

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI

INSTITUTE OF DISTANCE LEARNING

**STAKEHOLDER INFLUENCE, REVERSE LOGISTICS ADOPTION AND SUPPLY
CHAIN PERFORMANCE: THE MODERATING ROLE OF INFORMATION SYSTEMS**

BY

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**A THESIS SUBMITTED TO THE DEPARTMENT OF SUPPLY CHAIN AND
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KNUST



DECLARATION

I hereby declare that this submission is my original work for the Master of Science degree in Procurement and Supply Chain Management and that, to the best of my knowledge, it contains no material previously published by another person or material previously accepted for the award of any other University degree, except where appropriate acknowledgement is made in the text.

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DEDICATION

I dedicate this work to God, my children (Rodney and Chiara Ollennu), my family and friends.

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ABSTRACT

With rising environmental concerns worldwide, reverse logistics (RL) has become an increasingly important supply chain practice for organizations to adopt. RL involves activities like product returns, reuse, recycling, and proper disposal that can benefit the environment. This study aimed to examine the relationship between stakeholder influence, RL adoption, supply chain performance, and the moderating role of information systems among manufacturing firms in the Greater Accra region of Ghana. Using a quantitative research approach, primary data was collected through questionnaires from a sample across 100 manufacturing firms. The results showed that top management support, government regulations, and customer pressure positively and significantly influenced RL adoption, providing support for stakeholder theory. However, corporate citizenship pressure had no statistically significant effect on RL adoption, contrary to expectations. This suggests that firms adopt RL practices more in response to top-down pressures than broader social pressures. RL adoption was found to have a positive and significant impact on supply chain performance, including cost reduction, inventory management, and competitiveness. This aligns with arguments from diffusion of innovation theory regarding performance benefits driving adoption. However, the study found that information systems did not significantly moderate the relationship between RL adoption and supply chain performance, contrary to the study's hypothesis. This implies that information systems may not have been effectively utilized by the sampled firms to optimize RL practices and performance outcomes. The study provides useful insights into the key drivers of RL adoption and the benefits for supply chain performance among manufacturing firms in the Ghanaian context. It also highlights the need for better information systems to fully capitalize on RL practices. The findings have important implications for managers in prioritizing stakeholder needs during RL adoption to improve their supply chain and environmental performance.

TABLE OF CONTENTS

DECLARATION	i
DEDICATION	ii
ACKNOWLEDGEMENT	iii
ABSTRACT	iv
TABLE OF CONTENTS	v
LIST OF TABLES	xi
LIST OF FIGURES	xii
LIST OF ABBREVIATIONS/ACRONYMS	xiii
CHAPTER ONE:INTRODUCTION	1
1.1 Background of the Study	1
1.2 Statement of the Problem	2
1.3 Objectives of the Study	4
1.4 Research Questions	5
1.5 Significance of the Study	5
1.6 Overview of Research Methodology	6
1.7 Scope of the Study	6
1.8 Limitation of the Study	7
1.9 Organization of the Research Thesis	7

CHAPTER TWO: LITERATURE REVIEW	9
2.1 Introduction.....	9
2.2 Conceptual Review	9
2.2.1 Reverse Logistics	9
2.2.2 Stakeholder Influence	11
2.2.2.1 Top Management Support.....	12
2.2.2.2 Government Environmental Regulations.....	12
2.2.2.3 Corporate Citizenship Pressure.....	13
2.2.2.4 Customer Pressure	14
2.2.3 Information Systems	14
2.2.3.1. Electronic Data Interchange (EDI) Adoption	15
2.2.3.2 Blockchain Adoption	16
2.2.3.3 Radio Frequency Identification (RFID) Adoption.....	17
2.2.4 Supply Chain Performance	17
2.3 Theoretical Review	18
2.3.1 Stakeholder Theory	18
2.3.2 Diffusion of Innovation.....	19
2.4 Empirical Review.....	20
2.5 Conceptual Framework and Hypothesis Development.....	28
2.5.1 Top Management Support and Reverse Logistics	29

2.5.2 Environmental Regulations and Reverse Logistics	31
2.5.3 Corporate Citizenship Pressure and Reverse Logistics	33
2.5.4 Customer Pressure and Reverse Logistics	35
2.5.5 Reverse Logistics and Supply Chain Performance	36
2.5.6 The Moderating Role of Information Systems (IS)	38
CHAPTER THREE: METHODOLOGY AND INDUSTRY PROFILE	40
3.1 Introduction.....	40
3.2 Research Design.....	40
3.2.1. Research Strategy.....	41
3.2.2 Research Approach	42
3.3 Population of the Study.....	43
3.4 Sampling Technique and Sample Size.....	43
3.5 Sources of Data.....	43
3.6 Data Collection Tools	44
3.7 Data Analysis.....	45
3.7 Validity and Reliability.....	45
3.8 Ethical Consideration.....	46
3.9 Industry profile.....	46
CHAPTER FOUR: DATA PRESENTATION, ANALYSIS AND DISCUSSION OF RESULTS	47
4.1 Introduction.....	47

4.2.1 Annual Sales Revenue	48
4.2.2 Number of Employees	49
4.2.3 Industry Type	49
4.2.4 Job Position.....	50
4.2.6 Level of Education	50
4.3 Reliability and Validity.....	50
4.4 Descriptive Statistics.....	55
4.4.1 Top Management Support.....	55
4.4.2 Government Environmental Regulation	56
4.4.3 Corporate Citizenship Pressure.....	57
4.4.4 Customer Pressure	58
4.4.5 Reverse Logistics Adoption.....	59
4.4.6 Supply Chain Performance	60
4.4.7 Information Systems	62
4.5 Structural Equation Modelling.....	63
4.6 Hypotheses Confirmation	67
4.7 Discussion of Results.....	68
4.7.1 Stakeholder Influence and Reverse Logistics Adoption	68
4.7.1.1 Top Management Support and Reverse Logistics	68
4.7.1.2 Government Environmental Regulations and Reverse Logistics	69

4.7.1.3 Corporate Citizenship Pressure and Reverse Logistics	69
4.7.1.4 Customer Pressure and Reverse Logistics	70
4.7.2 Reverse Logistics and Supply Chain Performance	70
4.7.3 The Moderating Role of Information Systems (IS)	71
CHAPTER FIVE: SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS	73
5.1 Introduction.....	73
5.2 Summary of Findings.....	73
5.2.1 Stakeholder Influence and Reverse Logistics Adoption.....	73
5.2.1.1 Top management support and reverse Logistics adoption.....	73
5.2.1.2 Government Environmental Regulations and Reverse Logistics Adoption	74
5.2.1.3 Corporate Citizenship Pressure and Reverse Logistics Adoption	74
5.2.1.4 Customer Pressure and Reverse Logistics Adoption	74
5.2.2 Reverse Logistics Adoption and Firm Performance	75
5.2.3 The Moderating Role of Information Systems	75
5.3 Conclusion	75
5.4 Recommendations for Managers	75
5.5 Suggestion for Further Research.....	76
REFERENCES	79
APPENDIX.....	86

LIST OF TABLES

Table 4. 1 Demographics of Respondents.....	47
Table 4.2 Cronbach Alpha, Composite Reliability, and Average Variance Extracted	50
Table 4.3 Fornell Larcker Criterion	51
Table 4.4 Descriptive Statistics Results for Top Management Support	54
Table 4.5 Descriptive Statistics Results for Government Environmental Regulations	55
Table 4.6 Descriptive Statistics Results for Corporate Citizenship Pressure.....	56
Table 4.7 Descriptive Statistics Results for Customer Pressure.....	57
Table 4.8 Descriptive Statistics Results for Reverse Logistics Adoption.....	58
Table 4.9 Descriptive Statistics Results for Supply Chain Perform.....	60
Table 4.10 Descriptive Statistics Results for Information Systems.....	61
Table 4.11 Structural Equation Modelling.....	62
Table 4.12 Confirmation of the Hypothesis.....	66

LIST OF FIGURES

Figure 2.1: Conceptual Framework	30
Figure 4.1: Confirmatory Factor Analysis.....	53
Figure 4.2: Structural Equation Modelling.....	65



LIST OF ABBREVIATIONS/ACRONYMS

RL - Reverse Logistics

PLS-SEM - Partial Least Square Structural Equation Modelling

EDI - Electronic Data Interchange

RFID - Radio Frequency Identification

IS - Information Systems

CA - Cronbach Alpha

CR - Composite Reliability

AVE - Average Variance Extracted

CCP - Corporate Citizenship Pressure

CP - Customer Pressure

GER - Government Environmental Regulation

TMS - Top Management Support

SCP - Supply Chain Performance

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Organizations have become progressively concerned over supply chain sustainability issues in today's dynamic business environment characterized by fierce competition, stringent legal regulations, and the rising consensus for a clean and safe environment. Reverse logistics is an essential component of green supply chain management perceived by organizations across geographical areas as the panacea to the ever-present environmental concerns (Ndung'u and Moronge, 2017). Owing to this claim, organizations are now investing their time and other relevant resources to appreciate the concept of reverse logistics to integrate its related practices into their operations, goals and objectives. Hitherto, most organizations were only practicing forward logistics. However, due to environmental, economic and legal reasons, these organizations are steadily integrating reverse logistics practices into their supply chain (Guta, 2016; Yu et al., 2018).

Reverse logistics can be described as a practice whereby organizations take back products from end consumers to reduce adverse ecological effects and obtain potential benefits from re-using and recycling an entire product or its parts. Thus, it is concerned with reclaiming products from final consumers to properly dispose and capture value. Impliedly, reverse logistics primarily helps increase supply chain efficiency via cost reduction strategies while simultaneously reducing substances that threaten environmental sustainability. There are diverse reverse logistics practices adopted by manufacturing companies. Some researchers (Eshikhati, 2014; Ndung'u & Moronge, 2017) have identified remanufacturing, reuse, repackaging, recycling and disposal as the commonly adopted reverse logistics practices.

Undoubtedly, these practices have some perceived benefits to organizations. Laosirihongthong, Adebajo and Tan (2013) articulate that practicing reverse logistics helps organizations to follow stringent legal regulations which prevent them from incurring penalties related to non-compliance. Salim (2016) further indicates that organizations that adopt reverse logistics are considered socially responsible due to their consistent use of environmentally friendly activities. Thus, the integration and subsequent application of key reverse logistics activities makes an organization ecologically friendly. This enhances the reputation and goodwill of organizations, which is a significant determinant that gives firms the competitive edge over their rivals. A properly managed reverse logistics process also minimizes logistics cost and improves the profitability of organizations (Afum and Zhuo, 2019).

Undisputedly, firms compete to have urges over rivals and gain customer loyalty. Competition these days no longer directly exists between companies but between supply chains. The most responsive and resilient supply chain gains a competitive urge in the business environment. This has given rise to the emergence of the concept of reverse logistics.

Growing concerns about environmental issues, legislation and regulations, rapid technological changes have aroused the attention of the corporate environment on reverse logistic practices. Manufacturers are now focusing on forward and reverse logistics to satisfy customers and gain loyalty. It is disturbing to note that manufacturers have come to appreciate the importance and benefits of reverse logistics yet find it difficult to implement and manage reverse logistics practices. (Amoah and Koomson, 2017)

1.2 Statement of the Problem

Over the past few decades, reverse logistics has gained industry interest and become a topic of study. However, whereas reverse logistics is becoming an essential component of the supply

chain in wealthy nations due to legislative difficulties, the concept is still in its infancy in emerging economies such as Ghana. Reverse logistics adoption, as a component of the supply chain that deals with the reverse flow of goods, must be analyzed, and its impact on the supply chain must be evaluated. (Bouzon et al., 2016). In addition, this study builds upon the research conducted by Afum et al. (2020) entitled “Reverse Logistics, Stakeholder Influence and Supply Chain Performance in Ghanaian Manufacturing Sector,” in which the authors sought to assess the perceived stakeholder influence on reverse logistics (RL) adoption and further examined how the adoption of Reverse Logistics influences supply chain performance, with a focus on the Ghanaian manufacturing sector. There is a need to investigate the moderating effect of information systems on the relationship between Reverse Logistics adoption and supply chain performance because the adoption of reverse logistics practices has become increasingly important for companies due to environmental concerns and regulations, as well as potential cost savings and customer satisfaction benefits (Prahinski and Kocabasoglu, 2014). However, the effectiveness of reverse logistics practices in improving supply chain performance may depend on using information systems to manage and optimize these activities (Wu et al., 2016). Also, information systems have been shown to improve supply chain performance by enhancing communication, coordination, and information sharing among supply chain partners (Zhu et al., 2017). By adopting information systems to manage reverse logistics activities, organizations may better coordinate with suppliers, customers, and other partners to optimize their supply chain performance (Liu et al., 2020).

Despite the significant study on forward logistics and RL, there are still a dearth of Ghanaian studies examining the effects of reverse logistics adoption on supply chain performance. Afum et al. (2020) investigated the impact of reverse logistics adoption on the supply chain performance of manufacturing companies. Amoah and Koomson (2019) investigated the

deployment of reverse logistics (RL) in Ghana based on various criteria. The study also assesses the effects of environmental regulations, infrastructure availability, economic implications, and stakeholder knowledge on the level of effective execution of the reverse logistics program in selected firms. Afum and Zhou (2019) conducted a study investigating how reverse logistics effects company performance, with competitive advantage as a mediator; focused on bottled and sachet manufacturing companies. Saruchera and Asante- Darko's (2021) study aimed to demonstrate how Reverse Logistics and organizational culture (OC) contribute to the operational performance (OP) of service and manufacturing enterprises in the Ghanaian economy. In the Ghanaian context, these are the only studies undertaken on reverse logistics with varied performance outcomes. Only Afum et al. (2020) among the few cited research examined the impact of reverse logistics adoption on supply chain performance. This indicates the lack of research in the study area, indicating the necessity for additional study. Finally, investigating the moderating effect of information systems on the relationship between reverse logistics adoption and supply chain performance can provide important insights for managers and policymakers in improving their supply chain operations. By understanding the factors that influence the effectiveness of reverse logistics practices, organizations can make informed decisions on allocating resources to improve their supply chain performance (Touboullic and Walker, 2015).

1.3 Objectives of the Study

- i. To examine the perceived relationship between stakeholder influence and the adoption of reverse logistics
- ii. To examine the relationship between reverse logistics adoption and supply chain performance.

- iii. To examine the moderating effect of information systems on the relationship between reverse logistics and supply chain performance

1.4 Research Questions

- i. What is the relationship between stakeholder influence and reverse logistics adoption?
- ii. What is the relationship between reverse logistics adoption on supply chain performance?
- iii. Do information systems moderate the relationship between reverse logistics adoption and supply chain performance?

1.5 Significance of the Study

The results provide strategic insight for managers to voluntarily support Reverse Logistics and establish successful product return policies that satisfy customers' and society's "greening" expectations to improve their supply chains. Governments and other environmental regulatory agencies should also develop national waste management regulations to increase the pressure on industrial companies to comply and use Reverse Logistics.

Managers would recognize the need to promote Reverse Logistics practices by implementing efficient product return procedures that make it simple for customers to return unwanted products for recycling, reuse, and remanufacturing. The return policy will also be modified to satisfy customers' "greening" demands. Managers will not trivialize Reverse Logistics but embrace it holistically by investing time and other organizational resources to improve their supply chain. Government and other environmental regulatory agencies will use the findings to design effective national waste management policies to increase pressure on manufacturing companies to comply and accept responsibility for their products even after use. The study

would contribute supporting and contradictory empirical findings to the body of RL research for the academic community.

The strategic application of reverse supply chain would assist manufacturing companies in enhancing the reclamation of products at the end of their useful lives. The environmental effects of recovering, reusing, and recycling their products to save landfill space, fuel, and money.

1.6 Overview of Research Methodology

The researcher adopts a quantitative approach for this study, the deductive method, which involves developing hypotheses based on the study's objectives. The study's research design was a survey targeted at organizations operating within the manufacturing space as the target population. A sample of a hundred (100) would be drawn from the target population using probability sampling, and online questionnaires would be used to gather data from the selection. To derive meaningful information from the collected data, the researcher utilizes IBM SPSS version 26 to conduct descriptive and inferential analysis.

The study relies on only primary data sources. The researcher would ensure all ethical, reliability and validity principles are considered. To achieve ethical principles, questionnaires will ensure the anonymity of all respondents. The study would check the reliability of how consistently the method measures the variables. Also, Cronbach Alpha would be used to test for reliability.

1.7 Scope of the Study

The study would investigate the relationship between reverse logistics, supply chain performance, and the moderating role of information systems in manufacturing firms operating

within the Greater Accra region of Ghana. This region is the most populous and industrialized area in Ghana and is home to the capital city, Accra. The study would examine the concept of reverse logistics and its impact on supply chain performance in the manufacturing firms in the Greater Accra region. The study would also explore the role of information systems in moderating this relationship, including the types of information systems used and their impact on reverse logistics and supply chain performance. The study may also consider factors such as the regulatory environment, access to finance, and technology adoption that can affect the effectiveness of reverse logistics and supply chain performance.

1.8 Limitation of the Study

This study also has some limitations that researchers should consider in the future. First, this study focused on just manufacturing industry. Secondly, this study used cross-sectional data. However, future research might use longitudinal data. Later studies might consider other industries and that may be included to provide further insights. Finally, this research looks at Reverse logistics, Supply Chain performance, information systems. The focus of future research should be on other performance outcomes such as sustainability performance. Other mediating or moderating variables, such as collaboration, financial resource availability amongst others, should be considered in this model in further research.

1.9 Organization of the Research Thesis

The research is organized into five chapters. Introduction and background of the study, statement of the problem, research objectives, research questions, significance of the investigation, scope of the study, overview of the methodology, and organization of the study comprise the first chapter. The second chapter provides a literature assessment of the study's factors, including Reverse Logistics, Stakeholder impact, information systems, and supply

chain performance. The chapter addresses conceptual review, theoretical review, empirical review, conceptual framework building, and conceptual review. The third chapter describes the approach used to achieve the study's objectives. It consists of the research design, the study's population, the sample and sampling strategy, data collection methods, data analysis, reliability and validity, and ethical considerations. The fourth chapter, entitled Results and Discussions, contains the study's descriptive and inferential analyses and a discussion of the results. The summary of findings, recommendations, conclusions, and proposals for further research are provided in chapter five.



CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews the conceptual and empirical literature related to the topic. The section focuses on addressing three primary objectives, namely (1) to evaluate the perceived effect of stakeholder influence on the adoption of reverse logistics; (2) to examine the effect of reverse logistics adoption on supply chain performance, (3) to investigate how information systems moderate the link between reverse logistics and supply chain performance.

2.2 Conceptual Review

2.2.1 Reverse Logistics

The concept of RL has evolved and expanded in scope in response to the curiosity of scholars. Reverse logistics has been defined from several angles. RL is the planning, implementation, and control of the efficient, cost-effective movement of raw materials, in-process inventory, finished goods, and related information from the point of consumption to the point of origin to recapture value or correct disposal (Agarwal et al.,2015). Reverse Logistics was defined by Dutta et al. (2019) as the process of planning, implementing, and controlling the efficient, cost-effective flow of raw materials, in-process inventory, finished goods, and related information from the point of consumption to the point of origin to recapture value or dispose of the item properly. Reverse logistics entails efforts that seek to retrieve products or materials for reuse or recycling. (Asamoah et al.,2020)

Remanufacturing and refurbishment may also be included within the definition of reverse logistics. Thus, reverse logistics service includes product delivery and retrieval so that it can be sold, repaired, reindustrialized, recycled or disposed of. So, operations managers' objectives should not be restricted to burning retrieved products. Instead, products must be reused (Heizer et al., 2017; Govindan et al., 2015). So, because of regulations imposed on the environment, in response to resource consumption and waste absorption, organizations made efforts to support the ecological efficiency of the inbound supply chain system (Hosseini et al., 2014). One of those attempts is (the reuse) relying on reverse logistics philosophy. Researchers consider the reverse logistics process as a concept that helps reduce manufacturing costs and constrain environmental pressures, aiming to remanufacture in reverse. It plays an important role in reducing waste and establishing an eco-friendly manufacturing environment (Alnoor et al., 2019).

Reverse logistics operations are crucial because they help prevent pollution and save energy. Therefore, they may lead to sustainability and green manufacturing; businesses prefer to change their focus from product revenue to logistics and the reverse supply chain of import supply chain in the present day (Krajewski et al., 2013). This led to the proliferation of maintenance and repair centres. In addition to technology that determines reverse logistics enabling slavish management, businesses are expected to deploy technology that regulates the transportation of commodities (Vijayan et al., 2014). This approach assists businesses in reviving environmental systems and products via a porous supply chain for recycled materials (Bansia et al., 2014).

Consequently, reverse logistics must be a part of an organization's workplace strategy, although the active programs of the imports supply chain, where significant changes have prompted management to view competitive issues as porous reactions to the environment, and

that it contributes to an increase in weapons manufacturing that is sustainable (Anoor et al., 2019). In addition to the ability to match consumer expectations and create value, the reverse logistics process could give a company a competitive advantage by securing market share. When developing an eco-friendly industrial environment also cuts expenses. Numerous studies have demonstrated that reverse logistics helps organizations improve their operations by discovering and eliminating weaknesses in the import supply chain (Kumar et al., 2019).

Researchers and practitioners have consistently ignored the reverse flow of supply networks in favor of focusing on the forward flow. The forward supply chain has been broadened to encompass the reverse flow of goods from the point of consumption to the origin. In recent years, the importance of reverse logistics has grown, and more companies are adopting it as a strategic tool for economic gains and brand image. In addition, companies have discovered that a better understanding of product returns and efficient Reverse Logistics can provide a competitive advantage. There is no consensus about the timing of RL system adaptation and deployment, even though many industries acknowledge that RL is crucial for sustainable competitiveness. General Motors, Canon, Dell, and Hewlett-Packard are among the companies that have profited from RL. Kodak can reuse up to eighty per cent of discarded camera components. The possible advantages of RL implementation in the publishing industry were investigated. (Agrawal et al., 2015)

2.2.2 Stakeholder Influence

Stakeholders are persons or groups who rely on the organization to achieve their objectives and on whom the organization, in turn, depends. (CIPS, 2019). Internal stakeholders, connected stakeholders, and external stakeholders are examples of stakeholders. Among the stakeholders

under consideration are employees, top management, regulatory authorities, financiers, customers, suppliers, pressure groups, and professional bodies.

2.2.2.1 Top Management Support

Top management consists of a company's senior-level managers or those roles with the majority of critical tasks. Top managers in various firms typically utilize job titles such as Chief Operating Officer (COO) of the company, Chief Executive Officer (CEO) of the company, Chief Financial Officer (CFO) of the company, President, and Vice President. Typically, top management consists of multiple company-level managers. These managers are responsible for all the tasks in the company. Typically, these managers are the staff members' supervisors. These managers have a significant impact on logistical operations. Similarly, managers are included in the logistics company's senior management alongside the CEO. These managers oversee the entire organization. (Nampinyo et al., 2022). This executive leadership is involved with reverse logistics. According to prior research, reverse logistics and top management have a significant association (Garca-Sánchez et al., 2019; Jeenanunta et al., 2018; Ye, Zhao).

2.2.2.2 Government Environmental Regulations

Concerning demand from regulatory stakeholders, the firm enhances its environmental performance for institutional reasons, i.e., acquiring legitimacy and accessing resources inside the social system in which it operates (Castello & Lozano, 2011; Ho llerer, 2013). Firms respond to regulatory stakeholder pressure on environmental issues by enhancing their environmental performance and social legitimacy. Indeed, regulatory stakeholders are progressively adopting rigorous environmental laws to compel businesses to incorporate environmental performance improvements into their operations. They can enact laws and regulations that affect businesses' operations and levy taxes and other financial costs on

businesses (Guerci et al.,2015). In the absence of such incentives, governments may decrease or halt the flow of resources to businesses and expose them to public scrutiny, undermining their social legitimacy. In this manner, regulatory stakeholders can actively influence companies' decisions to enhance their environmental performance. As a result of these challenges, businesses reevaluate their strategic approaches to the natural environment to enhance their environmental performance. (Guerci et al.,2015)

2.2.2.3 Corporate Citizenship Pressure

Also known as corporate citizenship pressure, firms are under immense pressure to engage in a socially responsible manner. Corporate citizenship is the extent to which firms are socially accountable by adhering to their shareholders' legal, ethical, and economic obligations. The objective is for businesses to improve living conditions and quality of life in the communities in which they operate while remaining profitable for the benefit of their stakeholders (Abdullah and Yaaakub,2015). As the need for socially responsible businesses rises, investors, consumers, and workers are more willing to use their influence to punish companies that do not share their principles. According to research on Estonian customers, respondents would rather pay more for a product or service from a socially responsible firm than a cheaper product or service from a less responsible company (Veersalu, 2011). The Global, Socially Conscious Consumer Survey (Nielsen Company, 2012) reveals that 46% of respondents are willing to pay more for items and services offered by companies that have developed programs that give back to the community. In addition, they prefer to work for (62%) and invest in (59%) of these organizations.

2.2.2.4 Customer Pressure

There is an increasing concern for environmental conservation at present. Customers and stakeholders, including shareholders, the government, non-governmental organizations (NGOs), and other pressure groups, will likely exert significant pressure on businesses to employ reverse logistics. Because consumers are willing to pay extra for environmentally friendly items, businesses must embrace the finest reverse logistics methods or risk losing market share (Abdullah and Yaakub, 2015). One of the finest practices to embrace is the proper disposal of end-of-life products, which could negatively influence the environment if not disposed of correctly. The public's concern for the environment should not be perceived as a problem but as an opportunity for businesses to increase their profits by marketing green products. Reverse logistics adoption also necessitates a return policy that allows customers to return products for any reason. It may also involve the replacement of damaged or faulty goods, the recall of products, and the provision of maintenance and repairs. Therefore, logisticians must prioritize efficient returns management, as efficient after-sales services will boost customer satisfaction (Shaharudin et al., 2019).

2.2.3 Information Systems

Numerous past studies have examined information systems in the logistics and supply chain areas. These topics included adoption willingness, outcomes, and requirements (Panayides, 2017; Tsai et al., 2018, Saxe, 2018). Information technology partially dictates new directions in terms of logistics and supply chain management (Li, 2014). Moreover, port adoption and utilization of information systems tend to boost competitiveness (Panayides, 2017).

Adoption and judicious implementation of digital technologies in different logistics operations enable the attainment of competitive advantages (Bhandari, 2014; Choy et al., 2014). From

optimized resource planning and warehouse management systems to intelligent transportation systems, digital technologies influence and support the logistics industry in various activities while information and data security gain increasing importance (Barreto et al., 2017; Kayikci, 2018; Oleków-Szapowicz & Stachowiak, 2018). Enabling technologies also known as digital technologies are seen as accelerators or facilitators for digital transformation or Industry 4.0 in the industrial sector. Thus, current research efforts aim to identify innovative technologies anticipated to aid the digital transition in the context of the digital transformation of the logistics industry.

2.2.3.1. Electronic Data Interchange (EDI) Adoption

Electronic Data Interchange (EDI) is the exchange of data or electronic documents, such as invoices, bills of lading, and purchase orders, between computer systems in multiple organizations based on a standardized, recoverable, and formatted standard. EDI is the primary application that bolsters e-business; almost two hundred thousand businesses use EDI as part of their e-business operations. (Moldabekova et al., 2021)

There are numerous advantages to utilizing EDI. First, customers and suppliers can engage in the same time zone, reducing procurement time. EDI-connected suppliers can facilitate information exchange between customers, suppliers, distributors, and other trade partners (Rabbani et al., 2019). This arrangement enables all parties to be more responsive to market conditions, gaining a competitive edge. Second, the implementation of EDI permits instant access to pertinent information, resulting in enhanced customer service. Thirdly, EDI is recognized to increase transaction accuracy, accelerate payments, facilitate customs compliance, and simplify the complexities of global trade. Reverse logistics requires electronic

data to facilitate communication between logistics service providers and customers. (Moldabekova et al., 2021)

2.2.3.2 Blockchain Adoption

Blockchain is a mechanism for documenting transactions in numerous databases distributed across numerous computers with identical records on each. With this decentralized transaction record, it is nearly impossible to hack or unilaterally alter the record without owning the majority of databases or computers. The blockchain is shared, distributed, and synced to simplify the recording and tracking of business network assets. Intangible assets include intellectual property, energy, patents, and copyrights. Tangible assets include houses, automobiles, money, and land. A blockchain network enables the tracking and trading of virtually every value aspect (Chung et al., 2019). Blockchain comprises data that cannot be altered and is digitally stored in blocks. To prevent manipulation, these blocks are distributed over multiple servers in a public or private peer-to-peer network and kept in a chain. All parties require a certified consensus protocol for database synchronization, content agreements, and blockchain transactions (Brakeville & Perepa, 2018). Protocols efficiently handle hazards connected with entries on the blockchain, such as multiple or allowed expenditures, which let only specified parties submit and validate transactions, or public and undeliverable, which permit everyone to send transactions and participate in validating networks. In addition, a hybrid variant exists. These alternatives present various risk management issues.

Investment Return (ROI) and company value loss are risks associated with blockchain implementation (Drljevic et al., 2020), as are unsustainable consumption scenarios (Drljevic et al., 2020; Kim & Kang, 2017). It is also causing a lack of awareness of the potential of technology, which is directly related to the absence of standards and requirements and the

demand for engineering practices in any existing situation (Drljevic et al., 2020; Sayyadi & Awasthi, 2020). There is currently a dearth of studies on the usage of blockchain in humanitarian logistics. Blockchain technology is only applicable to conventional logistics.

2.2.3.3 Radio Frequency Identification (RFID) Adoption

Radio Frequency Identification (RFID) is a technique that employs communication via electromagnetic waves to exchange data between terminals and objects for identification and trace tracing using a device called an RFID tag. RFID enables an unprecedented display of assets and stock throughout the supply chain. Several industries, including manufacturing, retail, distribution, and transportation, may undergo significant changes (Hao et al., 2018; Sayyadi & Awasthi, 2018; Tsao, 2015). RFID talks now centre on RFID implementation's technical and administrative issues (Waters, 2013).

However, research shows an imbalance of research that supports aspects of technology explicitly. A recent literature review on RFID found a comprehensive source of information about RFID adoption technical aspects. Still, it lacked RFID adoption in the supply chain context (Waters, 2013). The use of RFID will be necessary for these companies. Research on RFID as one of the variables influencing the ease of tracking goods in logistics is still not done. (Moldabekova et al., 2021)

2.2.4 Supply Chain Performance

Supply chain performance is one of the most difficult topics in the literature on supply chain management (Neely, 2005; Bhagwat and Sharma, 2009; Martinez, Pavlov, and Bourne, 2010; Bititci, Firat, and Garengo, 2012, Fatorachian and Kazemi, 2020). Najmi and Makui (2012) evaluate the performance of the supply chain by analyzing its adaptability, dependability,

responsiveness, quality, and asset management. Similarly, Bourlakis et al. (2014) evaluate performance measures associated with adaptability, effectiveness, responsiveness, and quality. Following a different methodology derived by Dreyer et al. (2016), performance enhancements can be measured in terms of variety, innovation, time, price, and availability. Information exchange is crucial for managing supply chain partnerships and achieving performance success (Baihaqi and Sohal, 2013). Companies are investing in technological advances to build effective communication channels and collaboration mechanisms and afterwards to improve supply chain performance through better information sharing to assure effective information sharing (Govindan, Mangla, and Luthra 2017).

2.3 Theoretical Review

The theories underpinning the study are the Stakeholder Theory, Diffusion of Innovation theory and Resource-Based Theory.

2.3.1 Stakeholder Theory

The stakeholder theory has gained considerable attention in the literature on green sustainability (Sarkis et al., 2010; Yu & Ramanathan, 2014), and as a result, it is used to describe how different stakeholders push enterprises to implement RL. A stakeholder is a person or group (inside or outside the business) who can influence or be influenced by the company's operations. Stakeholders include employees, top management, consumers, competitors, the media, suppliers, the government, the community, and non-governmental groups. Reverse logistics and supply chain performance are two critical elements that impact the success of any organization. Stakeholder theory suggests that organizations must consider the interests of all stakeholders, including customers, suppliers, employees, shareholders, and the broader community. In the context of reverse logistics and supply chain performance,

stakeholders have different interests and needs that organizations must address to ensure their satisfaction. For example, customers may be interested in the sustainability of the organization's supply chain, including how the organization handles the reverse logistics of returned products. Suppliers may be interested in the organization's efficiency in managing returns and minimizing costs. Employees may be concerned about job security and the impact of reverse logistics on their workload. Shareholders may be focused on the financial performance of the organization and the impact of reverse logistics on profitability. Therefore, organizations must adopt a stakeholder-oriented approach to reverse logistics and supply chain performance. This approach involves engaging stakeholders, identifying their needs and interests, and developing strategies that meet their expectations. The organization must ensure that all stakeholders are satisfied to achieve sustainable and long-term success.

2.3.2 Diffusion of Innovation

Given the rich and extensive history regarding technology acceptance and diffusion of innovation (Davis et al., 1989; Venkatesh et al., 2003) combined with recent research in the area of supply chain innovation diffusion (Hazen et al., 2012), it follows that there may be a link between the reasons why an Information System (IS) is adopted and the degree to which it is utilized. Therefore, the study turns to the Diffusion of Innovation theory as a complement to IS Success theory in the context of RL. The diffusion of innovation theory suggests that the adoption and implementation of new ideas, practices, or technologies are influenced by various factors, including the perceived benefits, complexity, compatibility, observability, and trialability of the innovation. In the context of reverse logistics and supply chain performance, the adoption and implementation of information systems play a vital role in achieving success. Information systems can enhance the efficiency and effectiveness of reverse logistics and supply chain performance by providing real-time data, automating processes, and improving

communication and collaboration among stakeholders. However, the adoption and implementation of information systems may face resistance due to various factors, such as the complexity of the technology, lack of compatibility with existing systems, and the perceived cost.

Therefore, organizations must consider the diffusion of innovation theory when implementing information systems for reverse logistics and supply chain performance. The organization must identify the perceived benefits of the information system, communicate the compatibility of the system with existing processes, and ensure that the system is user-friendly and easy to trial. This approach can increase the adoption and implementation of information systems, leading to improved reverse logistics and supply chain performance.

2.4 Empirical Review

An empirical review examines relevant prior empirical research to address a research question. To reach conclusions, empirical research uses hard facts rather than assumptions, hypotheses, or preconceptions. This section empirically reviews pertinent literature on reverse logistics.

Alshamsi and Diabat (2015) in a study, suggested a mixed integer linear program (MILP) to solve the complicated network design of an RL system, which determines the optimal selection of sites, inspection center capacities, and remanufacturing facility capacities. Moreover, they addressed crucial transportation considerations by providing the option of employing an in-house fleet as well as outsourcing, which is one of their most significant contributions. In addition, they considered the initial investment, which limits fleet or center growth spending in the subsequent time periods. The model was applied to a real-world situation, and the results were presented.

Prajapati et al. (2018) thoroughly assessed the extant literature on reverse logistics, identifying research gaps and establishing future research goals. This literature evaluation utilized the Content Analysis technique and an Abductive research approach. In a well-known database, 449 relevant publications with the term “reverse logistics” in their title, abstract, and keywords are picked. Based on their structural dimensions and contents, these papers were painstakingly analyzed and classified into eleven categories. The literature review demonstrates the increasing interest of industrialists and academics in this field. This is due to government restrictions regarding end-of-life components, heightened consumer knowledge regarding the environment and society, economic rewards, and an enhanced business image.

In a study, Agrawal and Murtaza (2016) incorporated the relationship between reverse logistics and economic, environmental, and social sustainability, also known as the triple bottom line, and produced a methodology for evaluating reverse logistics performance. The weights, global weights of performance measures, and the reverse logistics performance index were estimated using the Fuzzy Analytical Hierarchy Process and Extent Analysis Method. The performance measures were chosen based on the triple bottom line approach, and the Fuzzy Analytical Hierarchy Process and Extent Analysis Method were used to calculate the weights and global weight. To illustrate the methodology, the reverse logistics performance of three electronic companies was examined and contrasted. The results indicate that the highest performance index is associated with economic success, followed by environmental and social performance. Higher performance indices are associated with “recapturing value” and “return on investment” from an economic perspective, “minimal energy consumption” and “optimum use of raw materials” from an environmental perspective, and “community complaints” and “customer health and safety” from a social perspective. Overall, the performance indices for “reduced packaging,” “use of recycled material,” and “employee benefits” are quite low.

Bazan et al. (2015) reviewed the literature on the modelling of reverse logistics inventory systems based on the economic order/production quantity (EOQ/EPQ) and the joint economic lot size (JELS) settings to systematically analyze the mathematics involved in capturing the primary characteristics of associated processes. The literature was reviewed and categorized based on the challenges encountered and the modelling assumptions. Environmental concerns receive special consideration. There were suggestions that the mathematics of reverse logistics models must adapt to the present “greening” of inventory and supply-chain models. For the development of reverse logistics models, modelling waste disposal, greenhouse gas emissions, and energy consumption during production is the most critical need. Presented is an illustration of modelling reverse logistics inventory models with environmental concerns.

In a 2016 study, Ayvaz et al. suggested a generic Reverse Logistics Network Design model under the uncertainties of return amount, sorting ratio (quality), and transportation cost. They presented a generic multi-echelon, multi-product, and capacity-constrained two-stage stochastic programming model to account for uncertainties in Reverse Logistics Network Design for third-party electrical and electronic equipment recycling enterprises to optimize profit. They validated the developed model by applying it to a real-world case study of a Turkish company that recycles electrical and electronic equipment waste. The method of average sample approximation was utilized to solve the model. The results indicate that the two-stage stochastic programming model gives adequate solutions for making efficient decisions in quantity, quality, and transportation cost uncertainty.

Pushpamali et al. (2020) investigated the perceived impact of reverse logistics methods on supply chain performance metrics, such as cost, quality, time, flexibility, and the environment. We performed semi-structured in-depth interviews with fifteen top industry professionals from Southeast Queensland, Australia. The analysis of interview transcripts involved coding,

classifying and determining the interrelated links between concepts. According to experts, reverse logistics procedures substantially reduce the cost of acquiring goods compared to new supplies. When employed materials match industry criteria, they are intended to function similarly without harming the construction schedule or the quality of the project as a whole, all while safeguarding the environment. However, adaptability is seen as quite challenging. It is conceivable that reverse logistics will be useful in the building if the emphasis on used material quality and acceptance criteria is significant.

Afum and Zhuo (2019) investigated the relationship between reverse logistics and business performance, with a competitive advantage as a mediator. Using stratified sampling, the study chose 187 logistics, procurement, and production managers from Ghanaian bottle and sachet manufacturers. The study's primary data collection instrument was a questionnaire. All hypotheses were examined using PLS-SEM and SMART PLS 3 software. The study found that reverse logistics affects competitive advantage and firm performance positively and significantly. The studies also revealed that competitive advantage has a favorable and substantial effect on company performance. In addition, the results demonstrated that competitive advantage plays an important mediating function between reverse logistics and business performance. The study's findings give managers a framework for holistically considering and integrating reverse logistics into their supply chains to gain a competitive advantage and enhance their performance.

Afum et al. (2019) evaluated the perceived stakeholder influence on reverse logistics (RL) adoption and how the adoption of RL impacts supply chain performance, focusing on the Ghanaian manufacturing sector. For the study, a total of 193 operation, logistics, and production managers were selected using stratified sampling. As the major data-gathering tool, a structured questionnaire was employed. Using Partial Least Squares structural equation

modelling, formulated hypotheses were examined. All stakeholder variables (top management support, corporate citizenship pressure, and customer pressure) significantly impact RL adoption, except environmental regulations. Furthermore, RL improves the performance of the supply chain. To improve their supply chains, the results provide strategic insight for managers to willingly promote RL and establish effective product return policies that satisfy customers' and society's "greening" expectations.



LITERATURE REVIEW TABLE FOR STUDIES ON REVERSE LOGISTICS ADOPTION AND SUPPLY CHAIN PERFORMANCE

<i>Author /year of publication</i>	<i>Country</i>	<i>Constructs/Concepts used</i>	<i>Purpose of the Study/Research Objectives</i>	<i>Methodology</i>	<i>Underlying theoretical framework</i>	<i>Key findings</i>	<i>Identified Gap</i>
Banihashemi et al (2019)		Reverse logistics Sustainability performance	To provide a comprehensive review of the literature to evaluate the performance of the RL process based on the three dimensions of sustainability, including environmental, economic and social aspects.	Content analysis	Institutional theory	Most of the studies have focused on the performance evaluation of RL by considering the factors associated with economic and environmental performance.	Finding empirical evidence on how each disposition option may impact sustainability performance. The social aspect of RL has been overlooked and requires investigation due to its contribution to positive social outcomes.
Afum et al., (2019)	Ghana	Reverse Logistics, Stakeholder Influence Supply Chain Performance	Assessing the perceived stakeholder influence on reverse logistics (RL) adoption and further examining how the adoption of RL influences supply chain performance	- A survey- - Structural equation modelling	Stakeholder theory	All the stakeholder variables (top management support, corporate citizenship pressure and customer pressure), except for environmental regulations, strongly influence Reverse logistics adoption.	Results cannot be generalized due to the relatively small sample size Studies should be conducted to test the moderating effect of organizational culture or

						Supply chain performance is enhanced through Reverse Logistics.	information systems on the RL and supply chain performance relationship.
Ferrando et al., (2021)		Circular economy-based reverse logistics Sustainable resource commitment Financial performance	To propose a circular economy-based reverse logistics (CERL) that emphasizes the mediation effect of reverse logistics (RL) on sustainable resource commitment and financial performance.	- Survey - Structural equation modelling	Resource-Based View (RBV)	The results confirm that CERL acts as an essential intervening entity between resources and financial performance	The study only deals with global product return and recovery in the automotive sector Development of strategic circular business models based on concepts of circular economy and Industry 4.0
Turrise et al., (2012)	Europe	Reverse Logistics Supply chain performance	To examine the impact of reverse logistics capabilities on firm performance and mediating role of logistics strategies.	Structural equation modelling		The variability of reverse flow in a closed loop SC increases the serviceable inventory variance. However, a proper reverse flow design considerably improves global performance.	A math model described a closed loop supply chain (CLSC). No empirical analysis is provided.

Vlachos (2016)	China	Reverse logistics capabilities Firm Performance Business strategy	To build upon the information processing view of risk management and explore the association between supply chain integration (SCI) and supply chain risk management	• Survey • Mediated hierarchical regression	• Resource-based view • Transaction cost economics • Institutional theory	Reverse logistics capabilities influence firm performance.	The study does not cover every facet of reverse logistics, but it could be considered as a first comprehensive step towards the development of the theoretical domain of reverse logistics
Huang and Yang (2014)	Taiwan	Reverse logistics innovation, institutional pressures organizational performance	To examine the relationship between RL innovation and environmental and economic performance while incorporating institutional theory to verify how institutional pressures moderate these relationships.	• Survey • Hierarchical regression	• Institutional theory • Resource-based View (RBV)	Reverse Logistics innovation is positively associated with environmental and economic performance. Three institutional pressures positively moderated the relationships between Reverse Logistics innovation and environmental performance.	This study focuses on the economic and environmental aspects of RL activities. Future studies should apply the RL perspective on social sustainability to probe Reverse Logistics issues from sustainability environmental, social and economic points of view.

Source: Researchers Construct (2022)

2.5 Conceptual Framework and Hypothesis Development

A conceptual framework results from a researcher's reasoning or tentative conclusion. The conceptions reached are based on a literature survey in which evidence is insufficient or theories reached are inadequate. It is a compilation of interconnected ideas that provides a complete understanding of a phenomenon. (Roginiel, 2020)

In a conceptual framework, the researcher must put the concepts together as in a jigsaw puzzle. The researcher examines how all the concepts fit together and relate to one another. The first stage of theorizing identifies and clarifies concepts; the second stage concentrates on the connections and relationships between the concepts. A conceptual framework comprises patterns of concepts and their interconnections (Fisher et al., 2010). The study presents six (6) hypotheses as depicted by the conceptual framework. The study's first hypothesis (H1) is that top management support positively and significantly affects reverse logistics adoption. The study's second hypothesis (H2) is that environmental regulations positively and significantly influence reverse logistics adoption. The study's third hypothesis (H3) is that corporate citizenship pressure positively and significantly influences reverse logistics adoption. The study's fourth hypothesis (H4) is that customer pressure positively and significantly affects reverse logistics adoption. The study's fifth hypothesis (H5) is that reverse logistics adoption positively and significantly influences supply chain performance. The study's sixth hypothesis (H6) is that information systems (IS) positively and significantly moderate the relationship between reverse logistics adoption and supply chain performance.

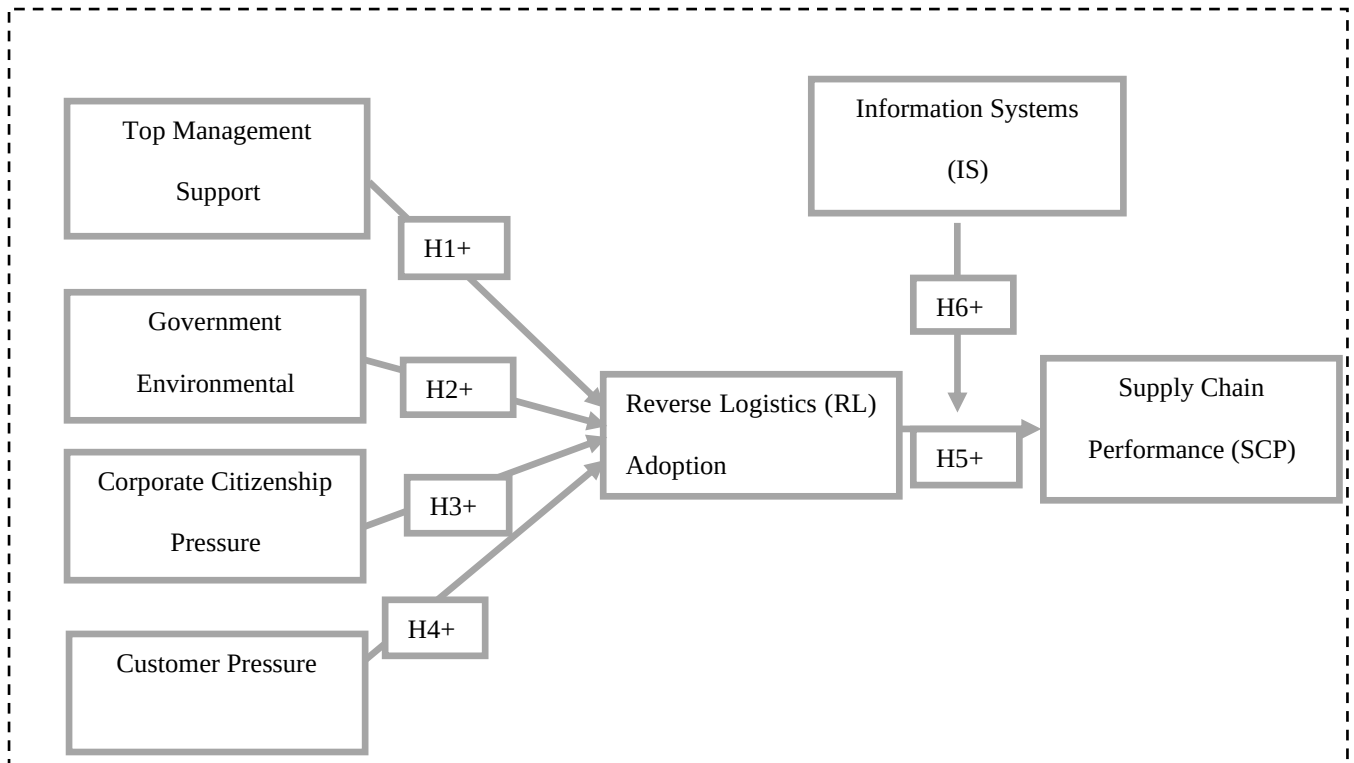


Figure 2.1 Conceptual Framework

2.5.1 Top Management Support and Reverse Logistics

An organizational strategy is developed with significant input from the top management. If RL is being used as part of a green project or plan, that indicates the initiative has the backing of upper management. Support from upper management is perhaps the most important factor in RL's widespread implementation since it guarantees the system's success by outlining its goals and vetting its product-returning mechanism (Huscroft, 2008). Examples of Ghanaian industrial companies whose top executives have shown considerable support for green programs, particularly RL, are Nelplast Ghana Ltd., Voltic Ghana Ltd., and Accra Brewer Ltd. (plastic return, reuse and recycling policies).

Several empirical investigations have examined how encouragement from above can benefit RL. Shafiq and Naqvi (2012) revealed that success in RL adoption depends on strategic attention and backing from upper management. Another reason why RL often fails is because of apathy and lack of backing from upper management, as Sharma et al. (2011) pointed out. It may be extrapolated from the existing empirical research that the backing of upper management has an actual and apparent impact on the spread of RL.

Stakeholder theory suggests that organizations should consider the interests and needs of all stakeholders involved in their operations, including suppliers, customers, employees, and the wider society. In the case of reverse logistics adoption, top management support can be seen as a means of fulfilling stakeholders' needs and interests. For example, top management support can demonstrate the organization's commitment to sustainability, which is an important concern for many stakeholders. This support can also provide the necessary resources and authority to initiate and implement reverse logistics processes, which can benefit various stakeholders by reducing waste, improving efficiency, and enhancing customer satisfaction. The diffusion of innovation suggests that the adoption of new practices such as reverse logistics, can be influenced by various factors, including the perceived benefits, compatibility with existing practices, complexity, and observability. Top management support can play a crucial role in addressing these factors by providing clear communication, training, and incentives that highlight the benefits of reverse logistics adoption, aligning it with existing practices and values, and reducing the complexity and uncertainty associated with the change. In this way, top management support can facilitate the diffusion of reverse logistics innovation throughout the organization.

H1: Top Management Support has a positive and significant relationship with reverse logistics adoption.

2.5.2 Environmental Regulations and Reverse Logistics

Governments and other government bodies adopt environmental rules that require firms to employ green practices such as RL. Clear environmental rules in Europe require industrial businesses to undertake ecologically friendly practices. Typical is the Waste Electrical and Electronic Equipment (WEEE) directive, which mandates that manufacturers of electrical and electronic goods collect, recycle, and recover their products (Govindan et al., 2015). Stakeholder theory suggests that organizations should consider the interests and needs of all stakeholders involved in their operations, including the environment, regulators, customers, suppliers, and employees. In the case of reverse logistics adoption, environmental regulations can be seen as a means of fulfilling environmental stakeholders' needs and interests by reducing waste, emissions, and other negative impacts on the environment. Moreover, environmental regulations can enhance the organization's reputation and legitimacy by demonstrating its compliance with legal and ethical standards, which can attract customers, investors, and other stakeholders. The diffusion of innovation theory suggests that the adoption of new practices, such as reverse logistics, can be influenced by various factors, including the perceived benefits, compatibility with existing practices, complexity, and observability. Environmental regulations can play a crucial role in addressing these factors by providing clear standards and incentives that promote adopting sustainable practices, including reverse logistics. For example, environmental regulations can require manufacturers to take back end-of-life products, creating opportunities for reverse logistics adoption by facilitating the recovery, reuse, or recycling of these products. Therefore, the stakeholder theory and diffusion of innovation theory suggest that top management support has a positive and significant relationship with reverse logistics adoption. Top management must consider the interests and needs of all stakeholders, communicate the importance and potential benefits of reverse

logistics adoption, and ensure compatibility with existing processes to enhance the likelihood of successful adoption.

Empirical studies from 2015 to 2023 provide support for the hypothesis that environmental regulations positively and significantly influence reverse logistics adoption. For example, a study by Zhang and colleagues (2018) found that environmental regulations in China were positively associated with the adoption of reverse logistics practices by manufacturers. Similarly, a study by Wu and colleagues (2015) found that environmental regulations in Taiwan were positively associated with the adoption of closed-loop supply chain practices, including reverse logistics. However, some studies suggest that environmental regulations can also pose challenges and barriers to reverse logistics adoption, such as increased costs, complexity, and uncertainty (e.g., Fang et al., 2020).

Prior studies (Darnall et al., 2008; Laosirihongthong et al., 2013) have shown that most businesses utilize green practices such as RL to avoid sanctions and legal penalties related to environmental laws. In other regions of Malaysia, Abdullah and Yaakub (2017) found that regulatory pressure significantly impacted the adoption of RL. Somuyiwa and Adebayo (2014) revealed that environmental regulations compel Nigerian businesses in the food and beverage industry to implement RL practices and product return operations. Therefore, the second hypothesis was proposed:

H2: Environmental Regulations have a positive and significant relationship with reverse logistics adoption.

2.5.3 Corporate Citizenship Pressure and Reverse Logistics

Companies work within a community, not in a vacuum. Therefore, community members exert increasing pressure on businesses to act socially responsibly. Once firms engage socially responsibly in response to community expectations, they are regarded to have fulfilled their corporate citizenship responsibilities. Corporate citizenship is an organization's contribution to the local community or society. Corporate citizenship is defined by lvarez-Gil et al. (2007) as a company's "extended obligation" toward the totality of society. These additional responsibilities may involve environmental efforts, humanitarian initiatives, and ethical obligations. It is essential to acknowledge that firms do not abandon business objectives to meet corporate citizenship standards. Some Ghanaian industrial companies have demonstrated exemplary corporate citizenship by educating their employees about environmentally conscious practices, strategically placing waste bins to collect plastics and other solid wastes and intensifying their recycling efforts.

Corporate citizenship pressure refers to the expectations and demands of stakeholders, including customers, employees, suppliers, and the community, for organizations to act in a socially responsible and environmentally sustainable manner. In the context of reverse logistics adoption, stakeholders play a crucial role in the success of the adoption process. Stakeholder theory suggests that organizations must consider the interests and needs of all stakeholders when making decisions. Corporate citizenship pressure can positively influence the adoption of reverse logistics practices by increasing the awareness and importance of sustainability and environmental responsibility among stakeholders. Organizations that adopt reverse logistics practices can improve their environmental performance, reduce waste, and contribute to the broader sustainability agenda. Therefore, by adopting a stakeholder-oriented approach,

organizations can positively influence the adoption of reverse logistics practices by responding to corporate citizenship pressure and meeting the needs and expectations of their stakeholders.

The diffusion of innovation theory suggests that the adoption and implementation of new ideas, practices, or technologies are influenced by various factors, including corporate citizenship pressure. Corporate citizenship pressure can positively impact the adoption of reverse logistics practices by increasing the perceived benefits and compatibility of the adoption process. Organizations that adopt reverse logistics practices in response to corporate citizenship pressure can improve their environmental performance and contribute to the broader sustainability agenda. This can enhance the perceived benefits of reverse logistics adoption, motivating employees and other stakeholders to embrace the adoption process. Moreover, organizations that respond to corporate citizenship pressure can ensure that the adoption process is compatible with existing processes and aligned with the organization's strategic goals.

By adopting RL, industrial firms display outstanding corporate citizenship. This view is supported by Govindan et al. (2015), who noted that promoting corporate citizenship is one of the key reasons organizations use RL. However, Abdullah and Yaakub (2017) found that the importance of corporate citizenship was very low among Malaysian industrial enterprises, resulting in a small effect on adopting and improving RL activities. This study focuses on the environmental aspect of corporate citizenship because the adoption of Responsible Leadership is considered a community-driven green project.

H3: Corporate Citizenship Pressure has a positive and significant relationship with reverse logistics adoption.

2.5.4 Customer Pressure and Reverse Logistics

Customers are arguably the most crucial stakeholder in every business, as revenue generation depends on them. According to Karel and Ales (2012), a firm's product offerings are intended for customers; hence, businesses need to prioritize the demands and concerns of customers. The level of client awareness regarding sustainability issues continues to rise with each passing day. Consequently, modern customers expect businesses to offer products and consider green efforts in their operations.

According to stakeholder theory, a firm's decisions and actions are influenced by its various stakeholders, including customers. If customers are putting pressure on a firm to adopt reverse logistics practices, the firm may be more likely to do so to meet the expectations of its customers and maintain positive relationships with them. This could be because customers are becoming more environmentally conscious and are demanding more sustainable practices from the companies, they do business with. In this way, customer pressure could be seen as a driving force behind the adoption of reverse logistics practices. According to the diffusion of innovation theory, the adoption of new practices or technologies is influenced by a variety of factors, including the perceived relative advantage of the innovation, its compatibility with existing practices, the complexity of the innovation, and the observability of its benefits. In the context of reverse logistics adoption, customer pressure could be seen as a factor that increases the perceived relative advantage of the innovation. If customers are demanding more sustainable practices, firms may see reverse logistics as a way to gain a competitive advantage and differentiate themselves from their competitors. Additionally, customer pressure could increase the observability of the benefits of reverse logistics, as firms that adopt these practices may be seen as more environmentally responsible and may receive positive publicity as a result.

Sarkis et al. (2010) affirm that customers prefer to purchase products from companies whose activities meet environmental quality criteria. This typically exerts significant pressure on businesses, notably those in Ghana's manufacturing sector. Adopting RL practices is an apparent method for businesses to respond positively to this customer expectation. According to Trivedi et al. (2018), consumers are always willing to spend more on eco-friendly goods, causing businesses to follow the best RL efforts to maintain or expand market share. Consistent with the preceding argument, a fourth hypothesis was proposed:

H4: Customer Pressure has a positive and significant relationship with reverse logistics adoption.

2.5.5 Reverse Logistics and Supply Chain Performance

In recent years, the complexity of firms' supply chains has prompted the implementation of RL. This is primarily due to the perceived benefits RL provides to businesses. Effective management of RL practices reduces logistics and operating expenses while enhancing supply chain performance. RL offers a more affordable way to acquire new raw materials from vendors. This helps manufacturing companies minimize production costs and inventory shortages, amongst others. (Turrisi et al., 2013).

According to stakeholder theory, a firm's decisions and actions are influenced by its various stakeholders, including suppliers, customers, and regulators. In the case of reverse logistics, suppliers may be a key stakeholder in the decision to adopt reverse logistics practices. By adopting reverse logistics practices, firms may be able to better manage their product returns and recover valuable materials, which can reduce waste and costs. This could lead to better relationships with suppliers who are also interested in reducing their waste and costs. Thus, by adopting reverse logistics practices, a firm may improve its supply chain performance and

maintain positive relationships with its suppliers. According to diffusion of innovation theory, the adoption of new practices or technologies is influenced by various factors, including the perceived relative advantage of the innovation, its compatibility with existing practices, the complexity of the innovation, and the observability of its benefits. In the case of reverse logistics adoption, it can be seen as an innovation that has the potential to bring about a relative advantage, by enabling firms to recover and reuse materials, reduce waste, and create a more sustainable supply chain. This can be seen as a competitive advantage for firms, as it allows them to differentiate themselves from competitors who may not be as sustainable. Reverse logistics adoption can also be compatible with existing practices, as it can be integrated into existing supply chain processes. The benefits of reverse logistics adoption can also be observable, as firms that adopt these practices may be able to track and report their sustainability improvements, which can provide positive publicity and build customer loyalty.

Mandota (2015) identified RL as an important predictor of the supply chain performance of industrial enterprises in Malawi. Specifically, the study found that adopting RL influences profitability and business growth, reduces the cost of acquiring additional raw materials, and increases firm competitiveness through efficient use. The introduction of the RL variable (product returns, product repairs, and end-of-life management) had a considerable impact on supply chain performance, according to David and Shalle (2014). The initial hypothesis was proposed by drawing conclusions from empirical studies.

H5: Reverse logistics adoption has a positive and significant relationship with supply chain performance.

2.5.6 The Moderating Role of Information Systems (IS)

Information is one of the most valuable assets of any company; due to its great and essential worth, information should be adequately safeguarded (Doherty and Fulford, 2015). Information is frequently utilized to direct the processes of personnel at the operational level and below. Decision-making is a crucial process based on data processing (Gerber, R. von Solms, 2011). In the current volatile and competitive environment, the survival and success of organizations depend on the optimal utilization of technologies and information systems that can facilitate internal process management and contribute to adaptation to market changes and rapid responsiveness to customer needs by ensuring the appropriate degree of flexibility. (Agarwal and Shankar, 2016). Stakeholder theory proposes that an organization has obligations to its shareholders and other stakeholders, including customers, employees, suppliers, and the broader society. Reverse logistics adoption and supply chain performance can impact multiple stakeholders, and adopting information systems can moderate this relationship. Adopting information systems can help organizations better manage their reverse logistics activities and improve their supply chain performance. For example, information systems can help track returned products, manage inventory levels, and optimize transportation routes, leading to cost savings and improved customer satisfaction. This can benefit both the organization's shareholders and other stakeholders, such as customers and suppliers. Diffusion of innovation theory suggests that adopting new technologies or practices can spread through a social system over time. In the context of this hypothesis, the adoption of information systems can be seen as an innovation that is being diffused through the supply chain network. The rate of adoption can be influenced by factors such as perceived benefits, compatibility with existing systems, complexity, and trialability.

If an organization adopts information systems to manage its reverse logistics activities, it can serve as an example for other organizations in the supply chain network to follow suit. This can lead to a more widespread adoption of information systems and ultimately result in improved supply chain performance for all stakeholders involved. There is evidence that supply chain coordination and integration are aided by the use of integrated information technologies (Vickery et al., 2013) and IT integration capabilities (Rai et al., 2016) and that this results in enhanced company performance. Shah et al. (2012) suggests that supply chain practices, such as supply chain integration, and initiatives, such as establishing long-term strategic relationships with suppliers, necessitate extensive use of EDI and web-based interchange; therefore, the support of inter-organizational information systems. To achieve improved supply chain performance, they argue that a high (low) level of supplier integration must be paired with a high (low) level of IT integration. Reverse logistics, a component of the supply chain, can only operate efficiently if information systems are functioning properly. Thus, the study hypothesizes that.

H6: Information Systems moderate the relationship between reverse logistics and supply chain performance.

CHAPTER THREE

METHODOLOGY AND INDUSTRY PROFILE

3.1 Introduction

Methodology, as defined by Baily (2018), is “the planned procedure for performing a study.”

This chapter discusses research methodology, including research design, strategy, approach, population, sample, sampling procedure, data collection method, data analysis, reliability and validity, and ethical considerations.

3.2 Research Design

Berman (2019) defines research design as the theoretical and practical underpinnings for selecting and implementing specific research methods and approaches. When conducting a study, researchers can choose between different research designs, including descriptive, exploratory and exploratory forms. Descriptive research aims to describe or define the topic at hand. It could help researchers gauge the full breadth and depth of the research constructs (cultural orientation, e-procurement adoption and process transparency). Exploratory research is usually conducted when a researcher has just begun an investigation and wishes to understand the topic generally. A researcher wanting to simply satisfy his or her own curiosity about a topic could also conduct exploratory research. Conducting exploratory research on a topic is often a necessary first step, both to satisfy researcher curiosity about the subject and to better understand the phenomenon and the research participants in order to design a larger, subsequent study. An explanatory research design allows the researcher is trying to identify the causes and effects of whatever phenomenon is being studied. Explanatory research aims to

explain why particular phenomena work in the way that they do (Sheppard,2015). An explanatory research method was chosen for this study.

3.2.1. Research Strategy

Research strategy refers to the overall approach and plan for conducting a study, which includes the methods, procedures, and techniques used to collect and analyze data (Saunders et al., 2021). It outlines how the research questions was answered and the objectives achieved. The research strategy guides the selection of appropriate research methods and ensures the reliability and validity of the study's findings.

Research strategies encompass various approaches or methods employed to conduct research. According to Zikmund et al. (2022), common research strategies include experiments, surveys, case studies, and archival research. Each strategy has its own strengths and is suitable for different research purposes. In the case of this study, the chosen research strategy is the survey research strategy.

The survey research strategy involves collecting data from a sample of individuals or organizations using questionnaires or structured interviews (Saunders et al., 2021). It aims to gather information on attitudes, opinions, behaviors, or characteristics of the target population. Surveys often utilize closed-ended questions with predefined response options, facilitating quantitative analysis of the collected data. The survey research strategy enables the researcher to collect data from a relatively large sample size efficiently and derive statistical conclusions.

The survey research strategy is justified for this study on environmental collaboration and supply chain sustainability. By employing surveys, the researcher can gather data from manufacturing firms operating within the Greater Accra region of Ghana, which constitutes the target population (Saunders et al., 2021). Surveys allow for the collection of quantitative data

on environmental collaboration, information sharing, and supply chain sustainability, facilitating statistical analysis and hypothesis testing.

3.2.2 Research Approach

The research approach refers to the general perspective or orientation taken by the researcher in conducting a study (Saunders, 2021). It guides the overall design and execution of the research, including the methods employed to collect and analyze data. The research approach provides a framework for systematically investigating research questions and generating empirical evidence.

There are different types of research approaches available for conducting studies. According to Zikmund, (2022), common research approaches include quantitative, qualitative, and mixed methods approaches. Each approach has its own characteristics and is suited to address different types of research questions. In the case of this study, the chosen research approach is the quantitative research approach. The quantitative research approach focuses on the collection and analysis of numerical data to examine relationships, patterns, and trends (Saunders et al., 2021). It involves the use of structured measurement instruments, such as surveys or experiments, to gather data from a sample. Quantitative research employs statistical techniques to analyze the data and derive objective conclusions. It aims to generalize findings to a larger population and test hypotheses.

By utilizing this approach, the researcher can gather numerical data on environmental collaboration, information sharing, and supply chain sustainability from manufacturing firms in the Greater Accra region of Ghana (Saunders et al., 2021). The quantitative approach allows for the application of statistical analysis to examine the relationships between variables, test hypotheses, and provide generalizable findings.

3.3 Population of the Study

According to Berman (2017), a researcher's population consists of all the objects, people, or other entities that pique the researcher's interest. The population of this study consists of the manufacturing firms within the greater Accra region. Among these are the industries of aluminum smelting, oil refining, chemical and cement production, metal processing, pharmaceutical production, woodworking, and textile and garment production.

3.4 Sampling Technique and Sample Size

The research utilized a non-probability sampling strategy, a quota and convenience sampling hybrid. The sample in a non-probabilistic sampling method known as "convenience" sampling is selected from a subset of the population that is easily accessible. For convenience, the researcher elected to employ this method of collecting a representative sample. With the help of quota sampling, researchers can ensure that a certain proportion of the population is reflected in their sample. One hundred (100) manufacturing firms in the greater Accra Region of Ghana was used as the study's sample. As a result of missing, biased, or erroneous results, a quantitative study's ability to make fair conclusions with sufficient confidence is contingent on having an appropriate sample size. Most statisticians agree that 100 respondents is the minimum for obtaining reliable results. (Cleave,2021)

3.5 Sources of Data

One definition of a data source is "any item from which data is obtained for use in a study" (Bailey, 2018). According to Bailey (2018), there are two sorts of information sources: primary and secondary. However, primary sources were heavily utilized in the present investigation.

3.6 Data Collection Tools

Data collecting instruments refer to the many methods used to acquire information for analysis. Researchers can collect data through various methods, including interviews, surveys, observations, and experiments. Despite the researcher's access to other data gathering methods, semi-structured questionnaires are the most suitable for this purpose.

Variables	No. of Items	Sources
Reverse Logistics		
• Green Image	3	Khalili-Damghani et al., (2015)
• Flexibility	3	Khalili-Damghani et al., (2015)
• Quality	3	Khalili-Damghani et al., (2015)
• Responsiveness	3	Khalili-Damghani et al., (2015)
Stakeholder influence		
• Top Management Support	4	Abdullah and Yakubu (2017)
• Government Environmental Regulation	6	Abdullah and Yakubu (2017)
• Corporate Citizenship Pressure	5	Abdullah and Yakubu (2017)
• Customer Pressure	6	Abdullah and Yakubu (2017)
Supply Chain Performance		
• Financial Effect	3	Mandota (2015)
• Materials Management Effect	4	Mandota (2015)
• Environment	3	Mandota (2015)
• Competitiveness	3	Mandota (2015)
Information Systems	5	Lee and Chan (2019)

3.7 Data Analysis

Since the purpose of the research was to explain something, a quantitative approach to data analysis using statistical methods was taken. Two distinct statistical analyses were performed. In the first place, we provided a descriptive analysis, using frequency and percentages, of the study's primary sources of information. Second, descriptive analysis, which involved using statistical methods such as minimum, maximum, means and standard deviations, aimed at producing descriptive results on reverse logistics, stakeholder influence, supply chain performance and information systems. Finally, inferential analysis would be employed to draw conclusions about the relationship between reverse logistics, stakeholder influence and supply chain performance. IBM SPSS version 26 and PLS-SEM would be used to analyze the moderating role of information systems. By applying these statistical techniques, it can be known how well the study's hypotheses hold up.

3.7 Validity and Reliability

According to O'Leary-Kelly and Vokurka (2018), validity is the degree to which an assessment tool assesses the construct for which it was developed. All construct measures may be said to have to pass a validity test with a 0.5 threshold to be considered reliable. But reliability is the degree to which a scale has internal consistency. Existing measures were utilized to capture the constructs to increase the data quality and ensure reliable results. Each scale's Cronbach's alpha must be more than .70 to ensure that they are dependable for the research.

3.8 Ethical Consideration

Ethics are the moral standards that a person should observe regardless of location or time (Macchiarini, 2015). Before conducting the study, the researcher would gather the companies' concerns to verify that they correspond with the ethical issues of the study. Respondents and other participants were informed that their information would be kept confidential and anonymous and would not be shared in any way. Plagiarism is also unethical, so the study would ensure that every piece of material is appropriately cited.

3.9 Industry profile

About 24.5 percent of Ghana's GDP is comprised of the industrial sector. Due to government industrialization programs, Ghana's industrial production is increasing at a rate of 7.8 percent, making it the 38th fastest growing industrial production in the world. Ghana's most prominent manufacturing industries are electronics, vehicle, electric car, automotive, light, aluminum smelting, food processing, cement, and small commercial ship building. Due to the high-quality sand accessible in the Tarkwa mining region, a small glass-making business has also evolved. In recent years, foreign money has surged. The majority of products are for domestic consumption and export. Other industries include manufacturing food and beverages, textiles, chemicals and pharmaceuticals, and metal and wood items.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSION OF RESULTS

4.1 Introduction

This chapter presents the data analysis and research findings. The presentation is divided into six distinct sections. The first section analyses the demographics of the respondents. The second section covers the constructs' reliability and validity, the third section describes the study constructs' descriptive statistics, and the fourth section describes partial least square (PLS) structural equation modelling. The fifth section addresses the confirmation and rejection of hypotheses, while the sixth section analyses the study's findings. A questionnaire was prepared and distributed to employees of manufacturing enterprises in Greater Accra. 100 per cent of the questionnaires sent were returned, for a total response rate of 100 per cent. The one hundred responses were entered into SPSS for evaluation. The one hundred replies were entered into SPSS before being imported into SMART PLS for analysis. The results of the analyses are presented in the sections that follow.

4.2 Demographics of the Respondents

This section includes the respondent demographics to provide information on the individuals and organizations that participated in the study. The main information obtained from the respondent includes the yearly sales income of the company, the number of employees, the industry type, the job position, and the level of education.

Table 4.1 Demographics of Respondents

Variables	Items	Frequency	Percentage
Annual sales revenue	<40,000	4	4%
	80,000-120,000	9	9%
	120,000-160,000	12	12%
	160,000-200,000	17	17%
	200,000-500,000	21	21%
	500,000-1,000,000	11	11%
	>1,000,000	26	26%
Number of employees	<6	5	5%
	6-29	46	46%
	30-59	31	31%
	60-99	7	7%
	100+	11	11%
Industry type	Manufacturing	36	36%
	Financial Services	2	2%
	Oil & Gas	4	4%
	Retail	22	22%
	Telecommunication	12	12%
	Electronics and Computing	14	14%
	Machinery		
	Mining& Minerals	2	2%
	Pharmaceuticals	3	3%
	Automobile and Heavy Equipment	4	4%
	Freight forwarding	1	1%
	Photography	1	1%
	Gaming	1	1%
Job Position	Supervisor	32	32%
	Middle manager	38	38%
	Top manger	30	30%
The educational level of Respondents	Diploma/HND	28	28%
	1st Degree	48	48%
	2 nd Degree or more	24	24%

4.2.1 Annual Sales Revenue

Results show that four per cent (4%) of firms make annual sales of less than GH 40,000 cedis; nine per cent (9%) make annual sales between GH80000 and GH 120000 cedis; twelve percent

(12%) make sales revenue between GH 120000 cedis and GH160000 Cedis; seventeen teen per cent (17%) make annual sales of between GH 160000 and GH 200000 cedis; twenty one per cent (21%) make annual sales between GH 200000 and GH 500000 cedis; eleven (11%) make annual sales between GH 500000 and GH 1000000 Cedis and twenty-six percent (26%) make annual sales greater than 100000

4.2.2 Number of Employees

Results also show that six per cent (6%) of firms have less than 6 employees, forty-six per cent (46%) have employees between 6 and 29; thirty-one per cent (31%) have employees between 30 and 59 employees, seven per cent (7%) of firms have employees between 60 and 99 and seven per cent (7%) have employees more than 100.

4.2.3 Industry Type

Furthermore, according to demographic data, thirty-six per cent (36%) of the firms interviewed are in the manufacturing sector, two per cent (2%) in the financial Services sector, four per cent (4%) in the oil and gas sector, twenty-two per cent (22%) in the retail sector, twelve per cent (12%) in the telecommunication sector, fourteen per cent (14%) in the Electronics and Computing Machinery sector, two per cent (2%) in the Mining& Minerals sector, three per cent (3%) in the pharmaceuticals sector, four percent (4%) in the automobile and Heavy equipment sector, one percent (1%) in the freight forwarding sector, one percent (1%) in the photography sector and one percent (1%) in the gaming sector.

4.2.4 Job Position

As regards the job positions of respondents, it was recorded that thirty- two per cent (32%) of respondents were supervisors; thirty-eight per cent (38%) were between middle managers and thirty percent were top managers.

4.2.6 Level of Education

Results further show that twenty-eight per cent (28%) of respondents had Diploma or HND, forty-eight percent (48%) had first degree, and twenty-four percent second degree or more.

4.3 Reliability and Validity

This section tests the data gathered from the hundred (100) respondents for validity and reliability. According to Heale (2017), reliability relates to the consistency of a measure. In other words, the extent to which a research instrument consistently has the same results if used in the same situation repeatedly. Validity is the extent to which a concept is accurately measured in a quantitative study. Cronbach alpha value and the composite reliability were used to measure the reliability of the constructs. The Cronbach alpha value and composite reliability determine the metrics' consistency in measuring the variables. The acceptable values for these measures are 0.7.

In assessing the validity of the data obtained, the study first uses confirmatory factor analysis to determine the factor loadings of each item to its latent variable. Each item is expected to load above 0.50 to be valid.

Furthermore, in measuring the convergent validity, the average variance extracted value (AVE) was used, and the values are expected to be greater than the acceptable value of 0.5 (Hair et al.,

2013). The discriminant validity was analyzed using the Fornell-Larcker criteria. The correlation of each item with itself should be greater than the correlation with all other variables.

Table 4.2 Cronbach Alpha, Composite Reliability, and Average Variance Extracted

Variable	Number Items	Cronbach Alpha (CA)	Composite Reliability (CR)	AVE
Reverse Logistics Adoption	15	0.994	0.994	0.923
Top Management Support	4	0.979	0.984	0.94
Government Environmental Regulations	7	0.973	0.978	0.881
Corporate Citizenship Pressure	5	0.980	0.984	0.926
Customer Pressure	6	0.990	0.991	0.951
Supply Chain Performance	13	0.992	0.993	0.917
Information System	5	0.983	0.986	0.935
Total	55			

The scores for the variables CA, CR, and AVE are displayed in Table 4.2. The predictor variable, reverse logistics adoption, received Cronbach Alpha and Composite Reliability values of 0.994 and 0.994, respectively. Top management support had Cronbach Alpha and Composite Reliability values of 0.979 and 0.984, respectively. Government environmental regulations had a Cronbach Alpha value and composite reliability values of 0.973 and 0.978 respectively. Corporate citizenship pressure had a Cronbach Alpha value and composite reliability values of 0.980 and 0.984, respectively. Customer pressure had a Cronbach Alpha value and composite reliability values of 0.990 and 0.991, respectively. Supply chain performance the dependent variable had Cronbach Alpha value and composite reliability values of 0.992 and 0.993, respectively.

Information System the moderating variable had Cronbach Alpha value and composite reliability values of 0.983 and 0.986, respectively.

All seven variables loaded over the 0.70 criterion and displayed high internal consistency. The data collected for the study is reliable.

The Average Variance Extracted (AVE) of reverse logistics adoption, top management support government environmental regulations, corporate citizenship pressure, customer pressure, supply chain performance and information system scored 0.923, 0.94, 0.881, 0.926, 0.951, 0.917 and 0.935, respectively. All seven variables scored above the 0.50 limit, indicating all items designed to assess these variables measure their intended latent variables. Therefore, the construct-measuring indicators have convergence validity.

Table 4.3 Fornell Larcker Criterion

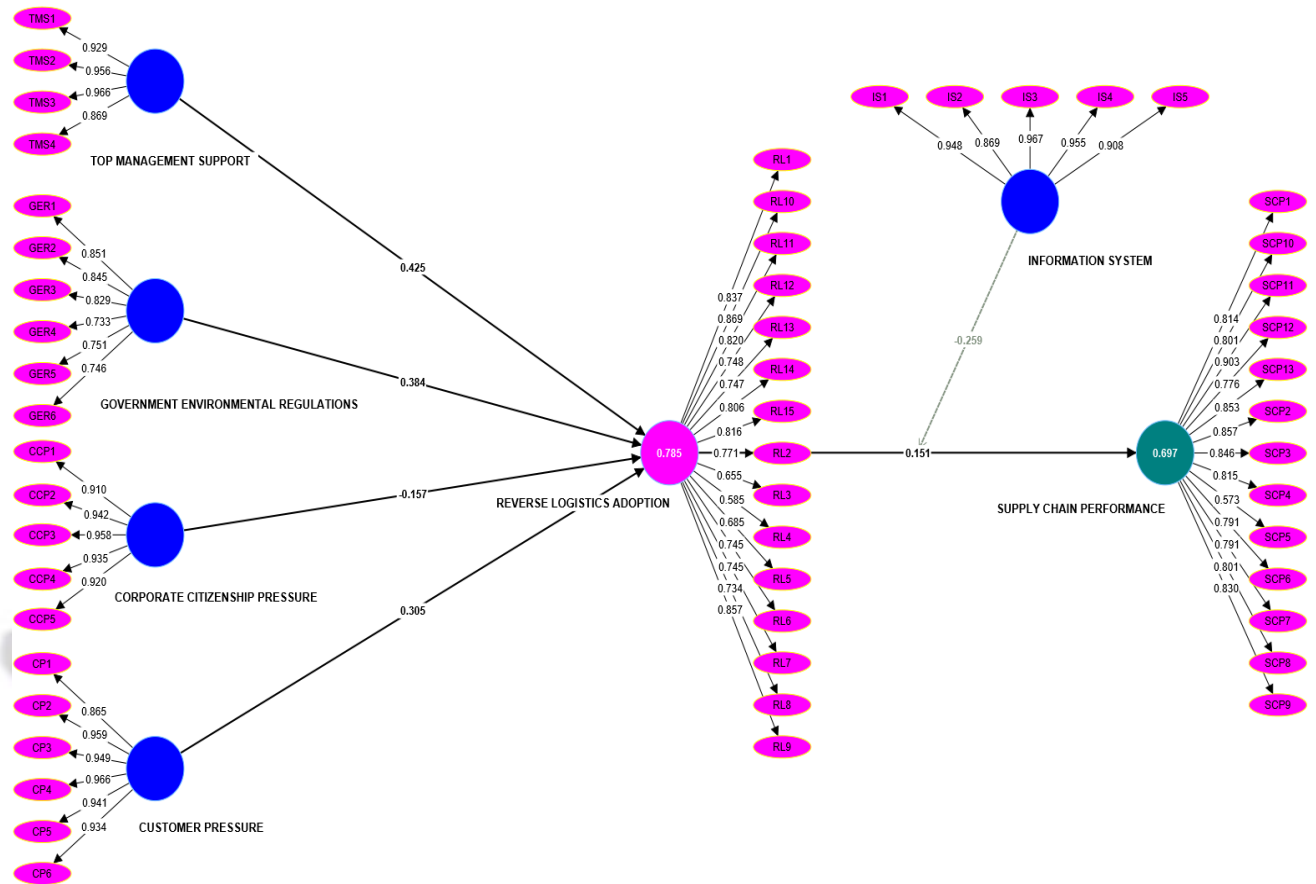
Variable	CCP	CP	GER	IS	RLA	SCP	TMS
CCP	0.962						
CP	0.953	0.983					
GER	0.956	0.973	0.979				
IS	0.955	0.981	0.977	0.983			
RLA	0.953	0.975	0.978	0.981	0.986		
SCP	0.960	0.981	0.969	0.978	0.980	0.985	
TMS	0.930	0.964	0.970	0.968	0.968	0.959	0.975

Source: Field Study (2022) Notes: CCP (Corporate Citizenship Pressure); CP (Customer Pressure); GER (Government Environmental Regulation); IS (Information Systems); RLA (Reverse Logistics Adoption), SCP (Supply Chain Performance); TMS (Top Management Support)

Concerning discriminant validity, the Fornell Larcker Criteria were applied. In contrast to convergent validity, discriminant validity ensures that the latent factors do not assess other variables compared to their latent variables. According to Table 4.3, corporate citizenship pressure had a correlation coefficient of 0.962 with itself, 0.953 with customer pressure, 0.956 with Government environmental regulations, 0.955 with information systems, 0.960 with reverse logistics adoption, 0.953 with supply chain performance, and 0.930 with top management support. Customer pressure scored a correlation coefficient of 0.983 with itself, 0.973 with government environmental regulations, 0.981 with information systems, 0.975 with reverse logistics adoption, 0.981 with supply chain performance and 0.964 with top management support. Government environmental regulations scored a correlation coefficient of 0.979 with itself, 0.977 with information systems, 0.978 with reverse logistics adoption, 0.969 with supply chain performance and 0.970 with top management support. Information systems scored a correlation coefficient of 0.983 with itself, 0.981 with reverse logistics adoption, 0.978 with supply chain performance and 0.968 with top management support. Reverse logistics adoption scored a correlation coefficient of 0.986 with itself, 0.980 with supply chain performance and 0.968 with top management support. Supply chain performance scored a correlation coefficient of 0.985 with itself and 0.959 with top management support. Top management support scored a correlation coefficient of 0.970. Each variable showed a stronger connection with itself than with the variables below it; each variable is, therefore, valid.

Figure 4.1 depicts the confirmatory factor analysis of the study. CFA is a statistical method for validating the factor structure of a set of observed data. CFA permits the researcher to examine the link between observed variables and their underlying latent constructs. Each item should have a loading score greater than 0.50 on each latent variable it is meant to measure.

Figure 4.1 Confirmatory Factor Analysis



Source: Field Study (2022)



4.4 Descriptive Statistics

The descriptive statistics provide scores for the variables used to measure the study's three primary constructs. The agreement was scored on a Likert scale ranging from 1 to 7, and the score is matched against the Likert scale to explain the degree to which the indicators of the variables occur in the manufacturing industry. 1 = Strongly disagree, 2 = Disagree, 3 = Slightly disagree, 4 = Neither agree nor disagree, 5 = Slightly agree, 6 = Agree, and 7 = Strongly agree. 1.00 - 2.99 Indicates extremely minimal/less occurrence of the phenomenon; 3.00 - 4.99 = minimal/less occurrence of the phenomenon. 5 – 5.99 indicates a moderate prevalence of the condition, and 6.00 – 7.00 indicates a regular occurrence. The succeeding sections elaborate on each measure:

4.4.1 Top Management Support

Four (4) items were utilized to measure top management support. Table 4.4 gives numerous descriptive results for top management support in detail.

Table 4.4 Descriptive Statistics Results for Top Management Support

Items	Min	Max	Mean	Std. Deviation
Our company's top managers provide strategic focus for reverse logistics	1	7	4.810	2.129
Our company's top managers commit resources to reverse logistics programs	1	7	4.750	2.174
Our company's top managers seek continuous improvement of reverse logistics	1	7	4.720	2.178
Our company's top managers ensure reverse logistics is cost effectiveness	1	7	4.360	2.443
OVERALL SCORE			4.66	2.231

Source: Field study (2022)

Table 4.4 presents the descriptive data for top management support. According to the data, manufacturing businesses operating in Greater Accra have a minimum or less occurrence of top management support. On a 7-point Likert scale, this is supported by an aggregate mean of 4.66 and a standard deviation of 2.321.

4.4.2 Government Environmental Regulation

Government environmental regulations was was evaluated using six (6) measures. Table 4.3 provides information on the descriptive outcomes of government environmental regulations.

Table 4.5 Descriptive Statistics Results for Government Environmental Regulations

Items	Min	Max	Mean	Std. Deviation
Our company has intensified its compliance to regulations over the last few years.	1	7	4.740	2.326
Our company has intensified compliance to regulations related to consumer purchase protection.	1	7	4.570	2.312
Our company has or is in the process of achieving the ISO 14000 Environmental management accreditation.	1	7	4.430	2.060
Our company's customers prefer to do business with companies that have been accredited with ISO 14000.	1	7	5.120	2.237
Our company's pressure for a proper waste management or recycling is higher for these days.	1	7	5.350	2.007
Our company's compliance with existing and future environmental regulations is a priority.	1	7	5.040	2.387
OVERALL SCORE	1	7	4.875	2.2215

Source: Field study (2022)

Table 4.5 displays the descriptive data regarding government environmental regulations. According to the data, sampled manufacturing enterprises operating in Greater Accra have a

minimal or less occurrence of government environmental regulatory pressure. On a 7-point Likert scale, this is supported by an aggregate mean of 4.87 and a standard deviation of 2.22.

4.4.3 Corporate Citizenship Pressure

Using five (5) metrics, corporate citizenship pressure was assessed across sampled firms. The descriptive results of corporate citizenship pressure are detailed in Table 4.6.

Table 4.6 Descriptive Statistics Results for Corporate Citizenship Pressure

Items	Min	Max	Mean	Std. Deviation
Our company sees environmental protection and sustainable development as an important exercise	1	7	4.810	1.968
Our company encourages customer to return used products to be recycled.	1	7	4.960	2.135
Our company always sponsors or gets involved in activities related to environmental protection and sustainable development	1	7	5.260	2.261
Our company's relationship with the community is important as it can affect my company's reputation	1	7	5.310	2.082
Our company's green manufacturing or green purchasing practices is one of our priorities.	1	7	5.250	2.095
Total	1	7	5.118	2.1082

Source: Field study (2022)

Table 4.6 presents the descriptive statistic for corporate governance. According to the data, firms in the manufacturing sector in Greater Accra have moderate occurrence of corporate

citizenship pressure. This is supported by a mean and standard deviation of 5.11 and 2.10 on a 7-point Likert scale.

4.4.4 Customer Pressure

Using seven (7) metrics, customer pressure was assessed across sampled firms. The descriptive results of customer pressure are detailed in Table 4.7.

Table 4.7 Descriptive Statistics Results for Customer Pressure

Items	Min	Max	Mean	Std. Deviation
Our company's customer and stakeholder had the power to influence my company's decision.	1	7	5.320	2.186
Our company views the demand made by customer/stakeholder as important	1	7	5.570	1.925
Our customer/stakeholder are very concern about environmental protection and sustainable development these days.	1	7	5.640	1.921
Our company sees continuously improvement in customer service a priority	1	7	5.810	1.864
Our company will definitely implement any new business initiative if it can handle customer issues more efficiently.	1	7	5.570	1.904
Our company is under pressure due to governmental agencies and NGOs strong demanding for responsible and sustainable environmental development	7	7	5.760	1.871
Our company's customer and stakeholder had the power to influence my company's decision.	1	7	5.320	2.186
Total	1	7	5.62	1.9492

Source: Field study (2022)

Table 4.7 presents the descriptive statistic for customer pressure. According to the data, firms in the manufacturing sector in Greater Accra have moderate occurrence of customer pressure. This is supported by a mean and standard deviation of 5.62 and 1.94 on a 7-point Likert scale.

4.4.5 Reverse Logistics Adoption

Reverse Logistics adoption was evaluated using fifteen (15) measures. Table 4.8 provides information on the descriptive outcomes of government environmental regulations.

Table 4.8 Descriptive Statistics Results for Reverse Logistics Adoption

Items	Min	Max	Mean	Std. Deviation
Our company is able to reduce consumption of rare material/ non-renewable energy	1	7	5.300	1.884
Our company is able to reduce the use of hazardous material /products processes	1	7	5.140	2.054
Our company has an environmental certification award	1	7	4.510	2.296
Our company conducts feasibility in recycling and repair options	1	7	4.390	2.190
Our company has outlets (market segments) for selling returned or refurbished products	1	7	4.900	2.114
Our company reuses of parts/ products (product modularity/ durability)	1	7	5.170	2.005
Our company reduces the number of faulty/ badly damaged returns	1	7	5.150	1.936
Our company reduces the number of defective products	1	7	4.890	2.190
Our company promptly resolves customer complaints	1	7	5.120	2.299

Our company has a return policy	1	7	5.100	2.252
Our company manages returns promptly and to customer satisfaction	1	7	5.210	2.160
Our company reduces total lead time	1	7	4.620	2.306
Our company generates revenue from reselling repaired products in value-recovery	1	7	4.470	2.295
Our company avoids cost by reusing refurbished parts/products in the forward supply chain	1	7	4.750	2.233
Our company avoids cost by recycling materials	1	7	4.560	2.334
OVERALL SCORE	1	7	4.89	2.169

Source: Field study (2022)

Table 4.8 presents the descriptive statistic for reverse logistics adoption. According to the data, firms in the manufacturing sector in Greater Accra have minimal or less occurrence of reverse logistics adoption. This is supported by a mean and standard deviation of 4.89 and 2.17 on a 7-point Likert scale.

4.4.6 Supply Chain Performance

Using thirteen (13) metrics, supply chain performance was assessed across sampled firms. The descriptive results of supply chain performance are detailed in Table 4.9.

Table 4.9 Descriptive Statistics Results for Supply Chain Performance

Items	Min	Max	Mean	Std. Deviation
Our company incurs high cost of Reverse logistics	1	7	5.840	1.701
Our company's reverse logistics capabilities impact company profit	1	7	5.660	1.976

Our companies amount invested in reverse logistics affect our business success and growth	1	7	5.710	1.867
Our company's cost incurred in reverse logistics reduces the cost of procuring new materials	1	7	5.710	1.722
Our company's products return oscillations (fluctuations) affect production (forecasting, planning, and control)	1	7	5.300	1.931
Our company's material management, in terms of procurement decisions and the level of stock to hold is affected by return oscillation (variation)	1	7	5.190	1.815
Our company's supply chain bullwhip effect increases due to return oscillations increase	1	7	5.120	2.099
Our company recycles and reuses more than 50% of products returned per year	1	7	5.180	2.022
Our company properly disposes less than 50% of returned products per year	1	7	5.110	2.054
Our company resends to manufacturers and remanufacture more than 50% of returned products per year.	1	7	4.680	2.258
Our company attains economic advantage due to reverse logistics	1	7	4.940	2.078
Our company attains good corporate image due to reverse logistics	1	7	4.680	2.449
Our company reverse logistics enhances customer satisfaction	1	7	4.940	2.240
Total	1	7	5.235	2.016

Source: Field study (2022)

Table 4.9 displays descriptive data regarding government environmental regulations. According to the data, sampled manufacturing enterprises operating in Greater Accra have a moderate occurrence of supply chain performance. On a 7-point Likert scale, this is supported by an aggregate mean of 5.235 and a standard deviation of 2.016.

4.4.7 Information Systems

Using five (5) metrics, corporate citizenship pressure was assessed across sampled firms. The descriptive results of information systems are detailed in Table 4.10.

Table 4.10 Descriptive Statistics Results for Information Systems

Items	Min	Max	Mean	Std. Deviation
Our company uses information system to determine the optimal collection point of returns	1	7	4.570	2.299
Our company uses information system to track the movement of products in the supply chain, from suppliers to distribution centres	1	7	4.490	2.360
Our company uses information systems to provide high visibility of goods/parts and reduce bullwhip effects	1	7	4.630	2.344
Our company uses information systems to reduce excess inventory and holding cost and provides better service level for the customers	1	7	4.400	2.429
Our company uses decision-support type systems frequently when it comes to managing customers	1	7	4.740	2.261
Total	1	7	4.566	2.3386

Source: Field study (2022)

Table 4.10 presents the descriptive statistic for information systems. According to the data, firms in the manufacturing sector in Greater Accra have minimal or less occurrence of information systems. This is supported by a mean and standard deviation of 4.56 and 2.33 on a 7-point Likert scale.

4.5 Structural Equation Modelling

The PLS Structural Equation model was utilized to examine the path coefficients (i.e., direct effects) and moderation relationship between the variables. A bootstrap of 5000 was executed to calculate the research model's path coefficients.

Table 4.11 Structural Equation Modelling

Path	Coefficients	T-value	P-value
<i>Direct Effects</i>			
TMS → RLA	0.437	6.495	0.000
GER → RLA	0.380	3.283	0.001
CCP → RLA	0.120	1.405	0.160
CP → RLA	0.308	2.898	0.004
RLA → SCP	0.144	1.962	0.050
<i>Moderation Effect</i>			
IS× RLA → SCP	-0.253	0.367	0.000

Source: Field Study (2022) **Notes:** CCP (Corporate Citizenship Pressure); CP (Customer Pressure); GER (Government Environmental Regulation); IS (Information Systems); RLA (Reverse Logistics Adoption), SCP (Supply Chain Performance); TMS (Top Management Support)

Table 4.11 displays the findings of testing the direct and moderation links between variables using the structural equation model.

Given the path coefficient findings $\beta=0.437$, $t = 6.495$, and $p < .000$, the table indicates that top management support has a positive and statistically significant effect on reverse logistics adoption. This suggests that for each unit of top management support, reverse logistics adoption increases by 0.43 units. There is more support for the association with a t-value of 6.495, exceeding the threshold of 1.96. A p-value of less than 0.00 also provides substantial support for H1, which asserts that top management support has a positive and significant effect on reverse logistics adoption.

Given the path coefficient results of $\beta=0.380$, $t = 3.283$, and $p=.01$, the table indicates that government environmental regulations have a positive and statistically significant effect on reverse logistics adoption. This indicates that environmental rules enhance the use of reverse logistics by 0.38 units. With a t-value of 3.283, which is greater than the significance level of 1.96, there is increased support for the aforementioned association. The hypothesis that government environmental restrictions have a positive and significant effect on the adoption of reverse logistics is likewise supported by a p-value of less than 0.01.

Given the data for the path coefficient $\beta=0.120$, $t = 1.405$, and $p > .05$, the table demonstrates that corporate citizenship pressure has no statistically significant effect on reverse logistics adoption. With a t-value of 1.405, which is less than the cut-off of 1.96, there is greater support for the insignificance of effect. A p-value greater than 0.05 also gives considerable support for the effect's insignificance. This indicates that data do not support the hypothesis that corporate citizenship pressure has a significant and positive effect on reverse logistics adoption (H3).

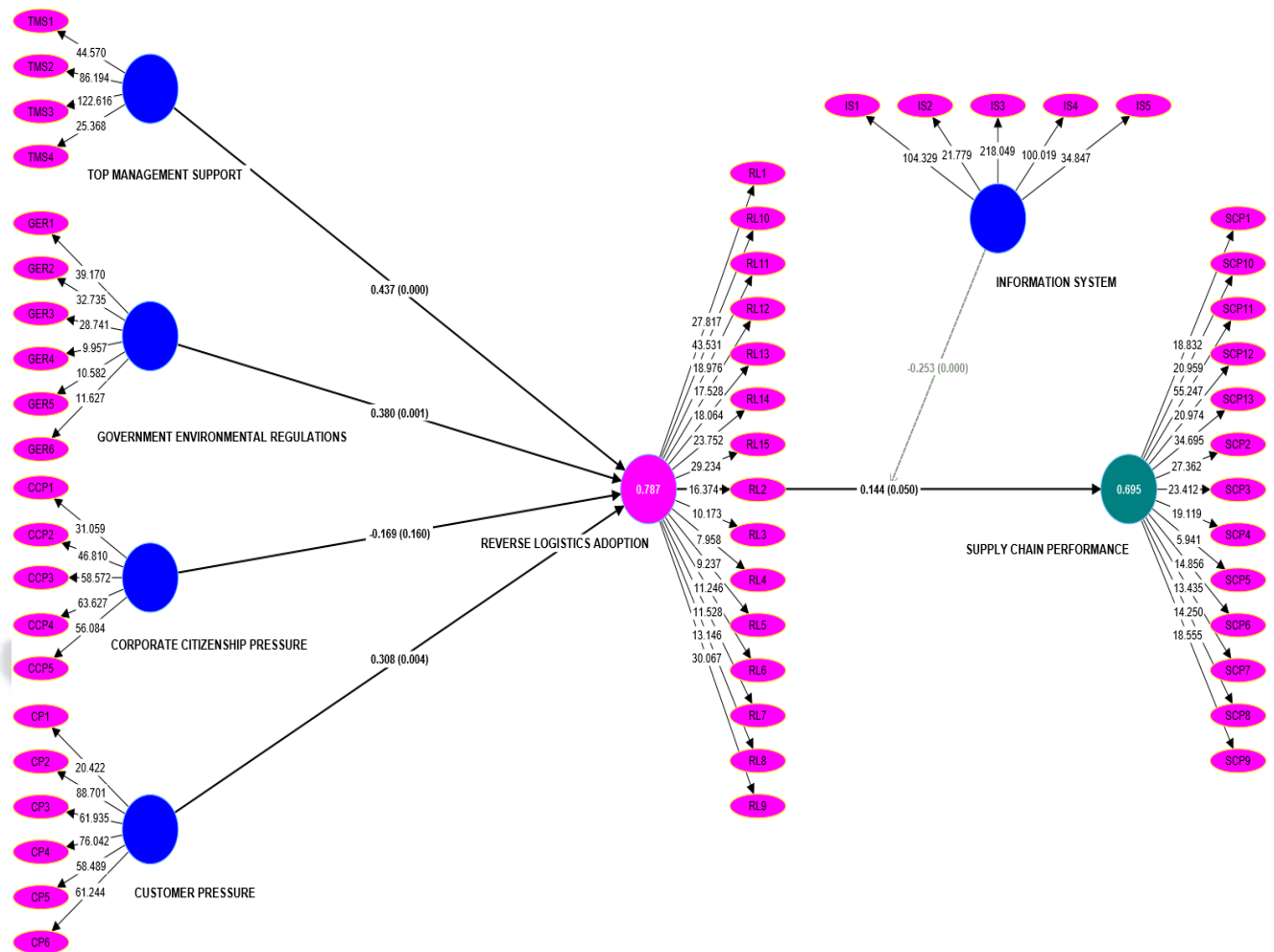
Based on the path coefficient values of $\beta =0.308$, $t = 2.898$, and $p .05$, the table suggests that customer pressure has a positive and statistically significant effect on the adoption of reverse logistics. This implies that reverse logistics adoption grows by 0.30 units for every unit of customer pressure. The t-value for the connection is 2.898, which is greater than the significant threshold of

1.96. A p-value less than 0.05 also gives substantial support for H4, which claims that customer pressure has a positive and significant effect on the adoption of reverse logistics.

Given the path coefficient values of $\beta = 0.144$, $t = 1.962$, and $p = .05$, the table suggests that the adoption of reverse logistics has a positive and statistically significant impact on supply chain performance. This indicates that supply chain performance improves by 0.14 units for every unit of reverse logistics adoption. The relationship has greater support with a t-value of 1.96, which is equivalent to the threshold of 1.96. A p-value of 0.05 also gives substantial support for H5, which claims that the implementation of reverse logistics has a favorable and significant impact on supply chain performance.

Given the path coefficient values of $\beta = -.253$, $t = 0.367$, and $p < .01$, the table reveals that the information system moderates the link between reverse logistics adoption and supply chain performance in a negative way. This indicates that supply chain performance decreases by 0.25 units for every unit of interaction between reverse logistics adoption and information systems. The t-value of 0.39 indicates greater support for the negative moderating effect of information systems, surpassing the threshold of 1.96. A p-value of less than 0.01 also provides substantial support for the statistically insignificant effect of information systems on moderation. Contrary to the study's premise that information systems positively moderate the association between reverse logistics adoption and supply chain performance, information systems have a negative moderating effect. Thus, H6 is not supported.

Figure 4.2 Structural Equation Modelling



Source: Field Study (2022)



4.6 Hypotheses Confirmation

Three hypotheses were created for this study based on a review of past research. Each of these hypotheses is confirmed or refuted by analyzing the collected data. The confirmation of hypotheses is summarized in table 4.12 below.

Table 4.12 Confirmation of the Hypothesis

Hypothesis	Path	T-value	Coefficient (P-value)	Decision
H1	TMS → RLA	6.495	0.437; p<0.01	Supported
H2	GER → RLA	3.283	0.380; p<0.01	Supported
H3	CCP → RLA	1.405	0.120; p>0.05	Not supported
H4	CP→RLA	2.898	0.308; p<0.01	Supported
H5	RLA→SCP	1.962	0.144; p=0.05	Supported
H6	IS×RLA → SCP	3.838	-0.253; p<0.01	Not Supported

4.7 Discussion of Results

The findings of this investigation are addressed in the context of the examined literature in this study. In accordance with the study's stated aims, a detailed discussion of the findings follows.

4.7.1 Stakeholder Influence and Reverse Logistics Adoption

The first purpose of the study is to investigate the perceived influence of stakeholders on the adoption of reverse logistics. The study investigated how top management support, government environmental restrictions, corporate citizenship pressure, and customer pressure as factors of stakeholder influence affect the adoption of reverse logistics.

4.7.1.1 Top Management Support and Reverse Logistics

The first hypothesis of the study posits that top management has a positive and significant effect on reverse logistics adoption. From the results, it was observed that top management has significant positive relationship with reverse logistics adoption ($\beta=.437$; $p < .01$). There is therefore support for the study's first hypothesis (H1) which stated that top management support has a positive effect on reverse logistics adoption.

This finding is corroborated by Shafiq and Naqvi (2012) who revealed that success in Reverse Logistics adoption depends on strategic attention and backing from top management. Sharma et al. (2011) argued that one reason Reverse Logistics often fails is because of apathy and lack of backing from top management. Afum et al. (2019) also revealed that top management support has a positive effect on reverse logistics adoption. It may be extrapolated from the existing empirical research that top management has an actual and apparent impact on reverse logistics adoption. Therefore, the first hypothesis (H1) that top management support has a positive effect on reverse logistics adoption is supported.

4.7.1.2 Government Environmental Regulations and Reverse Logistics

Hypothesis two(H2) postulates that government environmental regulations have a positive and significant effect on reverse logistics adoption. Results shows a positive effect of government environmental regulations on reverse logistics adoption ($\beta = .380$; $p < .01$). This implies that government environmental regulations have a positive and significant effect on reverse logistics adoption. This is corroborated by Abdullah and Yaakub (2017) who found that regulatory pressure significantly impacted the adoption of Reverse Logistics. Somuyiwa and Adebayo (2014) also revealed that environmental regulations compel businesses to implement Reverse Logistics practices and product return operations. Therefore, there is significant support for the hypothesis that government environmental regulations have a positive effect on reverse logistics adoption.

4.7.1.3 Corporate Citizenship Pressure and Reverse Logistics

The third hypothesis (H3) posits that corporate citizenship pressure has a positive effect on reverse logistics adoption. Results show that corporate citizenship pressure has a no statistically significant effect on reverse logistics adoption ($\beta=0.120$; $p > 0.05$). This implies that corporate citizenship pressure has no statistically significant effect on reverse logistics adoption. This result is not corroborated by Govindan et al. (2015) who noted that promoting corporate citizenship is one of the key reasons organizations use Reverse Logistics. The hypothesis that corporate citizenship pressure has a positive and significant effect on reverse logistics adoption is thus not supported.

4.7.1.4 Customer Pressure and Reverse Logistics

The fourth hypothesis (H4) postulates that customer pressure positively and significantly influences reverse logistics adoption. Results show that customer pressure positively and significantly influences reverse logistics adoption. The study's result is corroborated by Trivedi et al. (2018) who revealed that consumers are always willing to spend more on eco-friendly goods, causing businesses to follow the best Reverse Logistics efforts to maintain or expand market share. There is therefore statistically significant support for the hypothesis that customer pressure positively and significantly influences reverse logistics adoption.

4.7.2 Reverse Logistics and Supply Chain Performance

The fifth hypothesis (H5) posits that reverse logistics adoption positively and significantly influences supply chain performance. Results show that reverse logistics adoption positively and significantly influences supply chain performance ($\beta = 0.144$; $p \leq 0.05$). This implies that reverse logistics adoption positively and significantly influences supply chain performance. This is corroborated by Mandota (2015), who identified reverse logistics as an important predictor of the supply chain performance of industrial enterprises. Specifically, the study found that adopting reverse logistics influences profitability and business growth, reduces the cost of acquiring additional raw materials, and increases firm competitiveness. Also, David and Shalle (2014) argued that the introduction of the reverse logistics variable (product returns, product repairs, and end-of-life management) had a considerable impact on supply chain performance.

4.7.3 The Moderating Role of Information Systems (IS)

The sixth hypothesis(H6) postulated that Information Systems positively moderate the relationship between reverse logistics and supply chain performance. Results show that Information Systems negatively moderates the relationship between reverse logistics adoption and supply chain performance ($\beta=-0.253$; $p<0.01$). This implies that information systems do not positively moderate the relationship between reverse logistics adoption and supply chain performance. Shah et al. (2012) suggests that supply chain practices, such as supply chain integration, and initiatives, such as establishing long-term strategic relationships with suppliers, necessitate extensive use of EDI and web-based interchange; therefore, the support of inter-organizational information systems. To achieve improved supply chain performance, they argue that a high (low) level of supplier integration must be paired with a high (low) level of IT integration. Reverse logistics, a component of the supply chain, can only operate efficiently if information systems are functioning properly. On the contrary, the hypothesis (H6) that Information Systems moderate the relationship between reverse logistics adoption and supply chain performance was not supported by the results of the study.

The unexpected result of Information Systems negatively moderating the relationship between reverse logistics adoption and supply chain performance suggests intriguing avenues for further exploration. One plausible explanation for this discrepancy could be the presence of confounding variables or moderating factors (such as organizational culture, leadership styles, or external environmental factors) not considered in the initial hypothesis. Additionally, the quality and capability of the information systems themselves might vary widely among the sampled firms, impacting the moderation effect. A more in-depth examination of the specific functionalities, integration levels, and technological robustness of the information systems

across the organizations could provide valuable insights into why, contrary to expectations, they did not positively moderate the relationship.

Another avenue for exploration is the temporal dimension of information system implementation. It is possible that the sampled firms are at different stages of adopting and optimizing their information systems for reverse logistics. A longitudinal study or a retrospective analysis of the implementation trajectory could reveal whether the negative moderation effect diminishes or becomes positive over time.



CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter summarises the findings, conclusions, recommendations, and future research ideas. The study's objectives were (1) To examine the perceived relationship between stakeholder influence and the adoption of reverse logistics (2) To examine the relationship between reverse logistics adoption and supply chain performance. (3) To examine the moderating effect of information systems on the relationship between reverse logistics and supply chain performance

5.2 Summary of Findings

5.2.1 Stakeholder Influence and Reverse Logistics Adoption

5.2.1.1 Top management support and reverse Logistics adoption

The study's first hypothesis suggests that there is a positive and significant relationship between top management support and reverse logistics adoption. Findings show a positive and statistically significant relationship between top management support and reverse logistics. As a result, the hypothesis that a positive and statistically significant relationship exists between top management support and reverse logistics adoption is supported. This could be due to top decision-making powers and the influential status of top management of the firms. The attitudes and support levels of top executives and partners in accepting such practices, management activities, and systems. Thus, the willingness and active support of top executives

for the implementation of specific activities play an important role in the overall direction of the internal members and external partners and in the formation of a value chain.

5.2.1.2 Government Environmental Regulations and Reverse Logistics Adoption

The second hypothesis of the study suggests that there is a positive and significant relationship between government environmental regulations and reverse logistics adoption. Results show that a positive and significant relationship exists between government environmental regulations and reverse logistics adoption. Hypothesis two (H2) is thus supported. This may be due to the prevalence of top management support among sampled firms.

5.2.1.3 Corporate Citizenship Pressure and Reverse Logistics Adoption

The third hypothesis of the study was to examine the relationship between corporate citizenship pressure and reverse logistics adoption. Results show that a positive and significant relationship does not exist between corporate citizenship pressure and reverse logistics adoption. Hypothesis three (H3) is thus not supported.

5.2.1.4 Customer Pressure and Reverse Logistics Adoption

The third hypothesis of the study was to examine the relationship between customer pressure and reverse logistics adoption. Results show that a positive and significant relationship exists between customer pressure and reverse logistics adoption. Hypothesis four (H4) is thus supported.

5.2.2 Reverse Logistics Adoption and Firm Performance

The fifth hypothesis of the study was to examine the relationship between reverse logistics adoption and firm performance. Results show that a positive and significant relationship exists between reverse logistics adoption and firm performance. Hypothesis five (H5) is thus supported.

5.2.3 The Moderating Role of Information Systems

The sixth hypothesis of the study suggests that information systems moderate the relationship between reverse logistics adoption and firm performance. The results of the analysis show that, information systems do not positively moderate the relationship between reverse logistics adoption and firm performance. The hypothesis was thus not supported by the results of the study.

5.3 Conclusion

The researcher believes, based on the findings, that top management support, government environmental regulations and customer pressure have positive and statistically significant relationship with reverse logistics adoption. Moreover, corporate citizenship pressure does not have a positive and significant relationship with reverse logistics adoption. Furthermore, reverse logistics adoption has a positive and significant effect on firm performance. Moreover, Information Systems does not moderate the relationship between reverse logistics adoption and firm performance. Thus, four hypotheses were supported and two not supported.

5.4 Recommendations for Managers

There are a number of environmental issues that require close attention. Global warming, carbon emissions, acid rain, and pollution have negative effects on the environment.

Companies should collaborate closely with their suppliers to lessen the environmental impact of their operations. Therefore, it is no longer appropriate to select the best providers based on factors such as price, quality, delivery, dependability, and performance. The industries must also consider the environmental performance of the prospective suppliers.

The heart of supply chain management is managing connections with suppliers and customers. If they do not have access to sufficient resources, these suppliers may seek to form strategic partnerships. Green Supplier development activities may ultimately result in cooperative, long-lasting, and strategic partnerships. Companies should expand their supplier development initiatives to include green supplier development, and supply chain partners must collaborate more than ever before. Major corporations cannot be environmentally friendly or socially responsible if they do not go beyond their first-tier suppliers.

Currently, there are numerous vendors that lack the resources or capacity to manufacture ecologically friendly products (Agan et al,2018). If procurement entities are genuinely concerned about the environment, they should assist their suppliers in acquiring the required competencies.

Managers should finally create a climate that is conducive to adopting, implementing, and improving green supplier development initiatives. Equally important, as with any organizational activity, is the need to link and document supplier development to the core competencies of all firms involved along to their respective financial and stock performances.

5.5 Suggestion for Further Research

Future research in this domain could delve deeper into the nuances of information systems by conducting a detailed analysis of their specific components within organizations. This includes

exploring the level of integration, the technologies employed, and the overall maturity of these systems. Longitudinal studies could be employed to capture how the relationship between information systems, reverse logistics adoption, and supply chain performance evolves over time, providing insights into the dynamic nature of these interactions. Additionally, a comparative industry analysis could expand the scope to different sectors, examining whether the impact of information systems on the relationship between reverse logistics adoption and supply chain performance varies across industries. Incorporating qualitative methods, such as interviews and case studies, would complement quantitative findings by offering context-specific insights into the challenges and opportunities faced by organizations in managing reverse logistics through information systems.

Further avenues for research could explore the influence of emerging technologies, such as blockchain and artificial intelligence, on the efficiency of reverse logistics processes. Investigating benchmarking approaches to assess organizations' alignment with industry best practices in information system integration for reverse logistics would provide valuable insights into successful strategies. Additionally, exploring the role of collaborative networks and inter-organizational information systems in enhancing reverse logistics efficiency could shed light on the importance of partnerships and information sharing among supply chain partners. Overall, future research should aim to uncover the intricate dynamics between information systems and reverse logistics, considering technological advancements, industry-specific contexts, and the evolving nature of supply chain practices.

Future research could investigate whether this result holds for other businesses, such as the service sector. In addition, future study could investigate additional moderating factors (e.g.,

organizational or environmental factors) and new performance outcomes, such as operational and social performance.

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REFERENCES

- Afum, E. et al. (2019) Reverse Logistics, Stakeholder Influence and Supply Chain Performance in Ghanaian Manufacturing Sector. Available at: <http://publishingindia.com/jscms/>.
- Agrawal, S. and Singh, R.K. (2019) 'Analyzing disposition decisions for sustainable reverse logistics: Triple Bottom Line approach', *Resources, Conservation and Recycling*, 150. Available at: <https://doi.org/10.1016/j.resconrec.2019.104448>.
- Agrawal, S., Singh, R.K. and Murtaza, Q. (2015a) 'A literature review and perspectives in reverse logistics', *Resources, Conservation and Recycling*. Elsevier, pp. 76–92. Available at: <https://doi.org/10.1016/j.resconrec.2015.02.009>.
- Agrawal, S., Singh, R.K. and Murtaza, Q. (2015b) 'A literature review and perspectives in reverse logistics', *Resources, Conservation and Recycling*. Elsevier, pp. 76–92. Available at: <https://doi.org/10.1016/j.resconrec.2015.02.009>.
- Agrawal, S., Singh, R.K. and Murtaza, Q. (2016) 'Triple bottom line performance evaluation of reverse logistics', *Competitiveness Review*, 26(3), pp. 289–310. Available at: <https://doi.org/10.1108/CR-04-2015-0029>.
- Alshamsi, A. and Diabat, A. (2015) 'A reverse logistics network design', *Journal of Manufacturing Systems*, 37, pp. 589–598. Available at: <https://doi.org/10.1016/j.jmsy.2015.02.006>.
- Ayvaz, B., Bolat, B. and Aydin, N. (2015) 'Stochastic reverse logistics network design for waste of electrical and electronic equipment', *Resources, Conservation and Recycling*, 104, pp. 391–404. Available at: <https://doi.org/10.1016/j.resconrec.2015.07.006>.

- Banihashemi, T.A., Fei, J. and Chen, P.S.-L. (2019) 'Exploring the relationship between reverse logistics and sustainability performance', *Modern Supply Chain Research and Applications*, 1(1), pp. 2–27. Available at: <https://doi.org/10.1108/mscra-03-2019-0009>.
- Bazan, E., Jaber, M.Y. and Zanoni, S. (2016) 'A review of mathematical inventory models for reverse logistics and the future of its modeling: An environmental perspective', *Applied Mathematical Modelling*, 40(5–6), pp. 4151–4178. Available at: <https://doi.org/10.1016/j.apm.2015.11.027>.
- Chileshe, N., Rameezdeen, R. and Hosseini, M.R. (2015) 'Barriers to implementing reverse logistics in South Australian construction organisations', *Supply Chain Management*, 20(2), pp. 179–204. Available at: <https://doi.org/10.1108/SCM-10-2014-0325>.
- Daneshvar Kakhki, M. and Gargeya, V.B. (2019) 'Information systems for supply chain management: a systematic literature analysis', *International Journal of Production Research*. Taylor and Francis Ltd., pp. 5318–5339. Available at: <https://doi.org/10.1080/00207543.2019.1570376>.
- Ebenezer, A. and Zhuo, S. (2019) 'Reverse Logistics and Performance of Bottled and Sachet Water Manufacturing Firms in Ghana: The Intervening Role of Competitive Advantage', 21, pp. 39–49. Available at: <https://doi.org/10.9790/487X-2104043949>.
- Fernando, Y., Shaharudin, M.S. and Abideen, A.Z. (2023) 'Circular economy-based reverse logistics: dynamic interplay between sustainable resource commitment and financial performance', *European Journal of Management and Business Economics*, 32(1), pp. 91–112. Available at: <https://doi.org/10.1108/EJMBE-08-2020-0254>.
- González-Gallego, N. et al. (2015) 'Using integrated information systems in supply chain management', *Enterprise Information Systems*, 9(2), pp. 210–232. Available at: <https://doi.org/10.1080/17517575.2013.879209>.

- Govindan, K. and Soleimani, H. (2017) 'A review of reverse logistics and closed-loop supply chains: a Journal of Cleaner Production focus', *Journal of Cleaner Production*, 142, pp. 371–384. Available at: <https://doi.org/10.1016/j.jclepro.2016.03.126>.
- Guerci, M., Longoni, A. and Luzzini, D. (2016) 'Translating stakeholder pressures into environmental performance – the mediating role of green HRM practices', *International Journal of Human Resource Management*, 27(2), pp. 262–289. Available at: <https://doi.org/10.1080/09585192.2015.1065431>.
- Haghshenas Kashani, F. and Baharmast, S. (2017) Effect of Supply Chain Information Systems on Firm Performance: An Empirical Case Study, *Technology & Applied Science Research*. Available at: www.etasr.com.
- Hammes, G. et al. (2020) 'Evaluation of the reverse logistics performance in civil construction', *Journal of Cleaner Production*, 248. Available at: <https://doi.org/10.1016/j.jclepro.2019.119212>.
- Hazen, B.T. et al. (2012) 'Consumer reactions to the adoption of green reverse logistics', *International Review of Retail, Distribution and Consumer Research*, 22(4), pp. 417–434. Available at: <https://doi.org/10.1080/09593969.2012.690777>.
- Hazen, B.T. et al. (2014) 'Reverse logistics information system success and the effect of motivation', *International Journal of Physical Distribution and Logistics Management*, 44(3), pp. 201–220. Available at: <https://doi.org/10.1108/IJPDLM-11-2012-0329>.
- Huang, Y.C. and Yang, M.L. (2014) 'Reverse logistics innovation, institutional pressures and performance', *Management Research Review*, 37(7), pp. 615–641. Available at: <https://doi.org/10.1108/MRR-03-2013-0069>.

Husada Tarigan, Z.J., Siagian, H. and Bua, R.R. (2019) 'The Impact of Information System Implementation to the Integrated System for Increasing the Supply Chain Performance of Manufacturing Companies', in IOP Conference Series: Materials Science and Engineering. Institute of Physics Publishing. Available at: <https://doi.org/10.1088/1757-899X/473/1/012050>.

Jack, E.P., Powers, T.L. and Skinner, L. (2010) 'Reverse logistics capabilities: Antecedents and cost savings', *International Journal of Physical Distribution and Logistics Management*, 40(3), pp. 228–246. Available at: <https://doi.org/10.1108/09600031011035100>.

Jayaraman, V., Ross, A.D. and Agarwal, A. (2008) 'Role of information technology and collaboration in reverse logistics supply chains', *International Journal of Logistics Research and Applications*, 11(6), pp. 409–425. Available at: <https://doi.org/10.1080/13675560701694499>.

Khalili-Damghani, K., Tavana, M. and Najmodin, M. (2015) REVERSE LOGISTICS AND SUPPLY CHAINS: A STRUCTURAL EQUATION MODELING INVESTIGATION, *International Journal of Industrial Engineering*.

Lee, C.K.M. and Lam, J.S.L. (2012) 'Managing reverse logistics to enhance sustainability of industrial marketing', *Industrial Marketing Management*, 41(4), pp. 589–598. Available at: <https://doi.org/10.1016/j.indmarman.2012.04.006>.

Lee, J.C., Chen, C.Y. and Shiue, Y.C. (2017) 'The moderating effects of organisational culture on the relationship between absorptive capacity and software process improvement success', *Information Technology and People*, 30(1), pp. 47–70. Available at: <https://doi.org/10.1108/ITP-09-2013-0171>.

Mandota, E.J., Afum, E. and Kusi, L. (no date) THE IMPACT OF REVERSE LOGISTICS ON SUPPLY CHAIN PERFORMANCE Related papers THE IMPACT OF REVERSE LOGISTICS ON SUPPLY CHAIN PERFORMANCE ymund7 sult an waqar Procurement Process in the North-West Department of Education and Sports Development, Mmabat ... Nomsebenzi Letshaba Reverse Logistics, Stakeholder Influence and Supply Chain Performance in Ghanaian Manufacturing S....

Masudin, I. et al. (2021) 'The impact of the traceability of the information systems on humanitarian logistics performance: Case study of Indonesian relief logistics services', *Cogent Business and Management*, 8(1). Available at: <https://doi.org/10.1080/23311975.2021.1906052>.

Mishra, R., Austin, S.F. and Napier, R. (2014) Rajat Mishra, Randy Napier Reverse Logistics: Antecedents of Successful Implementation and Firm Performance Effects *Journal of Supply Chain and Operations Management*, Article in *Journal of Supply Chain and Operations Management*. Available at: <https://www.researchgate.net/publication/306253736>.

Mlimbila, J. and Mbamba, U.O.L. (2018) 'The role of information systems usage in enhancing port logistics performance: evidence from the Dar Es Salaam port, Tanzania', *Journal of Shipping and Trade*, 3(1). Available at: <https://doi.org/10.1186/s41072-018-0036-z>.

Modgil, S. and Sharma, S. (2017a) 'Information Systems, Supply Chain Management and Operational Performance: Tri-linkage—An Exploratory Study on Pharmaceutical Industry of India', *Global Business Review*, 18(3), pp. 652–677. Available at: <https://doi.org/10.1177/0972150917692177>.

Modgil, S. and Sharma, S. (2017b) 'Information Systems, Supply Chain Management and Operational Performance: Tri-linkage—An Exploratory Study on Pharmaceutical Industry of India',

Global Business Review, 18(3), pp. 652–677. Available at:
<https://doi.org/10.1177/0972150917692177>.

Moldabekova, A. et al. (2021) ‘Digital Technologies for Improving Logistics Performance of Countries’, *Transport and Telecommunication*, 22(2), pp. 207–216. Available at:
<https://doi.org/10.2478/ttj-2021-0016>.

Nkrumah, S.K. et al. (2021) ‘Examining green capabilities as drivers of green supply chain management adoption’, *Management Research Review*, 44(1), pp. 94–111. Available at:
<https://doi.org/10.1108/MRR-01-2020-0015>.

Prajapati, H., Kant, R. and Shankar, R. (2019) ‘Bequeath life to death: State-of-art review on reverse logistics’, *Journal of Cleaner Production*. Elsevier Ltd, pp. 503–520. Available at:
<https://doi.org/10.1016/j.jclepro.2018.11.187>.

Pushpamali, N.N.C. et al. (2021) ‘Stakeholder perception of reverse logistics practices on supply chain performance’, *Business Strategy and the Environment*, 30(1), pp. 60–70. Available at:
<https://doi.org/10.1002/bse.2609>.

Qrunfleh, S. and Tarafdar, M. (2014) ‘Supply chain information systems strategy: Impacts on supply chain performance and firm performance’, *International Journal of Production Economics*, 147(PART B), pp. 340–350. Available at: <https://doi.org/10.1016/j.ijpe.2012.09.018>.

Starostka-Patyk, M. (2021) ‘The use of information systems to support the management of reverse logistics processes’, in *Procedia Computer Science*. Elsevier B.V., pp. 2586–2595. Available at: <https://doi.org/10.1016/j.procs.2021.09.028>.

- Tatoglu, E. et al. (2016) 'How do supply chain management and information systems practices influence operational performance? Evidence from emerging country SMEs', *International Journal of Logistics Research and Applications*, 19(3), pp. 181–199. Available at: <https://doi.org/10.1080/13675567.2015.1065802>.
- Turrisi, M., Bruccoleri, M. and Cannella, S. (2013) 'Impact of reverse logistics on supply chain performance', *International Journal of Physical Distribution and Logistics Management*, 43(7), pp. 564–585. Available at: <https://doi.org/10.1108/IJPDLM-04-2012-0132>.
- Verma, P., Mahindroo, A. and Samalia, H.V. (2018) 'Information systems road map to enhance economic and operational reverse logistics performance', *International Journal of Logistics Systems and Management*, 29(2), p. 215. Available at: <https://doi.org/10.1504/ijlsm.2018.10009986>.
- Vlachos, I.P. (2016a) 'Reverse logistics capabilities and firm performance: the mediating role of business strategy', *International Journal of Logistics Research and Applications*, 19(5), pp. 424–442. Available at: <https://doi.org/10.1080/13675567.2015.1115471>.
- Vlachos, I.P. (2016b) 'Reverse logistics capabilities and firm performance: the mediating role of business strategy', *International Journal of Logistics Research and Applications*, 19(5), pp. 424–442. Available at: <https://doi.org/10.1080/13675567.2015.1115471>.
- Yang, S., Taghipour, A. and Canel-Depitre, B. (2017) 'Cost optimization of reverse logistics: A review', in *ACM International Conference Proceeding Series*. Association for Computing Machinery, pp. 158–161. Available at: <https://doi.org/10.1145/3134383.3134393>.

APPENDIX

SURVEY QUESTIONNAIRE

My name is David Asamoah. I am a Lecturer at Kwame Nkrumah University of Science and Technology School of Business, Department of Information Systems and Decision Sciences. This survey instrument has been designed to enable me carry out research on ***Reverse Logistics and supply chain performance in Ghana, the moderating role of information systems***. The purpose of the research is to provide practical insights that will assist business executives in manufacturing organizations to better manage reverse logistics to improve supply chain performance. Any information provided will ONLY be used for general information, and it will be treated as ***HIGHLY CONFIDENTIAL***.

INSTRUCTIONS: Please kindly write in ink in the box which corresponds to the statement, which in your opinion is the most appropriate answer to the related question. For the following questions, kindly select by checking (✓) all that apply.

Title or Job Position in the Company ☐ supervisor ☐ middle manager ☐ top manager	Level of education: ☐ diploma/HND ☐ 1st Degree ☐ 2nd Degree or more
Number of Employees ☐ <6; ☐ 6-29; ☐ 30-59; ☐ 60-99; ☐ 100+	When was the company incorporated in Ghana? _____
Please place a check in your company's corresponding industry	☐ Manufacturing; ☐ Financial Services (banking & investments); ☐ Oil & Gas; ☐ Health; ☐ Retail; ☐ Construction; ☐ Transportation; ☐ Telecommunication; ☐ Electronics and Computing Machinery; ☐ Mining & Minerals; ☐ Pharmaceuticals; ☐ Automobile and Heavy Equipment; ☐ Other (specify) _____
Please indicate the Revenue of the Company in New Ghana Cedis	☐ <40,000; ☐ 40,000-80,000; ☐ 80,000-120,000; ☐ 120,000-160,000; ☐ 160,000-200,000; ☐ 200,000-500,000; ☐ 500,000-1,000,000; ☐ >1,000,000

Instructions: Indicate your opinion for the following statement by placing a checkmark (✓) in the right column under the 7-point Likert Scale.

	7-point Likert Scale						
	Strongly Disagree	Moderately Disagree	Disagree	Neither Agree nor Disagree	Agree	Moderately Agree	Strongly Agree
Our company is able to reduce consumption of rare material/ non-renewable energy							
Our company is able to reduce the use of hazardous material /products processes							
Our company has an environmental certification award							
Our company conducts feasibility in recycling and repair options							
Our company has outlets (market segments) for selling returned or refurbished products							
Our company reuses of parts/ products (product modularity/ durability)							
Our company reduces the number of faulty/ badly damaged returns							
Our company reduces the number of defective products							

Our company promptly resolves customer complaints							
Our company has a return policy							
Our company manages returns promptly and to customer satisfaction							
Our company reduces total lead time							
Our company generates revenue from reselling repaired products in value-recovery							
Our company avoids cost by reusing refurbished parts/products in the forward supply chain							
Our company avoids cost by recycling materials							
	Strongly Disagree	Moderately Disagree	Disagree	Neither Agree nor Disagree	Agree	Moderately Agree	Strongly Agree
Our company's top managers provide strategic focus for reverse logistics							
Our company's top managers commit resources to reverse logistics programs							
Our company's top managers seek continuous improvement of reverse logistics							
Our company's top managers ensure reverse logistics is cost effectiveness							
Our company has intensified its compliance to regulations over the last few years.							
Our company has intensified compliance to regulations related to consumer purchase protection.							
Our company has or is in the process of achieving the ISO 14000 Environmental management accreditation.							
Our company's customers prefer to do business with companies that have been accredited with ISO 14000.							
Our company's pressure for a proper waste management or recycling is higher for these days.							
Our company's compliance with existing and future environmental regulations is a priority.							
Our company sees environmental protection and sustainable development as an important exercise							
Our company encourages customer to return used products to be recycled.							
Our company always sponsors or gets involved in activities related to environmental protection and sustainable development							
Our company's relationship with the community is important as it can affect my company's reputation							
Our company's green manufacturing or green purchasing practices is one of our priorities.							
Our company's customer and stakeholder had the power to influence my company's decision.							
Our company views the demand made by customer/stakeholder as important							

Our customer/stakeholder are very concern about environmental protection and sustainable development these days.							
Our company sees continuously improvement in customer service a priority							
Our company will definitely implement any new business initiative if it can handle customer issues more efficiently.							
Our company is under pressure due to governmental agencies and NGOs strong demanding for responsible and sustainable environmental development							
	Strongly Disagree	Moderately Disagree	Disagree	Neither Agree nor Disagree	Agree	Moderately Agree	Strongly Agree
Our company incurs high cost of Reverse logistics							
Our company's reverse logistics capabilities impact company profit							
Our companies amount invested in reverse logistics affect our business success and growth							
Our company's cost incurred in reverse logistics reduces the cost of procuring new materials							
Our company's products return oscillations (fluctuations) affect production (forecasting, planning, and control)							
Our company's material management, in terms of procurement decisions and the level of stock to hold is affected by return oscillation (variation)							
Our company's supply chain bullwhip effect increases due to return oscillations increase							
Our company recycles and reuses more than 50% of products returned per year							
Our company properly disposes less than 50% of returned products per year							
Our company resends to manufacturers and remanufacture more than 50% of returned products per year.							
Our company attains economic advantage due to reverse logistics							
Our company attains good corporate image due to reverse logistics							
Our company reverse logistics enhances customer satisfaction							
	Strongly Disagree	Moderately Disagree	Disagree	Neither Agree nor Disagree	Agree	Moderately Agree	Strongly Agree

Our company uses information system to determine the optimal collection point of returns							
Our company uses information system to track the movement of products in the supply chain, from suppliers to distribution centres							
Our company uses information systems to provide high visibility of goods/parts and reduce bullwhip effects							
Our company uses information systems to reduce excess inventory and holding cost and provides better service level for the customers							
Our company uses decision-support type systems frequently when it comes to managing customers							

Thank you. Your participation is greatly appreciated. If you are interested in a personalized copy of the analyzed results, please attach a business card or provide your contact information.

