THE RELATIONSHIP BETWEEN REVERSE LOGISTICS AND OPERATIONAL PERFORMANCE AMONG MANUFACTURING FIRMS IN KENYA

BY

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A RESEARCH PROJECT REPORT SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF BUSINESS ADMINISTRATION, SCHOOL OF BUSINESS, UNIVERSITY OF NAIROBI

2016

DECLARATION

This research project is my original work and has never been presented in any other university or college for an award of degree, diploma or certificate.

Signed…… Date……

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D61/73038/2012.

This research project has been submitted for examination with my approval as the university supervisor.

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DEDICATION

This research study is dedicated to my wife Mercy, daughters Tiffany and Patricia Maina.A special feeling of gratitude to my brothers Antony and Eric for being of great support throughout my studies.

ACKNOWLEDGEMENT

My special gratitude to my project supervisor Mr. Job Mwanyota for his tireless guidance and academic support. Special thanks to my entire family for their support, encouragement throughout this project. Last but not least my gratitude to my colleagues at Bunge E.A Ltd that have been of great assistance which encouraged me to remain focused on the project. Special thanks to you all.

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LIST OF ABBREVIATIONS & ACRONYMS

CLSC	Closed Loop Supply Chain
GDP	Gross Domestic Product
DCT	Dynamic Capabilities Theory
EAC	East Africa Community
EABL	East Africa Breweries Limited
EPZ	Export Processing Zone
IO	Industrial Organization
KAM	Kenya Association of Manufacturers
KNBS	Kenya National Bureau of Statistics
KFS	Kenya Forest Service
MILP	Mixed Integer Linear Programming
NEMA	National Environment Management Authority
PWC	PricewaterhouseCoopers
RAT	Resource-Advantage Theory
RBV	Resource-Based View
RSC	Reverse Supply Chain
RSCS	Reverse Supply Chain Strategy
SCM	Supply Chain Management
SEZ	Special Economic Zone
SKU	Stock Keeping Unit
UK	United Kingdom
USA	United States of America

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ABSTRACT

This study aimed to postulate the relationship of reverse logistics and operational performance of the manufacturing firms in Kenya. This study was anchored on three organizational theories that were examined to understand how companies adopt and develop reverse logistic practices. The three theories were resource advantage, dynamic capabilities and stakeholder theories. This study used descriptive and cross-sectional survey design. This study employed proportionate stratified random sampling technique. Data for this study was obtained from primary sources. The principal data was collected through organized questionnaire. Regression modelling was used to estimate the relationship between reverse logistics and operational performance. Study results revealed that third party logistics significantly and positively influenced cost in the manufacturing firms ($\beta = 0.6124$; $p < 0.05$). The study however established that both joint venture ($\beta = -0.0706$; $p > 0.05$) and closed loop ($\beta = -0.1772$; $p > 0.05$) did not have significant effect on cost. Joint ventures in the logistics firms positively and significantly influenced quality in the logistic firms ($\beta = 0.7745$; $p < 0.05$) while closed loop ($\beta = -0.2310$; $p > 0.05$) and third party logistics ($\beta = -0.0731$; $p > 0.05$) did not have significant effect on quality. Closed loop in the manufacturing firms positively and significantly influenced delivery speed ($\beta = 0.5816$; $p < 0.05$) while both joint venture ($\beta = -0.0391$; $p > 0.05$) and third party logistics ($\beta = 0.1059$; $p > 0.05$) did not have significant effect on delivery speed. Joint ventures ($\beta = 0.3989$; $p < 0.05$) and third party logistics ($\beta = 0.2872$; $p < 0.05$) positively and significantly influenced flexibility while closed loop did not have a significant effect on flexibility ($\beta = -0.0960$; $p > 0.05$). This study therefore recommended adoption of reverse logistics in a more formal manner with laid out policy guidelines as it has been well noted that reverse logistics adoption has positive relationship with the enhancement of operational performance measures of the manufacturing firms. Further stakeholder awareness on reverse logistics models needs to be enhanced as more of the respondents seemed not to appreciate other cost effective models of reverse logistics such as joint ventures and third party logistics (3PL).

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Reverse Logistics entails management, control and sorting of customer or market returns back to the manufacturing or collection center. Over the years, the business concept 'Reverse Logistics' has continued to attract increased attention; mainly as a result of consciousness to issues with the environment, environmental laws coupled with emerging awards and recognitions (Blumberg, 2005). It encompasses events in returns flows, initiated at customers point backwards to suppliers and manufacturers along the supply chain. Reverse Logistics entails both service activities (re-use, mending/repair, restoring, salvage, remanufacturing, or remodel of returned products from the market or end user) and the environmental component (Van Hoek & Harrison, 2007).

This study was anchored on three theories namely the resource advantage, dynamic capabilities theory together with stakeholder theory. These are examined to understand how companies adopt and develop reverse logistics practices. According to the resource advantage theory, organizations seek competitive advantage by obtaining a comparative advantage in resources; innovations such as adoption of business concepts like reverse logistics in a firm positively contribute to its competitiveness. Through dynamic capabilities, firms integrate, build and reconfigure competences through the adoption of reverse logistics thus ensuring competitive survival by delivering threshold capability standards other than just relying on competitive advantage. A firm's aptitude in ascertaining and upholding positive engagements within its stakeholder's network supports its successful survival (Post et al., 2002; Clarkson, 1995). Compulsions of the various stakeholders trigger awareness to reverse logistics enactment (Toffel, 2003; Carter et al., 1998). A theoretical review of these theories and further empirical review of

similar studies in this field is carried out seeking to link manufacturing entity's returns policy as an opportunity to enhance its operational performance through comparative and competitive advantages.

Manufacturing potentially plays an important role of putting Kenya on a sustainable growth path by directly contributing to employment creation, strong linkages with other sectors, smooth volatility in the economy by providing a buffer to foreign exchange shocks & provides robustness to withstand such shocks and ability to raise capital accumulation. Growth of Kenya's manufacturing sector will effectively open up borders and ease process of regional integration and knowledge spill over critical to structural transformation (KAM, 2015).

1.1.1 Reverse Logistics

Reverse logistics entails management, control and sorting of customer or market returns back to the manufacturing or collection centre. Specifically, it's the course of relocating products from the point of consumption back upstream in order to salvage or discard them properly (Tibben-Lembke & Rogers, 1999).

Many researchers have focused on establishment of operative and proficient forms of reverse logistics in costs reduction efforts. Barros et al (1998) created a mixed-integer linear programming (MILP) model defining suitable sites for regional waste yards from constructions. This study contemplated warehouse siting and assortment undertakings as reverse logistics concerns. Though, stock and conveyance challenges, such as increased construction wastes and depository stock levels, were not measured. Min and Ko (2008)

using mixed-integer package promptly simulated optimised salvage, re-deployment levels and defined size & siting of refurbishment, conveyance and storage facilities.

Notwithstanding choice of manufacturers' engagement in reverse logistics for efficient mix of production, satisfying stakeholder requirements and branding; Tactical choice on reverse logistic model to implement remains. Such models include: Joint Venture (JV) i.e. synergetic association with other firms in the industry undertaking similar reverse logistics activities such as collection centres and conveyance (Kasper et al, 2011). Secondly, closed - loop supply chain by combining forward and reverse product flows within the supply chains. CLSP is, ''designing, controlling and operating a supply chain system to maximize value creation over a product's entire life cycle with dynamic recovery of value from the different types and volumes of returns over time '' (Guide Jr. & Van Wassenhove, 2009).

Lastly, outsourcing reverse logistics, manufacturers contract third-party logistics (3PL) providers to run their reverse logistics program without interrupting forward product flows. Reverse logistics is outsourced within five areas (i) Expert collection and consolidation of returns (ii) Viable waste collection, sorting and marketing (iii) Dedicated collection of saleable waste (iv) Dealing with reusable packaging and pallet pools and (v) Green product validation (Logozar, 2008). In traditional logistics, products move within the supply chain beginning from supplier to consumer, whilst in reverse logistics they move backwards, moving from the consumer back to the supplier or distributor. In the end, the product will either be re-conditioned or resold, or will be scrapped and recycled, with its parts being used to create a new product for sale. There are three main dimensions of this product flow as it moves through the supply network i.e. Re-

manufacture, Re-use and Repair. Such dimensions can assist in the effective measure of operational performance.

1.1.2 Operational Performance

Operational Performance broadly refers to short-term goals whose attainment is deemed to move an organisation towards attaining its strategic or long-term goals. They can also be viewed in a nut-shell as tactical objectives. Broadly organizational stakeholder objectives forms a framework for strategic operations but the day to day operations needs more detailed defined objectives. Performance objectives have both external and internal effects. Operational performance is disaggregated into four dimensions, namely quality, delivery speed, flexibility and cost (Swink et al., 2005).

Quality means 'conformance and consistency' i.e. the product conforms to its specifications consistently and no requirements for returns for re-work or repairs. Quality is a major factor in customer satisfaction. It reduces overall costs and increases customers dependability on the firms' products as error free products are produced. Womack et al. (1990) concluded that one of the most common benefits related to lean manufacturing practices is quality improvement. Delivery speed increases the value to the customer- it helps to respond quickly to customers' returns and replacements of defective products. Cooperation, process integration, long term relationship, information sharing allow processes improvement and inventories and lead time reduction (Cooper et al., 1997).

Flexibility is the ability to being able to change in either, what, how and when so that the company is enabled to provide four types of requirements: Product flexibility which is ability of operations to repair or modify returned products, Mix flexibility relating to

ability to produce a wide or mix variety of products, volume flexibility which means being able to change level of output and delivery flexibility that relates to ability to change time of delivery. Flexibility inside the organization is also important as it speeds up responses to change, saves time and maintains dependability.

The cost structures of different organisations can vary greatly. If the other performance objectives are managed properly- high quality, high speed, and high flexibility can not only bring their own external rewards, they can also save the operation costs. Cooperation and processes integration between members of the same chain result in cost and time reduction and quality and flexibility improvements, as each organization can focus on its core competencies (Jarillo, 1988). Return policies are an indication of suitability and quality assurance to the customers. The higher the manufacturer is self-assured of their returns program; the higher the customers trust on the manufacturer's quality assurance. Additionally, a manufacture's returns program is a focal constituent of its customer service bundle. Engaging few resources gives the impression to only being suitable for firms targeting destruction of returned products. Therefore; dedicating meaningful resources to reverse logistics programs may essentially unlock exceptional performance. Resource commitment is critical in attaining effective recycling programs.

1.1.3 Reverse Logistics and Operational Performance

In relation to this research, reverse logistics is defined as the process of meticulously getting back products previously shipped out to the market back to the manufacturer for possible recycling, remanufacturing or disposal. This reverse logistics system defines a supply chain that is efficiently restructured to manage products or parts flows destined for manufacturing, recycling or disposal (Dowlatshahi, 2000). A mixture of efficiencies in

product mix and product routing contribute positively to a firm's profitability. Notwithstanding choice of manufacturers' engagement in reverse logistics for efficient mix of production, satisfying stakeholder requirements and branding; Tactical choice on reverse logistic model to implement remains (Weeks et al., 2010).

Such models include: Joint Venture (JV), that is, synergetic association with other firms in the industry undertaking similar reverse logistics activities such as collection centres and conveyance (Kasper et al., 2011). Secondly, closed - loop supply chain by combining forward and reverse product flows within the supply chains. Operations such as returns forecast, set up locations of recovery within the chain and management of first and second hand products (Dekker & Brito, 2004). Lastly, outsourcing reverse logistics, manufacturers contract third-party logistics (3PL) providers to run their reverse logistics program without interrupting forward product flows. Many manufactures have discovered that components and materials from end of life durable products can often be recycled or refurbished to substitute for new parts to be used as spares or in remanufacture of other products. In 2015, Apple Inc. recuperated a huge quantity of gold, silver and copper from recycled iPhones. In total 90 million pounds of materials was recovered through this recycling program.

1.1.4 Manufacturing Firms in Kenya

According to Kenya Association of Manufactures (KAM) 2016 directory; there are 563 members categorised into 15 sectors. Twelve of these sectors are in processing and value addition while two offer essential services enhancing formal industry and the last one covers multinationals. Most of the main manufacturing centres are located within Kenya's three key cities of Nairobi, Mombasa and Kisumu. Other locations include: Machakos,

Athi-river, Thika, Nakuru, Eldoret and Nyeri. Industrial activities in these sectors are varied from agricultural, food & beverages processing, wheat, maize and feed mills, liquor production, sugar, soybean crushes and many more.

Manufacturing share of value to Kenya's export earning is estimated at 28 percent. Over the last five years, the manufacturing sector's share of GDP has constantly been at 10 percent on average. A number of players in the manufacturing sector in Kenya have established reverse logistics practices in order to ensure that their defective products get their way back to the manufacturing center in order to help in the improvement of quality. Some of the major companies currently involved in reverse logistics practices include EABL, Cadbury Kenya and Unilever (Langat, 2012).

1.2 Research Problem

Competiveness is key with the vast supply chain remaining unexplored by researchers particularly in relation to the relationship of reverse logistics and operational performance objectives of the firms in enhancing their competiveness. Integrating competitive tools such as reverse logistics systems within the organisational supply chains will create competitive differentiation where the manufacturing organisations demonstrate speed and reliability in service offerings such as: replacing defective products, repairing used products, refurbishing returned goods, calling back sub-standard or harmful products and disposing of waste. These services related to reverse logistics add to organisations' competitiveness operating in regulated environments and creates customer value by providing a clean environment without any extra costs to the customer. The manufacturing industry in Kenya continues to grow contributing over 10 percent to the GDP according to KNBS. Manufacturing firms face increased operational costs

associated to amongst others the cost of doing business in Kenya. It is therefore imperative for manufacturing firms to prioritize and implement strategies that would enhance their operational performance objectives and increase their competitiveness. A number of players in the manufacturing sector in Kenya have established reverse logistics practices in order to ensure that their defective products get their way back to the manufacturing center thus improving on their quality, flexibility, costs and delivery speed.

Various studies have covered reverse logistics in Kenya. Ongombe (2012) studied reverse logistics and competitive advantage among water bottling companies in Nairobi. The study concluded existence of strong and significant relationship between reverse logistics practices and competitive advantage. Serut (2013) studied the effect of reverse logistics adoption on financial performance of manufacturing firms. The study concluded that reverse logistics showed progressive and noteworthy influence on manufacturing firms' performance financially. Kiberenge (2014) concluded that many players in Kenya's ICT sector had implemented reverse logistics extensively due to its significance for their operations given its fairly above average rating by the respondents.

Lauren et al (2008) on their study of impact of reverse logistics on organizational performance; revealed that with effective commitment of resources activities of re-cycle, dispose, re-furbish or re-manufacture superior organizational performance was imminent. Somuyiwa and Adebayo (2014) in their study investigating effects of reverse logistics objectives in food & beverages firms in Nigeria on their economic performance; surveyed companies' revealed effectively improving customer approval and environmental regulatory compliance through reverse logistics thus controlling their costs and increasing

profits. Ramirez (2012) in his survey of 284 firms in Spain concluded that reverse logistics implementation improved organizational performance conditioned by knowledge creation in logistics management.

It is evident from the above that research studies on reverse logistics were focused on different sectors of the industry and effects on other organizational aspects other than operational performance objectives. There is therefore a gap in literature as far as studies on holistic reverse logistics adoption by the manufacturing firms in Kenya and the relationship to their operational performance objectives such as cost, quality, flexibility and delivery speed are concerned. Does reverse logistics impact on a manufacturing firm's operational performance objectives?

1.3 Research Objectives

Manufacturing sector in Kenya is vibrant and the vast supply chain remains unexplored by researchers particularly in relation to reverse logistics and operational performance objectives. Various studies Ongombe (2012) and Serut (2013) studied reverse logistics in relation to competitive advantage and financial performance of manufacturing firms. This study aimed to postulate the relationship of reverse logistics and operational performance of the manufacturing firms in Kenya.

i. To find out the extent of reverse logistics adoption in manufacturing firms in Kenya.
ii. To determine the relationship between reverse logistics and operational performance among manufacturing firms in Kenya.

1.4 Value of the Study

The findings of this study envisage providing a rich field of theoretical study and practical application of reverse logistics with clear operational performance objectives and challenges faced by manufacturing firms in adoption of reverse logistics. To the industry it will provide insights on reverse logistics aspects and assist in integrating environmental thinking into supply chain management, including product design, materials sourcing and selection, manufacturing processes, delivery of the final product to the customers and end-of- life management of the product after its useful life.

Academicians will find conclusions out of this study to be profound on researchers' knowledge in the field of study with additional insights to execute more research gaps and issues in this field of reverse logistics within the supply chain network. To policymakers this study will serve as a guide when making policies regarding supply chain practices in the country. These policies will aid government authorities charged with environmental management such as National Environmental Management Authority (NEMA) and Kenya Forest Service (KFS) with insight into how effective reverse logistics can greatly contribute into environmental conservation and development of a policy frame work for minimizing environmental risk exposures such as pollution and depletion of natural resources.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter primarily explores a summary on theories that explain reverse logistics by other authors and academicians. Presented also is a summary of empirical studies from authors on drivers, strategies, framework, benefits and barriers of reverse logistics. A summary is provided at the end of this chapter.

2.2 Theoretical Review

This study was anchored on three organizational theories that were examined to understand how companies adopt and develop reverse logistics practices. The three theories were resource advantage, dynamic capabilities and stakeholder theories.

2.2.1 Resource Advantage Theory

Resource advantage theory gives prominence on diverse firm resources, segments of the market, resources comparative advantage and competitive advantage on positioning within the market. This theory postulates a new viewpoint regarding competition, prominently highlighting and aligning the firm's interests and those of its consumers. Resources of the firm are accentuated as essential elements of performance and competitive advantage. Such resources comprise of processes within the organization, market intelligence of information, proficiencies of the organisation and all other assets among others. These resources facilitate effective and efficient strategic conception and implementation of competitive strategies (Barney, 1991).

Main cause of firm profitability swiping back to the firm itself rather than the industry is founded on the view that higher performance and sustenance of a competitive position is

principally contingent on firm's resources. Managers have to strive in transforming these resources to central competencies establishing competitive positioning in the particular segment of the market. These critical resources are entrenched core competencies across the firm. They are nurtured, not procured hence are not transferable. They improve over time and they do not depreciate thus creating a long term source of sustaining competitive advantage. Resource advantage competitive theory delivers an absolute fresh viewpoint on nature of competition and more so where consumer and firm interests are aligned. Hunt and Morgan (1995) illustrated that development of resources is influenced by nature of competition and competitive environment of the firm and other competitors in the segment. Therefore not appropriate to view competitive policy as only being aligned to competition rather equally to competitive advantage. Type of competition stimulates build-up of resources that contribute to competitive advantage. It further shows from the segment level, inter-relationship of consumers and market position of the firm.

2.2.2 Dynamic Capabilities Theory

In this theory, emphasis is on firm's capacity to mix, create and refurbish both internal and external competencies addressing the rapid changes in the competitive environment. In Schumpeterian terms, this theory observes competition as where firms are continually looking for fresh ideas on resource mix and other competitive players in the market segment are also perpetually endeavouring on superior competences or emulating competences of their superior competitors .Accordingly competition clearly implies its paramount for a firm to nurture fresh competences in mounting long lasting competitive advantage (Pisano & Teece, 1994)

2.2.3 The Stakeholder Theory

The stakeholder theory contends organizations have interactions with numerous integral groupings and they stimulate and uphold supporting these groupings by studying and complementing their pertinent concerns (Wicks & Jones, 1999). An organization's stakeholder is any grouping or person affected by the organizations actions in achievement of its objectives (Freeman, 1984). The firm's capacity to create and sustain association with its stakeholder's network determines survival and attainment of successful results (Clarkson, 1995). Reverse logistics seeks to satisfy a myriad of stakeholder claims in its various activities such as re-cycling, refurbishment, repair, warranties and disposal.

2.3 Empirical Review

Internationally and locally a number of studies have been done to try and establish the connection between adopting reverse logistics with corresponding superior performance of the organizations. These studies concluded that reverse logistics had a positive and significant impact on financial performance and competitive advantage. Resource advantage theory accentuates firm resources as essential rudiments of performance and competitive advantage. Lauren et al. (2008) revealed that with effective commitment of resources to reverse logistics activities of re-cycle, dispose, re-furbish or re-manufacture superior organizational performance was imminent. These resources facilitate effective and strategic implementation of competitive strategies and concepts such as reverse logistics maximizing value creation over the entire life cycle of a product with dynamic recovery of value from different types and volumes of returns over time. Contract third party logistics enables the firm to free resources and capital to focus on core competence

which allows the firm to get into a new business, a new market, or a reverse logistics program without interrupting forward flows.

Synergetic horizontal alliance of firms in joint ventures, creates efficiency that may not only be explained in terms of productivity, product route or production mix efficiency, but more as the ability to examine and utilise partner's essential competencies through contractual arrangements as an alternative to developing such competencies internally (Haakansson et al., 1999). Stakeholder theory observes relationships between an organization and its internal and external environment. Reverse logistics models such as joint ventures, closed loop re-cycling systems and third party logistics seek to satisfy a myriad of stakeholders claims such as commitment, warranties, responsibility for all product lifecycle, environmental responsiveness and profits for the shareholders.

2.3.1 Closed Loop Supply Chains

Guide and Van Wassenhove (2009) defined closed-loop supply chains as the, design, control, and operation of a system to maximize value creation over the entire life cycle of a product with dynamic recovery of value from different types and volumes of returns over time. This is ideally, a zero-waste supply chain that completely reuses, recycles, or re-manufactures all materials. While conventional supply chains seek to efficiently move products in a linear fashion from raw materials to end consumers, a closed-loop supply chain is one that is also dependent on feeding used products back as raw materials. According to Flapper et al. (2005), there are four types of close-loop supply chains: production-related, distribution-related, use-related, and end-of life. Close loop supply chains combine forward and reverse product flows within the supply chains.

2.3.2 Joint Venture

Joint Venture (JV), that is, the synergetic horizontal alliance between firms in an industry undertaking similar reverse logistics activities such as establishing collection & recycling centres, collaborative transportation and joint quality control and conveyance (Kasper et al., 2011). A typical joint reverse supply chain contains four areas of collaboration: waste disposal, product/part/material in sales, cost sharing and profit distribution (Nnorom et al., 2009). JVs provide better methods of managing ambiguity in reverse logistics due to the following reasons: uncertainty in timing and volume of returns, striking a balance between demand and returns, requirement of disassembling returned products, uncertainty in eventual recovery from returned products, materials matching complications and restrictions owing to variable processing times. Efficiencies in JV are not only explained in productivity terms, production mix efficiencies or product route efficiencies, but also in ability of exploring and exploiting partner's core competencies via contractual agreements as substitute to developing these competencies internally (Haakansson et al., 1999).

2.3.3 Contract Third-Party Logistics (3PL)

Outsourcing reverse logistics, manufacturers contract third-party logistics (3PL) providers to run their reverse logistics program without interrupting forward product flows. Organizations that partner with a third-party logistics service provider (3PL) benefit from greater controls over the entire supply chain resulting in improved inventory management, increased visibility, reduced costs and enhanced risk management. Specifically, the benefits of utilizing the expertise of a 3PL for reverse logistics process management produces greater controls over inspecting, recovering, testing and disposing of returned products. A comprehensive 3PL solution with a holistic approach to all

logistics aspects offers many strategic capabilities, operational and technical benefits such as: deep industry and regional knowledge and expertise, scalability and flexibility, transparency into the entire product life-cycle and access to distribution and refurbishment centre management.

2.3.4 Reverse Logistics Components

According to Hazen et al. (2001) there are three reverse logistics components; re-use, re-manufacture and re-cycle. Through re-use customers return un-used products to the seller or retailer. Re-use brings back the products into the supply chain for similar or alternative uses. It also entails return of reusable packaging materials such as crates, bottles etc. These returns back to the seller or manufacturer are managed through a process of reverse logistics. Conversely, re-manufacturing on the other hand entails repair, refurbishing and overhauling a product item to re-instate it to its original condition.

Properly managed supply chain activities within organizations can enhance their economic performance by employing remanufacturing to re-claim value in products with diminished value, i.e. revive back life in the products. Recycling forms the third component and entails recovering returned materials and products to reintroduce value back in the products. Product disposal may no longer be the consumer's responsibility as products need to be recycled or remanufactured by the original manufacturer. Increasingly, stringent environmental and packaging regulations are forcing companies to become more accountable for residual and final products, long after the final product is sold and is in the hands of the customers (Willits and Giuntini, 1994).

2.4 Conceptual Framework

The concept of reverse logistic and operational performance can be examined within the framework developed below showing the relationship of the independent variable being reverse logistics and the dependent variable being operational performance objectives. Implementation of each of the reverse logistics models by joint venture, closed loop or contract third party logistics independently will have a direct co-relation to operational performance measure in the four areas of quality, flexibility, cost and delivery speed.

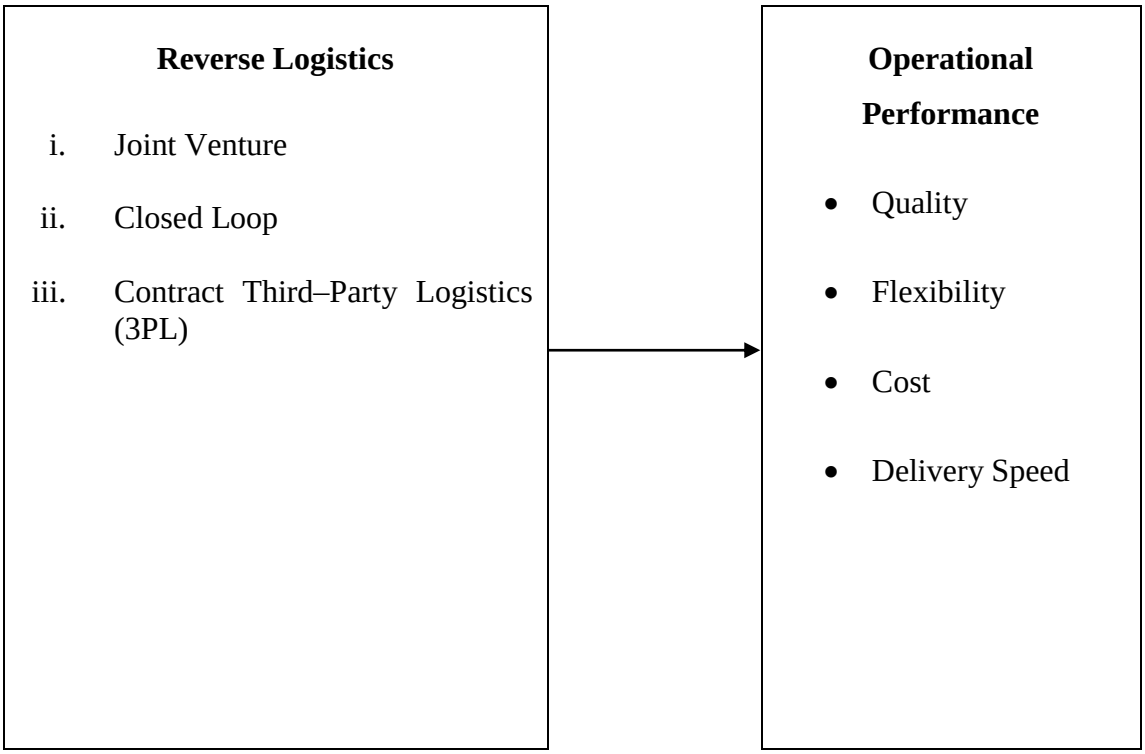

Figure 2.1: Framework of Reverse Logistics and Operational Performance

Source: Author (2016)

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

Methodology used in conducting this study is described in this chapter. It encompasses design of the research, sample & population of the study together with sampling techniques, methods of data collection, research variables and techniques of data analysis.

3.2 Research Design

This study used descriptive and cross-sectional survey design. Descriptive survey according to Kothari, Sabino & Zach (2005) is scientifically taking observations on a subject with no influence on it in any way and describing the behaviour thereof. Mugenda and Mugenda (1999) viewed descriptive survey as strategic collection of information from a populace using organized interviews & questionnaires among others. Descriptive cross-sectional survey design suitability to this study was due to its efficiency in collection of information from a select target group of respondents within the population under study. Cross-sectional studies involved data collection from the population, or a selected subset, at one specific point in time (Cooper & Schindler, 2006). Cross-sectional surveys have been used in previous studies dealing with reverse logistics including Serut (2013), Muttimos (2014) and Nyarenga (2015).

3.3 Population of the Study

The population of this study comprised of registered manufacturing firms under the umbrella body of Kenya Association of Manufacturers (KAM). According to the Kenya manufacturers and exporters 2016 directory KAM had 563 members categorised in 15 sectors, of which 12 are in processing and value addition while the others offer essential services to advance formal industry.

3.4 Sampling Design

This study employed proportionate stratified random sampling technique. This technique was preferred because manufacturing firms in Kenya fall under 15 sectors according to KAM. The sample size had been determined by use of survey monkey software calculator basis the following formula:

$$Sample\ Size = \frac{\frac{z^2 \times p(1-p)}{e^2}}{1+(\frac{z^2 \times p(1-p)}{e^2 N})}$$

Where: N = Population Size | e = margin of error | z = Score (from Z score table)

Out of a population size of 563, confidence level of 90 percent and 10 percent margin of error, using a normal distribution of 50 percent the ideal sample size of 61 firms was attained.

Table 3.1: Manufacturing Firms to be sampled per sub sector

Sub-sector	Total Firms	Sample
Building, Mining & Construction	20	3
Chemical & Allied	70	5
Energy,Electricals & Electronics	34	5
Food & Beverages	71	10
Fresh Produce	3	1
Leather & Footwear	7	4
Metal & Allied	66	5
Motor Vehicle & Accessories	27	3
Paper & Board Sector	63	3
Pharmaceutical & Medical Equipment	21	5
Plastics & Rubber	68	9
Service & Consultancy	61	0
Textile & Apparels	35	5
Timber, Wood & Furniture	17	3
	563	**61**

3.5 Data Collection

Data for this study was obtained from primary sources. The principal data was collected through organized questionnaire. This questionnaire was designed based on study

objectives and was distributed using 'drop-and-pick-later' method where-ever possible and phone interviews. Questionnaire comprised of closed and open ended questions. It contained three sub-sections; first part gathering general information on the respondent firm. Second part focused on reverse logistics model adopted by the respondent firm. Third part carried questions aimed at determining the effect of reverse logistics on quality, flexibility, cost and delivery speed operational performance measures. The target respondents were supply chain managers in the respective organizations charged with the daily running of the supply chain operations.

3.6 Data Analysis

Data collected from the respondents was checked for completeness and correctness followed by coding, tabulation and organizing in Microsoft excel. Regression modelling was used to estimate the relationship between reverse logistics and operational performance. Regression analysis is a statistical process for estimating the relationship between a dependant variable and one or more independent variables.

The following multiple regression model was used to predict the composite variable being operational performance basis joint venture, closed loop and contract 3PL as the independent variables.

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$

Where; Y – Operational Performance

β_0 - Constant

β_1 to β_3 - Regression coefficients

X_1 to X_3 – Joint Venture, Closed Loop and Contract 3PL respectively.

ε - Error term

Data collected on the three variables was aggregated by summing and averaging the raw scores. Descriptive statistics is used to find out extent of reverse logistics adoption and to establish challenging factors to implementation of reverse logistics among manufacturing firms in Kenya.

CHAPTER FOUR: RESULTS, DATA ANALYSIS AND DISCUSSION

4.1 Introduction

This chapter presents an analysis of data collected and discusses the findings on the relationship between reverse logistics practices and organisational performance of manufacturing firms in Kenya.

4.2 Respondents profile

This study targeted a total population sample of 61 manufacturing firms. A total of 26 useful questionnaires were received back. This represents 43 percent response rate. Further percentage response rate per sub sector as shown in table 4.1 below.

Table 4.1: Response Rate and Number of Firms Responded Per Sub Sector

Sub-sector	Total Firms	Sample	Response	% Response
Building, Mining & Construction	20	3	2	67%
Chemical & Allied	70	5	2	40%
Energy,Electricals & Electronics	34	5	2	40%
Food & Beverages	71	10	6	60%
Fresh Produce	3	1	0	0%
Leather & Footwear	7	4	1	25%
Metal & Allied	66	5	2	40%
Motor Vehicle & Accessories	27	3	1	33%
Paper & Board Sector	63	3	1	33%
Pharmaceutical & Medical Equipment	21	5	0	0%
Plastics & Rubber	68	9	7	78%
Service & Consultancy	61	0	0	0%
Textile & Apparels	35	5	1	20%
Timber, Wood & Furniture	17	3	1	33%
	563	**61**	**26**	**43%**

Data on Table 4.1 shows the highest response rate of 78 percent from the plastics & rubber sub sector which constitutes firms that are highly practising reverse logistics activity of re-cycling. A list showing all the firms surveyed under this study is attached as Annex 3.

4.3 Demographic Characteristics of Respondents

Table 4.2: Sampled Manufacturing Firms Demographics

	Manufacturing Firm	Ownership Structure	Sub Sector	Years In Operation
1	Bayer East Africa Ltd	Multi-National	Chemical & Allied	>10
2	Syngenta East Africa Ltd	Multi-National	Chemical & Allied	>10
3	Central Glass Industries	Multi-National	Building,Mining & Construction	>10
4	Flamingo Tiles (Kenya)Limited	Local Company	Building,Mining & Construction	>10
5	Metsec Ltd	Local Company	Energy,Electricals & Electronics	>10
6	Sollatek Electronics (Kenya) Limited	Local Company	Energy,Electricals & Electronics	>10
7	Alpine Coolers Limited	Local Company	Food & Beverages	>10
8	Kevian Kenya Ltd	Local Company	Food & Beverages	>10
9	Pearl Industries Ltd	Local Company	Food & Beverages	>10
10	Sigma Supplies Ltd	Local Company	Food & Beverages	>10
11	Proctor and Allan (E.A.) Ltd	Local Company	Food & Beverages	>10
12	Broadway Bakery Ltd	Local Company	Food & Beverages	>10
13	C and P Shoe Industries Ltd	Local Company	Leather & Footwear	>10
14	Blue Nile Wire Products Ltd	Local Company	Metal & Allied	>10
15	Nampak Kenya Ltd	Local Company	Metal & Allied	>10
16	Unifilters Kenya Ltd	Local Company	Motor Vehicle & Accesories	>10
17	Packaging Manufacturers (1976) Ltd	Local Company	Paper & Board Sector	>10
18	General Plastics Limited	Local Company	Plastics & Rubber	>10
19	Complast Industries Limited	Local Company	Plastics & Rubber	>10
20	Mombasa Polythene Bags Ltd	Local Company	Plastics & Rubber	>10
21	Umoja Rubber Products Limited	Local Company	Plastics & Rubber	>10
22	Techpak Industries Ltd	Local Company	Plastics & Rubber	>10
23	Cables and Plastics Ltd	Local Company	Plastics & Rubber	>10
24	Eslon Plastics of Kenya Ltd	Local Company	Plastics & Rubber	>10
25	Brilliant Garments	Local Company	Textile & Apparels	>10
26	Woodtex Kenya Ltd	Local Company	Timber,Wood & Furniture	>10

4.3.1 Ownership Structure

Eighty eight (88) percent of the total population sampled were locally owned companies which are mainly family owned businesses.

4.3.2 Manufacturing Firms' Categorisation

27 percent of the firms were under the plastics and rubber sub sector with the highest respondent rate followed by food & beverages at 23 percent. The rest of the subsectors follow at between four and eight percent.

4.3.3 Length of Operation

100 percent of the sampled manufacturing firms were in existence for over 10 years depicting resilience and reliability in their response owing to the long years of existence.

4.4 Reverse Logistics in the Organisation

Out of the respondents 81 percent confirmed they have a mechanism of accepting back returned goods. Seventy three (73) percent of these returns were mainly on distribution damages. Only one respondent was receiving empties back, while re-cycling and re-working mainly re-packaging of returned products stood at 46 and 38 percent respectively. Firms carrying out re-manufacturing affirmed that 50 percent of the returned products are successfully re-captured and re-circulated back to the market. Firms carrying out re-cycling affirmed that 100 percent of returned products are re-cycled. Nineteen (19) respondents rated their reverse logistics costs to be between 20-30 percent of their overall organizational costs. Outsourcing of reverse logistics services is not common in locally owned companies. Out of the 26 respondents only three which are multinationals

responded to the question of outsourcing to another company to manage their product returns. Further again, only the multinationals confirmed disposal of returned products.

4.5 Reverse Logistics

Respondents were asked to confirm the reverse logistics model they were running and extent to which they had adopted within the range of minimal to extensive. Sixty-five (65) percent of the respondents are fully running a closed loop system, 10 percent have engaged Third Party Logistics (3PL) and only one respondent was noted to run a joint venture. On further enquiry it emerged the joint venture was carried out together with their sister company that was located within the same complex as the respondent. Some of the manufacturing firms were running a combination of joint venture and closed loop or closed loop system and third party logistics (3PL).

4.6 Operational Performance

Respondents were requested to highlight how reverse logistics had influenced their operational measures of quality, delivery speed, cost and flexibility. Out of the 20 respondents that had confirmed existence of reverse logistics practice in their firms; 40 percent responded affirmatively that their operational measure on quality had greatly been enhanced. The rest confirmed that indeed not only quality had been improved but the rest of the operational measures of delivery speed; cost and flexibility had greatly been enhanced.

4.7 Regression Analysis

Regression analysis was applied to establish the effect of reverse logistics on operational performance. Before and after the regression analysis was conducted, diagnostic tests for

multicollinearity, heteroscedasticity and normality of residuals were conducted. First, multicollinearity was tested using Variance Inflation Factor (VIF). Kothari et al. (2005) notes that when the VIF is below 5, there is no Multicollinearity. The results from the study are presented in Table 4.3.

Table 4.3: Test of Multicollinearity

	Collinearity Statistics	
	Tolerance	VIF
Joint Venture	.748	1.337
Closed Loop	.756	1.323
Third party Logistics	.742	1.348
Mean		1.336

The results in Table 4.3 indicate that the VIFs for the three independent variables and also the mean VIF were below 5. This indicates that no two independent variables were highly correlated and hence the conclusion was that there was no multicollinearity.

Secondly, test for heteroscedasticity was conducted. One of the central assumptions for any regression analysis is that the variances of residuals are homogenous. This indicates that there should be no pattern to the residuals when they are plotted against the fitted values. The test for heteroscedasticity was conducted using Cameron and Trivedi's decomposition of IM-test. The null hypothesis in this test is that the variances of residuals are homoscedastic whereas the alternate is that the residuals are heteroscedastic. The results from the test are indicated in Table 4.4.

Table 4.4: Test for Heteroscedasticity

Source	chi2	df	p
Heteroskedasticity	6.27	9	0.7124
Skewness	3.16	3	0.3682
Kurtosis	2.17	1	0.1404
Total	11.60	13	0.5605

Source: Field Data (2016)

The results in Table 4.4 indicate that the variances of residuals were homoscedastic (χ^2 = 6.27; $p > 0.05$). This hence led to the conclusion that the variances of the residuals from the regression depicted homoscedasticty which satisfied this assumption.

Lastly, the normality of residuals was tested. This was tested graphically by plotting the standardised predicted values against the standardized residual values. A histogram was plotted as indicated in Figure 4.1. The histogram indicates that the residuals did not deviate significantly from the normal. The residuals were hence considered to be normally distributed.

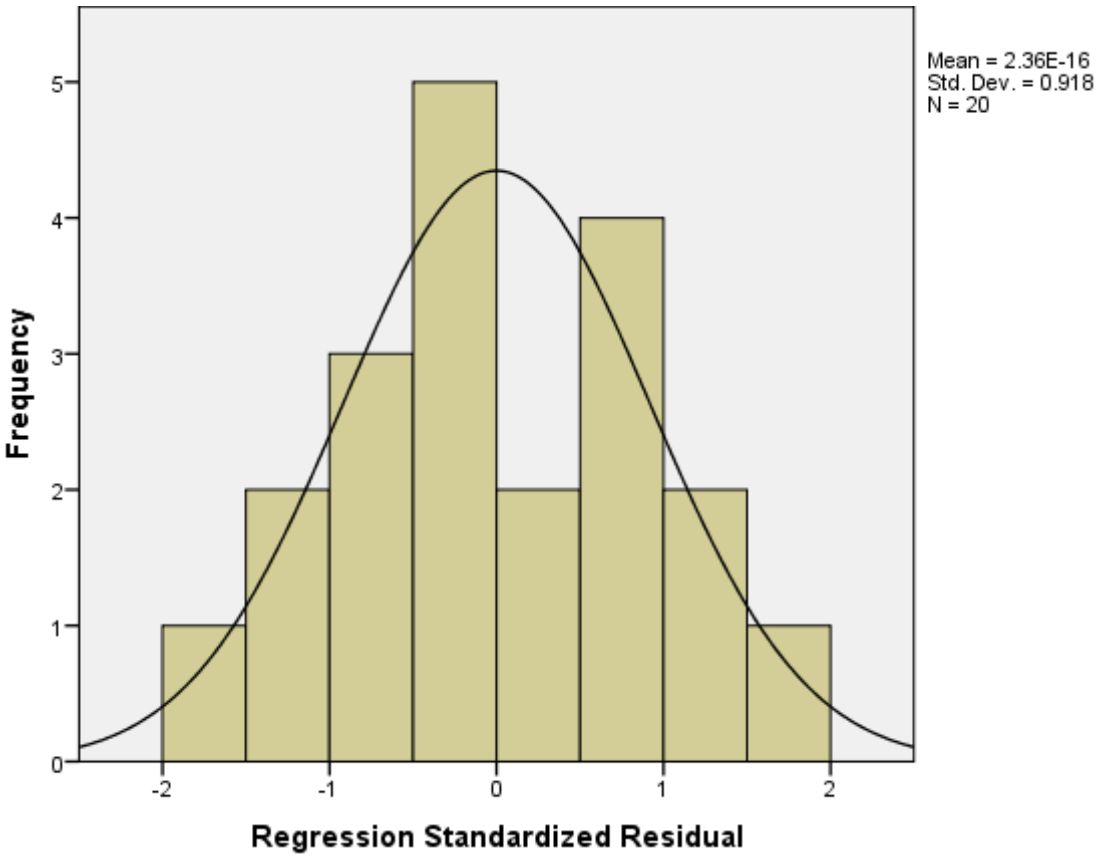

Figure 4.1: Normality of Regression Residuals

As the regression assumptions were satisfied, four regression models were run with the independent variables being joint venture, closed loop and third party logistics. The dependent variables in the four models were the operational performance measures used which included cost, flexibility, quality and delivery speed. The first regression was run with cost as the dependent variable. The results are presented in Table 4.5. The results indicated that the model explained 52.72% of change in cost (r squared = 0.5272). This indicates that joint ventures, closed loop and third party logistics explained 52.72% of the changes in cost in the logistics firms. Further, results in Table 4.5 indicated that the model was statistically significant and was a good fit for the data ($F = 5.95$; $p < 0.05$).

The results further indicated that third party logistics significantly and positively influenced cost in the manufacturing firms ($\beta = 0.6124$; $p < 0.05$). This indicated that

increase in third party logistics contracts led to increase in costs. The study however established that both joint venture (β = -0.0706; p > 0.05) and closed loop (β = -0.1772; p > 0.05) did not have significant effect on cost.

Table 4.5: Effect of Reverse Logistics on Cost

Source	SS	df	MS	Number of obs =	20
				F(3, 16) =	5.95
Model	6.32693626	3	2.10897875	Prob > F =	0.0063
Residual	5.67306374	16	.354566484	R-squared =	0.5272
				Adj R-squared =	0.4386
Total	12	19	.631578947	Root MSE =	.59545

cost	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
jv	-.0705963	.2008516	-0.35	0.730	-.4963826	.35519
cl	-.1771761	.1899697	-0.93	0.365	-.579894	.2255417
tpl	.6124058	.1847819	3.31	0.004	.2206857	1.004126
_cons	1.376971	.6405207	2.15	0.047	.0191274	2.734814

Source: Field Data (2016)

The second model involved quality as the dependent variable. The results are as indicated in Table 4.6.

Table 4.6: Effect of Reverse Logistics on Quality

Source	SS	df	MS	Number of obs =	20
				F(3, 16) =	6.10
Model	5.97703907	3	1.99234636	Prob > F =	0.0057
Residual	5.22296093	16	.326435058	R-squared =	0.5337
				Adj R-squared =	0.4462
Total	11.2	19	.589473684	Root MSE =	.57134

qual	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
jv	.7745031	.1927191	4.02	0.001	.3659568	1.183049
cl	-.2309801	.1822779	-1.27	0.223	-.617392	.1554317
tpl	-.0729952	.1773001	-0.41	0.686	-.4488546	.3028642
_cons	1.180809	.6145861	1.92	0.073	-.1220555	2.483673

Source: Field Data (2016)

The results in Table 4.6 indicated that the model explained 53.37% of change in quality (r squared = 0.5337). This indicates that joint ventures, closed loop and third party logistics explained 53.37% of the changes in quality in the manufacturing firms. Further, results in Table 4.6 indicated that the model was statistically significant and was a good fit for the data ($F = 6.10$; $p < 0.05$).

The results further indicated that joint ventures in the logistics firms positively and significantly influenced quality in the logistic firms ($\beta = 0.7745$; $p < 0.05$). This indicated that increase in joint venture arrangements in the manufacturing firms led to improved quality. The study however established that both closed loop ($\beta = -0.2310$; $p > 0.05$) and third party logistics ($\beta = -0.0731$; $p > 0.05$) did not have significant effect on quality.

The model was run where delivery speed was the dependent variable. The results are presented in Table 4.7.

Table 4.7: Effect of Reverse Logistics on Delivery Speed

Source	SS	df	MS	Number of obs =	20
				F(3, 16) =	3.90
Model	3.88690884	3	1.29563628	Prob > F =	0.0288
Residual	5.31309116	16	.332068197	R-squared =	0.4225
				Adj R-squared =	0.3142
Total	9.2	19	.484210526	Root MSE =	.57625

delspeed	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
jv	-.0390679	.1943748	-0.20	0.843	-.4511241	.3729884
cl	.5815627	.1838439	3.16	0.006	.1918311	.9712944
tpl	.1058944	.1788233	0.59	0.562	-.2731941	.484983
_cons	.622207	.6198662	1.00	0.330	-.6918506	1.936265

Source: Field Data (2016)

The results in Table 4.7 indicated that the model explained 42.25% of change in delivery speed in the logistics firms (r squared = 0.4225). This indicates that joint ventures, closed loop and third party logistics explained 42.25% of the changes in delivery speed in the manufacturing firms. Further, results in Table 4.7 indicated that the model was statistically significant and was a good fit for the data ($F = 3.90$; $p < 0.05$).

The results further indicated that closed loop in the manufacturing firms positively and significantly influenced delivery speed in the logistic firms ($\beta = 0.5816$; $p < 0.05$). This indicated that increase in closed loop supply chain management in the manufacturing firms led to improved delivery speed. The study however established that both joint venture ($\beta = -0.0391$; $p > 0.05$) and third party logistics ($\beta = 0.1059$; $p > 0.05$) did not have significant effect on delivery speed.

Lastly, a model was run where flexibility was applied as the dependent variable. The results are presented in Table 4.8.

Table 4.8: Effect of Reverse Logistics on Flexibility

Source	SS	df	MS		
Model	4.01302262	3	1.33767421	Number of obs =	20
Residual	2.98697738	16	.186686086	F(3, 16) =	7.17
Total	7	19	.368421053	Prob > F =	0.0029
				R-squared =	0.5733
				Adj R-squared =	0.4933
				Root MSE =	.43207

flex	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
jv	.3989034	.1457412	2.74	0.015	.0899458	.7078609
cl	-.0959561	.1378452	-0.70	0.496	-.3881748	.1962626
tpl	.287183	.1340808	2.14	0.048	.0029445	.5714215
_cons	.2679918	.4647723	0.58	0.572	-.7172816	1.253265

Source: Field Data (2016)

The results Table 4.8 revealed that the model explained 57.33% of change in flexibility (r squared = 0.5733). This indicates that joint ventures, closed loop and third party logistics explained 57.33% of the changes in flexibility in the manufacturing firms. Further, results in Table 4.8 indicated that the model was statistically significant and was a good fit for the data ($F = 7.17$; $p < 0.05$).

The results further indicated that joint ventures in the manufacturing firms positively and significantly influenced flexibility in the manufacturing firms ($\beta = 0.3989$; $p < 0.05$). This indicated that increase in joint venture arrangements in the logistics firms led to improved flexibility. The study also determined that third party logistics positively and significantly influenced flexibility ($\beta = 0.2872$; $p < 0.05$) indicating that increased third party logistics

contracts led to improved flexibility. The findings however revealed that closed loop did not have a significant effect on flexibility ($\beta = -0.0960$; $p > 0.05$).

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

In this chapter, the researcher endeavours to give a summary of the study findings, conclusions, recommendations and suggestions for further study. Main purpose for this research was to establish if there exists any relationship between reverse logistics and operational performance among manufacturing firms in Kenya. Data for analysis was obtained by use of a questionnaire drawn up by the researcher for response by supply chain or operations managers within the targeted sample population of manufacturing firms in Kenya under the umbrella of KAM, 2016. Data collected was analysed in Microsoft excel.

5.2 Summary

A total of 61 questionnaires were issued out to the sample population, 26 were duly received back representing a response rate of 43 percent. The highest response rate of 78 percent was from the plastics & rubber sub sector which constitutes firms that are highly practising reverse logistics activity of re-cycling. This study further established that 88 percent of the total population sampled were locally owned companies which are mainly family owned businesses. 100 percent of the sampled manufacturing firms were in existence for over 10 years depicting resilience and reliability in their response owing to the long years of existence.

The study sought to review practice of reverse logistics on the basis of category of returns accepted under damages, empties, re-work, disposal and re-cycling. Out of the 26 respondents 81 percent ratified existence of reverse logistics practice albeit mostly not in

a formal manner guided by a reverse logistics policy. 73 percent of these returns were mainly on distribution damages. Only one respondent was receiving empties back, while re-cycling and re-working mainly re-packaging of returned products stood at 46 and 38 percent respectively. Firms carrying out re-manufacturing affirmed that 50 percent of the returned products are successfully re-captured and re-circulated back to the market. Firms carrying out re-cycling affirmed that 100 percent of returned products are re-cycled. 19 respondents rated their reverse logistics costs to be between 20-30 percent of their overall organizational costs. Outsourcing of reverse logistics services is not common in locally owned companies. Out of the 26 respondents only three which are multinationals responded to the question of outsourcing to another company to manage their product returns. Further again, only the multinationals confirmed disposal of returned products.

Regression modelling was used to estimate the relationship between reverse logistics and operational performance. Data obtained from respondents indicating the models of reverse logistics being run by the respondents such as joint venture, closed loop and contract 3PL as the independent variables was regressed against the composite variable being operational performance.

Significantly a majority of the respondents employed the closed loop model in their reverse logistics. From the data gathered it was noted that these firms responded affirmatively to the enhancement of their operational performance measures especially on delivery speed with on time deliveries, reduced delivery lead times, faster response on returns for re-work and repair. Overall with enhanced delivery speed the firms noted a significant improvement in their production cycle time. Flexibility was not a major element noted as most of the returns were either re-cycled and or re-worked and thus no

major contribution on their production mix and volume and or capacity adjustments. A majority of the respondents enhancement of their operation measure on costs especially on the areas of reduced production costs out of re-cycling inputs, increased inventory turnover as quality checks to ensure minimal returns were put in place; enhanced capacity utilization and productivity leading to more cost effective product offering to their customers. Joint venture models were not popular within the sampled population and only one respondent confirmed some sort of alliance with their sister company and mainly this was on transportation, collection and distribution of returned and re-worked products. Third Party Logistics (3PL) services were not popular among the local companies and only noted within the multi- national set ups.

With a view to organisational performance, the findings show that there is a significant positive relationship between reverse logistics and operational performance among manufacturing firms in Kenya with recorded enhanced operational measures on their quality offering to their customers endeavouring to reduce customer complaints and thus the level of product returns; enhanced delivery speed significantly improving on their production cycle time, flexibility in customisation and innovation by developing or re-working returns to other useful products and lastly enhanced cost reduction measures mainly through re-cycling of production inputs.

5.3 Conclusions

Basis the foregoing dissertation it can be concluded that manufacturing firms in Kenya are already practicing reverse logistics albeit mostly devoid of formal structures and policies. The practice of reverse logistics has been proven to have a positive relationship with the enhancement of the operational performance of the sampled manufacturing

firms. Eventually, enhanced operational performance measures of the organisations were found to be dependent on the reverse logistic model adopted such as closed loop, joint venture or third party logistics (3PL). This finding corresponds to that of Langat (2012) who discerned that implementation of reverse supply chain practices significantly influenced performance of the organisation. Likewise, Serut (2013) noted existence of a positive relationship between implementation of reverse logistics practices and organizational performance an argument also supported by Gitau (2010) in a study on the effects of reverse logistics on the performance of East African Breweries Ltd.

5.4 Recommendations

This study therefore recommends adoption on reverse logistics in a more formal manner with laid out policy guidelines as it has been well noted that reverse logistics adoption has positive relationship with the enhancement of operational performance measures of the manufacturing firms. Stakeholder awareness on reverse logistics models needs to be enhanced as more of the respondents seemed not to appreciate other cost effective models of reverse logistics such as joint ventures and third party logistics (3PL). More focus and enlightenment needs to be done to the manufacturing firms to adopt reverse logistics as a social responsibility as well to enhance proper disposal of their products support environmental conservation and carbon reduction policies in generation of green energy out of the disposal and re-cycling of returned products; and further developing innovative products that provide extended value in re-use for other purposes after the primary products are consumed.

5.5 Suggestions for Further Study

Out of this study, it was noted that there's still a vast area of knowledge in reverse logistics that still remains unexplored. This study suggests the following areas for further study. First, an in-depth study of the various reverse logistics models and explore areas of synergetic alliances between the different firms within the same sub sectors or cross sectors .Secondly , a study on reverse logistics in relation to environmental opportunities to generate clean green energy and reduction of carbon foot print in the environment. Lastly, a study on viability of customer involvement in the reverse logistic practice with incentives promoting their participation towards supporting the manufacturing organisations with a view to controlling reverse logistics costs.

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Appendix 1: Questionnaire

UNIVERSITY OF NAIROBI

This research intends to examine the relationship between reverse logistics and operational performance among manufacturing firms in Kenya. Information obtained from this survey will be held in confidence and strictly used for academic purposes only. Your participation in this survey shall be highly appreciated.

Section 1: Profile of the Organisation

1.1 Organisation Name

_____

1.2 What is the ownership structure of your Organisation?

[ ] Sole proprietor [ ] Local company [ ] Multi-National [ ] other (specify) _____

1.3 Name & Position of person completing this questionnaire

_____

1.4 Under KAM on which Sub-sector is your company categorised in? (please tick)

[ ] Food & Beverages	[ ] Pharmaceutical & Medicals Equip.
[ ] Building, Mining & Construction	[ ] Chemical & Allied Sector
[ ] Energy, Electricals & Electronics	[ ] Fresh Produce
[ ] Leather & Footwear	[ ] Metal & Allied
[ ] Motor Vehicle & Accessories	[ ] Paper & Board
[ ] Plastic & Rubber	[ ] Textile & Apparels
[ ] Timber, Wood & Furniture	[ ] Service & Consultancy

1.5 For how long has your company been in operation_____years?

Section 2: Reverse Logistics in the Organisation

2.1 Do you accept returned goods or allow customers to return goods [Y / N]

If YES, under which category as per below best describes the returns?

Damages [ ] Re-work / Cleaning / Repackage [ ]

Empties [ ] Disposal [ ]

Re-cycle [ ] Other _____

2.2 Is there a formal structure governing these returns in form of a reverse logistics strategy?
[Y / N]

If yes, for how long has this been place? _____years.

2.3 What is the % of total returned products

[ ] Recovered [ ] Re-cycled [ ] Re-Manufactured

Less than 10% 20 to 30% More than 50%

2.4 How would you rate your annual Reverse Logistics Management Costs compared to overall organizational costs?

Less than 10% 20 to 30% More than 50%

2.5 Do you out-source another company to manage these returns? [Y / N]
or do you have joint ventures with other manufacturing partners in your sector?
[Y / N]

Section 3: Reverse Logistics

Use the key 1-3 for all questions under section 3-4 of the questionnaire as outlined

1) Minimal 2) Moderately 3) Extensively

3.1 Kindly indicate the model of reverse logistics your firm is running and extent of adoption of the same:

	Model adopted :	1	2	3
1.	Joint Venture • Waste disposal • Product/part/materials in sales • Cost sharing • Profit distribution			
2.	Closed Loop • Production-related • Distribution-related • Use –related • End-of life			
3.	Contract Third–Party Logistics (3PL) • Collection / consolidation centers • Waste collection, sorting and marketing • Green product validation • Recovery plants- value adding activity			

Section 4: Facts about Operational Performance

4.1 Reverse logistics has enhanced our performance in the following operational measures

		1	2	3
1.	Quality • Enhanced product performance • Reduced number of product defects • Increased conformance to product specification • Reduced number of customer complaints			
2.	Delivery Speed • On-time delivery • Reduced delivery lead time • Faster response to returns and repairs • Reduced customer complaint resolution time • Improved production cycle time			
3.	Flexibility • Enhanced product and volume mix • More customisation and innovation • Rapid capacity adjustments • Enhanced process /production flexibility			
4.	Cost • Reduced input / production costs • Increased inventory turn over • Enhanced capacity utilization • Increased productivity • Cost effective product offering to our			

	customers			

Thank you for your assistance and co-operation in completing this questionnaire.

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Appendix II: Letter of Introduction

UNIVERSITY OF NAIROBI

DEPARTMENT OF MANAGEMENT SCIENCE

P.O.Box 83732-80100 MOMBASA-KENYA

TEL : 041-223540,020-2059161

Ref: D61/73038/2012 06 September 2016

RE: MUTHEMBA M JULIUS

The above named is a student at this department pursuing a degree of master of business adminstration on Procurement and Supply Chain Management.

He is currently undertaking his academic project titled ***'THE RELATIONSHIP BETWEEN REVERSE LOGISTICS AND OPERATIONAL PERFORMANCE AMONG MANUFACTURING FIRMS IN KENYA'.***

I kindly request your kind assistance to enable him collect information / data that he may require from your estemeed organization to enable him complete the aforementioned project succesfully.Information obtained from this survey will be held in confidence and strictly used for academic purpose only.

For any enquiries,please do not hesitate to get intouch with the under mentioned.

Sincerely,

Mwanyota Job Lewela

Project Supervisor

Appendix III: List of sampled manufacturing firms

	Manufacturing Firm	Sub Sector
1	Bayer East Africa Ltd	Chemical & Allied
2	Orbit Chemicals Industries Limited	Chemical & Allied
3	Milly Glass Works Ltd	Chemical & Allied
4	Superfoam Ltd	Chemical & Allied
5	Syngenta East Africa Ltd	Chemical & Allied
6	Central Glass Industries	Building, Mining & Construction
7	Flamingo Tiles (Kenya)Limited	Building, Mining & Construction
8	Bamburi Cement Limited	Building, Mining & Construction
9	Power Technics Ltd	Energy,Electricals & Electronics
10	Metsec Ltd	Energy,Electricals & Electronics
11	Powerex Lubricants	Energy,Electricals & Electronics
12	Solimpexs Africa Ltd	Energy,Electricals & Electronics
13	Sollatek Electronics (Kenya) Limited	Energy,Electricals & Electronics
14	Alpine Coolers Limited	Food & Beverages
15	Deepa Industries Limited	Food & Beverages
16	Farmers Choice Ltd	Food & Beverages
17	Kenblest Limited	Food & Beverages
18	Kevian Kenya Ltd	Food & Beverages
19	Milly Fruit Processors Ltd	Food & Beverages
20	Mombasa Maize Millers	Food & Beverages
21	Pearl Industries Ltd	Food & Beverages
22	Sigma Supplies Ltd	Food & Beverages
23	Proctor and Allan (E.A.) Ltd	Food & Beverages
24	Capwell Industries Limited	Food & Beverages
25	Broadway Bakery Ltd	Food & Beverages
26	Fontana Limited	Fresh Produce

27	C and P Shoe Industries Ltd	Leather & Footwear
28	Bata Shoe Company (Kenya) Ltd	Leather & Footwear
29	Zingo Investments Limited	Leather & Footwear
30	Budget Shoes Limited	Leather & Footwear
31	Apex Steel Limited	Metal & Allied
32	Blue Nile Wire Products Ltd	Metal & Allied
33	Welding Alloys Limited	Metal & Allied
34	Steelwool (Africa) Ltd	Metal & Allied
35	Nampak Kenya Ltd	Metal & Allied
36	Associated Battery Manufacturers (EA) Ltd	Motor Vehicle & accessories
37	Autofine Filters and Seals Ltd	Motor Vehicle & accessories
38	Unifilters Kenya Ltd	Motor Vehicle & accessories
39	Bags and Balers Manufacturers (K) Ltd	Paper & Board Sector
40	Dodhia Packaging Limited	Paper & Board Sector
41	Packaging Manufacturers (1976) Ltd	Paper & Board Sector
42	Cosmos Limited	Pharmaceutical & Medical Equipment
43	Medivet Products Ltd	Pharmaceutical & Medical Equipment
44	Regal Pharmaceuticals Ltd	Pharmaceutical & Medical Equipment
45	Elys Chemical Industries Limited	Pharmaceutical & Medical Equipment
46	Gesto Pharmaceuticals Ltd	Pharmaceutical & Medical Equipment
47	General Plastics Limited	Plastics & Rubber
48	Complast Industries Limited	Plastics & Rubber
49	Kenpoly Manufacturers Limited	Plastics & Rubber
50	Mombasa Polythene Bags Ltd	Plastics & Rubber
51	Umoja Rubber Products Limited	Plastics & Rubber
52	Techpak Industries Ltd	Plastics & Rubber

53	Silpack Industries Limited	Plastics & Rubber
54	Cables and Plastics Ltd	Plastics & Rubber
55	Eslon Plastics of Kenya Ltd	Plastics & Rubber
56	Alpha Knits Ltd	Textile & Apparels
57	Brilliant Garments	Textile & Apparels
58	Ashton Apparel EPZ Ltd	Textile & Apparels
59	Woodtex Kenya Ltd	Timber, Wood & Furniture
60	Comply Industries Ltd	Timber, Wood & Furniture
61	Furniture International Limited	Timber, Wood & Furniture