

GREEN SUPPLY CHAIN MANAGEMENT PRACTICES AND OPERATIONAL EFFICIENCY AT MUKWANO INDUSTRIES UGANDA LTD

JONATHAN MBABAZI

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**A DISSERTATION SUBMITTED TO THE SCHOOL OF BUSINESS IN PARTIAL FULFILLMENT
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**UGANDA CHRISTIAN
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DECLARATION

I, Jonathan Mbabazi, hereby declare that this dissertation titled “*Green Supply Chain Management Practices and Operational Efficiency at Mukwano Industries Uganda Ltd*” is my own original work and has never been presented in fulfilment of the requirements for any academic award at any other academic Institution. All sources of information used in this report have been well cited and corresponding authors acknowledged. I therefore submit it to Uganda Christian University in partial fulfillment for the award of a master’s degree in business administration.

Signed:

A handwritten signature in blue ink, appearing to be 'J. Mbabazi', with a circular flourish at the end.

Date: 29/04/2026

APPROVAL

I certify that this dissertation by Jonathan Mbabazi, titled: “*Green Supply Chain Management Practices and Operational Efficiency at Mukwano Industries Uganda Ltd*”, has been written under my supervision and is ready for examination.

DR MUGISHA HENRY



Signature:

Date: 30/04/2026

SUPERVISOR

DEDICATION

I dedicate this dissertation to my wife Mrs Kobusinge Charity Jovia and my Children Mbabazi Shanice, Mbabazi Smiles and Mbabazi Spencer

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I thank God because it is by his sufficient grace that I have come this far. I extend my gratitude to my supervisor, Dr Mugisha Henry, who didn't stop at being my supervisor but became a friend and an inspiration to me. I sincerely thank God for giving me the chance to meet him as my supervisor.

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ABSTRACT

This study examined the influence of Green Supply Chain Management (GSCM) practices on operational efficiency at Mukwano Industries Uganda Ltd. Specifically, it explored the role of green procurement, green manufacturing, and green logistics in enhancing the organization's operational performance. A descriptive and correlational research design was adopted, with data collected from 132 respondents, including top management, middle-level managers, and operational staff, using structured questionnaires. Descriptive statistics, Pearson's correlation, and multiple regression analyses were employed to analyze the data. The findings indicated that respondents generally agreed that Mukwano Industries had moderately implemented green supply chain practices, with overall mean scores of 3.88 for green procurement, 3.87 for green manufacturing, and 3.86 for green logistics. Operational efficiency was also perceived positively, with an overall mean score of 3.91. Correlation analysis revealed significant positive relationships between all dimensions of GSCM and operational efficiency ($p < 0.01$). Regression results showed that green logistics had the strongest influence on operational efficiency ($B = 0.502$, $p < 0.001$), followed by green manufacturing ($B = 0.160$, $p = 0.013$) and green procurement ($B = 0.151$, $p = 0.008$). The study concluded that the adoption of green supply chain practices positively contributed to operational efficiency, although areas such as cost control, waste reduction, employee training, and reverse logistics required further strengthening. Recommendations included enhancing supplier compliance, promoting energy-efficient technologies, improving recycling initiatives, and optimizing logistics practices to sustain performance and environmental sustainability.

CHAPTER ONE

INTRODUCTION

1.0 Introduction

In recent years, organisations across the globe have increasingly embraced environmentally sustainable business practices in response to rising environmental concerns, regulatory pressures, and stakeholder expectations. One such approach is Green Supply Chain Management (GSCM), which integrates environmental thinking into supply chain activities, including procurement, production, distribution, and waste management, with the aim of minimising environmental impact while enhancing organisational performance (Srivastava, 2007). As industries face mounting pressure to balance economic performance with environmental responsibility, GSCM has emerged as a strategic tool to improve operational efficiency and achieve sustainable competitive advantage.

Operational efficiency remains a vital goal for manufacturing companies, especially in developing economies where resource limitations, high production expenses, and infrastructural hurdles still exist. Operational efficiency describes an organisation's ability to use its resources in the best way possible to produce goods and services at the lowest cost while upholding quality and timeliness (Slack et al., 2019). For manufacturing companies, achieving efficient operations is crucial for reducing costs, boosting productivity, minimising waste, and remaining competitive. Incorporating green practices into supply chain operations has been shown to reduce material waste, energy use, and operational expenses, thereby improving efficiency (Zhu & Sarkis, 2004).

In the Ugandan context, industrial growth has significantly contributed to economic development, employment creation, and value addition. However, this growth has also been accompanied by environmental challenges such as pollution, excessive waste generation, and inefficient resource utilization, particularly within the manufacturing sector (NEMA, 2022). As a result, the Government of Uganda, through regulatory frameworks such as the National Environment Act and industrial sustainability guidelines, has encouraged firms to adopt environmentally responsible practices. This policy environment has heightened the relevance of GSCM as firms seek to comply with regulations while maintaining operational effectiveness.

Mukwano Industries Uganda Ltd., one of the leading manufacturing companies in Uganda, operates across diverse product lines including edible oils, soaps, detergents, and packaging materials. Given the scale of its operations and extensive supply chain network, the company's activities have significant implications for both environmental sustainability and operational performance. The adoption of green supply chain practices, such as green procurement, eco-friendly production processes, waste recycling, and energy-efficiency initiatives, has the potential to enhance operational efficiency while reducing the environmental footprint. However, the extent to which these practices contribute to operational efficiency within Mukwano Industries Uganda Ltd. remains under-explored in empirical research.

Although several studies have examined GSCM and firm performance globally, there is limited empirical evidence on the relationship between GSCM practices and operational efficiency in manufacturing firms in Uganda. Most existing research concentrates on large multinational companies or developed economies, paying little attention to local

manufacturing settings and firm-specific case studies. This gap requires an in-depth exploration of how green supply chain management practices influence operational efficiency in a leading Ugandan manufacturing firm. Consequently, this study aims to investigate Green Supply Chain Management Practices and Operational Efficiency at Mukwano Industries Uganda Ltd, with the goal of providing context-specific insights that can guide managerial decision-making, policy development, and sustainable industrial advancement in Uganda.

1.1 Background of the Study

Global environmental degradation, resource scarcity, and increasing regulatory pressures have compelled organisations to rethink traditional supply chain models in favour of more sustainable alternatives. As industries strive to balance economic growth with environmental stewardship, Green Supply Chain Management (GSCM) has emerged as an influential paradigm that embeds environmental considerations across supply chain functions—from sourcing and production to distribution and end-of-life disposal (Srivastava, 2007). GSCM not only addresses environmental concerns such as waste, emissions, and resource depletion but also creates opportunities for firms to optimize operations, reduce costs, and enhance competitiveness (Zhu & Sarkis, 2006).

Operational efficiency is a vital factor influencing organisational performance, particularly in manufacturing industries where the optimal use of resources directly affects cost structures, product quality, and customer satisfaction. Defined as an organisation's ability to produce desired outputs with minimal resource consumption, operational efficiency includes lean production, process optimisation, waste reduction,

and timely delivery (Slack, Brandon-Jones & Burgess, 2019). Studies indicate that incorporating green practices into supply chain processes can substantially improve operational performance by reducing waste, lowering energy consumption, and increasing process reliability (Govindan et al., 2015).

In Sub-Saharan Africa, increasing industrialisation has stimulated economic growth but has also exacerbated environmental challenges, including air and water pollution, solid waste management problems, and inefficient resource use (United Nations Environment Programme [UNEP], 2019). Uganda's manufacturing sector makes a significant contribution to the national GDP and employment; however, it also faces inefficiencies, high energy demand, and environmental compliance issues. The Government of Uganda, through agencies such as the National Environment Management Authority (NEMA), has promoted sustainable industrial practices to mitigate environmental impacts while urging firms to adopt cleaner production methods (NEMA, 2022).

Mukwano Industries Uganda Ltd., a leading manufacturer in Uganda's industry sector, produces a variety of consumer and industrial products, including edible oils, soaps, detergents, and packaging materials. The company's extensive supply chain involves suppliers, production facilities, distributors, and retailers, making its operations complex and resource intensive. In this context, GSCM practices such as green procurement, eco-efficient production techniques, recycling and waste management, and green logistics are increasingly important for reducing environmental impacts and enhancing operational performance.

Empirical evidence from other manufacturing contexts shows that GSCM practices can produce positive operational outcomes. For example, research in Chinese manufacturing firms found that environmental integration in supply chain processes led to improved operational performance, including reduced defect rates and lower production costs (Zhu & Sarkis, 2004). Similarly, studies in South African industries indicate that green practices are associated with enhanced resource efficiency and competitive advantage (Oke & Gopalakrishnan, 2009). Despite these findings, empirical research on the relationship between GSCM and operational efficiency in Ugandan manufacturing firms remains limited, particularly at the firm level.

Understanding how GSCM practices influence operational efficiency at Mukwano Industries Uganda Ltd. is essential not only for academic enrichment but also for practical implications in policy formulation and managerial decision-making. This study, therefore, seeks to examine the extent to which green supply chain management has been adopted at Mukwano Industries and how these practices correlate with operational efficiency outcomes, providing informed recommendations to support sustainable industrial growth in Uganda.

1.2 Statement of the Problem

Manufacturing firms worldwide are facing growing pressure to adopt environmentally sustainable practices due to stricter regulatory requirements, increasing environmental concerns, and evolving stakeholder expectations for responsible production and consumption. Green Supply Chain Management (GSCM) has emerged as a strategic approach that integrates environmental considerations into supply chain activities—

including procurement, production, distribution, and waste management—to reduce environmental impacts while enhancing firm performance (Srivastava, 2007). Empirical evidence suggests that effective implementation of GSCM can improve operational efficiency through indicators such as minimized waste, reduced energy consumption, optimized resource utilization, shorter process lead times, and enhanced product quality (Zhu & Sarkis, 2004; Govindan et al., 2015).

Despite the theoretical benefits, practical adoption of GSCM practices and their performance outcomes remain uneven, particularly in developing economies such as Uganda. Studies in Asian and South African manufacturing contexts have shown positive associations between green practices and operational performance (Zhu & Sarkis, 2004; Oke & Gopalakrishnan, 2009). However, these findings may not be directly generalizable to Uganda due to differences in institutional frameworks, regulatory enforcement, resource availability, and organizational capacity.

In Uganda, the manufacturing sector is vital for economic growth, employment creation, and value addition. Yet, it often experiences inefficiencies, high production costs, poor resource utilization, and challenges in complying with environmental standards (National Environment Management Authority [NEMA], 2022). While national policies and guidelines encourage environmentally friendly practices, empirical evidence on the adoption and operational impact of GSCM practices remains limited. Key operational efficiency indicators—such as production costs, waste reduction, energy consumption, process lead times, and quality outcomes—are not well-documented in relation to environmental initiatives.

At Mukwano Industries Uganda Ltd., a leading manufacturer with diverse product lines and complex supply chain operations, there is limited documented research on the adoption of GSCM practices and their influence on operational efficiency. Most existing Ugandan studies have focused on general environmental compliance or corporate social responsibility, without systematically examining the link between GSCM practices and measurable operational outcomes (Tumwine, 2020; Kafeero, 2021). This knowledge gap limits managers' understanding of the operational benefits of investing in green initiatives and constrains policymakers from designing targeted interventions that simultaneously promote sustainability and operational performance.

Specifically, there is a need to investigate how components of GSCM—such as green procurement, eco-efficient production, recycling, and reverse logistics—are implemented within Ugandan manufacturing firms, and how these practices affect operational efficiency metrics including cost reduction, waste minimization, process optimization, and quality improvement. Addressing this gap, this study seeks to explore the relationship between GSCM practices and operational efficiency at Mukwano Industries Uganda Ltd., providing empirical insights into the adoption of green practices, their operational outcomes, and their broader implications for sustainable manufacturing in Uganda.

1.3 Purpose of the study

The purpose of the study will be to examine the influence of Green Supply Chain Management practices on operational efficiency at Mukwano Industries Uganda Ltd.

1.4 Specific objectives

The study sought to achieve the following objectives;

- 1) To assess the effects of green procurement practices on operational efficiency at Mukwano Industries.
- 2) To examine the effect of green manufacturing practices on operational efficiency at Mukwano Industries.
- 3) To examine the effect of green logistics on operational efficiency at Mukwano Industries.

1.5 Research questions.

The study answered the following research questions;

- 1) What is the effect of green procurement practices on operational efficiency at Mukwano Industries?
- 2) What is the effect of green manufacturing practices on operational efficiency at Mukwano Industries?
- 3) What is the effect of green logistics on operational efficiency at Mukwano Industries?

1.6 Hypothesis

The study tested the following hypothesis;

H₁: Green procurement practices have a significant positive effect on operational efficiency at Mukwano Industries.

H₂: Green manufacturing practices have a significant positive effect on operational efficiency at Mukwano Industries.

H₃: Green logistics practices has a significant positive effect on operational efficiency at Mukwano Industries

1.7 Conceptual Framework

Green Supply Chain Management Practices

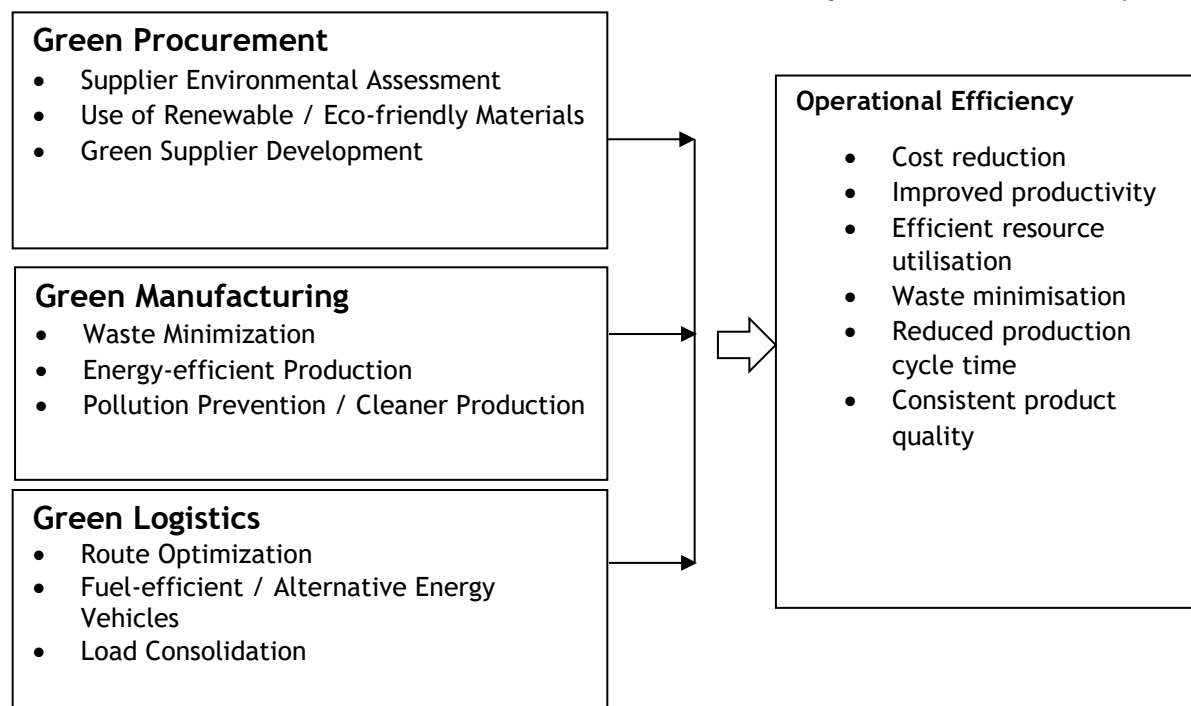


Figure 1.1: Conceptual framework

Source: adapted from Holm (2010) and revised by the researcher

The conceptual framework of this study illustrates the relationship between Green Supply Chain Management (GSCM) practices and operational efficiency at Mukwano

Industries Uganda Ltd. It provides a theoretical representation of how the independent variable, GSCM practices, influences the dependent variable, operational efficiency, through various key dimensions. This framework serves as a guide for understanding how environmentally conscious supply chain strategies contribute to improved organizational performance.

Green Supply Chain Management practices encompass strategies and activities that integrate environmental considerations into supply chain operations. For this study, the main dimensions include green procurement, green manufacturing, green logistics, green packaging, reverse logistics, environmental collaboration with partners, and environmental management systems (EMS). These practices involve sourcing eco-friendly materials, reducing waste and emissions during production, optimizing transportation, using sustainable packaging, recycling and reusing products, collaborating with stakeholders on environmental initiatives, and implementing formal environmental policies and certifications such as ISO 14001.

Operational efficiency, the dependent variable, refers to the organization's ability to maximize output while minimizing input, costs, and waste. At Mukwano Industries, this is reflected in reduced production costs, faster and more efficient production processes, timely delivery of products, and decreased environmental risks. The framework assumes that the adoption of GSCM practices positively impacts operational efficiency. For instance, green procurement and manufacturing reduce material and energy costs, green logistics and packaging lower transportation expenses, reverse

logistics and EMS improve recycling and compliance, and collaboration with partners enhances coordination and minimizes delays.

1.8 Scope of the study

This study is limited to examining Green Supply Chain Management (GSCM) practices and their influence on operational efficiency at Mukwano Industries Uganda Ltd. The content scope specifically focuses on green procurement, environmentally friendly production processes, waste management and recycling practices, and green logistics. Operational efficiency is assessed in terms of cost reduction, optimal resource utilisation, waste minimisation, production effectiveness, and process timeliness. To maintain depth and clarity, the study excludes other dimensions of sustainability, such as social sustainability and corporate governance.

Geographically, the study is confined to Mukwano Industries Uganda Ltd. within Uganda, with emphasis on its manufacturing and supply chain operations. The research will be conducted at the company's operational sites, including production plants, warehouses, and distribution units located in the country. This geographical focus enables an in-depth understanding of GSCM practices as applied in the Ugandan manufacturing environment.

In terms of time scope, the study covers a three-year period from 2022 to 2024, during which Mukwano Industries Uganda Ltd. has undertaken various environmental and operational improvement initiatives. This period provides an appropriate basis for assessing recent green supply chain practices and their effects on operational

efficiency. Data collection for the study will be conducted during the 2025 academic year using both primary and secondary sources.

1.9 Justification of the Study

This study is justified on theoretical, practical, and policy grounds, given the growing importance of environmental sustainability in manufacturing and supply chain management. Theoretically, although Green Supply Chain Management (GSCM) has been widely discussed in global literature, much of the existing research is concentrated in developed economies and large multinational firms. There is limited empirical evidence examining the relationship between GSCM practices and operational efficiency within manufacturing firms in developing countries, particularly in Uganda. By focusing on Mukwano Industries Uganda Ltd., this study contributes to the existing body of knowledge by providing context-specific insights that enrich supply chain management and operations management theories within a developing economy setting.

Practically, the findings of this study will be valuable to Mukwano Industries Uganda Ltd. and other manufacturing firms in Uganda. Understanding how green procurement, eco-friendly production processes, waste management, and green logistics influence operational efficiency will enable managers to make informed decisions on resource allocation, cost reduction, and process improvement. The study will also provide practical guidance on how environmental sustainability initiatives can be integrated into core supply chain operations without compromising efficiency, thereby enhancing competitiveness and long-term organizational performance.

From a policy and societal perspective, the study supports national efforts to promote sustainable industrial development in Uganda. Government agencies such as the National Environment Management Authority (NEMA) and the Ministry of Trade, Industry and Cooperatives advocate for environmentally responsible production practices. The findings of this research can inform policymakers on the operational benefits of green supply chain practices, supporting the formulation of evidence-based policies and guidelines that encourage wider adoption of GSCM among manufacturing firms. Additionally, the study contributes to environmental protection by promoting practices that reduce waste, conserve resources, and minimize environmental degradation, aligning with Uganda's sustainable development goals.

1.10 Significance of the Study

This study is significant to Mukwano Industries Uganda Ltd. as it provides empirical evidence on how Green Supply Chain Management (GSCM) practices influence operational efficiency. The findings will help management understand which green practices such as green procurement, eco-friendly production processes, waste management, and green logistics contribute most to cost reduction, efficient resource utilization, and improved production effectiveness. This knowledge will support informed managerial decision-making, enhance operational performance, and strengthen the company's competitiveness while promoting environmental sustainability.

The study is also significant to other manufacturing firms in Uganda and the wider business community. By demonstrating the operational benefits of adopting GSCM

practices within a local manufacturing context, the research offers practical insights that can be replicated by similar firms seeking to improve efficiency while complying with environmental regulations. This contributes to the promotion of sustainable manufacturing practices and encourages industries to view environmental responsibility as a strategic opportunity rather than a cost burden.

From an academic and policy perspective, the study contributes to existing literature on supply chain management by providing context-specific evidence from a developing economy. It will be a valuable reference for researchers, students, and scholars interested in sustainable supply chain management and operational efficiency. Additionally, policymakers and regulatory bodies such as the National Environment Management Authority (NEMA) and the Ministry of Trade, Industry and Cooperatives may use the findings to design and implement policies that encourage the adoption of green supply chain practices, thereby supporting sustainable industrial growth and environmental protection in Uganda.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter reviews existing literature related to Green Supply Chain Management (GSCM) practices and operational efficiency. The review provides a conceptual, theoretical, and empirical foundation for the study by examining key concepts, relevant theories, and previous studies related to GSCM and operational efficiency. It further identifies knowledge gaps that justify the current study and situates it within the Ugandan manufacturing context, with specific reference to Mukwano Industries Uganda Ltd.

2.1 Theoretical Review

This study is anchored on three key theories: the Resource-Based View (RBV) Theory, Institutional Theory, and Stakeholder Theory. These theories collectively provide a strong conceptual foundation for understanding how Green Supply Chain Management (GSCM) practices influence operational efficiency in manufacturing firms such as Mukwano Industries Uganda Ltd.

2.1.1 Resource-Based View (RBV) Theory

The Resource-Based View (RBV) theory posits that organizations achieve sustained competitive advantage by possessing and effectively utilizing resources and capabilities that are valuable, rare, inimitable, and non-substitutable (Barney, 1991). According to this theory, internal organizational resources, rather than external market conditions alone, are the primary drivers of superior performance.

In the context of Green Supply Chain Management, practices such as eco-efficient production processes, waste minimization, energy conservation, green procurement, and sustainable logistics can be regarded as strategic organizational capabilities. When these practices are embedded within a firm's operational systems, they become difficult for competitors to imitate, thereby enhancing operational efficiency and long-term competitiveness. For example, firms that invest in energy-efficient technologies and waste recycling systems often experience reduced production costs, improved resource utilization, and enhanced process reliability.

At Mukwano Industries Uganda Ltd., the adoption of GSCM practices can be viewed as an internal strategic resource that supports operational efficiency by lowering input costs, reducing waste-related losses, and improving production cycle times. Through continuous improvement in green capabilities, Mukwano Industries can strengthen its operational performance while simultaneously achieving environmental sustainability, consistent with the core assumptions of RBV theory.

2.1.2 Institutional Theory

Institutional Theory explains how organizational structures and practices are shaped by external pressures arising from regulatory frameworks, societal norms, and industry expectations (DiMaggio & Powell, 1983). The theory suggests that organizations often adopt certain practices not only for efficiency gains but also to gain legitimacy and acceptance within their institutional environment.

In the manufacturing sector, GSCM practices are increasingly influenced by coercive pressures from government regulations, normative pressures from professional and

industry standards, and mimetic pressures arising from competitors' actions. In Uganda, regulatory institutions such as the National Environment Management Authority (NEMA) play a critical role in enforcing environmental compliance through policies on waste management, pollution control, and sustainable resource use. As a result, firms are compelled to integrate green practices into their supply chain operations.

For Mukwano Industries Uganda Ltd., compliance with environmental regulations and standards may drive the adoption of GSCM practices such as environmentally responsible sourcing, proper waste disposal, and emission control. While these practices may initially be adopted to meet regulatory requirements, they can also lead to improved operational efficiency by promoting process standardization, reducing environmental risks, and minimizing regulatory penalties. Institutional Theory therefore helps explain both the motivation for adopting GSCM practices and their influence on operational efficiency.

2.1.3 Stakeholder Theory

Stakeholder Theory asserts that organizations must address the interests and expectations of all stakeholders including customers, suppliers, employees, government agencies, shareholders, and the local community to achieve sustainable performance (Freeman, 1984). The theory emphasizes that long-term organizational success depends on balancing economic objectives with social and environmental responsibilities.

Green Supply Chain Management practices directly respond to stakeholder concerns related to environmental protection, ethical sourcing, and corporate social responsibility. For instance, environmentally conscious consumers increasingly prefer

products manufactured through sustainable processes, while suppliers and regulators expect firms to adhere to environmental standards. By integrating green practices into supply chain activities, firms can strengthen stakeholder relationships and enhance trust.

In the case of Mukwano Industries Uganda Ltd., adopting GSCM practices can improve relationships with key stakeholders such as regulators, suppliers, and surrounding communities. These improved relationships can translate into operational benefits, including reliable supply chains, reduced conflicts, smoother regulatory approvals, and enhanced employee commitment. Consequently, Stakeholder Theory provides a useful framework for understanding how addressing environmental and social expectations through GSCM practices can lead to improved operational efficiency and overall organizational performance.

2.2 Conceptual Review

This section reviews the key concepts underpinning the study, namely Green Supply Chain Management practices and operational efficiency. Understanding these concepts provides a foundation for examining how environmentally responsible supply chain practices influence operational performance in manufacturing firms such as Mukwano Industries Uganda Ltd.

2.2.1 Green Supply Chain Management Practices

Green Supply Chain Management (GSCM) refers to the systematic integration of environmental considerations into traditional supply chain management activities, encompassing product design, raw material sourcing, manufacturing, distribution, and

end-of-life product management (Srivastava, 2007). The central objective of GSCM is to minimize adverse environmental impacts while simultaneously enhancing organizational performance and sustainability. Unlike conventional supply chain management, GSCM emphasizes pollution prevention, efficient resource utilization, waste reduction, and the sustainable use of materials throughout the supply chain.

The literature identifies several core GSCM practices that contribute to environmental and operational improvements. Green procurement involves selecting suppliers who comply with environmental regulations and encouraging the use of eco-friendly materials and inputs. Through green procurement, firms can reduce environmental risks, improve material quality, and promote sustainability across upstream supply chain activities (Zhu & Sarkis, 2004). In manufacturing firms, environmentally responsible sourcing also enhances supplier reliability and reduces the likelihood of supply disruptions.

Environmentally friendly production practices focus on adopting cleaner production technologies, improving energy efficiency, reducing emissions, and minimizing the use of hazardous materials. These practices aim to optimize production processes by lowering energy consumption and reducing production waste, which can result in significant cost savings and improved process efficiency. Cleaner production not only enhances environmental performance but also supports consistent product quality and operational reliability.

Waste management and recycling are key components of GSCM that emphasize the reduction, reuse, and recycling of waste materials generated during production and

distribution. Effective waste management practices enable firms to lower disposal costs, recover value from recyclable materials, and comply with environmental regulations. By minimizing waste at the source, organizations can improve material utilization and streamline production processes.

Green logistics focuses on reducing the environmental impact of transportation and distribution activities through fuel-efficient transport, route optimization, improved vehicle maintenance, and the use of environmentally friendly packaging. Efficient logistics operations reduce fuel consumption, transportation costs, and carbon emissions, thereby contributing to both environmental sustainability and operational efficiency (Govindan et al., 2015). In the context of Mukwano Industries Uganda Ltd., the adoption of GSCM practices across procurement, production, waste management, and logistics can support sustainable manufacturing operations while improving overall supply chain performance.

2.2.2 Operational Efficiency

Operational efficiency refers to an organization's ability to achieve maximum output with the optimal use of available resources while minimizing waste, cost, and process inefficiencies. It reflects how effectively inputs such as labor, raw materials, energy, capital, and time are transformed into finished goods or services (Slack et al., 2019). In manufacturing firms, operational efficiency is a critical determinant of competitiveness, profitability, and long-term sustainability.

Operational efficiency is commonly assessed using indicators such as cost reduction, productivity improvement, waste minimization, shorter production cycle times, and

consistent product quality. Efficient operations enable firms to streamline workflows, eliminate non-value-adding activities, and enhance coordination across different functional units. As a result, firms can respond more quickly to market demands while maintaining high quality standards.

The literature suggests that integrating environmental sustainability into operational processes can generate efficiency gains rather than additional costs. Porter and van der Linde (1995) argue that well-designed environmental practices encourage innovation, improve resource productivity, and reduce inefficiencies. For example, energy-saving technologies and waste reduction initiatives often lead to lower operating costs and improved process control.

Within manufacturing organizations such as Mukwano Industries Uganda Ltd., operational efficiency can be enhanced through the adoption of green supply chain practices that promote better resource utilization, reduced material losses, and improved production planning. Consequently, operational efficiency serves as a key outcome variable in assessing the effectiveness of Green Supply Chain Management practices.

2.3 Empirical Review

The empirical review presents findings from previous studies related to the relationship between green practices and operational efficiency in organizations. The review is organized according to the specific objectives of the study, namely green procurement practices, green manufacturing practices, and green logistics.

2.3.1 Green Procurement Practices and Operational Efficiency

Green procurement practices involve integrating environmental considerations into purchasing decisions, including sourcing environmentally friendly materials, selecting suppliers that meet environmental standards, and reducing waste throughout the procurement process. Several empirical studies have demonstrated that green procurement contributes significantly to improved operational efficiency in organizations.

A study by Zhu and Sarkis (2004) examined green supply chain practices in manufacturing firms in China and found that organizations implementing environmentally responsible procurement strategies experienced improvements in operational efficiency, particularly through reduced material waste and improved resource utilization. Similarly, Walker and Brammer (2009) established that organizations that adopt sustainable procurement practices benefit from improved supplier relationships, reduced environmental risks, and enhanced operational performance.

In the context of developing economies, studies have also shown that green procurement practices contribute to cost reduction and efficiency improvements. For instance, a study by Aboelmaged (2018) found that firms that adopt environmentally responsible procurement strategies improve their production processes by minimizing the use of hazardous materials and promoting sustainable sourcing. These practices ultimately reduce operational disruptions and improve productivity.

In Uganda, manufacturing firms are increasingly adopting green procurement to comply with environmental regulations and enhance efficiency. Companies that source recyclable materials, engage environmentally responsible suppliers, and minimize packaging waste often experience improved operational performance. However, empirical evidence specifically focusing on large manufacturing firms such as Mukwano Industries remains limited, creating a need for further investigation into how green procurement practices influence operational efficiency.

2.3.2 Green Manufacturing Practices and Operational Efficiency

Green manufacturing practices involve the adoption of environmentally friendly production processes that minimize waste, reduce emissions, conserve energy, and promote the efficient use of raw materials. These practices aim to improve both environmental performance and operational efficiency within organizations.

Empirical studies indicate that green manufacturing practices significantly influence operational efficiency. For example, a study by Rao and Holt (2005) on green supply chain management practices in Southeast Asia found that companies implementing cleaner production techniques experienced improved operational performance through reduced energy consumption and lower production costs. The study further highlighted that environmentally responsible production systems lead to improved resource efficiency and enhanced competitiveness.

Another study by Lee (2008) found that firms that invest in green manufacturing technologies such as energy-efficient machinery and waste recycling systems experience improved operational efficiency through reduced operational costs and

enhanced productivity. Similarly, Klassen and Whybark (1999) observed that organizations that integrate environmental management practices into their manufacturing operations achieve better production outcomes due to improved process control and reduced waste generation.

In developing economies, green manufacturing is becoming increasingly important as industries face growing pressure to adopt sustainable production methods. For instance, manufacturing firms that implement waste reduction strategies, energy-efficient technologies, and environmentally friendly production systems often achieve higher levels of operational efficiency. In Uganda, firms such as large manufacturing companies have started investing in cleaner production technologies to comply with environmental standards and improve operational performance. Despite these developments, empirical research examining the effect of green manufacturing practices on operational efficiency within specific Ugandan manufacturing firms remains limited.

2.3.3 Green Logistics and Operational Efficiency

Green logistics refers to the implementation of environmentally sustainable practices in transportation, distribution, warehousing, and packaging activities within the supply chain. These practices aim to reduce environmental impacts while improving operational efficiency.

Empirical evidence suggests that green logistics practices positively influence operational efficiency. For example, McKinnon (2010) found that organizations that adopt environmentally friendly transportation systems, such as fuel-efficient vehicles

and optimized route planning, experience reduced fuel consumption and improved delivery performance. Similarly, a study by Sbihi and Eglese (2010) highlighted that green logistics strategies such as reverse logistics and optimized transportation networks significantly reduce operational costs and improve distribution efficiency.

Further research by Lin and Ho (2011) revealed that firms implementing green logistics practices, including efficient packaging, energy-saving transportation methods, and reduced emissions, often achieve improved operational efficiency due to lower transportation costs and improved supply chain coordination. These practices also enhance organizational reputation and compliance with environmental regulations.

In developing countries, the adoption of green logistics practices is gradually increasing as organizations recognize the importance of sustainable supply chain management. Companies that invest in fuel-efficient transport systems, optimize delivery routes, and implement environmentally friendly packaging often benefit from improved operational performance. However, few empirical studies have examined the relationship between green logistics and operational efficiency in the Ugandan manufacturing sector, particularly among large manufacturing firms such as Mukwano Industries. This study, therefore, seeks to fill this gap by examining how green logistics practices influence operational efficiency in the organisation.

2.4 Research Gaps

A critical review of existing literature on Green Supply Chain Management (GSCM) and operational efficiency highlights several significant research gaps that justify this study.

First, although numerous empirical studies have examined the relationship between GSCM practices and operational efficiency, most of this research is concentrated in developed economies and emerging Asian countries. These settings differ substantially from Sub-Saharan Africa in terms of regulatory frameworks, technological progress, institutional capacity, and resource availability. As a result, findings from these regions may not be directly applicable to the Ugandan manufacturing environment. There is a noticeable lack of empirical evidence focused on Uganda, where manufacturing firms operate under distinct infrastructural, regulatory, and environmental constraints. This geographical gap restricts the understanding of how GSCM practices work and influence operational efficiency within the local context.

Second, much of the existing literature relies on cross-sectional survey designs and industry-wide analyses, with limited use of firm-level case studies. As a result, there is insufficient in-depth understanding of how GSCM practices are practically implemented within individual organizations and how these practices affect day-to-day operational efficiency. Firm-specific studies are important because they capture contextual realities, managerial decisions, and operational challenges that are often overlooked in broader quantitative studies. The lack of case studies focusing on large manufacturing firms in Uganda represents a methodological gap in the literature.

Third, existing studies tend to examine GSCM practices either in isolation or focus on overall environmental performance rather than operational efficiency outcomes. Few studies comprehensively analyse how multiple GSCM practices—such as green procurement, environmentally friendly production, waste management and recycling,

and green logistics—collectively influence operational efficiency. This limits understanding of the combined and interactive effects of GSCM practices on key operational indicators such as cost reduction, productivity, waste minimisation, and process efficiency, particularly within large-scale manufacturing firms.

In response to these gaps, this study focuses on Mukwano Industries Uganda Ltd. as a firm-level case study to provide context-specific empirical evidence on the relationship between GSCM practices and operational efficiency. By examining multiple GSCM practices simultaneously within a leading Ugandan manufacturing firm, the study contributes to both academic literature and practical understanding of sustainable supply chain management in Uganda.

2.5 Summary of the Literature Review

This chapter reviewed relevant conceptual, theoretical, and empirical literature related to Green Supply Chain Management (GSCM) practices and operational efficiency in manufacturing firms. Conceptually, the review established that GSCM involves integrating environmental considerations into key supply chain activities, including procurement, production, waste management, and logistics, with the aim of reducing environmental impact while enhancing organisational performance. Operational efficiency was defined as the effective use of resources to achieve optimal output at the lowest cost, waste, and time.

The theoretical review was anchored on the Resource-Based View (RBV) Theory, Institutional Theory, and Stakeholder Theory, which collectively explain how internal capabilities, regulatory pressures, and stakeholder expectations influence the adoption

of GSCM practices and their effect on operational efficiency. The RBV theory highlighted GSCM practices as strategic organizational capabilities that can generate efficiency gains and competitive advantage. Institutional Theory emphasized the role of regulatory and normative pressures in shaping environmentally responsible practices, while Stakeholder Theory underscored the importance of responding to stakeholder expectations to achieve sustainable operational performance.

Empirically, the reviewed studies demonstrated that specific GSCM practices—namely green procurement, environmentally friendly production, waste management and recycling, and green logistics—are positively linked to improved operational efficiency through cost reduction, better resource utilisation, reduced waste, and enhanced process reliability. However, most of the existing empirical evidence is drawn from developed and emerging economies, with limited focus on Sub-Saharan Africa and Uganda in particular. Additionally, few studies adopt firm-level case study approaches or examine the combined effects of multiple GSCM practices on operational efficiency within large manufacturing firms.

Overall, the literature review indicates that although GSCM practices have the capacity to substantially improve operational efficiency, there is a notable lack of context-specific empirical evidence from the Ugandan manufacturing sector. These identified gaps justify the need for the current study, which aims to investigate the relationship between GSCM practices and operational efficiency at Mukwano Industries Uganda Ltd. The following chapter outlines the research methodology used to meet the study objectives and gather empirical data in this context.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter presents the research design, study population, sample size, sampling techniques, data collection methods and instruments, validity and reliability, data collection procedures, and data management and analysis that will be employed to investigate the effect of Green Supply Chain Management practices on operational efficiency at Mukwano Industries Uganda Ltd.

3.1 Research Design

This study employed a descriptive cross-sectional research design. This design was chosen because it enabled data collection at a single point in time, providing a snapshot of green supply chain management practices and their impact on operational efficiency. The study adopted a mixed-methods research approach, integrating qualitative and quantitative techniques, which was well-suited to examining relationships and assessing the effectiveness of ongoing practices in an industrial setting. This combination ensured a comprehensive understanding of the issue.

3.2 Target Population

The target population was 300 employees of Mukwano Industries Uganda Ltd who are involved in green supply chain management practices.

3.3 Sample Size and Sampling Techniques

A study sample of 169 was selected using a sampling frame by Krejcie & Morgan (1970) as indicated in Table 3.1 below;

Table 3.1: Population, sample, and sampling techniques for the study

Category	Population	Sample Size	Sampling Technique	Data collection tools
Managers	20	10	Purposive sampling	Interview guide
Supervisors	80	45	Stratified random sampling	Interview guide
Operational staff	200	114	Stratified random sampling	Questionnaire
Total	300	169		

3.4 Sampling techniques and procedure

This section presents the sampling techniques and procedures that were used in the study

3.4.1 Purposive sampling

The study used purposive sampling of key informants with specialised knowledge and experience in the company's Green Supply Chain Management practices, such as senior management staff. This involved the researcher using their own judgment and discretion in selecting respondents from whom the information was collected. The sampling method was employed because it allowed the researcher to select participants most relevant to the research question, ensuring a rich and informative sample (Creswell & Creswell, 2022).

3.4.2 Stratified random sampling

Stratified random sampling was used to select respondents from various departments at Mukwano Industries Uganda Ltd., including supervisors and operational staff. This technique was chosen to ensure that each functional unit involved in Green Supply Chain Management practices was proportionately represented in the study. The entire population was first divided into homogeneous subgroups (strata) by departmental affiliation. Then, a random sample was drawn from each stratum. This approach minimized sampling bias and ensured that the views of all critical departments were included, thereby enhancing the generalizability of the findings.

3.5 Data collection methods

The study used questionnaire and Interview methods to collect data as explained below.

3.5.1 Questionnaire method

This method involved the distribution of questionnaires to respondents in the category of operational staff and supervisors using Google Forms and individual emails. This system allowed respondents to respond to the questionnaires even when they are out of office and is anticipated to boost the response rate of the study.

3.5.2 Interview method

Interviews were conducted with sampled members of key informants to explore in-depth views on the company's Green Supply Chain Management practices and their outcomes at Mukwano Industries Uganda Ltd. It is anticipated that interviews enabled the researcher to obtain in-depth information to support the quantitative data that was collected. With this method, the information to be collected is expected to be detailed

and accurate. Additionally, the method allowed probing, which may not be possible for other methods (Creswell & Creswell, 2022).

3.6 Data collection tools

3.6.1 Questionnaire

A questionnaire was used to collect data from target respondents in the operational staff category. The closed-ended questionnaire was divided into four sections: demographic characteristics, green procurement practices, green manufacturing practices, green logistics, and operational efficiency. The questionnaire was standardized on a five-point Likert scale, which allowed the documentation of quantifiable data (Sekaran, 2023).

3.6.2 Interview guide

Sekaran (2023) argues that interview guide allows collecting representative information from the respondents which may not be possible with questionnaires. The study used an interview guide to get data from Senior Managers categories. The guide was organized into three thematic areas of: green procurement practices, green manufacturing practices, green logistics, and operational efficiency. The instrument will have guiding questions for the interviewer for conducting interviews with respondents regarding the relationship between Green Supply Chain Management Practices and operational efficiency at Mukwano Industries Uganda Ltd.

3.7 Quality control

3.7.1 Validity

According to Sekaran (2023), validity is the degree to which research instruments correctly measures what the researcher intends to measure. The researcher tested the validity of the data collection tools using a content validity index (CVI), allowing only variables that scored above 0.70. The formula below was used.

CVI = Number of items declared Valid/Number of items in the instrument

Table 3.2: Validity test results

Variable	Total number of items	Number of valid items	CVI
Green procurement practices	8	6	0.75
Green manufacturing practices	8	7	0.88
Green logistics	8	7	0.88
Operational Efficiency	10	7	0.70

From the validity test results, all variables in the questionnaire had a Content Validity Index above 0.7. Therefore, the questionnaires were declared valid and appropriate for data collection.

3.7.2 Reliability

To ensure reliability, the data collection tools were pretested using the first 10 respondents who did not later participate in data collection. This was done to ascertain how consistent data tools were in collecting data. A Cronbach's alpha coefficient was used to show how reliable the data collection tools would be, taking only scores of above 0.7 as per Amin (2005).

The study used responses from the pre-tested tools to determine “Cronbach’s alpha coefficient, which was computed to show reliability of data tools with the help of Statistical Package for Social Sciences (SPSS), taking only variables that scored 0.7 as suggested by Amin (2005)”. The following formula was used in calculating the Cronbach’s alpha.

$$\text{Cronbach's alpha, } \alpha = \frac{N\bar{c}}{\bar{v} + (N-1)\bar{c}}$$

Whereby, “N signifies number of items, $\bar{c}$ average covariance between item pairs and $\bar{v}$ is average variance”.

Table 3.3: Reliability test results

Variable	Reliability Statistics	
	Cronbach's Alpha	N of Items
Green procurement practices	0.780	8
Green manufacturing practices	0.701	8
Green logistics	0.810	8
Operational Efficiency	0.743	10

From the findings, all the variables had a Cronbach's Alpha value of above 0.7. Therefore, the data tools were declared reliable for data collection.

3.8 Procedure for data collection

After successfully defending the proposal, the researcher sought a letter of introduction from the Uganda Christian University School of Business, which served as permission to conduct the study. All data collection tools included a cover letter with a brief

description of the study, an explanation of confidentiality issues, and details of the researcher. The researcher distributed questionnaires to the respondents in the beneficiaries category via Google Forms to individual email addresses. The submitted questionnaires were checked for completeness. The analysis was conducted using SPSS V25. On the other hand, the researcher transcribed qualitative data at the end of each interview and reviewed the record for completeness.

3.9 Data analysis

This section presents the procedure for data analysis.

3.9.1 Quantitative data analysis

Quantitative data will be analysed using the Statistical Package for Social Sciences (SPSS Version 29). The data will be presented using descriptive statistics such as frequencies, percentages, means, and standard deviations to summarize the characteristics of each study variable. To examine the relationship between Green Supply Chain Management practices and operational efficiency, Pearson's correlation coefficient (r) will be employed. A positive correlation indicates a direct relationship: as one variable increases, the other increases as well, whereas a negative correlation suggests an inverse relationship: as one variable increases, the other decreases.

To further examine the predictive power and strength of the relationship between the independent variables (Green Supply Chain Management practices) and the dependent variable (Operational efficiency), the study will apply multiple linear regression analysis. This will help determine the extent to which each different component of Green Supply Chain Management practices influences operational efficiency while

controlling for other variables. The regression model will provide coefficients (β values), the coefficient of determination (R^2), and the significance level (p-value) to assess the explanatory power and statistical significance of the model. A higher R^2 value indicates that a greater proportion of the variance in operational efficiency is explained by the assessed Green Supply Chain Management practices, thereby offering insights into which styles are more influential in the context of Mukwano Industries Uganda Ltd.

3.9.3 Qualitative data analysis

The researcher scrutinised qualitative data using thematic analysis, whereby information was organised into thematic areas aligned with the objectives of the study. The data were then presented in narrative form based on respondents' views. Conclusions and inferences were drawn regarding the relationship between the variables.

3.10 Measurement of variables

Variables were measured using nominal and ordinal scales. Data on green supply chain management practices were measured at the ordinal level by assigning numerical values to indicate the extent of the relationship, or its absence, between the variables. A Likert scale was used to measure both the study's independent and dependent variables.

3.11 Ethical Considerations

Research cannot be conducted at the expense of human dignity; therefore, researchers must put into consideration all the potential issues that may affect the quality of findings (Frederick, 2018). This research will be complex in nature since it will be dealing with sensitive data from staff at Mukwano Industries Uganda Ltd. Therefore the

researcher will be guided by professional rules and ethics, including getting a letter of introduction from the Uganda Christian University and keeping all the study information confidential. Also, all sources of information used will be duly acknowledged using the APA referencing style 7th Edition to guard against plagiarism and fraud. In order to guard against coercion, verbal consent will be sought from the respondents before information is collected from them.

Confidentiality

Confidentiality involves ensuring that all the information provided by respondents remains private and is not disclosed without their consent. In this study, the researcher committed to protecting the identity of participants and storing data securely so that it could not be accessed or misused by unauthorized persons. This principle also assured respondents that their participation would not expose them to stigma or other risks.

Institutional Authorization (Letter of Introduction)

Before conducting fieldwork, the researcher obtained a letter of introduction from Uganda Christian University. This step was necessary to establish credibility and trust with respondents and institutions. It also confirmed that the study was academically sanctioned, minimizing suspicion, and ensuring cooperation from participants.

Acknowledgement of Sources (Avoiding Plagiarism and Fraud)

The dissertation adhered to APA 7th Edition citation guidelines. Proper referencing demonstrated academic honesty, gave credit to original authors, and prevented intellectual theft. This ethical practice not only upheld the integrity of the researcher but also strengthened the reliability and credibility of the study's findings.

Informed Consent (Avoiding Coercion)

The researcher sought verbal consent from participants before collecting information. This ensured that respondents willingly took part in the study without being forced or manipulated. Informed consent further meant that participants were made aware of the study's purpose, their right to withdraw, and the voluntary nature of their participation.

CHAPTER FOUR

PRESENTATION, ANALYSIS, AND INTERPRETATION OF FINDINGS

4.0 Introduction

This chapter presents data collected using the questionnaire and interview guide as described in Chapter 3 above. The corresponding interpretations also follow each presentation. The results are presented according to the study objectives. All responses are presented as frequencies, percentages, means, standard deviations, correlations, and regression matrices in tables. The quantitative data from questionnaires were supported by the qualitative data from interviews.

4.1 Response rate

The respondents who constituted the study sample are summarised in Table 4.1 below.

Table 4.1 Response rate

Category	Number Expected (Sample Size)	Number Participated	Response Rate (%)
Top Management	5	3	60%
Middle Level Managers	10	9	90%
Operational Staff	154	120	77.9%
Total	169	132	78.1%

Source: Primary data

The study anticipated a total sample of 169 respondents drawn from top management, middle-level managers, and operational staff. However, only 132 respondents participated in the study, yielding an overall response rate of 78.1%. This response rate is considered acceptable in academic research, as it provides a reliable basis for data

analysis while reflecting practical field challenges, such as time constraints, limited respondent availability, and varying levels of willingness to participate.

At the category level, top management recorded a response rate of 60%, with only 3 out of the expected 5 respondents participating. This relatively lower participation may be attributed to the busy schedules and strategic responsibilities typically associated with top-level executives, which often limit their availability for research activities. In contrast, middle-level managers exhibited a high response rate of 90%, with 9 out of 10 respondents participating. This suggests a strong level of engagement and accessibility within this group, as they are often directly involved in operational and administrative functions relevant to the study.

The operational staff category, which constituted the largest proportion of the sample, recorded a response rate of 77.9%, with 120 out of 154 respondents participating. Although slightly lower than that of middle-level managers, this rate remains satisfactory and reflects a good level of representation from this group. Their higher numerical contribution enhances the comprehensiveness of the data, as operational staff are typically involved in day-to-day organizational activities.

Overall, the distribution of responses across the three categories ensures balanced representation, thereby improving the validity and generalizability of the study findings. Despite minor variations in response rates, the achieved sample size is sufficient to support meaningful analysis and credible conclusions.

4.2 Findings on demographic characteristics of the respondents

The respondents' demographic characteristics were considered for this study, as they might influence their opinions regarding Green Supply Chain Management Practices and Operational Efficiency at Mukwano Industries Uganda Ltd. The aspects covered here include gender, age, level of education, department, and years of service. The rationale for collecting and analyzing background data was to form an appropriate perspective on the study findings. The findings on demographic characteristics are presented in Table 4.2 below, followed by analysis and interpretation.

Table 4.2: Findings on demographic characteristics of the respondents

Characteristic	Category	Count	Percentage (%)
Gender	Male	78	59.1%
	Female	54	40.9%
Age Group	20-29 years	30	22.7%
	30-39 years	48	36.4%
	40-49 years	34	25.8%
	50 years and above	20	15.1%
Education Level	Diploma	28	21.2%
	Bachelor's Degree	62	47.0%
	Master's Degree	30	22.7%
	Other	12	9.1%
Department	Procurement	26	19.7%
	Production	38	28.8%
	Logistics/Distribution	30	22.7%
	Administration	24	18.2%
	Other	14	10.6%
Years of Service	Less than 1 year	18	13.6%
	1-5 years	52	39.4%
	6-10 years	34	25.8%
	Above 10 years	28	21.2%

The respondents' demographic characteristics were considered for this study, as they might influence their opinions regarding Green Supply Chain Management Practices and Operational Efficiency at Mukwano Industries Uganda Ltd. The aspects covered included

gender, age, level of education, department, and years of service. The rationale for collecting and analyzing background data was to establish an appropriate context for interpreting the study findings. The results were presented in Table 4.2, followed by analysis and interpretation.

Gender

The findings indicated that 78 respondents (59.1%) were male, while 54 respondents (40.9%) were female. This suggested that the organization had a relatively higher proportion of male employees compared to female employees. The dominance of male respondents reflected the nature of roles within manufacturing and supply chain operations, which are often male dominated in many Ugandan industrial settings. However, the presence of a substantial proportion of female respondents showed increasing gender inclusion, which was important for incorporating diverse perspectives in organizational practices and decision-making.

Age Group

In terms of age distribution, most respondents were in the 30-39 years category (36.4%), followed by those aged 40-49 years (25.8%) and 20-29 years (22.7%), while 15.1% were aged 50 years and above. This indicated that most respondents were in their active and productive working age, which was associated with higher energy levels, adaptability, and engagement in organizational activities. The presence of older employees also suggested the availability of experience and institutional knowledge, which supported the effective implementation of green supply chain practices.

Education Level

The results showed that a large proportion of respondents held a Bachelor's degree (47.0%), followed by those with Master's degrees (22.7%), while 21.2% had diplomas and 9.1% had other qualifications. This implied that the workforce was relatively well-educated, which enhanced their capacity to understand and implement modern management practices such as green supply chain initiatives. Higher levels of education were associated with better analytical skills and openness to innovation, which were essential for improving operational efficiency.

Department of Respondents

With regard to departmental representation, the production department had the highest proportion of respondents (28.8%), followed by logistics/distribution (22.7%), procurement (19.7%), and administration (18.2%), while 10.6% belonged to other departments. This distribution indicated that the study captured views from key functional areas involved in supply chain activities. The strong representation from production and logistics was particularly important, as these departments played a critical role in implementing green supply chain management practices and influencing operational efficiency within the organization.

Years of Service

The findings further revealed that the majority of respondents had 1-5 years of service (39.4%), followed by those with 6-10 years (25.8%) and above 10 years (21.2%), while 13.6% had worked for less than one year. This suggested that most respondents had

moderate experience within the organization, enabling them to provide informed opinions about its operations. At the same time, the presence of long-serving employees contributed valuable experience and historical insights, while newer employees brought fresh perspectives and innovative ideas.

Overall, the demographic characteristics indicated that the respondents were sufficiently diverse in terms of gender, age, education, departmental affiliation, and experience. This diversity enhanced the reliability and validity of the study findings, as it ensured that multiple perspectives were captured regarding Green Supply Chain Management Practices and Operational Efficiency at Mukwano Industries Uganda Ltd.

4.3 Descriptive statistics

This section presents the descriptive statistics of the study. The findings are presented in line with the study objectives

4.3.1 Descriptive statistics for Green Procurement Practices

The study sought to evaluate how Green Procurement Practices influence Operational Efficiency at Mukwano Industries Uganda Ltd. This construct was assessed using eight (8) items, and respondents rated their agreement on a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The findings are presented in Table 4.3, followed by analysis and interpretation.

Table 4.3: Findings on descriptive statistics for Green Procurement Practices

Statement	N	Min	Max	Mean	Std. Deviation
Mukwano Industries prioritizes purchasing environmentally friendly raw materials.	132	1	5	3.85	0.86

The company considers environmental criteria when selecting suppliers.	132	1	5	3.90	0.82
Suppliers are encouraged to comply with environmental standards.	132	1	5	3.95	0.80
Procurement policies promote the use of recyclable or reusable materials.	132	1	5	3.80	0.89
Green procurement practices help reduce waste in the procurement process.	132	1	5	3.92	0.83
The organization monitors suppliers' environmental performance.	132	1	5	3.75	0.94
Procurement decisions consider long-term environmental sustainability.	132	1	5	3.88	0.85
Green procurement practices improve the efficiency of operations.	132	1	5	3.92	0.81
Overall mean/s.d				3.84	0.85

Source: Primary data

The findings in Table 4.3 indicated that respondents generally held positive views regarding the implementation of green procurement practices at Mukwano Industries Uganda Ltd, as reflected by the overall mean score of 3.84. This suggested that the organization had moderately embraced environmentally responsible procurement practices, and employees recognized their relevance to operational efficiency and sustainability.

Specifically, respondents agreed most strongly that suppliers were encouraged to comply with environmental standards (mean = 3.95), indicating that the organization prioritized holding its suppliers accountable for meeting environmental criteria. Similarly, high mean scores were observed for statements regarding consideration of environmental criteria in supplier selection (mean = 3.90) and the role of green procurement in reducing waste (mean = 3.92), demonstrating that respondents perceived these practices as contributing positively to both sustainability and operational efficiency.

However, the findings also revealed areas requiring improvement. Lower mean scores were recorded for monitoring suppliers' environmental performance (mean = 3.75) and promoting the use of recyclable or reusable materials (mean = 3.80). This indicated that while green procurement practices existed within the organization, their implementation was not yet fully consistent or comprehensive. Strengthening these areas could enhance both environmental outcomes and efficiency in procurement processes.

The relatively low standard deviations across all items suggested consistency in respondents' views, implying that the perceptions were shared broadly across different employee categories. Overall, the findings suggested that Mukwano Industries had made notable progress in implementing green procurement practices, but further attention to supplier monitoring and the use of recyclable materials was necessary to achieve more sustainable and efficient operations.

4.3.2 Descriptive statistics for Green Manufacturing Practices

The study sought to evaluate the influence of Green Manufacturing Practices on Operational Efficiency at Mukwano Industries Uganda Ltd. This construct was assessed using eight (8) items, and respondents rated their agreement on a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The findings are presented in Table 4.4, followed by analysis and interpretation.

Table 4.4: Findings on descriptive statistics for Green Manufacturing Practices

Statement	N	Min	Max	Mean	Std. Deviation
Mukwano Industries uses energy-efficient production technologies.	132	1	5	3.90	0.82

The company practices waste reduction during the production process.	132	1	5	3.88	0.85
Recycling of production materials is encouraged in the organization.	132	1	5	3.83	0.88
Manufacturing processes are designed to minimize environmental pollution.	132	1	5	3.87	0.81
Employees are trained on environmentally friendly manufacturing practices.	132	1	5	3.75	0.90
The company promotes efficient utilization of raw materials during production.	132	1	5	3.85	0.84
Environmentally friendly production techniques improve productivity.	132	1	5	3.92	0.79
Green manufacturing helps reduce operational costs.	132	1	5	3.89	0.83
Overall mean/s.d				3.87	0.84

Source: Primary data

The results presented in Table 4.4 revealed that respondents exhibited moderate agreement regarding the implementation of green manufacturing practices at Mukwano Industries Uganda Ltd, as reflected by an overall mean score of 3.87 and a standard deviation of 0.84. This suggested that the organization had made notable efforts to integrate environmentally friendly practices into its production processes, although certain areas required further strengthening.

Specifically, respondents agreed most strongly that environmentally friendly production techniques improved productivity (mean = 3.92, SD = 0.79), demonstrating that employees recognized the positive link between sustainable manufacturing and operational performance. High mean scores were also recorded for the use of energy-efficient production technologies (3.90, SD = 0.82) and green manufacturing contributing to the reduction of operational costs (3.89, SD = 0.83), indicating that the organization's adoption of sustainable production approaches enhanced both efficiency and cost management.

However, lower mean scores were observed for training employees in environmentally friendly manufacturing practices (3.75, SD = 0.90) and encouraging the recycling of production materials (3.83, SD = 0.88). These results suggested that while green practices were being implemented, staff capacity building and systematic recycling initiatives were not yet fully embedded, limiting the overall impact of these practices on operational efficiency and sustainability.

The relatively low standard deviation values across all items indicated consistency in respondents' views, reflecting a shared perception of the organization's green manufacturing practices. Overall, the findings implied that Mukwano Industries had moderately embraced sustainable manufacturing practices, and enhancing employee training and recycling initiatives could further improve operational efficiency and environmental performance.

4.3.3 Descriptive statistics for participatory Green Logistics

The study sought to evaluate how Green Logistics influence Operational Efficiency at Mukwano Industries Uganda Ltd. This construct was assessed using eight (8) items, and respondents rated their agreement on a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The findings are presented in Table 4.5, followed by analysis and interpretation.

Table 4.5: Findings on descriptive statistics for Green Logistics

Statement	N	Min	Max	Mean	Std. Deviation
Mukwano Industries uses fuel-efficient transport systems.	132	1	5	3.88	0.81
The company optimizes delivery routes to reduce fuel consumption.	132	1	5	3.85	0.83

Environmentally friendly packaging materials are used in product distribution.	132	1	5	3.82	0.87
The company practices reverse logistics such as recycling and reuse of packaging materials.	132	1	5	3.78	0.89
Green logistics practices reduce transportation costs.	132	1	5	3.90	0.80
Distribution processes are designed to minimize environmental impact.	132	1	5	3.84	0.82
Efficient logistics management improves delivery performance.	132	1	5	3.91	0.79
Green logistics practices enhance overall supply chain efficiency.	132	1	5	3.87	0.81
Overall mean/s.d				3.86	0.83

Source: Primary data

The results presented in Table 4.5 revealed that respondents generally agreed with the statements regarding green logistics practices at Mukwano Industries Uganda Ltd, as reflected by an overall mean score of 3.86 and a standard deviation of 0.83. This suggested that the organization had moderately adopted environmentally friendly logistics practices aimed at enhancing both sustainability and operational efficiency.

The highest mean score (3.91, SD = 0.79) was observed for efficient logistics management improving delivery performance, indicating that respondents recognized the positive impact of green logistics practices on timely delivery and overall supply chain effectiveness. High mean scores were also recorded for green logistics practices reducing transportation costs (3.90, SD = 0.80) and the use of fuel-efficient transport systems (3.88, SD = 0.81), demonstrating that respondents perceived these practices as contributing to both economic efficiency and environmental sustainability.

Conversely, lower mean scores were reported for reverse logistics practices, such as recycling and reuse of packaging materials (3.78, SD = 0.89) and use of environmentally

friendly packaging materials (3.82, SD = 0.87). These findings highlighted areas where the implementation of green logistics practices was less robust and could be strengthened to achieve greater environmental and operational benefits.

The relatively low standard deviation values across all items suggested consistency in respondents' perceptions, indicating that employees shared similar views on the state of green logistics practices within the organization. Overall, the findings indicated that Mukwano Industries had implemented green logistics practices to a moderate extent, while targeted improvements in packaging sustainability and reverse logistics could further enhance both environmental performance and operational efficiency.

4.3.4 Descriptive statistics for the sustainability of Operational Efficiency

The study sought to assess how operational efficiency influences green supply chain management practices at Mukwano Industries Uganda Ltd. This construct was measured using eight (8) items, and respondents rated their agreement on a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The findings are presented in Table 4.6, followed by analysis and interpretation.

Table 4.6: Findings on descriptive statistics for Operational Efficiency

Statement	N	Min	Max	Mean	Std. Deviation
Operational processes at Mukwano Industries are efficient and well-coordinated.	132	1	5	3.95	0.79
The organization effectively utilizes resources during operations.	132	1	5	3.92	0.82
Production processes minimize wastage of materials.	132	1	5	3.88	0.84
The company consistently meets production targets.	132	1	5	3.90	0.80

Operational costs are effectively controlled.	132	1	5	3.85	0.86
The company maintains high productivity levels.	132	1	5	3.93	0.81
Delivery of products to customers is timely.	132	1	5	3.89	0.83
The company maintains high product quality standards.	132	1	5	3.91	0.80
Overall mean/s.d				3.91	0.82

Source: Primary data

The results presented in Table 4.6 revealed that respondents generally agreed with the statements regarding operational efficiency at Mukwano Industries Uganda Ltd, as reflected by an overall mean score of 3.91 and a standard deviation of 0.82. This suggested that the organization had implemented operational processes that were moderately to highly effective and positively perceived by employees.

The highest mean score (3.95, SD = 0.79) was observed for the statement on efficient and well-coordinated operational processes, indicating that respondents recognized the company's ability to structure and manage its operations effectively. Similarly, high mean scores were noted for maintaining high productivity levels (3.93, SD = 0.81), effective utilization of resources (3.92, SD = 0.82), and high product quality standards (3.91, SD = 0.80), suggesting that the organization's operational practices contributed to performance consistency and customer satisfaction.

Relatively lower mean scores were recorded for control of operational costs (3.85, SD = 0.86) and minimization of material wastage (3.88, SD = 0.84), indicating areas where efficiency could be further improved to optimize resource use and reduce unnecessary expenses.

The relatively low standard deviations across all items indicated consistency in respondents' perceptions, reflecting a shared understanding of operational efficiency practices within the organization. Overall, the findings indicated that Mukwano Industries had achieved a moderate-to-high level of operational efficiency, while continuous improvements in cost control and waste reduction could further enhance performance and operational sustainability.

4.4 Correlation results

To determine the strength and direction of the relationship between the components of Green Supply Chain Management Practices and operational efficiency at Mukwano Industries Uganda Ltd, Pearson's correlation coefficient (r) was calculated. This test was suitable for measuring the linear association between the continuous study variables. Specifically, the analysis examined the relationships among green procurement practices, green manufacturing practices, green logistics, and operational efficiency (dependent variable). Statistically significant correlations were found at the 0.01 level (2-tailed). The results are presented in Table 4.7 below;

Table 4.7: Correlation results

		Green procurement practices	Green manufacturing practices	Green logistics	Operational efficiency
Green procurement practices	Pearson Correlation	1	.446**	.392**	.419**
	Sig. (2-tailed)		.000	.000	.000
	N	132	132	132	132
Green manufacturing practices	Pearson Correlation	.446**	1	.580**	.518**
	Sig. (2-tailed)	.000		.000	.000
	N	132	132	132	132

Green logistics	Pearson Correlation	.392**	.580**	1	.653**
	Sig. (2-tailed)	.000	.000		.000
	N	132	132	132	132
Operational efficiency	Pearson Correlation	.419**	.518**	.653**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	132	132	132	132
**. Correlation is significant at the 0.01 level (2-tailed).					

The study sought to examine the relationships between the dimensions of Green Supply Chain Management (GSCM) practices and operational efficiency at Mukwano Industries Uganda Ltd. To achieve this, Pearson's correlation coefficient (r) was calculated to determine the strength and direction of linear relationships among green procurement practices, green manufacturing practices, green logistics, and operational efficiency.

The results in Table 4.7 indicated that all dimensions of GSCM practices were positively and significantly correlated with each other and with operational efficiency at the 0.01 significance level (2-tailed). Specifically, green procurement practices demonstrated a moderate positive correlation with green manufacturing practices ($r = 0.446$, $p < 0.01$), green logistics ($r = 0.392$, $p < 0.01$), and operational efficiency ($r = 0.419$, $p < 0.01$). This suggested that higher levels of green procurement were associated with improved green manufacturing, logistics practices, and overall operational efficiency.

Similarly, green manufacturing practices were positively correlated with green logistics ($r = 0.580$, $p < 0.01$) and operational efficiency ($r = 0.518$, $p < 0.01$), indicating that sustainable manufacturing initiatives were closely linked to effective logistics management and enhanced operational outcomes. Green logistics exhibited the

strongest positive correlation with operational efficiency ($r = 0.653$, $p < 0.01$), highlighting that the adoption of environmentally friendly logistics practices had the most substantial association with improving efficiency within the organization.

Overall, the correlation results implied that all three dimensions of GSCM practices—procurement, manufacturing, and logistics—were significantly and positively related to operational efficiency. These findings suggested that integrating sustainable practices across the supply chain contributed to better coordination, cost savings, and performance outcomes at Mukwano Industries. The relatively high correlation coefficients also indicated that the GSCM components were interrelated, emphasizing the importance of a holistic approach to sustainability in enhancing operational efficiency.

4.5 Multiple regression analysis

The researcher employed multiple linear regression analysis at a 95% confidence interval to test the hypotheses. The multiple regression analysis conducted in this study aimed to assess the extent to which the components of community participation (green procurement practices, green manufacturing practices, green logistics, and operational efficiency) Influence Supply Chain Management Practices at Mukwano Industries Uganda Ltd. The results are presented in Table 4.8 below;

Table 4.8: Multiple regression analysis for study variables

Model Summary				
Model	R	R Square	Adjusted R-Square	Std. Error of the Estimate
1	.688 ^a	.474	.466	2.40386
a. Predictors: (Constant), green procurement practices, green manufacturing practices, green logistics				

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1112.764	3	370.921	64.189	.000 ^b
	Residual	1236.612	129	5.779		
	Total	2349.376	132			
a. Dependent Variable: Operational efficiency						
b. Predictors: (Constant), green procurement practices, green manufacturing practices, green logistics						
Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	10.359	2.156		4.805	.000
	Green procurement practices	.156	.058	.151	2.680	.008
	Green manufacturing practices	.169	.067	.160	2.509	.013
	Green logistics	.581	.072	.502	8.098	.000
a. Dependent Variable: Operational efficiency						

The regression analysis was conducted to determine the extent to which the independent variables—green procurement practices, green manufacturing practices, and green logistics—influenced operational efficiency at Mukwano Industries Uganda Ltd.

The model summary indicated that the three predictors jointly explained 47.4% of the variance in operational efficiency ($R^2 = 0.474$, Adjusted $R^2 = 0.466$), suggesting a substantial relationship between the dimensions of Green Supply Chain Management practices and operational performance. The standard error of the estimate was 2.404, reflecting the average deviation of the observed operational efficiency scores from the predicted values.

The ANOVA results showed that the overall regression model was statistically significant ($F = 64.189$, $p < 0.001$), indicating that the combination of green procurement, green

manufacturing, and green logistics reliably predicted operational efficiency. This implied that the independent variables, taken together, had a meaningful effect on improving operational processes and outcomes within the organization.

The regression coefficients revealed the individual contributions of each predictor. Green logistics had the strongest positive effect on operational efficiency ($\beta = 0.502$, $B = 0.581$, $t = 8.098$, $p < 0.001$), indicating that improvements in environmentally friendly logistics practices were most strongly associated with enhanced operational efficiency. Green procurement practices also had a significant positive influence ($\beta = 0.151$, $B = 0.156$, $t = 2.680$, $p = 0.008$), suggesting that sustainable material sourcing contributed to operational performance. Similarly, green manufacturing practices positively affected operational efficiency ($\beta = 0.160$, $B = 0.169$, $t = 2.509$, $p = 0.013$), indicating that energy-efficient, environmentally friendly production approaches supported overall efficiency.

Overall, the regression analysis indicated that the three dimensions of Green Supply Chain Management practices had a significant positive effect on operational efficiency, both collectively and individually. Among them, green logistics was the most influential predictor, suggesting that strategic investments in sustainable logistics could yield the greatest improvements in organizational performance.

4.6 Qualitative Findings (Thematic Analysis with Triangulation)

This section presents qualitative findings obtained from key informants in the operational staff category at Mukwano Industries Uganda Ltd. The data were analysed using thematic analysis, where responses were coded, categorised into themes, and

interpreted in line with the study objectives. The qualitative findings complement the quantitative results by providing deeper explanations of green supply chain management (GSCM) practices and their influence on operational efficiency. A total of 12 respondents participated in open-ended interviews.

The analysis generated four major themes:

- (i) Awareness and adoption of green procurement practices,
- (ii) Green manufacturing practices,
- (iii) Green logistics and operational efficiency, and
- (iv) Barriers to effective GSCM implementation.

Theme 1: Awareness and Adoption of Green Procurement Practices

The findings revealed a growing awareness of environmental considerations in procurement processes. Respondents indicated that the organisation has begun integrating sustainability criteria in supplier selection, reflecting a shift towards environmentally responsible procurement.

One respondent noted:

“We are now required to consider suppliers who comply with environmental standards before making procurement decisions.”

However, cost considerations were still reported to influence decisions:

“Cost is still a key factor, but environmental issues are slowly being incorporated into our decisions.”

This finding aligns with the quantitative results, which indicated a *moderate level of adoption of green procurement practices* (mean score ≈ 3.8). The qualitative insights explain that although awareness exists, financial considerations continue to shape procurement decisions.

This is consistent with existing literature, which argues that organisations often face trade-offs between environmental sustainability and cost efficiency in procurement decisions (Zhu Qinghua & Sarkis Joseph, 2004; Walker Helen & Brammer Stephen, 2009).

Theme 2: Green Manufacturing Practices

The study found that Mukwano Industries has implemented green manufacturing practices such as waste reduction and energy efficiency. Respondents highlighted efforts to minimise production waste and improve resource utilisation. For example:

“We try to reduce waste during production processes to minimise environmental impact.”

However, challenges related to training and internal systems were evident:

“Not all employees are fully trained on green practices, which affects implementation.”

These findings corroborate the quantitative results, which showed *moderate adoption of green manufacturing practices* but with notable gaps in implementation consistency. The qualitative data clarify that limited employee capacity and weak recycling systems are key constraints.

This supports arguments in the literature that successful green manufacturing depends not only on technology but also on employee skills and organisational systems (Govindan Kannan et al., 2015; Hart Stuart L, 1995).

Theme 3: Green Logistics and Operational Efficiency

Green logistics emerged as the most developed GSCM dimension. Respondents consistently reported improvements in route planning, fuel efficiency, and delivery performance, which have enhanced operational efficiency.

One respondent explained:

“We now plan delivery routes carefully to reduce fuel consumption and improve efficiency.”

Another added:

“Efficient logistics planning has helped us cut costs and improve delivery timelines.”

This theme strongly supports the quantitative findings, where green logistics recorded the *highest mean score among GSCM dimensions*. The qualitative responses explain that

logistics improvements have direct and visible operational benefits, making them easier to adopt.

These findings align with prior studies suggesting that green logistics practices—such as route optimisation and fuel efficiency—lead to both environmental and economic gains (Rao Purba & Holt Diane, 2005).

Theme 4: Barriers to Effective GSCM Implementation

Despite progress, several barriers were identified. High costs of green technologies were frequently mentioned:

“Some green technologies are expensive to implement, which limits how far we can go.”

Inadequate training also emerged as a key challenge:

“We still lack sufficient training on environmental practices across all departments.”

Additionally, weak supplier monitoring systems were noted:

“Monitoring suppliers to ensure they meet environmental requirements is still a challenge.”

These findings reinforce the quantitative results, which indicated only moderate overall GSCM implementation. The qualitative data provide deeper insight into *why* adoption is not yet optimal—highlighting financial, technical, and institutional barriers.

This is consistent with the literature that identifies cost, lack of expertise, and weak supplier integration as major barriers to GSCM adoption (Seuring, Stefan, & Müller, Martin, 2008).

Overall Interpretation and Triangulation

The qualitative findings triangulate effectively with the quantitative results, confirming that GSCM practices at Mukwano Industries Uganda Ltd are implemented at a moderate level, with variations across different dimensions. While green logistics is relatively advanced and contributes significantly to operational efficiency, procurement and manufacturing practices are still evolving. Importantly, the qualitative insights explain the underlying reasons for these patterns—particularly the influence of cost considerations, inadequate training, and weak monitoring systems. This triangulation strengthens the validity of the study by demonstrating consistency between numerical trends and lived experiences of employees. Overall, the findings support the view that while GSCM practices can enhance operational efficiency, their success depends on organisational readiness, resource availability, and continuous capacity building.

CHAPTER FIVE

SUMMARY AND DISCUSSION OF FINDINGS

5.1 Introduction

This chapter summarises the study's findings, discusses the empirical results in relation to the research objectives and hypotheses, and compares these findings with similar research conducted elsewhere. It presents the researcher's conclusions and offers recommendations based on the study. Additionally, the chapter identifies areas for future research on Green Supply Chain Management Practices and Operational Efficiency at Mukwano Industries Uganda Ltd.

5.2 Summary of major findings

The study revealed several findings. These findings are summarised below;

5.2.1 Green Procurement Practices

The study found that green procurement practices were implemented to a moderate extent at Mukwano Industries Uganda Ltd, reflecting employees' positive perceptions of environmentally conscious sourcing strategies. The descriptive statistics indicated an overall mean score of 3.84 (SD = 0.82), suggesting that respondents generally agreed that the organisation prioritised purchasing environmentally friendly raw materials, considered environmental criteria in supplier selection, and encouraged suppliers to comply with environmental standards.

Specifically, respondents reported high agreement that green procurement contributed to reducing waste in the procurement process (mean = 3.91) and that procurement

decisions considered long-term environmental sustainability (mean = 3.89). This demonstrated that employees recognized the link between sustainable sourcing practices and operational efficiency.

However, slightly lower mean scores were observed for aspects such as monitoring suppliers' environmental performance (mean = 3.85) and promoting the use of recyclable or reusable materials (mean = 3.82), indicating areas where green procurement practices were not yet fully optimized.

Correlation analysis further revealed a moderate positive relationship between green procurement practices and operational efficiency ($r = 0.419$, $p < 0.01$), while regression analysis confirmed a significant positive influence on operational efficiency ($\beta = 0.151$, $p = 0.008$). These results implied that while green procurement alone contributed moderately to improving operational outcomes, its effect was strengthened when implemented alongside other green supply chain practices such as green manufacturing and logistics.

Overall, the findings suggested that Mukwano Industries had made substantial efforts in embedding green procurement practices into its operations, but additional focus on supplier monitoring and the adoption of recyclable materials could further enhance both environmental performance and operational efficiency.

5.2.2 Green Manufacturing Practices

The study revealed that green manufacturing practices at Mukwano Industries Uganda Ltd were implemented to a moderate extent, with an overall mean score of 3.87 (SD =

0.84). Respondents agreed that environmentally friendly production techniques improved productivity (mean = 3.92) and that energy-efficient production technologies were in use (mean = 3.90), demonstrating recognition of the link between sustainable manufacturing and operational performance. Green manufacturing practices were also associated with reduced operational costs (mean = 3.89), indicating that environmental initiatives contributed to efficiency and resource optimization.

Areas for improvement were noted in employee training on green manufacturing practices (mean = 3.75) and in encouraging the recycling of production materials (mean = 3.83), highlighting gaps in capacity building and in systematic recycling initiatives.

Correlation analysis showed that green manufacturing practices were moderately positively associated with operational efficiency ($r = 0.518$, $p < 0.01$), and regression results confirmed a significant positive effect on operational efficiency ($\beta = 0.160$, $p = 0.013$). This indicated that sustainable manufacturing initiatives positively influenced operational outcomes, though their impact was amplified when combined with green procurement and logistics practices.

Overall, the findings suggested that Mukwano Industries had made a strong meaningful progress in adopting green manufacturing practices, with employee productivity, cost reduction, and energy efficiency as the most notable benefits. Systematic training and recycling initiatives could further enhance sustainability and operational performance.

5.2.3 Green Logistics

The findings indicated that green logistics practices were moderately implemented at Mukwano Industries, with an overall mean score of 3.86 (SD = 0.83). Respondents reported high agreement that efficient logistics management improved delivery performance (mean = 3.91) and that green logistics practices helped reduce transportation costs (mean = 3.90) and utilized fuel-efficient transport systems (mean = 3.88). These results suggested that sustainable logistics contributed to both operational efficiency and environmental performance.

Lower mean scores were noted for reverse logistics, such as recycling and reuse of packaging materials (mean = 3.78), and the use of environmentally friendly packaging materials (mean = 3.82), indicating that certain aspects of green logistics were less fully adopted and presented opportunities for further improvement.

Correlation results revealed a strong positive association between green logistics and operational efficiency ($r = 0.653$, $p < 0.01$), and regression analysis identified green logistics as the most influential predictor of operational efficiency ($\beta = 0.502$, $p < 0.001$). These findings highlighted that improvements in sustainable logistics had the greatest impact on enhancing overall operational performance compared to green procurement or green manufacturing.

Overall, the study concluded that Mukwano Industries had moderately embraced green logistics practices, with notable benefits in delivery performance, cost reduction, and fuel efficiency, while strengthening reverse logistics and sustainable packaging initiatives could further optimize environmental and operational outcomes.

5.2.4 Operational Efficiency

The study found that operational efficiency at Mukwano Industries Uganda Ltd was generally perceived positively by respondents, with an overall mean score of 3.91 (SD = 0.82). Respondents agreed most strongly that operational processes were efficient and well-coordinated (mean = 3.95), reflecting the organization's ability to structure and manage operations effectively. High mean scores were also observed for maintaining high productivity levels (mean = 3.93), effective utilization of resources (mean = 3.92), and high product quality standards (mean = 3.91), suggesting that operational practices supported performance consistency and customer satisfaction.

Lower mean scores were noted for control of operational costs (mean = 3.85) and minimization of material wastage (mean = 3.88), indicating areas where efficiency could be further strengthened to optimize resource use and reduce unnecessary expenses. The relatively low standard deviations across items suggested consistency in respondents' perceptions, reflecting a shared view of operational processes within the organization.

Correlation analysis demonstrated that operational efficiency had a strong positive association with green logistics ($r = 0.653$, $p < 0.01$), and moderate positive associations with green manufacturing ($r = 0.518$, $p < 0.01$) and green procurement practices ($r = 0.419$, $p < 0.01$). The regression results further confirmed that all three dimensions of Green Supply Chain Management practices significantly predicted operational efficiency, with green logistics being the most influential factor ($\beta = 0.502$, $p < 0.001$),

followed by green manufacturing ($\beta = 0.160$, $p = 0.013$) and green procurement practices ($\beta = 0.151$, $p = 0.008$).

Overall, the findings suggested that Mukwano Industries had achieved a moderate to high level of operational efficiency, with well-coordinated processes, high productivity, and quality performance being key strengths. The study also indicated that integrating green supply chain practices—particularly green logistics—was a critical driver of operational efficiency, while further improvements in cost control and waste reduction could strengthen overall performance.

5.3 Discussion of Findings

This section presents the discussion of the findings in line with the study objectives and existing empirical literature.

5.3.1 Green Procurement Practices

The study examined the influence of green procurement practices on operational efficiency at Mukwano Industries Uganda Ltd. The findings indicated that respondents generally agreed moderately with the implementation of green procurement practices, as reflected by an overall mean score of 3.84 ($SD = 0.83$). High agreement was observed for prioritizing environmentally friendly raw materials and considering environmental criteria in supplier selection, suggesting that the company had integrated sustainability considerations into procurement decisions.

These findings are consistent with Agyabeng-Mensah et al. (2020), who argued that green procurement enhances operational efficiency by ensuring that firms source

environmentally compliant inputs, reduce waste, and improve supply chain reliability. Similarly, Zhu et al. (2013) found that firms adopting sustainable procurement practices experience improved cost efficiency and better environmental performance due to reduced material wastage and improved supplier coordination.

Correlation analysis revealed a positive and statistically significant relationship between green procurement practices and operational efficiency ($r = 0.419$, $p < 0.01$), indicating that improvements in sustainable procurement were associated with enhanced operational outcomes. Regression results further confirmed a significant positive effect ($B = 0.151$, $p = 0.008$), although its influence was relatively moderate compared to other GSCM dimensions.

Despite these positive outcomes, lower mean scores were recorded for monitoring supplier environmental compliance and sustainability reporting. This aligns with findings from Walker and Jones (2012), who observed that many firms struggle to enforce supplier environmental standards due to weak monitoring systems and limited supplier engagement mechanisms. This suggests that although Mukwano Industries had adopted green procurement practices, supplier control mechanisms required strengthening to fully realize efficiency gains.

Overall, the findings suggest that green procurement played a supportive but not dominant role in enhancing operational efficiency at Mukwano Industries, consistent with prior literature emphasizing its foundational rather than transformational impact on performance.

5.3.2 Green Manufacturing Practices

The study examined the role of green manufacturing practices in influencing operational efficiency. The findings indicated moderate agreement (mean = 3.87, SD = 0.84), with respondents highlighting improvements in productivity and energy efficiency through environmentally friendly production techniques.

These results are supported by Agyabeng-Mensah et al. (2020), who found that green manufacturing improves productivity and cost efficiency by optimizing resource use and reducing waste. Similarly, Zhu and Sarkis (2007) established that firms adopting eco-efficient production systems experience enhanced operational performance due to reduced energy consumption and improved process efficiency.

Correlation analysis showed a moderate positive relationship with operational efficiency ($r = 0.518$, $p < 0.01$), while regression results confirmed a significant positive effect ($\beta = 0.160$, $p = 0.013$). This indicates that green manufacturing contributed meaningfully to operational performance, although not as strongly as green logistics.

However, lower scores for employee training and recycling practices reflect implementation gaps. This supports Jabbour et al. (2015), who emphasized that the effectiveness of green manufacturing is highly dependent on employee environmental training and organizational learning systems. Without adequate training, the impact of sustainable production practices tends to remain limited.

Overall, the findings suggest that green manufacturing moderately enhanced operational efficiency, but its full potential had not yet been realized due to insufficient capacity building and weak recycling systems.

5.3.3 Green Logistics Practices

The study further examined green logistics practices and their influence on operational efficiency. The findings showed moderate agreement (mean = 3.86, SD = 0.83), with respondents acknowledging improvements in delivery performance, fuel efficiency, and cost reduction.

These findings strongly align with Agyabeng-Mensah et al. (2020) and Khan et al. (2019), who established that green logistics significantly improves operational efficiency by reducing transportation costs, optimizing delivery routes, and minimizing environmental impact.

Correlation results revealed a strong positive relationship with operational efficiency ($r = 0.653$, $p < 0.01$), while regression analysis confirmed that green logistics had the strongest effect among all variables ($B = 0.502$, $p < 0.001$). This indicates that logistics efficiency was the most critical driver of operational performance at Mukwano Industries.

However, lower scores in reverse logistics and sustainable packaging suggest partial implementation. This is consistent with Rogers and Tibben-Lembke (2001), who noted that reverse logistics is often underdeveloped in many developing country firms due to cost constraints and limited infrastructure.

Overall, green logistics emerged as the most influential GSCM dimension for enhancing operational efficiency, underscoring its strategic importance to supply chain performance.

5.3.4 Operational Efficiency

The study assessed operational efficiency in relation to GSCM practices. The findings indicated relatively high efficiency levels (mean = 3.91, SD = 0.81), particularly in process coordination, productivity, and resource utilization.

Correlation results showed significant positive relationships between operational efficiency and green procurement ($r = 0.419$), green manufacturing ($r = 0.518$), and green logistics ($r = 0.653$), all at $p < 0.01$. This confirms the theoretical proposition that sustainable supply chain practices enhance operational performance.

Regression analysis further revealed that all three GSCM dimensions significantly influenced operational efficiency, with green logistics having the strongest effect, followed by manufacturing and procurement. These findings are consistent with Porter and van der Linde (1995), who argued that environmental sustainability can drive operational efficiency and competitive advantage when properly integrated into business processes.

However, lower scores in cost control and waste minimization indicate that efficiency gains are not yet fully optimized. This aligns with Luthra et al. (2016), who noted that firms often struggle to translate sustainability initiatives into full cost efficiency due to implementation constraints.

Overall, the findings suggest that operational efficiency at Mukwano Industries was moderately high and was significantly influenced by GSCM practices, with strong potential for further improvement through enhanced cost management and waste-reduction strategies.

5.4 Conclusions

5.4.1 Green Procurement Practices

The study concluded that green procurement practices at Mukwano Industries Uganda Ltd were implemented to a moderate extent and contributed positively to operational efficiency. Respondents generally agreed that environmentally friendly procurement decisions, such as prioritising sustainable raw materials and considering environmental criteria when selecting suppliers, enhanced efficiency and aligned with organisational sustainability objectives.

The findings indicated that green procurement had a significant positive effect on operational efficiency ($\beta = 0.151$, $p = 0.008$) and a positive correlation ($r = 0.419$, $p < 0.01$), demonstrating that procurement practices that incorporated environmental considerations were associated with improved operational outcomes.

However, the study also concluded that areas such as monitoring suppliers' compliance with environmental standards and systematic sustainability reporting required further strengthening. Enhancing these areas could further optimize procurement efficiency, reduce environmental risks, and support long-term operational performance.

Overall, green procurement practices were recognized as an important component of the organization's supply chain strategy, contributing moderately to operational efficiency while offering potential for further improvement through enhanced supplier management and compliance initiatives.

5.4.2 Green Manufacturing Practices

The study concluded that green manufacturing practices at Mukwano Industries Uganda Ltd were moderately adopted and contributed positively to operational efficiency. Respondents recognized that environmentally friendly production techniques, such as the use of energy-efficient technologies and resource-efficient production methods, enhanced productivity and helped reduce operational costs.

The findings indicated that green manufacturing had a significant positive effect on operational efficiency ($\beta = 0.160$, $p = 0.013$) and a moderate correlation ($r = 0.518$, $p < 0.01$), suggesting that sustainable manufacturing initiatives were associated with improved operational performance.

However, the study also concluded that areas such as employee training in green manufacturing practices and the promotion of recycling of production materials were less developed. Strengthening staff capacity and systematic recycling initiatives could further enhance both environmental sustainability and operational efficiency.

Overall, green manufacturing practices were considered an essential component of Mukwano Industries' operational strategy, contributing moderately to efficiency,

productivity, and cost management, while offering opportunities for improvement through enhanced employee engagement and sustainable production processes.

5.4.3 Green Logistics Practices

The study concluded that green logistics practices at Mukwano Industries Uganda Ltd were implemented to a moderate extent and played a critical role in enhancing operational efficiency. Respondents acknowledged that the use of fuel-efficient transport systems, optimization of delivery routes, and efficient logistics management significantly improved delivery performance and reduced operational costs.

The findings indicated that green logistics had the strongest positive effect on operational efficiency among the GSCM dimensions ($B = 0.502$, $p < 0.001$) and a strong correlation with operational efficiency ($r = 0.653$, $p < 0.01$), demonstrating that environmentally sustainable logistics practices were closely associated with improved operational outcomes.

Despite these positive effects, areas such as reverse logistics initiatives, recycling, and use of environmentally friendly packaging materials were less developed, suggesting opportunities to further strengthen the sustainability of logistics operations. Enhancing these areas could improve both environmental performance and supply chain efficiency.

Overall, the study concluded that green logistics practices were a key driver of operational efficiency at Mukwano Industries, contributing significantly to timely delivery, cost reduction, and sustainability. Continuous improvements in packaging

sustainability, recycling, and reverse logistics were recommended to maximize the benefits of green logistics practices.

5.4.4 Operational Efficiency

The study concluded that Mukwano Industries Uganda Ltd had achieved a moderate-to-high level of operational efficiency, as reflected in the overall mean score of 3.91. Respondents agreed that operational processes were well-coordinated, productive, and resource-efficient, highlighting the organization's ability to manage operations effectively while maintaining consistent performance.

Correlation and regression analyses indicated that operational efficiency was significantly influenced by green supply chain management practices. Green logistics had the strongest impact ($\beta = 0.502$, $p < 0.001$), followed by green manufacturing ($\beta = 0.160$, $p = 0.013$) and green procurement ($\beta = 0.151$, $p = 0.008$). This demonstrated that sustainable practices across procurement, manufacturing, and logistics collectively contributed to operational performance.

However, certain areas such as control of operational costs (mean = 3.85) and minimization of material wastage (mean = 3.88) were identified as opportunities for improvement. Enhancing efficiency in these areas could further optimise resource utilisation and reduce unnecessary expenses.

Overall, the study concluded that operational efficiency at Mukwano Industries was positively associated with the adoption of green supply chain practices, and continuous

improvements in cost control, waste reduction, and sustainability-focused operational practices could further strengthen both performance and environmental outcomes.

5.5 Recommendations

Based on the findings of the study, the following practical and organizational policy recommendations are proposed.

5.5.1 Green Procurement Practices

The study recommended that Mukwano Industries Uganda Ltd strengthen its green procurement practices to enhance operational efficiency and sustainability by systematically monitoring supplier compliance with environmental standards, integrating environmental criteria into procurement policies, and providing staff training on sustainable sourcing. Additionally, fostering supplier collaboration on initiatives such as waste reduction, recycling, and energy-efficient practices was advised to ensure a shared commitment to sustainability throughout the supply chain, ultimately improving procurement effectiveness and supporting long-term operational and environmental performance.

5.5.2 Green Manufacturing Practices

The study recommended that Mukwano Industries Uganda Ltd enhance green manufacturing practices by investing in energy-efficient production technologies, promoting efficient use of raw materials, and strengthening employee training on environmentally friendly production processes. Additionally, the organization should implement systematic recycling initiatives and reduce production waste to further improve sustainability. By integrating these measures, Mukwano Industries can increase

productivity, reduce operational costs, and achieve a higher level of operational efficiency while minimizing environmental impact.

5.5.3 Green Logistics Practices

The study recommended that Mukwano Industries Uganda Ltd strengthen green logistics practices by expanding the use of fuel-efficient transport systems, optimizing delivery routes, and promoting environmentally friendly packaging materials. Additionally, the organization should enhance reverse logistics initiatives, including recycling and reusing packaging materials, to further reduce environmental impact. Implementing these measures would improve delivery performance, reduce transportation costs, and enhance overall supply chain efficiency, thereby supporting both operational efficiency and sustainability objectives.

5.5.4 Operational Efficiency

The study recommended that Mukwano Industries Uganda Ltd further enhance operational efficiency by continuously monitoring and improving cost control measures, minimizing material wastage, and ensuring well-coordinated operational processes. Integrating sustainable practices across procurement, manufacturing, and logistics was advised to maintain high productivity, consistent quality, and timely delivery. By addressing these areas, the organization can optimize resource utilization, reduce operational expenses, and sustain performance improvements while supporting its broader environmental and sustainability goals.

5.6 Limitations of the study

Despite the valuable insights generated, this study had several limitations that should be considered when interpreting the findings. First, the study was limited to Mukwano

Industries Uganda Ltd, which restricted the generalizability of the findings to other manufacturing organizations or industries in Uganda and beyond. Second, the study relied on self-reported data from employees, which may have introduced response bias, as participants could have provided socially desirable answers or overestimated the implementation of green supply chain practices. Third, the study adopted a cross-sectional design, capturing perceptions at a single point in time, which limited the ability to assess changes in green practices or operational efficiency over time. Additionally, although the study focused on key dimensions of green supply chain management—procurement, manufacturing, and logistics—other potentially influential factors, such as organizational culture, leadership commitment, and external regulatory pressures, were not explored in depth. Finally, the sample size of 132 respondents, while sufficient for the analyses conducted, may have constrained the representation of all perspectives within the organization, particularly at operational and middle management levels.

Despite these limitations, the study provided meaningful insights into the relationship between green supply chain management practices and operational efficiency, and it offers a foundation for further research and practical interventions in sustainable manufacturing and logistics.

6.4 Areas recommended for future research

Based on the findings and limitations of this study, several areas are recommended for future research. First, future studies could expand the scope to include multiple manufacturing firms or different industries in Uganda to enhance the generalizability

of the findings and provide a broader perspective on green supply chain management practices. Second, longitudinal studies are recommended to track the implementation and impact of green practices over time, which would allow for a better understanding of how sustainability initiatives influence operational efficiency in the long term. Third, research could examine additional factors influencing operational efficiency, such as organizational culture, leadership commitment, regulatory compliance, and technological innovation, to provide a more comprehensive analysis of the determinants of sustainable performance. Fourth, future studies could investigate the financial implications and return on investment of implementing green supply chain practices, particularly in terms of cost savings, revenue growth, and market competitiveness. Finally, comparative studies between local and multinational manufacturing firms in Uganda could reveal differences in green supply chain adoption and highlight best practices that can be applied in local contexts. By addressing these areas, future research can provide deeper insights into sustainable supply chain practices, operational efficiency, and the broader impact of green initiatives on organizational performance.

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APPENDICIES

Appendix i: Structured Questionnaire

Dear Respondent,

My name is **Jonathan Mbabazi**, and I'm conducting an interview as part of my research on Green Supply Chain Management Practices and Operational Efficiency at Mukwano Industries Uganda Ltd. Your input is highly valuable, and I assure you that any information you provide will be treated with strict confidentiality. This interview will take about 30-40 minutes. With your permission, I would like to record our conversation for accuracy. May I proceed?"

Instructions

Please tick the most appropriate option. Your responses will be kept confidential and used only for academic purposes.

Section A: Background Information of Respondents

Please tick (✓) the appropriate option.

1. **Gender**
Male ☐
Female ☐
2. **Age Group**
20-29 years ☐
30-39 years ☐
40-49 years ☐
50 years and above ☐
3. **Education Level**
Diploma ☐
Bachelor's Degree ☐
Master's Degree ☐
Other ☐
4. **Department**
Procurement ☐
Production ☐
Logistics/Distribution ☐
Administration ☐
Other ☐
5. **Years of Service at Mukwano Industries**
Less than 1 year ☐
1-5 years ☐

6-10 years ☐

Above 10 years ☐

Section B: Green Procurement Practices

Please indicate your level of agreement with the following statements.

Code	Statement	1	2	3	4	5
GP1	Mukwano Industries prioritizes purchasing environmentally friendly raw materials.	☐	☐	☐	☐	☐
GP2	The company considers environmental criteria when selecting suppliers.	☐	☐	☐	☐	☐
GP3	Suppliers are encouraged to comply with environmental standards.	☐	☐	☐	☐	☐
GP4	Procurement policies promote the use of recyclable or reusable materials.	☐	☐	☐	☐	☐
GP5	Green procurement practices help reduce waste in the procurement process.	☐	☐	☐	☐	☐
GP6	The organization monitors suppliers' environmental performance.	☐	☐	☐	☐	☐
GP7	Procurement decisions consider long-term environmental sustainability.	☐	☐	☐	☐	☐
GP8	Green procurement practices improve the efficiency of operations.	☐	☐	☐	☐	☐

Section C: Green Manufacturing Practices

Please indicate your level of agreement with the following statements.

Code	Statement	1	2	3	4	5
GM1	Mukwano Industries uses energy-efficient production technologies.	☐	☐	☐	☐	☐
GM2	The company practices waste reduction during the production process.	☐	☐	☐	☐	☐
GM3	Recycling of production materials is encouraged in the organization.	☐	☐	☐	☐	☐
GM4	Manufacturing processes are designed to minimize environmental pollution.	☐	☐	☐	☐	☐
GM5	Employees are trained on environmentally friendly manufacturing practices.	☐	☐	☐	☐	☐
GM6	The company promotes efficient utilization of raw materials during production.	☐	☐	☐	☐	☐
GM7	Environmentally friendly production techniques improve productivity.	☐	☐	☐	☐	☐

GM8	Green manufacturing helps reduce operational costs.	☐	☐	☐	☐	☐
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Section D: Green Logistics

Please indicate your level of agreement with the following statements.

Code	Statement	1	2	3	4	5
GL1	Mukwano Industries uses fuel-efficient transport systems.	☐	☐	☐	☐	☐
GL2	The company optimizes delivery routes to reduce fuel consumption.	☐	☐	☐	☐	☐
GL3	Environmentally friendly packaging materials are used in product distribution.	☐	☐	☐	☐	☐
GL4	The company practices reverse logistics such as recycling and reuse of packaging materials.	☐	☐	☐	☐	☐
GL5	Green logistics practices reduce transportation costs.	☐	☐	☐	☐	☐
GL6	Distribution processes are designed to minimize environmental impact.	☐	☐	☐	☐	☐
GL7	Efficient logistics management improves delivery performance.	☐	☐	☐	☐	☐
GL8	Green logistics practices enhance overall supply chain efficiency.	☐	☐	☐	☐	☐

Section E: Operational Efficiency

Please indicate your level of agreement with the following statements.

Code	Statement	1	2	3	4	5
OE1	Operational processes at Mukwano Industries are efficient and well coordinated.	☐	☐	☐	☐	☐
OE2	The organization effectively utilizes resources during operations.	☐	☐	☐	☐	☐
OE3	Production processes minimize wastage of materials.	☐	☐	☐	☐	☐
OE4	The company consistently meets production targets.	☐	☐	☐	☐	☐
OE5	Operational costs are effectively controlled.	☐	☐	☐	☐	☐
OE6	The company maintains high productivity levels.	☐	☐	☐	☐	☐
OE7	Delivery of products to customers is timely.	☐	☐	☐	☐	☐
OE8	The company maintains high product quality standards.	☐	☐	☐	☐	☐

Appendix ii Interview Guide

Dear Respondent,

My name is **Jonathan Mbabazi**, and I'm conducting an interview as part of my research on **Green Supply Chain Management Practices and Operational Efficiency** at Mukwano Industries Uganda Ltd. Your input is highly valuable, and I assure you that any information you provide will be treated with strict confidentiality. This interview will take about 30-40 minutes. With your permission, I would like to record our conversation for accuracy. May I proceed?"

Section A: Background Information

1. What is your current position at Mukwano Industries?
2. How long have you worked with the company?
3. Which department do you work in?

Section B: Green Procurement Practices

4. How does Mukwano Industries incorporate environmental considerations when selecting suppliers?
5. In what ways does the company ensure that suppliers comply with environmental standards?
6. What procurement policies or strategies promote environmentally friendly purchasing in the organization?
7. How does the company ensure that purchased materials are recyclable, reusable, or environmentally friendly?
8. What challenges does the organization face in implementing green procurement practices?
9. In your opinion, how do green procurement practices influence operational efficiency in the organization?

Section C: Green Manufacturing Practices

10. What environmentally friendly practices are integrated into the manufacturing or production processes at Mukwano Industries?
11. How does the company minimize waste and pollution during production?
12. What measures are in place to promote efficient use of energy and raw materials in manufacturing?
13. Does the organization implement recycling or waste reduction programs in production? Please explain.
14. How are employees trained or encouraged to adopt environmentally friendly manufacturing practices?
15. In your view, how do green manufacturing practices contribute to operational efficiency?

Section D: Green Logistics Practices

16. What strategies does Mukwano Industries use to make its transportation and distribution activities environmentally friendly?
17. How does the company ensure efficient use of fuel and transportation resources?
18. Are there initiatives to promote eco-friendly packaging or reduce packaging waste?
19. Does the company practice reverse logistics, such as recycling or reusing packaging materials?
20. What challenges does the organization face in implementing green logistics practices?
21. How do green logistics practices affect the efficiency of distribution and delivery operations?

Section E: Operational Efficiency

- 22. How would you describe the level of operational efficiency at Mukwano Industries?
- 23. What factors contribute most to improving operational efficiency in the organization?
- 24. In your opinion, how do green supply chain practices influence productivity and cost efficiency?
- 25. What improvements would you recommend to enhance both environmental sustainability and operational efficiency in the company?

Thank you very much for your time and valuable contribution to this study.

Appendix iii. Sampling Guide

TABLE FOR DETERMINING SAMPLE SIZE FROM A GIVEN POPULATION

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	246
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	351
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	181	1200	291	6000	361
45	40	180	118	400	196	1300	297	7000	364
50	44	190	123	420	201	1400	302	8000	367
55	48	200	127	440	205	1500	306	9000	368
60	52	210	132	460	210	1600	310	10000	373
65	56	220	136	480	214	1700	313	15000	375
70	59	230	140	500	217	1800	317	20000	377
75	63	240	144	550	225	1900	320	30000	379
80	66	250	148	600	234	2000	322	40000	380
85	70	260	152	650	242	2200	327	50000	381
90	73	270	155	700	248	2400	331	75000	382
95	76	270	159	750	256	2600	335	100000	384

Note: "N" is population size
 "S" is sample size.

Krejcie, Robert V., Morgan, Daryle W., "Determining Sample Size for Research Activities",
Educational and Psychological Measurement, 1970.

Appendix iv: REC letter



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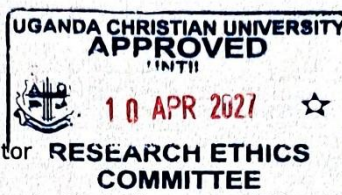
Office of the Vice Chancellor
Research Ethics Committee UG-026



10th April, 2026

MBABAZI JONATHAN
Uganda Christian University
jonathanmbabazi1991@gmail.com

UG-REC-026 APPROVAL NOTICE



To: Mbabazi Jonathan; Principal Investigator

Re: UCU-REC Application titled : *Green Supply Chain Management Practices and Operational Efficiency at Mukwano Industries Uganda Ltd.*

Application Number: UCUREC-2026-1912

Version: 4.1

Type: [*] INITIAL REVIEW

- [] Exemption Request
- [] Protocol Amendment
- [] Letter of Amendment (LOA)
- [] Continuing Review
- [] Material Transfer Agreement
- [] Other, Specify:

I am pleased to inform you that the UG-REC-026; UCUREC under expedited review approved the above referenced application.

Approval of the research is for a period from 10th April, 2026 to 10th April, 2027.

This research is considered minimal risk category.

As Principal Investigator of the research, you are responsible for fulfilling the following requirements of approval:

1. All co-investigators must be kept informed of the status of the research.
2. Changes, amendments, and additions to the protocol or the consent form must be submitted to the REC for re-review and approval prior to the activation of the changes. The REC application number assigned to the research should be cited in any correspondence.
3. Reports of unanticipated problems involving risks to participants or other must be submitted to the REC. New information that becomes available which could change the risk: benefit ratio must be submitted promptly for REC review.

Research and Ethics



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Office of the Vice Chancellor
Research Ethics Committee UG-026



4. Only approved consent forms are to be used in the enrollment of participants. All consent forms signed by subjects and/or witnesses should be retained on file. The REC may conduct audits of all study records, and consent documentation may be part of such audits.
5. Regulations require review of an approved study not less than once per 12-month period. **Therefore, a continuing review application must be submitted to the REC eight weeks prior to the above expiration date of 10th April, 2027 in order to continue the study beyond the approved period.** Failure to submit a continuing review application in a timely fashion may result in suspension or termination of the study, at which point new participants may not be enrolled and currently enrolled participants must be taken off the study.
6. The REC application number assigned to the research should be cited in any correspondence with the REC of record.
7. Your research details have been shared with the Executive secretary of Uganda National Council for Science and Technology (UNCST) and you are **not** required to get clearance.

The following is the list of all documents approved in this application by UG-REC_026:

	Document Title	Language	Version	Version Date
1.	Protocol	English	1.0	2026-04-10
3.	Research tools	English	1.0	2026-04-10
4.	Informed Consent form	English	1.0	2026-04-10
5.	Study work plan	English	1.0	2026-04-10
6.	Budget	English	1.0	2026-04-10

Signed and Stamped

Prof. Peter Waiswa.
UCUREC Chairperson,
pwaiswa@musph.ac.ug



Appendix v: Introductory letter



**UGANDA CHRISTIAN
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School of Business
Department of Postgraduate Studies

16th April 2026

To Whom It May Concern;

RE: MASTERS IN BUSINESS ADMINISTRATION (MBA)

Mr. Mbabazi Jonathan, Reg No S24M15/035 is a student at Uganda Christian University, pursuing a degree of Master's in Business Administration.

In partial fulfillment of the requirements for the award of the Master's degree, he is conducting a research on Green supply chain management practices and operational efficiency at Mukwano Industries Uganda Limited.

This communication therefore serves to formally request you to allow him access any information in your custody/organization, which is relevant to his research .

Thank you for your cooperation on this matter

Yours Sincerely,

UGANDA CHRISTIAN UNIVERSITY
P. O. BOX 4, MUKONO
16 APR 2026
HEAD OF DEPARTMENT
RESEARCH & POSTGRADUATE STUDIES
SCHOOL OF BUSINESS

Mrs Comfort Tumuhanywe
Head of Department, Postgraduate Studies

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Plot 67-173, Bishop Tucker Road, Mukono Hill, P.O. Box 4, Mukono, Uganda.
Tel: +256 312 350 411 Fax: +256 4142 90 800 Email: sob-postgraduate@ucug.ac.ug Web: www.ucug.ac.ug
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