.05. The findings implied that the model was statistically significant and would predict the relationship between reverse logistics and performance of building and construction manufacturing firms in Kenya.

The regression coefficients for the model are as shown in Table 4.44. As the results portray, the Beta coefficient for reverse logistics was 0.667 at a significant level of 0.000<0.05. The findings imply that a unit change in reverse logistics would influence the performance of building and construction manufacturing firms by 0.667 units. The P-value being less than the standard p-value of 0.05 implies that there is a significant relationship between reverse logistics and performance, thus the alternative hypothesis is accepted, and a conclusion drawn that reverse logistics has a significant effect on the performance of building and construction manufacturing firms in Kenya.

Table 4.42: Model Summary on Reverse Logistics and Firm Performance

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.644[a]	.415	.412	.42980

a. Predictors: (Constant), Reverse Logistics

Model		Sum ofdf Squares		Mean Square	F	Sig.
1	Regression	29.590	1	29.590	160.185	.000[b]
	Residual	41.748	226	.185		
	Total	71.338	227			

a. Dependent Variable: Firm Performance
b. Predictors: (Constant), Reverse Logistics

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.056	.161		6.558	.000
	Reverse Logistics	.667	.053	.644	12.656	.000

a. Dependent Variable: Firm Performance

4.10.2 Green Packaging

H_{A2}: Green packaging has a significant effect on the performance of building and construction manufacturing firms in Kenya

The study sought to establish the influence of green packaging on the performance of building and construction manufacturing firms in Kenya. The model summary as shown in Table 4.43 revealed that the R^2 for the model was 0.444. This implies that as a result of green packaging, the variation of performance of building and construction manufacturing firms will be 44.4%. This is an indication that green packaging has a strong influence on the performance of building and construction manufacturing firms in Kenya.

The ANOVA test results for the model are as shown in Table 4.43. As the results portray, the F-statistic for the model was 180.641 at a significant level of 0.000<0.05. This implies that the model is significant in predicting the effect of green packaging and firm performance. It also shows that there is a possibility of a significant relationship between the variables.

The regression coefficients for the model on the relationship between green packaging and firm performance are as shown in Table 4.43. As the results portray, the Beta coefficient for green packaging is 0.620. This implies that a unit change in green packaging would influence the performance of the building and construction firms by 0.62 units. The significant level for the variable is 0.000<0.05. This implies that there is a significant relationship between green packaging and performance of building and construction manufacturing firms in Kenya.

Table 4.43: Model Summary on Green Packaging and Firm Performance

Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.667[a]	.444	.442	.41885

a. Predictors: (Constant), Green Packaging

Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	31.690	1	31.690	180.641	.000[b]
	Residual	39.648	226	.175		
	Total	71.338	227			

a. Dependent Variable: Firm Performance
b. Predictors: (Constant), Green Packaging

Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	1.160	.144		8.039	.000
	Green Packaging	.620	.046	.667	13.440	.000

a. Dependent Variable: Firm Performance

4.10.3 Logistics Innovation

H_{A3}: Logistics innovation has a significant effect on the performance of building and construction manufacturing firms in Kenya

The study sought to assess the influence of logistics innovation on the performance of building and construction manufacturing firms in Kenya. The model summary for the variable is as shown in Table 4.44. As the results portray, the R^2 for the model is 0.581. This implies that through logistics innovation, there will be a 58.1% variation in the performance of building and construction manufacturing firms in Kenya.

The ANOVA results on the logistics innovation and firm performance are as shown in Table 4.44. As the results portray, the F-statistic for the variable is 313.139 at a significant level of 0.000<0.05. This is an implication that the model is statistically significant and it can be used to estimate the relationship between logistics innovation and firm performance.

The regression coefficients for the model are as shown in Table 4.44. As the results portray, the Beta coefficient for logistics innovation was 0.752. This indicates that a unit change in logistics innovation would influence the performance of building and construction manufacturing firms by 0.752 units. The P-value for the model was 0.000<0.05, which implies that there is a significant relationship between logistics innovation and performance of the building and construction manufacturing firms in Kenya. To this end, the alternative hypothesis that there is a significant influence of logistics innovation on the performance of building and construction manufacturing firms in Kenya is accepted.

Table 4.44: Regression Model Results on Logistics Innovation and Performance of Building and Construction Manufacturing Firms

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.762[a]	.581	.579	.36376

a. Predictors: (Constant), Logistics innovation

ANOVA Test Results

Model		Sum Squares	ofdf	Mean Square	F	Sig.
1	Regression	41.434	1	41.434	313.139	.000[b]
	Residual	29.904	226	.132		
	Total	71.338	227			

a. Dependent Variable: Firm Performance
b. Predictors: (Constant), Logistics innovation

Regression Coefficients on Logistics innovation and Performance

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.772	.132		5.863	.000
	Logistics innovation	.752	.042	.762	17.696	.000

a. Dependent Variable: Firm Performance

4.10.4 Green Distribution Systems

H_{A4}: Green distribution systems has a significant effect on the performance of building and construction manufacturing firms in Kenya

The study sought to establish the influence of green distribution systems on the performance of building and construction manufacturing companies in Kenya. The model summary results are as shown in Table 4.45. As the results portray, the R^2 for the model is 0.422. This implies that 42.2% of the variation in the performance of building and construction manufacturing firms will be as a result of green distribution systems.

The Analysis of Variance (ANOVA) results are as shown in Table 4.45. As the results portray, the F-statistic for the variable is 164.710 at a significant level of 0.000<0.05. The findings imply that the model is statistically significant for predicting the relationship between green distribution systems and performance of building and construction manufacturing firms in Kenya.

The regression coefficients for the relationship between green distribution systems and performance of building and construction manufacturing firms in Kenya are as shown in Table 4.45. As the results portray, the Beta coefficient for green distribution systems is 0.608. This implies that a unit change in green distribution systems would influence the performance of building and construction manufacturing firms by 0.608 units. The P-value for the model was 0.000<0.05. This implies that the green distribution systems has a significant influence on the

performance of the building and construction manufacturing firms in Kenya, hence the alternative hypothesis is accepted.

Table 4.45: Regression Model Results on Green Distribution Systems and Performance of Building and Construction Manufacturing Firms

Model Summary Green Distribution Systems

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.649[a]	.422	.419	.42730

a. Predictors: (Constant), Green Distribution Systems

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	30.074	1	30.074	164.710	.000[b]
	Residual	41.264	226	.183		
	Total	71.338	227			

a. Dependent Variable: Firm Performance

b. Predictors: (Constant), Green Distribution

Regression Coefficients on Green Distribution Systems

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.200	.148		8.113	.000
	Green Distribution Systems	.608	.047	.649	12.834	.000

a. Dependent Variable: Firm Performance

4.11 Moderating Effect of Firm Characteristics

The study sought to establish the moderating effect of firm characteristics on the relationship between reverse logistics, green packaging, logistics innovation and green distribution systems and performance of building and construction manufacturing firms in Kenya. This was done using the interaction effect and regressing the interaction effect through a univariate regression analysis. The findings are presenting systematically per the variables.

4.11.1 Moderating effect of Firm Characteristics on the Relationship between Reverse Logistics and Firm Performance

The moderating effect of firm characteristics on the relationship between reverse logistics and performance of building and construction manufacturing firms was

carried out. The model summary results as shown in Table 4.46 revealed that when interacted with firm characteristics, reverse logistics was responsible for 70.4% of the variation in performance of building and construction manufacturing firms in Kenya.

The ANOVA results on the other hand revealed that the F-statistic for the model was 538.091 at a significant level of 0.000<0.05, implying that the model was statistically significant to predict the moderating effect of firm characteristics on the relationship between reverse logistics and performance of building and construction manufacturing firms in Kenya.

The regression coefficient for the model on the other hand revealed that the Beta coefficient (β) for interaction effect of firm characteristics and reverse logistics was 0.149 at a significant level of 0.000<0.05. The results imply that a unit change in the residual from the interaction between firm characteristics and reverse logistics influenced performance of the building and construction manufacturing firms by 14.9%. The interaction effect is significant implying that firm characteristics has a significant moderating effect on the relationship between reverse logistics and performance of building and construction manufacturing firms in Kenya.

Table 4.46: Interaction Effect between Reverse Logistics and Firm Characteristics

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.839[a]	.704	.703	.30555

a. Predictors: (Constant), Reverse Logistics*Firm Characteristics

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	50.238	1	50.238	538.091	.000[b]
	Residual	21.100	226	.093		
	Total	71.338	227			

a. Dependent Variable: Firm Performance

b. Predictors: (Constant), Reverse Logistics*Firm Characteristics

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.711	.062		27.740	.000
	Reverse Logistics*Firm Characteristics	.149	.006	.839	23.197	.000

a. Dependent Variable: Firm Performance

4.11.2 Moderating effect of Firm Characteristics on the Relationship between Green Packaging and Firm Performance

The moderating effect of firm characteristics on the relationship between green packaging and performance of building and construction manufacturing firms was carried out. The model summary results as shown in Table 4.47 revealed that when interacted with firm characteristics, green packaging was responsible for 70.9% of the variation in performance of building and construction manufacturing firms in Kenya.

The ANOVA results on the other hand revealed that the F-statistic for the model was 549.352 at a significant level of 0.000<0.05, implying that the model was statistically significant to predict the moderating effect of firm characteristics on the relationship between green packaging and performance of building and construction manufacturing firms in Kenya.

The regression coefficient for the model on the other hand revealed that the Beta coefficient (β) for interaction effect of firm characteristics and green packaging was 0.144 at a significant level of 0.000<0.05. The results imply that a unit change in the residual from the interaction between firm characteristics and green packaging influenced performance of the building and construction manufacturing firms by 14.4%. The interaction effect is significant implying that firm characteristics have a significant moderating effect on the relationship between green packaging and performance of building and construction manufacturing firms in Kenya.

Table 4.47: Interaction Effect between Green Packaging and Firm Characteristics

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.842[a]	.709	.707	.30333

a. Predictors: (Constant), Green Packaging*Firm Characteristics

ANOVA

Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	50.544	1	50.544	549.352	.000[b]
	Residual	20.794	226	.092		
	Total	71.338	227			

a. Dependent Variable: Firm Performance
b. Predictors: (Constant), Green Packaging*Firm Characteristics

Coefficients

Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	Std. Error	Beta		
1	(Constant)	1.731	.060		28.720	.000
	Green Packaging *Firm Characteristics	.144	.006	.842	23.438	.000

a. Dependent Variable: Firm Performance

4.11.3 Moderating effect of Firm Characteristics on the Relationship between Logistics Innovation and Firm Performance

The moderating effect of firm characteristics on the relationship between logistics innovation and performance of building and construction manufacturing firms was carried out. The model summary results as shown in Table 4.48 revealed that when interacted with firm characteristics, logistics innovation was responsible for 75.8% of the variation in performance of building and construction manufacturing firms in Kenya.

The ANOVA results on the other hand revealed that the F-statistic for the model was 706.447 at a significant level of 0.000<0.05, implying that the model was statistically significant to predict the moderating effect of firm characteristics on the relationship between logistics innovation and performance of building and construction manufacturing firms in Kenya.

The regression coefficient for the model on the other hand revealed that the Beta coefficient (β) for interaction effect of firm characteristics and logistics innovation was 0.148 at a significant level of 0.000<0.05. The results imply that a unit change in the residual from the interaction between firm characteristics and logistics innovation influenced performance of the building and construction manufacturing firms by 14.8%. The interaction effect is significant implying that firm characteristics have a significant moderating effect on the relationship between logistics innovation and performance of building and construction manufacturing firms in Kenya.

Table 4.48: Interaction Effect between Logistics Innovation and Firm Characteristics

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.870[a]	.758	.757	.27660

a. Predictors: (Constant), Logistics Innovation*Firm Characteristics

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	54.048	1	54.048	706.447	.000[b]
	Residual	17.290	226	.077		
	Total	71.338	227			

a. Dependent Variable: Firm Performance
b. Predictors: (Constant), Logistics Innovation*Firm Characteristics

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.700	.054		31.229	.000
	Logistics Innovation*Firm Characteristics	.148	.006	.870	26.579	.000

a. Dependent Variable: Firm Performance

4.11.4 Moderating effect of Firm Characteristics on the Relationship between Greed Distribution Systems and Firm Performance

The moderating effect of firm characteristics on the relationship between green distribution systems and performance of building and construction manufacturing firms was carried out. The model summary results as shown in Table 4.49 revealed that when interacted with firm characteristics, green distribution systems was

responsible for 68.6% of the variation in performance of building and construction manufacturing firms in Kenya.

The ANOVA results on the other hand revealed that the F-statistic for the model was 493.928 at a significant level of 0.000<0.05, implying that the model was statistically significant to predict the moderating effect of firm characteristics on the relationship between green distribution systems and performance of building and construction manufacturing firms in Kenya.

The regression coefficient for the model on the other hand revealed that the Beta coefficient (β) for interaction effect of firm characteristics and green distribution systems was 0.143 at a significant level of 0.000<0.05. The results imply that a unit change in the residual from the interaction between firm characteristics and green distribution systems influenced performance of the building and construction manufacturing firms by 14.3%. The interaction effect is significant implying that firm characteristics has a significant moderating effect on the relationship between green distribution systems and performance of building and construction manufacturing firms in Kenya.

Table 4.49: Interaction Effect between Green Distribution Systems and Firm Characteristics

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.828[a]	.686	.685	.31479

a. Predictors: (Constant), Green Distribution*Firm Characteristics

ANOVA

Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	48.943	1	48.943	493.928	.000[b]
	Residual	22.394	226	.099		
	Total	71.338	227			

a. Dependent Variable: Firm Performance

b. Predictors: (Constant), Green Distribution*Firm Characteristics

Coefficients

Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	Std. Error	Beta		
1	(Constant)	1.748	.063		27.867	.000
	Green Distribution*Firm Characteristics	.143	.006	.828	22.224	.000

a. Dependent Variable: Firm Performance

4.12 Multiple Linear Regression Analysis

4.12.1 Unmoderated Multiple Regression Model

A multivariate regression analysis was carried out to establish the relationship between the green logistics aspects and performance of the building and construction manufacturing firms in Kenya. The overall model for the study was of the form:

$$Y= \beta o + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

The model summary as shown in Table 4.50 revealed that R-square for the model was 0.722. This is an implication that 72.2% of the variation in the performance of the building and construction manufacturing firms will be achieved through the combined effect of Green Distribution systems, Reverse Logistics, Green Packaging, and Logistics innovation.

The ANOVA results for the overall model are as shown in Table 4.50. As the results reveal, the F-statistic for the model is 144.586 at a significant level of 0.000<0.05. This implies that the model is statistically significant in explaining the relationship between the aspects of green logistics and performance of building and construction manufacturing firms in Kenya. The results also imply that at least one or more variables have a significant relationship with the dependent variable.

The regression coefficients for the overall model are as shown in Table 4.50. From the unstandardized coefficients on the table, the model of the study now becomes as shown:

$$Y= 0.024+ 0.211X_1+ 0.190X_2+ 0.379X_3+ 0.233X_4 +0.132$$

The results imply that reverse logistics would influence the performance of the building and construction manufacturing firms by 0.211 units, when all the other factors are held constant. The P-value for the variable is 0.000<0.05, implying that even with the other aspects of green logistics, reverse logistics will have a significant influence on the performance of the building and construction manufacturing firms in Kenya. The Beta coefficient for green packaging is 0.190, an indication that when all the other factors are held constant, a unit change in green packaging would influence the performance of the construction firms by 0.19 units. With a P-value of 0.000<0.05, it implies that green packaging has a significant influence on the performance of the construction industry in Kenya. The findings further revealed that the beta coefficient for logistics innovation is 0.379, an indication that a unit change in logistics innovation and holding the other factors constant, there will be an increase in performance of the building and construction manufacturing firms by 0.379 units. The variable had a P-value of 0.000<0.05, which implies that logistics innovation has a significant influence on the performance of the building and construction manufacturing firms in Kenya. The Beta coefficient for green distribution systems was 0.233, an indication that when holding the other factors constant, a unit change in green distribution systems would influence performance of the building and construction manufacturing firms in Kenya by 0.233 units. With a P-value of 0.000<0.05, it implies that green distribution systems has a significant

effect on the performance of the building and construction manufacturing firms in Kenya.

Table 4.50: Overall Unmoderated Regression Model

Model Summary for the Overall Model

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.850[a]	.722	.717	.29837

a. Predictors: (Constant), Green Distribution Systems, Reverse Logistics, Green Packaging, Logistics innovation

ANOVA Test Results for the Overall Model

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	51.486	4	12.871	144.586	.000[b]
	Residual	19.852	223	.089		
	Total	71.338	227			

a. Dependent Variable: Firm Performance

b. Predictors: (Constant), Green Distribution Systems, Reverse Logistics, Green Packaging, Logistics innovation

Regression Coefficients for the Overall Model

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.024	.132		.181	.026
	Reverse Logistics	.211	.047	.204	4.519	.000
	Green Packaging	.190	.044	.204	4.314	.000
	Logistics innovation	.379	.050	.384	7.530	.000
	Green Distribution Systems	.233	.041	.248	5.661	.000

a. Dependent Variable: Firm Performance

4.12.2 Moderated Multiple Regression

H_{A5}: Firm characteristics has a moderating effect between green logistics and performance of building and construction manufacturing firms in Kenya

The study sought to establish the moderating effect of firm characteristics on the relationship between green logistics (Green Distribution Systems, Reverse Logistics, Green Packaging, and Logistics innovation) and performance of building and construction manufacturing firms in Kenya. The model for the hypothesis was as shown below:

$$\beta_0 + \beta_1 X_1 * Z + \beta_2 X_2 * Z + \beta_3 X_3 * Z + \beta_4 X_4 * Z + \varepsilon$$

The model summary for the moderated model as shown in Table 4.51 revealed that the R-square for the model was 0.792, which implies that when firm characteristics is introduced as a moderator, 79.2% of the variation of performance of the building and construction manufacturing firms in Kenya will be achieved as a result of Green Distribution Systems, Reverse Logistics, Green Packaging, and Logistics innovation. When not moderated, the R^2 was 0.722 (Table 4.53) which implies that through the moderator, the performance variation due to green logistics aspects increases by 7%.

The ANOVA test results of the moderated model are as shown in Table 4.51. As the results reveal, the F-statistic for the model was 211.670 at a significant level of 0.000<0.05. This implies that the model is statistically significant for predicting the moderating effect of firm characteristics on the relationship between logistics and performance of the building and construction manufacturing firms. The regression coefficients for the moderated model are as shown in Table 4.51. From the unstandardized coefficients, the following regression model has been derived:

$$Y = 1.591 + 0.029X_1Z + 0.033X_2Z + 0.067X_3Z + 0.031X_4Z + 0.054e$$

From the model, it is evident that the Beta coefficient for the moderation effect of reverse logistics and firm characteristics was 0.029, an indication that when moderated, reverse logistics would influence performance of the building and

construction manufacturing firms by 0.029 units. The P-value is 0.034<0.05, an indication that there is a significant moderating effect of the relationship between reverse logistics and performance of the building and construction manufacturing firms in Kenya. The Beta coefficient for the moderation effect of green packaging and firm characteristics is 0.033, an implication that when moderated, green packaging will influence the performance of the building and construction manufacturing firms in Kenya by 0.033 units. With a P-value of 0.010<0.05, is an indication that firm characteristics has a significant moderating effect on the relationship between green packaging and performance of the building and construction manufacturing firms in Kenya.

Table 4.51: Moderated Multiple Regression Model

Model Summary for the Moderated Model

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.890[a]	.792	.788	.25825

a. Predictors: (Constant), Green Distribution*Firm Characteristics, Green Packaging*Firm Characteristics, Reverse Logistics*Firm Characteristics, Green Logistics*Firm Characteristics

ANOVA Test Results for the Moderated Model

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	56.466	4	14.116	211.670	.000[b]
	Residual	14.872	223	.067		
	Total	71.338	227			

a. Dependent Variable: Firm Performance

b. Predictors: (Constant), Green Distribution*Firm Characteristics, Green Packaging*Firm Characteristics, Reverse Logistics*Firm Characteristics, Green Logistics*Firm Characteristics

Regression Coefficients for the Overall Moderated Model

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.591	.054		29.495	.000
	Reverse Logistics*Firm Characteristics	.029	.014	.163	2.130	.034
	Green Packaging*Firm Characteristics	.033	.013	.195	2.593	.010
	Logistics innovation*Firm Characteristics	.067	.015	.392	4.548	.000
	Green Distribution Systems*Firm Characteristics	.031	.012	.180	2.606	.010

a. Dependent Variable: Firm Performance

4.13 Optimal Model

Logistics innovation when moderated by firm characteristics had a Beta coefficient of 0.067, and indication that when moderated, a unit change in logistics innovation will influence the performance of the building and construction manufacturing firms in Kenya by 0.067 units. The P-value for the variable was 0.000<0.05, an indication that when moderated by firm characteristics, logistics innovation will have a significant influence on the performance of the building and construction manufacturing firms in Kenya. The moderation effect between green distribution systems and firm characteristics has a Beta coefficient of 0.031, which implies that a unit change in green distribution systems when moderated by firm characteristics will influence performance of the building and construction manufacturing firms by 0.031 units. The P-value for the variable is 0.010<0.05, which implies that firm characteristics has a significant moderating effect on the relationship between green distribution systems and performance of building and construction manufacturing firms in Kenya.

The findings are in line with previous empirical evidence that has shown the role played by green logistics in enhancing firm performance. A study by Jinru et al. (2022) found that social and environmental activities in logistics have a more important effect than financial-economic activities in terms of green logistics to

provide for the expansion of the monetary policy. According to Liu *et al.* (2020), green logistics among other sustainable supply chain processes are essential in enhancing performance through reducing operating costs, which helps improve performance and profitability.

A study by Eshikumo (2017) revealed that reverse logistics, logistics innovation and green packaging were key practices of green logistics that had a significant impact on organizational performance. Zawadi (2018) indicated that green logistics helps in improving the quality of the product for the purposes of customer satisfaction with the service or product provided thus enhancing firm competitiveness and performance. This was also confirmed by Yingfei et al. (2022) who indicated that green logistics practices are integral in bringing the customers closer to the organization whereby they gain confidence with the firm due to its sustainable processes.

4.14 Revised Conceptual Framework

The revised conceptual is as shown below. This has been informed by the optimal model. The conceptual framework shows that the flow of variables will change from the initial flow on the former conceptual framework where reverse logistics, green packaging, logistics innovation and green distribution systems was the flow. Now based on the optimal model which shows the level of significance for the variables, the flow will be logistics innovation ($\beta = 0.067$), green packaging ($\beta = 0.033$), green distribution ($\beta = 0.031$) and reverse logistics ($\beta = 0.029$). Moderating variable (Firm characteristics) has been retained since it was found to have a significant moderating effect on the relationship between green logistics and performance of building and construction manufacturing firms.

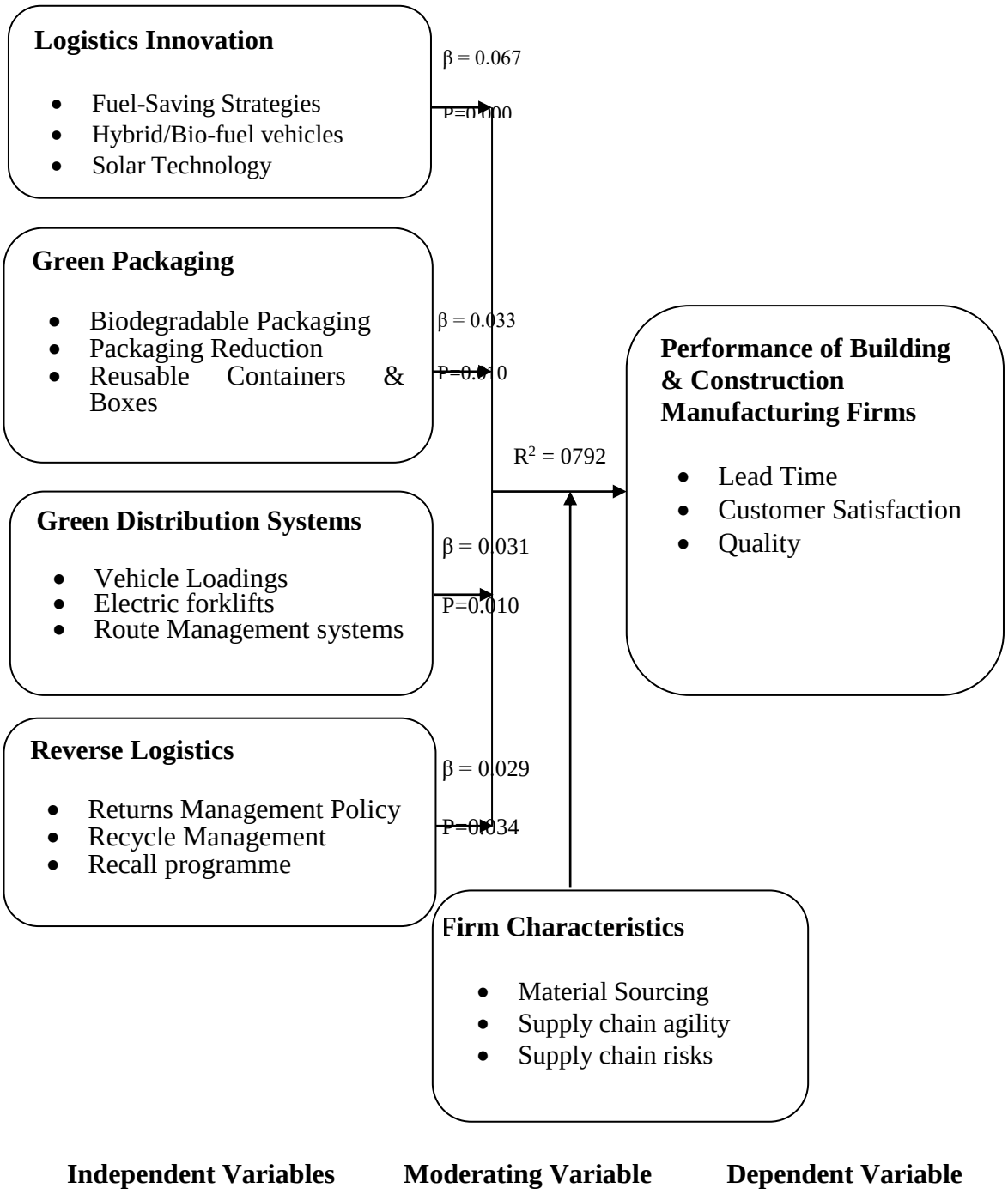

Figure 4.7: Revised Conceptual Framework

4.15 Summary of Hypotheses Testing Results

The study tested hypotheses to assess the relationship between green logistics and performance of building and construction manufacturing firms. The findings are as

shown. This implies that a unit change in green packaging would influence the performance of the building and construction firms by 0.62 units. The significant level for the variable is 0.000<0.05. This implies that there is a significant relationship between green packaging and performance of building and construction manufacturing firms in Kenya. The P-value for the model was 0.000<0.05, which implies that there is a significant relationship between logistics innovation and performance of the building and construction manufacturing firms in Kenya. To this end, the alternative hypothesis that there is a significant influence of logistics innovation on the performance of building and construction manufacturing firms in Kenya is accepted. The P-value for the model was 0.000<0.05. This implies that the green distribution systems has a significant influence on the performance of the building and construction manufacturing firms in Kenya, hence the alternative hypothesis is accepted.

Table 4.52: Summary of Hypotheses Testing

Hypotheses	t- Calculated	t- critical	P value	Decision
H_{A1}: Reverse logistics has a significant effect on the performance of building and construction manufacturing firms in Kenya	12.656	1.96	0.000	Accept alternative hypothesis
H_{A2}: Green packaging has a significant effect on the performance of building and construction manufacturing firms in Kenya	13.440	1.96	0.000	Accept alternative hypothesis
H_{A3}: Logistics innovation has a significant effect on the performance of building and construction manufacturing firms in Kenya	17.696	1.96	0.000	Accept alternative hypothesis
H_{A4}: Green distribution systems has a significant effect on the performance of building and construction manufacturing firms in Kenya	12.834	1.96	0.000	Accept alternative hypothesis
H_{A5}: Firm characteristics has a moderating effect on the relationship between green logistics and performance of building and construction manufacturing firms in Kenya	13.056	1.96	0.000	Accept alternative hypothesis

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The chapter highlights the summary of findings of the study. The study's main aim was to assess the influence of green logistics on the performance of building and construction manufacturing firms in Kenya. The chapter also captures the conclusion of the study which is based on the findings. The recommendations of the study will also be included in the chapter, as well as suggestions of areas for further studies.

5.2 Summary of Findings

The study assessed the influence of green logistics on the performance of building and construction manufacturing firms in Kenya. The study was specifically set to assess the effect of reverse logistic, green packaging, logistics innovation and green distribution systems on the performance of building and construction manufacturing firms in Kenya. With a sample size of 270, the study obtained a response rate of 228 respondents, which is equivalent to 84.4%. The demographic analysis of the respondents' characteristics revealed that most of the respondents had worked in their respective manufacturing firms for a period of less than 10 years while majority were procurement managers and heads of departments. Most of the firms surveyed had operated in the country for a period of less than 9 years and had between 1 and 6 building and construction products that they dealt with. The demographic results revealed that diverse characteristics of the respondents were obtained.

5.2.1 Reverse Logistics

The first objective of the study was to assess the influence of reverse logistics on the performance of building and construction manufacturing firms in Kenya. The descriptive analysis of the study findings revealed that returns policy which is encouraged for green logistics was not embraced in most of the firms, the same case to the recall programs which are meant to ensure that the products that are found to

be environmentally unfriendly are recalled back by the manufacturers. The recycling and refurbishment was also not embraced in most of the firms surveyed, which exposes the firms to be active contributors of pollution. The reverse logistics through return policies, recall programs and recycling is meant to ensure that the manufacturing firms have an active role to play in conserving the environment and promoting sustainable practices even after producing and dispensing the products to the consumers. It is expected that the manufacturing firms in the construction and building industry promotes policies and guidelines that ensure that the customers and any other distributor of their produced goods have the capability and responsibility to return any goods that are found to override the environmental friendly and sustainable practices.

The findings revealed that the reverse logistics were not embraced in most of the surveyed building and construction manufacturing firms, despite the ability of the practice to reduce the timeframes used in deliveries, promoting customer satisfaction, saving on operational costs and enhancing the quality of goods. This explains why the manufacturing firms in the building and construction sub-sector may lose their superiority in performance despite embracing other key production and supply chain technologies. The descriptive statistics are also in line with the inferential statistics results through the regression model which revealed reverse logistics had a significant impact on the performance of building and construction manufacturing firms in Kenya. This led to the rejection of the null hypothesis that reverse logistics has not significant effect on the performance of building and construction manufacturing firms in Kenya.

5.2.2 Green Packaging

The second objective of the study was to assess the effect of green packaging on the performance of building and construction manufacturing firms in Kenya. The descriptive results of the study revealed that most of the manufacturing firms surveyed did not apply packaging made of recyclable materials, despite this being a major way of enhancing the quality of goods. Most of the organizations also did not embrace packaging materials that were biodegradable. The findings further revealed

that the surveyed firms used minimum transportation packaging materials which is a way of preserving the natural resources and reduce the cost of transportation. The firms however did not embraced use of post-consumer polyethylene materials to package their goods and also embrace of renewable resources in packaging was minimal.

The respondents further disagreed that their respective firms used packaging materials that helped to preserve the natural state of the products and the materials used in packaging enhanced the delivery of goods in their original state. Most of the companies did not enhance packaging optimization through reduction of packaging and retaining product protection, and this could mean that increased costs and lack of proper protection in the products was high. The respondents further noted that their respective firms did not actively use eco-friendly packaging materials, an indication that the building and construction manufacturing firms could be actively contributing to environmental pollution through unsustainable packaging practices thus not benefiting from reduced costs and enhanced customer satisfaction. The results from the regression model on the other hand revealed that green packaging had a significant and positive effect on the performance of building and construction manufacturing firms in Kenya. This was both when regressed alone through univariate regression analysis and when regressed with other variables on green logistics through multivariate regression model.

5.2.3 Logistics innovation

The third objective of the study was to establish the effect of logistics innovation of the performance of building and construction manufacturing firms in Kenya. The results from the descriptive analysis revealed that the embrace of vehicles and machineries that had low fuel and low energy consumption was minimal in most of the surveyed firms while most of the firms had embraced ways of minimizing the gas emissions in their production process. Most of the surveyed firms had not embraced technology in monitoring their logistics and truck movements, which could be a factor leading to increased costs and wastage of fuels. One of the major costs that manufacturing firms have to deal with is the cost of fuel, which can be easily dealt

with by enhanced used of logistics innovation. The findings however revealed that keys innovation practices such as research and development which is meant to enhance the creativity of the employees on how to observe green logistics as well as continuous training on logistics innovation were not effectively upheld by most of the surveyed building and construction manufacturing firms. This could be factors that contributes to declining in performance of the manufacturing firms in the building and construction sub-sector.

The findings further had it that adoption of new designs that saved on costs and more friendly to the environment were not used in most of the firms, which could be an issue led by the lack of proper involvement of the suppliers in designing the required products and materials. The findings are supported by the inferential results that revealed that the logistics innovation had a significant and positive impact on the performance of manufacturing firms in the building and construction industry. The results showed that when regressed alone, logistics innovation had a significant influence on performance, the same case to when it is regressed with the other aspects of green logistics.

5.2.4 Green Distribution Systems

The third objective of the study was to assess the effect of green distribution systems on the performance of building and construction manufacturing firms in Kenya. The analysis of the descriptive statistics revealed that consolidation of loads as a strategy to avoid sub-optimal use of the transportation was not effectively upheld in most of the manufacturing firms surveyed. The firms also did not pool together less-than-load cargo when distributing to ensure maximum use of trucks. Vehicle loadings in most of the building and contrition manufacturing firms were not arranged based on the customer locations despite this being an effective way of easing and speeding-up the delivery process thus saving on costs and enhancing customer satisfaction. The findings further revealed that the embrace of vehicle management systems was not effectively upheld on most of the surveyed firms, while most of the firms did not seek certification on their delivery vehicles which is a strategy recommended for

enhancing compatibility with the environmental policies and sustainable distribution process.

The firms lacked an effective way of ensuring use of lesser congested routes and having sequence stops routes preferred over routes with minimal delivery stops. The findings are a clear indication that the building and construction firms are not effective in embracing the green distribution systems. This is despite distribution through sustainable practices being an essential way that modern firms are using not only to save on operational costs buts also to enhance efficiency and ensure proper lead-time reduction. The inferential analysis of the study model revealed that green distribution systems had a positive and significant effect on the performance of manufacturing firms in the 2building and construction sub-sector.

5.2.5 Firm Characteristics

The study sought to establish the moderating effect of firm characteristics on the relationship between green logistics and performance of building and construction manufacturing firms in Kenya. The descriptive results revealed that most of the firms did not carry out sourcing of materials with close involvement of suppliers to embrace green logistics. Most of the companies did not give priority to suppliers who were capable of supplying environmental friendly materials and they were not keen on embracing supply chain agility for effectiveness of their supply chain processes. The findings further revealed that most of the companies frequently analysed and mitigated risks associated with supply chain processes and that their respective companies had a framework for managing supply chain risks. It was revealed that the overall characteristics of the building and construction manufacturing firms were streamlined towards enhancing the adoption of green logistics. The model analysis results revealed that firm characteristics had a significant moderating effect on the relationship between reverse logistics, logistics innovation, green packaging and green distribution systems and performance of the building and construction manufacturing firms in Kenya.

5.3 Conclusions of the Study

The study concluded that reverse logistics had a significant effect on the performance of building and construction manufacturing firms in Kenya. Manufacturing of building and construction materials is a process that requires extensive and comprehensive use of materials, most of which may have varied impacts on the environment. When the firms establish that some of their products do not meet the required environmental friendly characteristics, having return policies and recalling some of the products would be essential in promoting sustainable logistics. The study concluded that the use of recall programmes and embrace of recycling are essential way which play a significant impact on the success of the reverse logistics, thus enhancing firm performance.

The study concludes that green packaging as one of the aspects of green logistics play a significant role in promoting the performance of building and construction manufacturing firms in Kenya. The use of biodegradable packaging materials and reducing the materials used in packaging are essential way through which the manufacturing firms can embrace green sustainable logistics practices. These practices despite saving on operation costs, they also enhance the satisfaction of customers and enhance the public image of the companies. The study concludes that the use of green packaging through promotion of reusable containers in packaging enhances recycling among the customers thus promoting a greener environment. Moreover many customers would prefer products from a company that packages its products with reusable packages, which is to the advantage of the manufacturing entity.

Logistics innovation is one aspect of green logistics that extensively promotes the performance of building and construction manufacturing firms. The study concludes that the logistics innovation is essential in manufacturing firms in the building and construction sub-sector in that it enhances fuel-saving which is synonymous to cost-saving, while ensuring sustainable logistics practices. The use of solar-technology and bio-fuel has been found to be key aspects of logistics innovation that the building and construction manufacturing firms in Kenya lack, despite these being essentials

aspects that enhance the performance of the firms. Firm characteristics moderated the relationship between logistics innovation and firm performance. The material sourcing processes as one of the characteristics as well as the supply chain risks determined how effective a firm embraces green logistics for continued performance.

The study concluded that green distribution systems had a significant and positive effect on the performance of the building and construction manufacturing firms in Kenya. The green distribution aspects such as use of vehicle loadings and embraces of electric forklifts and use of route management systems are essential ways of ensuring effective distribution that is time consuming and with minimal vehicle distance, thus reducing costs and environmental pollution. The study concluded that while most of the manufacturing companies in the building and construction sub-sector in Kenya face issues with route management and overall distribution and transportation challenges, the embrace of green distribution systems is minimal. This could be one of the aspects that may be leading to poor performance of the firms. The study further concluded that firm characteristics significantly moderated the relationship between green distribution systems and performance of the manufacturing firms.

The characteristics of the firms were found to be essential in determining the ability of the green logistics to contribute to the performance of the building and construction manufacturing firms in Kenya. The study concluded that through the supply chain agility, firms were able to acquire more knowledge on embracing green logistics for enhanced performance. The supply chain risks also enhanced the effectiveness of green logistics towards enhancing the performance of the firms.

5.4 Recommendations of the Study

The study makes the following recommendations as per the foregoing findings and the conclusions. The recommendations are categorized in managerial recommendations and recommendations to policy.

5.4.1 Managerial Recommendations

The study recommends the need for the management of building and construction manufacturing firms in Kenya to embrace green logistics through reverse logistics as a way of promoting sustainable practices and enhancing performance. The manufacturing of building and construction materials and products partakes vigorous processes most of which a times may led to some products not meeting the environmental friendliness, or not going as per the customer needs. As such, embracing return management policies and recall programmes for such products would play a significant role in promoting customer satisfaction while at the same time contributing to environmental conservation.

Packaging is one of the crucial processes in the logistics practices of the manufacturing firms, particularly those in the building and construction sub-sector. It is recommended that the management of the building and construction manufacturing firms steps up to ensure that the packaging of their products is done in a more sustainable manner such that conserves the environment. Through use of biodegradable materials to package, and ensuring the packages used are reusable, the customers are attracted to such products and this would mean enhanced performance of the firms. The management should require that those in charge of packaging minimize the materials used in packaging while ensuring that the quality of the products is not compromised. This ensures that as the company is upholding green logistics practices, the costs of packaging are minimized as well.

Innovation has been an instrumental aspect of every modern-day business operation, including green logistics. Adopting logistics innovation is a process that every organizational management particularly the building and construction manufacturing firms ought to uphold as a way of not only recording superior performance but also promoting sustainability in their logistics processes. It is recommended that the management of the building and construction manufacturing firms spearheads the innovation in green logistics through adoption of fuel-saving strategies, embracing bio-fuels and solar technology. This will ensure that the companies save on the

operational costs such as the costs of electricity and fuel, while at the same time conserving the environment by reducing the emissions from fuels and gases.

The study recommends that the managers and other key stakeholders in the construction and building manufacturing firms steps up to adopt the green distribution systems as one of the aspect of green logistics. Distribution is one of the major activity in the logistics process, and accounts to a major share of the logistics and supply chain budget, especially in the manufacturing industry. Embracing sustainable distribution through vehicle loading systems, and route management systems, therefore, would play a significant role in promoting the effectiveness of distribution processes, thus enhancing firm performance.

5.4.2 Policy Recommendations

The building and construction manufacturing industry remains an integral part of the manufacturing sector, which is one of the government's pillars of speeding-up economic growth and development. Therefore, it remains the role of the government in its capacity to ensure that the building and construction manufacturing firms are capacitated to achieve greater performance. This can be enhanced through formulation of policies and legislations that support and promote green logistics among the manufacturing firms.

Embrace of green logistics among other sustainable business practices among the organizations in the country remains a blueprint for the government as one of the sustainable development goals. The government therefore ought to incorporate policing and governance framework that provide guidance to the manufacturing firms on how to embrace green logistics as one of the sustainable practices. The government through key arms such as the parliament should come up with policies that highlight the key green logistics practices to be adopted by the building and construction manufacturing firms. This will ensure that the firms have a clear and common direction towards incorporating aspects such as green packaging, reverse logistics, logistics innovation and green distribution systems to enhance performance.

The embrace of green logistics among the building and construction manufacturing firms should be addressed on the policy and legislation perspective as a way of ensuring that the firms operate on a levelled ground such that there no firms who have the advantage over the other on what green logistics aspects to embrace. Through policies and proper legislations, the firms will be dedicated towards enhancing green logistics without going for short-cuts that make them gain over the advantage of others.

5.5 Areas for Further Study

The study focused on firm characteristics as the moderator on the relationship between green logistics and firm performance. Future researchers should assess the direct effect of firm characteristics on the performance of the building and construction firms so as to enhance the comprehensiveness of the findings.

The study focused on building and construction manufacturing firms. The building and construction manufacturing industry is a sub-sector of the manufacturing sector in the country. It is therefore recommended that a similar study focuses on other categories of the manufacturing industry, that also would require green logistics as an enabler to their continue performance.

The study focused on four key aspects of green logistics which included the reverse logistics, green packaging, logistics innovation and green distribution systems. While the study only majored on these four, the sustainability theories reveal that there are other aspects of green logistics that define its ability to enhance firm performance. It is recommended that future researchers focus identifying these aspects and assessing how they affect firm performance.

REFERENCES

Abazov, R. (2021). 'Education for sustainable development and ICT: The case of MDP program at al-Farabi KazNU'. *Herald of Journalism, 58*(4), 34-43. https://doi.org/10.26577/HJ.2020.v58.i4.04

Agrawal, S., & Singh, R. K. (2019). Analyzing disposition decisions for sustainable reverse logistics: Triple Bottom Line approach. *Resources, Conservation and Recycling*, *150*, 104448.

Aguilera-Caracuel, J., & Ortiz-de-Mandojana, N. (2013). Green innovation and financial performance: An institutional approach. *Organization and Environment*, 2(6), 365-385.

Agyemang, M.; Zhu, Q.; Adzanyo, M.; Antarciuc, E.; & Zhao, S. (2018). Evaluating barriers to green supply chain redesign and implementation of related practices in the West Africa cashew industry. *Resources Conservation and Recycling Review*, 2(136), 209–222

Alexander, A. & Martin, D. (2013). Intermediaries for open innovation: A competence-based comparison of knowledge transfer offices practices. *Technological Forecasting & Social Change.* 80: 38–49.

Al-Shubiri, F. N. (2017). The impact of green logistics-based activities on the sustainable monetary expansion indicators of Oman, *Journal of Industrial Engineering and Management (JIEM)*, ISSN 2013-0953, OmniaScience, Barcelona, Vol. 10, Iss. 2, pp. 388-405

Amin, S. H., & Baki, F. (2017). A facility location model for global closed-loop supply chain network design. *Application Math Model* 41:316–330. https://doi.org/10.1016/j.apm.2016.08.030

Amina A.B. (2013) Green Supply Chain Practices and Operational Performance of Personal Care Manufacturing firms in Nairobi Kenya" University of Nairobi. Unpublished Thesis.

Amoako-Gyampah, K., Boakye, K. G., Adaku, E., & Famiyeh, S. (2019). Supplier relationship management and firm performance in developing economies: A moderated mediation analysis of flexibility capability and ownership structure. *International Journal of Production Economics*, *208*, 160-170.

An, H., Razzaq, A., Nawaz, A., Noman, S. M., & Khan, S. A. R. (2021). Nexus between green logistic operations and triple bottom line: evidence from infrastructure-led Chinese outward foreign direct investment in Belt and Road host countries. *Environmental Science and Pollution Research*, *28*(37), 51022-51045.

Anne, T. & Hellen, .W (2015). Theories in sustainable supply chain management: a structured literature review, *International Journal of Physical Distribution and Logistics Management,* 45(2), 16–42.

Araz, O. M., Choi, T. M., Olson, D. L., & Salman, F. S. (2020). Data analytics for operational risk management. *Decisions Science*, *51*(6), 1316-1319.

Arefieva, O., Polous, O., Arefiev, S., Tytykalo, V., & Kwilinski, A. (2021). 'Managing Sustainable Development by Human Capital Reproduction in the System of Company's Organizational Behaviour.' *IOP Conference Series: Earth and Environmental Science*, 628, 012039.

Autry, C. W., Grawe, S. J., Daugherty, P. J., and Richey, R. G. (2010). The effects of technological turbulence and breadth on supply chain technology acceptance and adoption. *Journal of Operations Management*, 28(6), 522-536.

Awaysheh, A. & Klassen, R. (2010). The impact of supply chain structure on the use of supplier socially responsible practices, *International Journal of Operations and Production Management,* 30(12), 1246-1268.

Awino Z. B. & Gituro W. (2011). An Empirical Investigation of Supply Chain Management Best Practices in Large Private Manufacturing Firms in Kenya. *Prime Journal of Business Administration and Management* Volume 1, Issue

Awino, Z. B. (2011). Strategic Management: An Empirical Investigation of Selected Strategy Variables on Firms Performance: *A Study of Supply Chain Management in Large Private Manufacturing Firms in Kenya. Business Administration and Management* (BAM) 1(1), 09-18

Ayoub, H. F., & Abdallah, A. B. (2019). The effect of supply chain agility on export performance: The mediating roles of supply chain responsiveness and innovativeness. *Journal of Manufacturing Technology Management*, 7(12); 156-172.

Azevedo, S. G., Carvalho, H., & Cruz Machado, V. (2011). The influence of green practices on supply chain performance: a case study approach. Transportation Research Part E: *Logistics and Transportation Review,* 47(6), 850-871.

Azizi, S., and Tarhandeh, F. (2014). Physical Distribution Service Quality through Iranian Convenience Stores Retailers Perspectives: a Mixed Method Approach. *Iranian Journal of Management Studies,* 7(1), 121

Baechler, Christian; DeVuono, Matthew; Pearce, Joshua M. (2013). Distributed Recycling of Waste Polymer into RepRap Feedstock. Rapid Prototyping Journal. **19** (2): 118–125.

Bag, S., Gupta, S., & Luo, Z. (2020). Examining the role of logistics 4.0 enabled dynamic capabilities on firm performance. *The International Journal of Logistics Management, 31*(3), 607-628.

Balasubramanian, S., Shukla, V., Mangla, S., & Chanchaichujit, J. (2021). Do firm characteristics affect environmental sustainability? A literature review-based assessment. *Business Strategy and the Environment*, *30*(2), 1389-1416.

Ballot, B., &Fontane, F. (2010).Reducing transportation Co2 emissions through pooling of supply networks: perspectives from a case study in French retail chains: *Production Planning & amp; C*ontrol, 21 (6), 640-650.

Barut, A., Citil, M., Ahmed, Z., Sinha, A., & Abbas, S. (2023). How do economic and financial factors influence green logistics? A comparative analysis of E7 and G7 nations. *Environmental Science and Pollution Research*, *30*(1), 1011-1022.

Baryannis, G., Dani, S., & Antoniou, G. (2019). Predicting supply chain risks using machine learning: The trade-off between performance and interpretability. *Future Generation Computer Systems*, *101*, 993-1004.

Batova, N., Sachek, P., & Tochickaja, I. (2019). 'Financing circular business projects'. *BEROC Green Economy Policy Paper Series*, PP no. 9. http://www.beroc.by/webroot/delivery/ files/PP_GE_6_finance.pdf (in Russian)

Bechtsis, D., Tsolakis, N., Vlachos, D., & Iakovou, E. (2017). Sustainable supply chain management in the digitalisation era: The impact of Automated Guided Vehicles. *Journal of Cleaner Production,* 142, 3970–3984.

Beers, C. (2014). Rand D cooperation, partner diversity, and innovation performance: an empirical analysis. *Journal of Product Innovation Management,* 31(2), 292-312.

Bellamy, M.A., & Basole, R.C., (2013). Network analysis of supply chain systems:a systematic review and future research. *Syst. Eng. 16* (2), 235–249.

Beyene, Z. (2015). Green supply chain management practices in Ethiopian tannery industry. *International Research Journal of Engineering and Technology (IRJET),* 2(7), 587-598.

Bigliardi, B., Ferraro, G., Filippelli, S., & Galati, F. (2020). The influence of open innovation on firm performance. *International Journal of Engineering Business Management*, *12*, 1847979020969545.

Bigsten (2010). Chapter 10: The Manufacturing Sector, Policies for Prosperity. Oxford University Press and Central Bank of Kenya.

Boichuk, N., & Kauf, S. (2019). 'Sustainable logistics: a framework for green city logistics – examples of Polish cities'. *Conference Proceedings of the 9th Carpathian Logistics Congress* - CLC 2019, December 2-4, 2019, Zakopane, Poland, 339-346

Boiral, O., (2009). Greening the corporation through organizational citizenship behaviors. *Journal of Busienss and Ethics 87* (2), 221–236.

Bosman, L., Hartman, N., & Sutherland, J. (2019). How manufacturing firm characteristics can influence decision making for investing in Industry 4.0 technologies. *Journal of Manufacturing Technology Management*, 4(19); 301-312.

Browne, J., Coffey, B., Cook, K., Meiklejohn, S., & Palermo, C. (2019). A guide to policy analysis as a research method. *Health promotion international*, *34*(5), 1032-1044.

BS EN ISO 14004: Environmental management systems. General guidelines on principles, systems and support techniques (2010)

Busetto, L., Wick, W., & Gumbinger, C. (2020). How to use and assess qualitative research methods. *Neurological Research and practice*, *2*(1), 1-10.

Cameron, Bobby Thomas. (2014). Using responsive evaluation in Strategic Management.Strategic *Leadership Review* 4 (2), 22-27

Campos, L. M. S., & Vazquez-Brust, D. A. (2016). Lean and Green Synergies in Supply Chain Management. *Supply Chain Management, 21*(5), 627-641. http://dx.doi.org/10.1108/SCM-03-2016-0101.

Carter, C. R. & Easton, P. L., (2011). Sustainable supply chain management: evolution and future directions, *International Journal of Physical Distribution & Logistics Management*, 4(1), 46-62.

Centobelli, P., Cerchione, R., & Esposito, E. (2017). Developing the WH2 framework for environmental sustainability in logistics service providers: a taxonomy of green initiatives. *Journal of Cleaner Production,* 165, 1063-1077. http://dx.doi.org/10.1016/j. jclepro.2017.07.150.

Chen, J., Rojniruttikul, N., Kun, L. Y., & Ullah, S. (2022). Management of green economic infrastructure and environmental sustainability in one belt and road enitiative economies. *Environmental Science and Pollution Research*, *29*(24), 36326-36336.

Chen, L., Li, T., & Zhang, T. (2021). Supply chain leadership and firm performance: A meta-analysis. *International Journal of Production Economics*, *235*, 108082.

Chen, Le; Karen, Manley (2014). Validation of an instrument to measure governance and performance on collaborative infrastructure projects. *Journal of Construction Engineering and Management.* ***140***

Chen, M., & Delmas, M. (2011). Measuring corporate social performance: An efficiency perspective. *Journal of Production and Operations Management*, 20(6), 789-804.

Cherrafi, A., Garza-Reyes, J. A., Kumar, V., Mishra, N., Ghobadian, A., & Elfezazi, S. (2018). Lean, green practices and process innovation: a model for green supply chain performance. *International Journal of Production Economics, 206*, 79-92. http://dx.doi.org/10.1016/j. ijpe.2018.09.031.

Choi, T. M., & Luo, S., (2019). Data quality challenges for sustainable fashion supply chain operations in emerging markets: roles of blockchain, government sponsors and environment taxes. Transp. Res. Part E-Logist. *Transparenyc Review. 131*, 139–152.

Chrisostom, A. O., & Monari, F. (2018). Influence Green Logistics Management on Performance of registered Automotive Firms in Kenya. *International Journal of Academic Research in Business and Social Sciences*, 8(4), 351–365.

Chu, C. Y., Park, K., & Kremer, G. E. (2020). A global supply chain risk management framework: An application of text-mining to identify region-specific supply chain risks. *Advanced Engineering Informatics*, *45*, 101053.

Closs, D.J. & Meacham, N. (2011). Sustainability to support end-to-end value chains: the role of supply chain management. *Journal of the Academy of Marketing Science*, 3(9), 101-116.

Colliver, J. A., Conlee, M. J., & Verhulst, S. J. (2012). From test validity to construct validity… and back?. *Medical education*, *46*(4), 366-371.

Cooper, R., & Foster, M., (1971). Sociotechnical systems. Am. Psychol. 26 (5), 467–474.

Creswell J. W. (2013), Review of the Literature. Research Design. Qualitative, Quantitative, and Mixed Method Approaches (4th ed.). Thousand Oaks, California: SAGE Publications. ISBN 9781452226101.

Das, K. (2012). Integrating reverse logistics into the strategic planning of a supply chain. *International Journal of Production Research*, Vol. 50 No. 5, pp. 1438-1456.

Daugherty, P. J. (2011). Review of logistics and supply chain relationship literature and suggested research agenda. *International Journal of Physical Distribution and Logistics Management*, 41(1), 16-31.

de Souza, E. D., Kerber, J. C., Bouzon, M., & Rodriguez, C. M. T. (2022). Performance evaluation of green logistics: Paving the way towards circular economy. *Cleaner Logistics and Supply Chain*, *3*, 100019.

DeGroote, S. E., & Marx, T. G. (2013). The impact of IT on supply chain agility and firm performance: An empirical investigation. *International Journal of Information Management*, *33*(6), 909-916.

Deloitte (2012). *Strategic Review of National Construction Authority in Kenya*. Nairobi: International finance Corporation-World Bank Group Press. Retrieved February 2019.

Devika K, Jafarian A, & Nourbakhsh V (2014) Designing a sustainable closed-loop supply chain network based on triple bottom line approach: a comparison of metaheuristics hybridization techniques. *Eur J Oper Res* 235(3):594–615. https://doi.org/10.1016/j.ejor.2013.12.032

Dovbischuk, I. (2021). Sustainable firm performance of logistics service providers along maritime supply chain. *Sustainability*, *13*(14), 8040.

Dubey, R., Gunasekaran, A., & Papadopoulos, T., (2017). Green supply chain management: theoretical framework and further research directions. *Benchmarking-an Int. Journal 24* (1), 184–218.

Dutta, P., Mishra, A., Khandelwal, S., & Katthawala, I. (2020). A multiobjective optimization model for sustainable reverse logistics in Indian E-commerce market. *Journal of Cleaner Production*, *249*, 119348.

Dźwigoł, H., & Dźwigoł, B., M. (2018). Scientific research methodology in management sciences. *Financial and credit activity problems of theory and practice*, *2*(25), 424-437.

Dzwigol, H., Trushkina, N., Kvilinskyi, O. S., & Kvilinskyi, O. S. (2021). *Green logistics as a sustainable development concept of logistics systems in a circular economy* (Doctoral dissertation, Proceedings of the 37th International Business Information Management Association (IBIMA)).

Dzwigol, H., Trushkina, N., Kvilinskyi, O. S., & Kvilinskyi, O. S. (2021). The organizational and economic mechanism of implementing the concept of green logistics.

Eltayeb, T. K., Zailani, S., & Ramayah, T. (2011). Green supply chain initiatives among certified companies in Malaysia and environmental sustainability: investigating the outcomes. *Resources, Conservation and Recycling, 55*(5), 495-506. http://dx.doi.org/10.1016/j. resconrec.2010.09.003.

Eltayeb, T. K., Zailani, S., &Ramayah, T. (2017). Green supply chain initiatives among certified companies in Malaysia and environmental sustainability: Investigating the outcomes. *Resources, conservation and recycling*, *55*(5), 495-506.

Eltayeb, T.K. (2019). Green manufacturing initiatives among certified companies in Malaysia and environmental sustainability: *Investigating the outcomes, Resources, Conservation and Recycling, 55* (5), 495– 506.

Eshikumo, S. (2017). Green Manufacturing and Operational Performance of a Firm: Case of Cement Manufacturing in Kenya. *International Journal of Business and Social Science*, *8*(4).

Famiyeh, S., Adaku, E., Gyampha, K., Darko, D., & Teye, C. (2018). Environmental management practices, operational performance and environmental performance. *Journal of Manufacturing Technology Management, 29* (3), 588-607.

Gaganpreet, S., & Neeraj, P. (2019). Revisiting green packaging from a cost perspective: The remanufacturing vs new manufacturing process. *Benchmarking: An International Journal*, https:// doi.org/10.1108/BIJ-04-2018-0099

Gan, W., Yao, W., & Huang, S. (2022). Evaluation of green logistics efficiency in Jiangxi Province based on Three-Stage DEA from the perspective of high-quality development. *Sustainability*, *14*(2), 797.

Ghauri, P., Grønhaug, K., & Strange, R. (2020). *Research methods in business studies*. Cambridge University Press.

Gil-Saura, I., and Ruiz-Molina, M. E. (2011). Logistics service quality and buyer–customer relationships: the moderating role of technology in B2B and B2C contexts. *The service industries journal*, *31*(7), 1109-1123

Gimenez, C., & Tachizawa, E. M. (2012). Extending sustainability to suppliers: a systematic literature review, *International Journal of Supply Chain Management*, 17(5), 531-543

Gligor, D. M. (2016). The role of supply chain agility in achieving supply chain fit. *Decision Sciences*, *47*(3), 524-553.

Gligor, D., Russo, I., & Maloni, M. J. (2022). Understanding gender differences in logistics innovation: A complexity theory perspective. *International Journal of Production Economics*, *246*, 108420.

Gold, S., & Beske, P. (2010). Sustainable supply chain management and interorganizational resources: a literature review, *Corporate Social Responsibility and Environmental Management*, 17(4), 230-245.

Gopal, P. and Thakkar, K. (2015). A boundaries and flows perspective of green supply chain management. Supply Chain Management: *An International Journal* 17:202-216

Govindan K., Soleimani H.,& Kannan D., (2015). Reverse logistics and closed-loop supply chain: A comprehensive review to explore the future. *European Journal of Operational Research,* vol. 240, pp. 603–626.

Govindan, K., Rajeev, A., Padhi, S. S., & Pati, R. K. (2020). Supply chain sustainability and performance of firms: A meta-analysis of the literature. *Transportation Research Part E: Logistics and Transportation Review*, *137*, 101923.

Grant, R.M. 1991. The resource-based theory of competitive advantage. *California Management Review* 33, no. 3: 114–35.

Green, K.W., Zelbst, P.J., Meacham, J., & Bhadauria, V.S., (2012). Green supply chain management practices: impact on performance. *Supply Chain Manage.-Int. Journa;. 17* (3), 290–305.

Guarnieri, P., Cerqueira-Streit, J. A., & Batista, L. C. (2020). Reverse logistics and the sectoral agreement of packaging industry in Brazil towards a transition to circular economy. *Resources, conservation and recycling*, *153*, 104541.

Gupta, R.C. and Dandekar, M. (2012).An empirical study of green supply chain management in Indian perspective. *International Journal of Applied Sciences and Engineering Research* 1(2)372-383

Hakimi, D. (2012). Environmental and economic issues arising from the pooling of SMEs' supply chains: case study of the food industry in Western France. *Flexible Services and Manufacturing Journal*, 1-27

Handfield, R. (2018). Environmental management systems and green supply chain management: complements for sustainability?. *Business Strategy and the Environment*, 17(1), 30-45.

Harris, D. E., Holyfield, L., Jones, L., Ellis, R., & Neal, J. (2019). Research methods. In *Spiritually and Developmentally Mature Leadership* (pp. 57-65). Springer, Cham.

Hausman, W. H., Lee, H. L., & Subramanian, U. (2013). The impact of logistics performance on trade, *Production and Operations Management,* 22(2), 236-252.

Hazen, B.T., and J.B. Hanna. 2011. Diffusion of green supply chain management: Examining perceived quality of green reverse logistics. *International Journal of Logistics Management* 22, no. 3: 373–89.

Henryk D., Nataliia T., & Aleksy K (2021) Green Logistics as a Sustainable Development Concept of Logistics Systems in a Circular Economy " Proceedings of the 37th *International Business Information Management Association (IBIMA),* , Cordoba, Spain, ISBN: 978-0-9998551-6-4, ISSN: 2767-9640

Hsueh, C. F. (2015). A bi-level programming model for corporate social responsibility collaboration in sustainable supply chain management. *Transportation Research Part E: Logistics and Transportation Review,* 7(3), 84-95.

Hu, W., Dong, J., Hwang, B. G., Ren, R., & Chen, Z. (2019). A scientometrics review on city logistics literature: Research trends, advanced theory and practice. *Sustainability*, *11*(10), 2724.

Hunt, S.D., and R.M. Morgan. 1996. The resource-advantage theory of competition: Dynamics, path dependencies, and evolutionary dimensions. *Journal of Marketing* 60, no. 4: 107–14.

Ilgin, M.A. & Gupta, S.M. (2018), Performance Improvement Potential of Sensor Embedded Products in Environmental Supply Chains, *Resources Conservation Recycle, 55*(6), pp. 580–592.

Jaafar, E. and Tajuddin, N. (2016). Could green logistics a contributor to firm underperformance? An environmental management systems and environmental reveiw. *Journal of Cleaner Production* 17:601-607

Jabbour, C.J.C., Jugend, D., de Sousa, Lopes, Jabbour, A.B., Gunasekaran, A., & Latan, H., (2015). Green product development and performance of Brazilian firms: measuring the role of human and technical aspects. *J. Cleaner Prod. 87,* 442–451.

Jawaad, M., & Zafar, S. (2020). Improving sustainable development and firm performance in emerging economies by implementing green supply chain activities. *Sustainable Development*, *28*(1), 25-38.

Jinru, L., Changbiao, Z., Ahmad, B., Irfan, M., & Nazir, R. (2022). How do green financing and green logistics affect the circular economy in the pandemic situation: key mediating role of sustainable production. *Economic Research-Ekonomska Istraživanja*, *35*(1), 3836-3856.

Johnston, W. J. and Cheng, J. M. S. (2012). Determinants of joint action in international channels of distribution: The moderating role of psychic distance. *Journal of International Marketing, 20(3), 34-49.*

Julianelli, V., Caiado, R. G. G., Scavarda, L. F., & Cruz, S. P. D. M. F. (2020). Interplay between reverse logistics and circular economy: critical success factors-based taxonomy and framework. *Resources, Conservation and Recycling*, *158*, 104784.

Jump up Yang, C. (2015). The integrated model of core competence and core capability. *Total Quality Management*. 26: 173–189

KAM (2019). KAM Directory 2018/2019. Nairobi: Oxford Printing Press

Kamande, M. W. (2011). ―The Impact of Clean Production on the Performance of Kenya Manufacturing Firms.Ph.D (Economics). Dissertation .University of Dar es Salaam: Tanzania

Keller S. B. and Keller B. C. (2014) Definitive Guide to Warehousing, Managing the Storage and Handling of Materials and Products in the Supply Chain. *Kenya Manufacturers and Exporters Directory*, 2014; the 10th Edition.

Kenya Association of Manufacturing (K.A.M) (2015).The Kenya Association of Manufacturing Industrial Business Agenda, *Priority actions to build competitive local industry to expand employment in Kenya*

Khaksar, E., Abbasnejad, T., Esmaeili, A. and Tamošaitienė, J. (2016). The effect of green supply chain management practices on environmental performance and competitive advantage: a case study of the cement industry. *Technological and Economic Development of Economy,* 22(2), 293-308.

Khan, S.A.R., Dong, Q., SongBo, W., Zaman, K., Zhang, Y. (2017). Environmental logistics performance indicators affecting per capita income and sectoral growth: evidence from a panel of selected global ranked logistics countries. *Environmental Science and Pollution Research*, 24(2), 1518-1531.

Khanra, S., Kaur, P., Joseph, R. P., Malik, A., & Dhir, A. (2022). A resource-based view of green innovation as a strategic firm resource: Present status and future directions. *Business Strategy and the Environment*, *31*(4), 1395-1413.

Khattab, S., Abu Rumman, A. and Massad, M. (2015). The Impact of the Green Supply Chain Management on Environmental-Based Marketing Performance. *Journal of Service Science and Management,* 8, 588-597.

Kiechel, Walter (2010). The Lords of Strategy. *Harvard Business Press*. ISBN 978-1-59139-782-3.

KIPPRA (2010). The Demographic Governance Support Programme (DGSP). Nairobi: KIPPRA.

Kothari, C.R. (2014). *Research Methodology; Methods & Techniques (2nd Ed.).* New Delhi; New Age International Press Limited.

Kour, S. (2014). Ethical and Legal issues in Educational research. *Indian Journal of Applied Research*, 4(6) 23-45.

Kull, T.J., Ellis, S.C., & Narasimhan, R., (2013). Reducing behavioral constraints to supplier integration: a socio-technical systems perspective. *J. Supply Chain Manage. 49* (1), 64–86.

Kumar, S., & Putnam, V. (2008). Cradle to Cradle: Reverse Logistics Strategies and Opportunities across Three Industry Sectors. *International Journal of Production Economics,* 115(2), 305-315.

Kurbatova, S. M., Aisner, L. Y., & Mazurov, V. Y. (2020, August). Green logistics as an element of sustainable development. In *IOP Conference Series: Earth and Environmental Science* (Vol. 548, No. 5, p. 052067). IOP Publishing.

Laosirihongthong, T., Adebanjo, D. and Tan, K. C.(2013).Green supply chain management practices and performance. *Industrial Management & Data Systems*, 113(8), 1088- 1109

Laszlo, Chris and Zhexembayeva, Nadya (April 25, 2011) Embedded Sustainability: A strategy for market leaders. *The European Financial Review*

Le, T. T., & Ikram, M. (2022). Do sustainability innovation and firm competitiveness help improve firm performance? Evidence from the SME sector in vietnam. *Sustainable Production and Consumption*, *29*, 588-599.

Lebreton, B. (2017) Strategic Closed-Loop Supply Chain Management, in Lecture Notes in Economics and Mathematical Systems 586, *Springer Berlin Heidelberg*, *2*(7), pp. 1–158.

Lee, S.M., Kim, S.T. and Choi, D. (2012). Green supply chain management and organizational performance. *Industrial Management & Data Systems*, Vol. 112 No. 8, pp. 1148-1180.

Li, Y. & Zhang, M. (2018). Green manufacturing and environmental productivity growth. *Industrial Management & Data Systems,* 118 (6), 1303-1319.

Liu, C., & Ma, T. (2022). Green logistics management and supply chain system construction based on internet of things technology. *Sustainable Computing: Informatics and Systems, 35*, 100773.

Liu, J., Feng, Y., Zhu, Q., & Sarkis, J., (2018). Green supply chain management and the circular economy: reviewing theory for advancement of both fields. *Int. J. Phys. Distri. Logistics Manage. 48* (8), 794–817.

Liu, J., Hu, H., Tong, X., & Zhu, Q. (2020). Behavioral and technical perspectives of green supply chain management practices: Empirical evidence from an emerging market. *Transportation Research Part E: Logistics and Transportation Review, 140*, [102013]. https://doi.org/10.1016/j.tre.2020.102013

Liu, P., & Li, Y. (2021). An improved failure mode and effect analysis method for multi-criteria group decision-making in green logistics risk assessment. *Reliability Engineering & System Safety*, *215*, 107826.

Loeser, F. et al. (2011) 'aligning green IT with environmental strategies: development of a conceptual framework that leverages sustainability and firm competitiveness', proceeding of: *A Renaissance of Information Technology for Sustainability and Global Competitiveness, 17th Americas Conference on Information Systems*

Machio J. & Keitany, P. (2018). Effects of Green Sourcing On the Performance of Sugar Factories in Western Kenya Sugar Zone, *East African Scholars Journal of Agriculture and Life Sciences*, 1(2), 44-51

Mackelprang, A. W. & Nair, A. (2010). Relationship between just-in-time manufacturing practices and performance: A meta-analytic investigation. *Journal of Operations Managemen*t, 28(4), 283-302.

Manz, C.C., & Stewart, G.L., (1997). Attaining flexible stability by integrating total quality management and socio-technical systems theory. *Organizational Science, 8* (1), 59–70.

Marett, K., Otondo, R. and Taylor, G.S. (2013) 'Assessing the effects of benefits and institutional influences on the continued use of environmentally munificent bypass systems in long-haul trucking', *MIS Quarterly*, *Vol. 37*, No. 4, pp.1301–1312.

Maruthia, G.D. & Rashmi, R. (2015). Green manufacturing: its tools and techniques that can be Implemented in manufacturing sectors, P*roceedings of 4th International Conference on Materials Processing and Characterization*, 3350-3355.

McKinnon, A (2012). Green Logistics: *Improving the Environmental of Logistics. London, United Kingdom: K*ogan Page Limited. pp. 347–364.

McKinnon, A., & Whiteing, A. (2010). Green Logistics: Improving the environmental sustainability of logistics, (3nd ed.), *Published by Kogan* Page, London.

Meehan, J. & Bryde, D.J. (2014). *Procuring sustainably in social housing:* The role of social integration in governments.

Mentzer, J.T. and Cook, R.L. (2015). Supply chain management: the pursuit of a consensus definition. *Journal of Business Logistics*, Vol.26 No. 2, pp.17-25.

Meysam, M. A., (2013). *Supply Chain Integration Model: Practices and Customer Values*, unpublished PhD Thesis. Universidade Nova de Lisboa, Portugal.

Mickoleit, A. (2010) Greener and Smarter: ICTs, the Environment and Climate Change, OECD, Committee for Information, Computer and Communications *Policy, Secretary-General of the OECD*

Miguel, P. A. C., & Campos, L. M. S. (2013). Practices of environmental and social responsibility in companies that adopt the Brazilian award for performance excellence. *International Journal of Business Excellence, 6*(4), 488-503. http://dx.doi.org/10.1504/IJBEX.2013.054723.

Minglang, T., & Wai, P.W. (2014). Supply chain management: A closed-loop network hierarchical approach. *Industrial management and data systems*, 115(3), 436-461.

Ministry of Housing, Land and Urban Development (2014). *Ministry of Housing, Land and Urban Development.* Kenya Ministry of Housing, Land and Urban Development Report. Nairobi: Government of Kenya Press.

Mishra, S. B., & Alok, S. (2022). Handbook of research methodology. Retrieved from http://74.208.36.141:8080/jspui/bitstream/123456789/1319/1/BookResearch Methodology.pdf

Mohammad, S. (2015). Integrated Supply Chain Model for Sustainable Manufacturing: A system dynamics approach. *Published online:* 6(7), 155-399.

Mudgal, R.K., Shankar, R., Talib, P. and Raj, T. (2017). Modelling the barrier of green supply chain practices: an Indian perspective. *International Journal of Logistics Systems and Management*, Vol. 7 No. 1, pp. 81-107.

Mugenda, O. (2014). Research methods quantitative and qualitative approaches. Nairobi: Acts Press.

Muma, B., Nyaoga, R., Matwere, R. and Nyambega, E. (2014). Green supply chain management and environmental performance among tea processing firms in Kericho County- Kenya. *International Journal of Economics, Finance and Management Sciences*, 2(5), 270-276

Muraguri, E.K. & Musyimi, P.K. (2015). Application and Practice of Sustainable Procurement in Kenya, *International Journal of Innovative Science, Engineering and Technology*, 8(12), 289 – 299.

Murutu, J. (2016). Sustainable ethical procurement strategies and supply chain performance of five-star hotels in Nairobi County, Kenya. Unpublished MBA Project, School of Business University of Nairobi.

Musau E.M. & Rucha K. (2021). Effect of Green Manufacturing on Operational Performance of Manufacturing Firms in Mombasa County, Kenya. *European Scientific Journal, ESJ, 17*(23), 323.

Mwaura, A. W., Letting, N., Ithinji, G. K., & Orwa, B. H. (2016). Green Distribution Practices and Competitiveness of Food Manufacturing Firms in Kenya. *Technological Forecasting and Social Change*, 80(9), 1815-1833

Mwirigi, N. D. & Were, S. (2014). Assessment of Factors Affecting Supply Chain Management Performance in Kenya Public Institutions-A Case of the Judiciary. .European Journal of Business Management, 2(1), 141-155.

Nasiche, F., & Ngugi, G. K. (2014). Determinants of adoption of green procurement in the public sector: A case study of Kenya Pipeline Company. *International Journal of Social Sciences and Entrepreneurship*, 1(11), 351-372.

Nayal, K., Kumar, S., Raut, R. D., Queiroz, M. M., Priyadarshinee, P., & Narkhede, B. E. (2022). Supply chain firm performance in circular economy and digital era to achieve sustainable development goals. *Business Strategy and the Environment*, *31*(3), 1058-1073.

Nderitu, M. and Ngugi, K. (2014). Effects of green procurement practices on an organization performance in manufacturing industry: case study of East African Breweries Limited. *European Journal of Business Management*, 2(1), 341-352.

Ni, Z., Chan, H. K., & Tan, Z. (2023). Systematic literature review of reverse logistics for e-waste: overview, analysis, and future research agenda. *International Journal of Logistics Research and Applications*, *26*(7), 843-871.

Olorunniwo, F. and Li, X. (2016). Information sharing and collaboration practices in reverse logistics. Supply Chain Management: *An International Journal*, Vol. 15 No. 6, pp. 454-462.

Orji, I. & Wei, S. (2016). A detailed calculation model for costing of green manufacturing. *Industrial Management and Data Systems, 116* (1), 65-86.

Osmani, A., & Zhang, J. (2014). Economic and environmental optimization of a large scale sustainable dual feedstock lingo-cellulosic-based bioethanol supply chain in a stochastic environment. *Applied Energy,* 1(1), 572-587.

Pandey, P., & Pandey, M. M. (2021). *Research methodology tools and techniques*. Bridge Center.

Paola, S. & Susan, G. (2015). Toward Sustainable Supply Chain Orientation: mapping managerial perspectives. *International Journal of Physical Distribution & Logistics,* 45(6), 536-564.

Parasuraman, A. 1997. Reflections on gaining competitive advantage through customer value. Journal of the Academy of Marketing Science 25, no. 2: 154–61.

Pasmore, W.A., (1988). Designing effective organizations: the sociotechnical systems perspective. John Wiley & Sons Inc, New York.

Patel, M., & Patel, N. (2019). Exploring Research Methodology. *International Journal of Research and Review*, *6*(3), 48-55.

Paula, I. C. D., Campos, E. A. R. D., Pagani, R. N., Guarnieri, P., & Kaviani, M. A. (2020). Are collaboration and trust sources for innovation in the reverse logistics? Insights from a systematic literature review. *Supply Chain Management: An International Journal*, *25*(2), 176-222.

Peprah, F. (2016). European Journal of Logistics, Purchasing and Supply Chain Management Vol.4, No.1, pp.32-50, February 2016 Published by European Centre for Research Training and Development UK (www.eajournals.orgperformance? *International Journal of Operations & Production Management,* 25(9).

Perkumienė, D., Pranskūnienė, R., Vienažindienė, M., & Grigienė, J. (2020). The right to a clean environment: Considering green logistics and sustainable tourism. *International Journal of Environmental Research and Public Health*, *17*(9), 3254.

Perotti, S., Zorzini, M., Cagno, E. and Micheli, G. (2012). Green supply chain practices and company performance: the case of 3PLs in Italy. *International Journal of Physical Distribution & Logistics Management*, 42(7), 640-672.

Persson, G. (1991). Achieving competitiveness through logistics. *International Journal of Logistics Management* 2, no. 1: 1–11.

Pierre, C.; Francesco, P.; & Theo, N. (2019). Towards low carbon global supply chains: A multi-trade analysis of Carbon dioxide (CO_2) emission reductions in container shipping. *International Journal of Production Economy*, *19*(208), 17–28.

Pietro, E., Huge-Brodin, M., Isaksson, K. & Sweeney, E. (2012).*Purchasing Green Transport and Logistics Services: Implications for Small Business*.National Institute for Transport and Logistics

Pietro, E., Huge-Brodin, M., Isaksson, K. & Sweeney, E.(2012).*Purchasing Green Transport and Logistics Services: Implications for Small Business*. National Institute for Transport and Logistics

Privitera, G. J. (2022). *Research methods for the behavioral sciences*. Sage Publications.

Przychodzen, J. (2013). Corporate sustainability and shareholder wealth. *Journal of Environmental Planning and Management. pp*. 474–493

Qin, L., Kirikkaleli, D., Hou, Y., Miao, X., & Tufail, M. (2021). Carbon neutrality target for G7 economies: Examining the role of environmental policy, green innovation and composite risk index. *Journal of Environmental Management*, *295*, 113119.

Qureshi, P., Rasli, M., and Zaman, C. (2016). Relationship between green supply chain management and firm performance; A case of Manufacturing Firms in Pakistan. *Journal of Operations Management* 2(8):163-176.

Rathore, P., Kota, S., & Chakrabarti, A. (2011). Sustainability through Remanufacturing in India: A Case Study on Mobile Handsets, *Journal of Clean. Production, 19*(15), 2011, pp. 1709–1722.

Rauer, J., & Kaufmann, L. (2015). Mitigating external barriers to implementing green supply chain management: a grounded theory investigation of green-tech companies rare earth metals supply chains. *The Journal of Supply Chain Management, 51*(2), 65-88. http://dx.doi.org/10.1111/jscm.12063.

Richnák, P., & Gubová, K. (2021). Green and reverse logistics in conditions of sustainable development in enterprises in Slovakia. *Sustainability*, *13*(2), 581.

Rioba E. M.(2015), Manufacturing Industry and Economic Growth in Kenya: A Kaldorian Approach

Roberta, H. & Alison, T. (2015). *Validity and Reliability in Quantitative Studies,* 7(8), 66-67. Retrieved from: http://ebn.bmj.com/content/18/3/66.

Rodriguez, A., & Smith, J. (2018). Phenomenology as a healthcare research method. *Evidence-Based Nursing*, *21*(4), 96-98.

Rostamzadeh, R., Govindan, K., Esmaeili, A., & Sabaghi, M. (2015). Application of fuzzy VIKOR for evaluation of green supply chain management practices. *Ecological Indicators, 49*(0), 188-203. http://dx.doi.org/10.1016/j.ecolind.2014.09.045.

Rumelt, Richard P. (2011). Good Strategy / Bad Strategy. *Crown Business*. ISBN 978-0-307-88623-1.

Salkind, N. J. (2010). *Demographics; in: Encyclopedia of Research Design*. Retrieved from: https://dx.doi.org/10.4135/9781412961288.n108

Saman, A., N. Seman, Zakuan, N., Jusoh, A., Shoki, M.&Arif, M. (2012). Green Supply Chain Management: A review and research direction. *International Journal of Managing Value and Supply Chains*, 3 (1)

Sang, M. L., Jin Sung, R., Donghyun, C., & Yonghwi, N. (2013). Pressures affecting green supply chain performance. *Management Decision, 51*(8), 1753-1768. http://dx.doi.org/10.1108/MD-12-2012-0841.

Sarhaye , S., A. & Marendi, P., N. (2017). Role Of Green Procurement On Organizational Performance Of Manufacturing Firms In Kenya: A Case Of Cocacola Company. *The Strategic Journal of Business and Change Management*, 3 (7), 85 – 102

Sarkis, J., Zhu, Q. and Lai, K. (2010).An Organizational Theoretic Review of Green Supply Chain Management Literature.*Working Paper* No. 2010-11

Sarkis, J., Zhu, Q., & Lai, K. H. (2019). An organizational theoretic review of green supply chain management literature. *International Journal of Production Economics, 130*(1), 1-15. http://dx.doi.org/10.1016/j.ijpe.2010.11.010.

Sarkis, J., Zhu, Q.H., & Lai, K.H., (2011). An organizational theoretic review of green supply chain management literature. *Int. Journal of Production Economics, 130* (1), 1–15.

Sauer, P. C., & Seuring, S. (2018). A three-dimensional framework for multi-tier sustainable supply chain management. *Supply Chain Management, 23*(6), 560-572. http://dx.doi.org/10.1108/SCM-06-2018-0233.

Sauer, P. C., & Seuring, S. (2018). A three-dimensional framework for multi-tier sustainable supply chain management. *Supply Chain Management: An International Journal*, 18(13); 102-126.

Saunders, M., & Thornhill, A., (2009). *Research methods for business students*. (5th ed.) London: Personal Educational Ltd.

Schmalensee, R., 2010. Renewable electricity generation in the United States. In: Moselle, B., Padilla, J., Schmalensee, R. (Eds.), Harnessing Renewable Energy in Electric Power Systems. Resources for the Future Press, Washington.

Seman, A.Zakuan, N., Jusoh, A., Shoki, M.&Arif, M. (2012). Green Supply Chain Management: A review and research direction. *International Journal of Managing Value and Supply Chains*, 3 (1)

Seroka-Stolka, O. (2014). Environmental Management Practices in Polish Enterprises - An Empirical Analysis. *Eurasian Journal of Business and Management, Eurasian Publications*, 2(3), 1-10

Shang, K. C., Lu, C. S., & Li, S. (2010). A taxonomy of green supply chain management capability among electronics-related manufacturing firms in Taiwan. *Journal of Environmental Management, 91*(5), 1218-1226. http://dx.doi.org/10.1016/j.jenvman.2010.01.016. PMid:20181423.

Shang, K.-C., & Marlow, P. B. (2005).Logistics capability and performance in Taiwan's major manufacturing firms: Transportation Research Part *E: Logistics and Transportation Review* 41, 217-234.

Shen, B., Ding, X., Chen, L.,& Chan, H.L. (2017). Low carbon supply chain with energy consumption constraints: case studies from China's textile industry

and simple analytical model. *Supply Chain Manage.-Int. Journal*, 22 (3), 258–269.

Shen, L., Muduli, K., & Barve, A., (2015). Developing a sustainable development framework in the context of mining industries: AHP approach. *Resource Policy* 46, 15–26.

Singhal, P. (2013). Green Supply Chain and ecodesign in electronic industry. *Delhi Business Review, 14*(1), 57-78.

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of business research, 104*, 333-339.

Sustainable Public Procurement Implementation Guidelines, Introducing UNEP'S Approach (2012). *United Nations Environment Programme*

Tamulis, V., & Žalgirytė, L. (2012). Factors influencing the use of green logistics: theoretical implications. *Economics and Management*, 17(2), 706-711.

Tang, C.S., 2018. Socially responsible supply chains in emerging markets: some research opportunities. *J. Oper. Manage.* 57, 1–10.

Teixeira, C. R. B., Assumpção, A. L., Correa, A. L., Savi, A. F., & Prates, G. A. (2018). The contribution of green logistics and sustainable purchasing for green supply chain management. *Independent Journal of Management & Production*, *9*(3), 1002-1026.

Telewa, R.S. (2014). *Sustainable Procurement Practices in the Public Water Sector Institutions in Kenya*. Unpublished MBA project, University of Nairobi School of Business.

Terra, L. A. A. (2017). Symbiotic Dynamic: The Strategic Problem from the Perspective of Complexity. *Systems Research and Behavioral Science.* 33 (2): 235–248

Tian, G., Lu, W., Zhang, X., Zhan, M., Dulebenets, M. A., Aleksandrov, A., ... & Ivanov, M. (2023). A survey of multi-criteria decision-making techniques for green logistics and low-carbon transportation systems. *Environmental Science and Pollution Research*, *30*(20), 57279-57301.

Toke, L.K., Gupta, R.C. and Dandekar, M. (2012).An empirical study of green supply chain management in Indian perspective.*International Journal of Applied Sciences and Engineering Research*

Touboulic, A., & Walker, H. (2015). Theories in sustainable supply chain management: a structured literature review. *International Journal of Physical Distribution & Logistics Management, 45*(1-2), 16-42. http://dx.doi.org/10.1108/IJPDLM-05-2013-0106.

Touboulic, A., & Walker, H., (2014). Theories in Sustainable Supply Chain Management: a structured literature review, *International journal of physical distribution and logistics management*, 45(1), 16-42

Tozay G. J. (2012)Warehouse location and design decisions among large scale manufacturing firms in Nairobi, Kenya; *Research Project, University of Nairobi.*

Trist, E.L., & Bamforth, K.W. (1951). Some social and psychological consequences of the longwall method of coal-getting. *Human Relat. 4* (1), 3–38.

Trivellas, P., Malindretos, G., & Reklitis, P. (2020). Implications of green logistics management on sustainable business and supply chain performance: evidence from a survey in the greek agri-food sector. *Sustainability*, *12*(24), 10515.

Tseng, M.-L., & Chiu, A. S. F. (2013). Evaluating firm's green supply chain management in linguistic preferences. *Journal of Cleaner Production, 40,* 22-31. http://dx.doi.org/10.1016/j.jclepro.2010.08.007.

Tseng, M.-L., Islam, M. S., Karia, N., Fauzi, S. A., & Afrin, S. (2019). A literature review on green supply chain management: trends and future challenges. *Resources, Conservation and Recycling, 141*, 145-162. http://dx.doi.org/10.1016/j.resconrec.2018.10.009.

Tseng, S. C., & Hung, S. W. (2014). A strategic decision-making model considering the social costs of carbon dioxide emissions for sustainable supply chain management. *Journal of Environmental Management*, 13(3), 315-322.

United Nations (2012). *Purchasing for Sustainability Forum of the Future.* A guide for public sector organizations, Yorkshire.

Vamshidhar, R., V. (2013) Ant colony optimisation for location routing problem and its application to bill delivery services. *International Journal of Logistics Systems and Management 14:1, 1-37.*

Vermeulen, W. (2015). Impact of green Logistics on firm performance in Thailand: a qualitative approach. *International Journal of Organizational Analysis* 17:169-183

Visich, J.K., Li, S., & Khumawala, B.M. (2019). Enhancing Product Recovery Value in Closedloop Supply Chains with RFID, *Journal of Management Issues, 19*(3) , pp. 436–452.

Waithaka S. T., Mburu T.K., Koror J. and Muathe S. (2012) Environmental Factors that influence SupplyChain Management Implementation in the Manufacturing Industries in Kenya: *A Case of Manufacturing Industries in Nairobi, Kenya.*

Wan, M. (2022). Research methods. In CSR Image Discursive Construction of Banks and the Effects on Capital Markets (pp. 69-86). Springer, Singapore.

Wang, C. N., Dang, T. T., & Nguyen, N. A. T. (2021). Outsourcing reverse logistics for e-commerce retailers: A two-stage fuzzy optimization approach. *Axioms*, *10*(1), 34.

Wang, J., Zhao, J., & Wang, X. (2012), Optimum Policy in Hybrid Manufacturing/ Remanufacturing System, Compututational *Industrial Engineering*, *60*(3), pp. 411–419.

Wedawatta, G., Ingirige, B., Jones, K. & Proverbs, D. (2011), Extreme weather events and construction SMEs: Vulnerability, impacts, and strategies, *Structural Survey*, 29(2), 106 – 119,

Wieland, Andreas; Handfield, Robert B. (2013). The Socially Responsible Supply Chain: An Imperative for Global Corporations. Supply Chain Management Review. **17** (5): 22–29

Wijewickrama, M. K. C. S., Chileshe, N., Rameezdeen, R., & Ochoa, J. J. (2021). Information sharing in reverse logistics supply chain of demolition waste: A systematic literature review. *Journal of cleaner production*, *280*, 124359.

Wijewickrama, M. K. C. S., Chileshe, N., Rameezdeen, R., & Ochoa, J. J. (2021). Information sharing in reverse logistics supply chain of demolition waste: A systematic literature review. *Journal of cleaner production*, *280*, 124359.

Wilcox, R. R. (2011). Introduction to robust estimation and hypothesis testing. Academic press.

Williamson, O. E. (1979). "Transaction-Cost Economics: The Governance of Contractual Relations". *The Journal of Law and Economics*. **22** (2): 233–261. doi:10.1086/466942

Wilson, M., Paschen, J., & Pitt, L. (2022). The circular economy meets artificial intelligence (AI): Understanding the opportunities of AI for reverse logistics. *Management of Environmental Quality: An International Journal*, *33*(1), 9-25.

Wolf, J. (2014). The relationship between sustainable supply chain management, stakeholder pressure and corporate sustainability performance. *Journal of Business Ethics*, 11(9),

Wong, Stanley Kam Sing (2012).The role of management involvement ninnovation. *Management Decision*. **51** (4): 709–729

Woodruff, R. 1997. Customer value: The next source for competitive advantage. Journal of the Academy of Marketing Science 25, no. 2: 139–53.

World Bank (2011), "Guidelines procurement under IBRD loans and IDA credits", Washington D. C: World Bank

Wu, G.-C., Ding, J.-H., & Chen, P.-S. (2012). The effects of GSCM drivers and institutional pressures on GSCM practices in Taiwan's textile and apparel industry. *Int. J. Prod. Econ. 135* (2), 618–636.

Yan, Y. K., & Yazdanifard, R. (2014). The concept of green marketing and green product development on consumer buying approach. *Global Journal of Commerce & Management Perspective, 3*(2), 33-38.

Yingfei, Y., Mengze, Z., Zeyu, L., Ki-Hyung, B., Avotra, A. A. R. N., & Nawaz, A. (2022). Green logistics performance and infrastructure on service trade and environment-measuring firm's performance and service quality. *Journal of King Saud University-Science*, *34*(1), 101683.

Yu, W. and Ramanathan, R. (2015). An empirical examination of stakeholder pressures, green operations practices and environmental performance. *International Journal of Production Research*, 53(21), 6390-6407.

Yusof, M. N. & Abubakar, A. H. (2012). Knowledge management and growth performance in construction companies: a framework. Procedia – *Social and Behavioural Sciences*, 62(1), 128-134.

Zawadi, A. E. J. (2018). Determinants of green procurement implementation in the public sector in kenya: a case of rural electrification authority. *Strategic Journal of Business & Change Management, 5*(1).

Zhang, Y., Hêriş , G., and Khan, S.A.R. (2018) The relationship between green supply chain performance, energy demand, economic growth and environmental sustainability: An empirical evidence from developed countries, *Log Forum-Scientific Journal of Logistics*, 14(4), 479-498.

Zhao, R., Mashruwala, R., Pandit, S., & Balakrishnan, J. (2019). Supply chain relational capital and the bullwhip effect: An empirical analysis using financial disclosures. *International Journal of Operations & Production Management*, 4(16); 209-226.

Zhexembayeva, N. (2014). Overfished Ocean Strategy: Powering Up Innovation for a Resource-Depleted World. San Francisco, *CA: Berret-Koehler Publishers*. ISBN 1 609-94964-1

Zhu, Q., Sarkis, J., & Lai, K.-H. (2012). Green supply chain management innovation diffusion and its relationship to organizational improvement: an ecological modernization perspective. *Journal of Engineering and Technology Management*, *29*(1), 168-185. http://dx.doi.org/10.1016/j.jengtecman.2011.09.012.

Zhu, Q., Sarkis, J., & Lai, K.-H. (2015). Reprint of Supply chain-based barriers for truck-engine remanufacturing in China. *Logistics and Transportation Review*, *74*, 94-108. http://dx.doi.org/10.1016/j.tre.2014.12.004.

Zubcic, J., & Sims, R. (2011). Examining the link between enforcement activity and corporate compliance by Australian companies and the implications for regulators. *International Journal of Law and Management, 53*(4), 299-30

APPENDICES

Appendix I: Introduction Letter

Dear Respondent,

I am a doctoral candidate at the Jomo Kenyatta University of Agriculture and Technology, School of Human Resource Development. As part of my academic program, I am conducting a study on the influence of green logistics on performance of building and construction manufacturing firms in Kenya.

You have been identified as a potential respondent in this research. Please respond to all questions, using your best estimates. Your participation in answering these questions is very much appreciated. Your responses will be Completely Confidential.

Thank you for your support and cooperation.

Yours Faithfully,

Peter Gikonyo

HD411-COO4-5026/2015

Tel: 0723 956 720

email: kiamagikonyo19@gmail.com.

Appendix II: Questionnaire

This questionnaire has been set in relation to the objectives of the study. All the questions relate to the influence of green Logistics management on performance of building and construction manufacturing firms in Kenya. Kindly read the questions carefully and answer them as honestly as possible by ticking (✓), rating, specifying or writing the correct answers precisely on the spaces provided.

SECTION 1: RESPONDENT'S INFORMATION

1. Number of years served in your current office

3-5 [ ] 6-8 [ ] 9 and above [ ]

2. Current position in your firm?

Procurement Manager [ ] Department Head [ ] Supply Chain Personnel [ ] Any other (specify)…….

3. Number of years the firm has been operating in Kenya

Below 5 Yrs [ ] 6-9 Yrs [ ] 10-15 Years [ ] Above 15 Years [ ]

4. How many products/services does your organization deal with?

1-3 [ ] 4-6 [ ] 7-10 [ ] Above 10 [ ]

SECTION 2: REVERSE LOGISTICS MANAGEMENT

7**.** Please indicate the extent to which you agree or disagree with the following statements on the influence of reverse logistics on performance of building and construction manufacturing firms. (Please Tick 1 for Strongly Disagree, 2 for Disagree, 3 for neutral, 4 for Agree and 5 for Strongly Agree).

	Statement	1	2	3	4	5
a)	Our firm has a returns policy and does remanufacturing which has role in cost reduction					
b)	Our firm has recall programs and procedures which have a role in cost reduction					
c)	Our firm practices rrecycling and refurbishment which has role in cost reduction					
d)	Our firm has a returns policy and does remanufacturing which has role in scope attainment					
e)	Our firm has recall programs and procedures which have a role in scope attainment					
f)	Our firm practices rrecycling and refurbishment which has role in scope attainment					
g)	Our firm has a returns policy and does remanufacturing which has role in attaining timely deliveries					
h)	Our firm has recall programs and procedures which have a role in attaining timely deliveries					
i)	Our firm practices rrecycling and refurbishment which has role in attaining timely deliveries					

How would you explain the general use of reverse logistics in your company?.

……

SECTION 3: GREEN PACKAGING

8.Please indicate the extent to which you agree or disagree with the following statements on the influence of green packaging on performance of building and construction manufacturing firms. (Please Tick 1 for Strongly Disagree, 2 for Disagree, 3 for neutral, 4 for Agree and 5 for Strongly Agree).

		1	2	3	4	5
a)	The organization applies packaging made of recyclable materials enhancing quality of goods					
b)	The organization packaging materials are bio-degradable which has increased sales					
c)	organization uses minimum transportation packaging materials to preserve the natural resources which has reduced the cost of transportation					
d)	Post-consumer recycled polyethylene bags made from recycled waste					
e)	Does your organisation use Renewable resource-based packaging					
f)	The organization uses minimum packaging materials on the products to preserve the natural resources which increases delivery of goods					
g)	Packaging optimization by Packaging reduction, while retaining product protection					
h)	Does your organisation use Packaging with additives added in order to make the packaging degradable.					
i)	Use eco-friendly packaging material - without sacrificing appearance and quality					

Does tour organisation use recyclable materials. Plastic, paperboard, cardboard and other materials can be reconstituted to create new items?.

Explain……
……..

SECTION 4: LOGISTICS INNOVATION

10. Please indicates the extent to which you agree or disagree with the following statements on the influence of Logistics innovation on performance of building and construction manufacturing firms. (Please Tick 1 for Strongly Disagree 2 for Disagree 3 for neutral 4 for Agree and 5 for Strongly Agree).

	Statement	1	2	3	4	5
a)	Our firm uses vehicles and machineries that have low fuel/power consumption					
b)	Our firm has come up with ways of minimizing gas emissions in its production processes					
c)	We have embraced technology in lonitoring our logistics and truck movements					
d)	Research and development has been embraced through financing to establish how best we can save on production					
e)	Training is done frequently on how to embrace green logistics					
f)	Our production systems are based on new ways established through research					
g)	We have adopted new designs of our products that are more environmental friendly					
h)	We adequately involve our suppliers in coming up with products that are aligned to green logistics					
i)	The designs of our products are based on the set regulations and standards					

SECTION 5: GREEN DISTRIBUTION SYSTEMS

11. Please indicates the extent to which you agree or disagree with the following statements on the influence of Green Distribution Systems on performance of building and construction manufacturing firms. (Please Tick 1 for Strongly Disagree 2 for Disagree 3 for neutral 4 for Agree and 5 for Strongly Agree).

	Statement	1	2	3	4	5
a)	The vehicle loadings in our organization are arranged based on the route and customer locations					
b)	Our firm has end-to-end transportation system for effectiveness and efficiency					
c)	We have embraced a monitoring system to avoid overloading and tracking the vehicle movement					
d)	We have embraced multi-stage distribution to reduce lead time and distance from the production point to the customers					
e)	Our distributions channels are integrated for easier management and inventory monitoring					
f)	The production points are decentralized closer to the customers for distance-reduction					
g)	There are warehouses closer to customer for timeliness					

SECTION 6: FIRM CHARACTERISTICS

11. Please indicates the extent to which you agree or disagree with the following statements on the influence of firm characteristics on performance of building and construction manufacturing firms. (Please Tick 1 for Strongly Disagree 2 for Disagree 3 for neutral 4 for Agree and 5 for Strongly Agree).

	Statement	1	2	3	4	5
•	The sourcing of materials is done with close involvement of suppliers to embrace green materials					
•	The company had embraced diverse sources of materials to ensure environmental friendly materials are obtained					
•	Our company gives priority to suppliers who are capable of supplying environmental friendly materials					
•	The company has been keen on embracing supply chain agility for effectiveness of its supply chain processes					

•	The supply chain agility of our company has been instrumental in string adoption of green logistics					
•	The company is keen to integrate new changes in the supply chain processes such as the green logistics					
•	The company frequently analyses and mitigates risks associated with supply chain processes					
•	The company has a framework for managing supply chain risks					
•	The overall characteristics of our firm is streamlined towards enhancing the adoption of green logistics to steer performance					

In your opinion, in which ways do you think the characteristics of your firm influences the effectiveness of green logistics and the overall firm performance?

……

……

SECTION 7: Performance of Building and construction manufacturing firms

14 (Please indicate by ticking the reduction in cost, scope attainment and lead time reduction in delivery of supplies over the last five years)

Category	Very low	low	medium	high	Very high
Average Lead Time in days					
Revenue (Ksh.)					
Gross Revenues					
Operational Expenses					
Net Revenues					
Quality					
Number of Returns					
Rejects					
Total Defectives					

Please indicates the extent to which you agree or disagree with the following statements on performance of building and construction manufacturing firms. (Please Tick 1 for Strongly Disagree 2 for Disagree 3 for neutral 4 for Agree and 5 for Strongly Agree).

Statements	**SD**	**D**	**N**	**A**	**SA**
Our company has drastically reduced the rate of customer returns over the past five years					
The cost of operations in our firm has reduced for the past five years					
Our company has seen an increase in the sales revenue for the past five years					
There are fewer customer complaints with regard to our products over the past five years					

THANK YOU FOR YOUR TIME

Appendix III: List of Building and Construction Manufacturing Companies in Kenya

S/No	Name	Subsector
1	Aristocrats Concrete Limited	Building and Construction Accessories
2	Boyama Building Materials	Building and Construction Accessories
3	Cemex Holding Ltd	Building and Construction Accessories
4	Dittman Construction Co. Ltd	Building and Construction Accessories
5	Elegant Fittings Limited	Building and Construction Accessories
6	Erdemann Gypsum Limited	Building and Construction Accessories
7	Eurocon Tiles Products Ltd	Building and Construction Accessories
8	Gjenge Makers Limited	Building and Construction Accessories
9	Hydro Water Well (K) Limited	Building and Construction Accessories
10	International Green Structures	Building and Construction Accessories
	Manufacturing Kenya Limited	Building and Construction Accessories
11	Keda (Kenya) Ceramics Company Ltd	Building and Construction Accessories
12	Kenbro Industries Ltd	Building and Construction Accessories
13	Kenya Builders & Concrete Ltd	Building and Construction Accessories
14	Koto Housing Kenya Ltd	Building and Construction Accessories
15	Laxmanbhai Construction Limited	Building and Construction Accessories
16	Lexcon Enterprises Ltd	Building and Construction Accessories
17	Mineral Enterprises Ltd	Building and Construction Accessories
18	Questworks Limited	Building and Construction Accessories
19	Rexe Roofing Products	Building and Construction Accessories
20	Roofings Kenya Limited	Building and Construction Accessories
21	Saj Ceramics Ltd	Building and Construction Accessories
22	Skylark Construction Ltd	Building and Construction Accessories
23	Space And Style Ltd	Building and Construction Accessories
24	Tile & Carpet Centre	Building and Construction Accessories
25	Wotech Kenya Limited	Building and Construction Accessories
26	Bamburi Cement Limited	Cement Production
27	East African Portland Cement Company Limited	Cement Production
28	Karsan Ramji And Sons Limited	Cement Production
29	Mombasa Cement Ltd	Cement Production
30	National Cement Limited	Cement Production
31	Rai Cement Limited	Cement Production

32	Savannah Cement Ltd	Cement Production
33	Afrikstones Limited	Mining & Quarrying
34	African Diatomite Industries	Mining & Quarrying
35	Blue Stone Limited	Mining & Quarrying
36	Coast Calcium Limited	Mining & Quarrying
37	Eldoret Quarry Limited	Mining & Quarrying
38	Halai Concrete Quarries	Mining & Quarrying
39	Homa Lime Co. Ltd	Mining & Quarrying
40	Kay Construction Company Ltd	Mining & Quarrying
41	Shajanand Creative Limitesd	Mining & Quarrying
42	Silverstone Quarry Limited	Mining & Quarrying
43	Superstone 2006 Ltd	Mining & Quarrying
44	Tiptop Constructions Limited	Mining & Quarrying
45	Vallem Construction Ltd	Mining & Quarrying
46	Virji Vishram Patel & Son's Ltd	Mining & Quarrying
47	North Rift Concrete Works Ltd	Precast and Ready-Mix Concrete
48	Bamburi Special Products Ltd	Precast and Ready-Mix Concrete
49	Compact Poles & Services Ltd	Precast and Ready-Mix Concrete
50	Greystone Industries Limited	Precast and Ready-Mix Concrete
51	Kisumu Concrete Products	Precast and Ready-Mix Concrete
52	Orbit Enterprises Ltd	Precast and Ready-Mix Concrete
53	Pride Enterprises Ltd	Precast and Ready-Mix Concrete
54	Reliable Concrete Works Ltd	Precast and Ready-Mix Concrete