AN ASSESSMENT OF THE EFFECTS OF REVERSE LOGISTICS ADOPTION ON SUPPLY CHAIN PERFORMANCE IN THE MANUFACTURING SECTOR IN KENYA: A CASE OF HEWLETT- PACKARD KENYA

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ABSTRACT

Increased competition caused by globalization and rapid technological advances has driven organizations to address and make efforts to improve efficiency in their supply chain. Increasing efficiency in reverse logistics processes such as the recovery of the returned products or disposal of end-of-life products is one way in which firms attempt to maintain and increase competitiveness and market share. Companies have gradually included the backwards flow within their scope of logistics planning and control, to increase their efficiency and effectiveness and create more sustainable supply chains.

This study sought to assess the impact of reverse logistics assessment on supply chain performance with a special focus on HP Kenya. The study used both primary (collected using questionnaires) and secondary data. To facilitate data collection, the study's sampling frame constituted; supply chain officers, procurement officers, logistics managers, business managers, HP Kenya supply chain organization structure consisting of strategic, tactical, operational and support levels. Content analysis and descriptive statistics has been used to analyze the data, also the inferential statistics such as correlation models, and ANOVA have been used. Data was analyzed using statistical package for social scientists (SPSS) Version 21.

Generally the research established that reverse logistics adoption has a significant impact of the supply chain performance in the manufacturing industry; the reverse logistics variables had a statistically significant impact on supply chain performance both independently and as a result of

their interaction, three variables; product returns, End of Life (EOL) Management and product repairs were highly correlated and therefore had the most significant influence on supply chain performance both independently and as a result of their interaction. The respective organizations should therefore carry on and continually assess their reverse logistics approaches periodically and make the necessary corrective measures to ensure that they reap the maximum benefits of its adoption.

Keywords: *An Assessment of the Effects of Reverse Logistics Adoption*

Introduction

An effective and standardized reverse logistics process can give a firm the necessary competitive advantage to move above peers and competitors, and possibly capture larger market share within their industry because of their superior process and being able to meet the demands of the customers. Today's customer expects and demands to be able to return a defective or unwanted product smoothly and quickly, and receive a refund or correct order as fast and as inexpensive as possible. A firm that is able to meet these increasing customer requirements is going to gain customer loyalty and retain, and perhaps increase, their overall market share (Huscroft, 2010; El-Nakib, 2012)

This is a key factor as to why management within a firm needs to focus necessary resources on the reverse logistics process and properly monitor and measure their reverse logistics processes. The possible penalties for not adequately addressing the reverse logistics needs of the firm could be increased transportation costs, increased inventory and warehousing costs, increased repair costs of returned products, and lost secondary value of defective products or materials due to processing delays in the reverse logistics process. This is a main reason that reverse logistics processes and their management have increased in importance within the business community and academia (El-Nakib, 2012; Rogers et al. 2012). Logistics is defined by The Council of Logistics Management (2013) 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 origin to the point of consumption for the purpose of conforming to customer requirements.

On the other hand, reverse logistics encompasses all of the activities that are mentioned in the council's definition the only difference being that reverse logistics operates in reverse. From this reverse logistics is defined 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 for the purpose of recapturing value or proper disposal. (Elmas and Erdoğmuş, 2011) Reverse logistics is an essential capability for any business that operates in today's global marketplace. It impacts customer relations and the firm's reputation. Therefore, the development of effective reverse logistics capabilities and its integration throughout the supply chain should be considered managerial priorities. This logistics capability has many processes that have the capacity to promote effective logistics management operations and service quality. To ensure that the processes are operating as they should and producing results that impact the goals of the firm, performance metrics are necessary to gauge and make adjustments to changes as the uncertainty of the reverse logistics process creates unexpected returns.(Rogers et al. 2012). Managers need reliable and effective supply chain management processes, systems, and metrics in order to keep costs down and remain competitive. According to Corrêa (2010), the growing importance of reverse logistics in the manufacturing industries supply chain and the need to be able to assess the process performance served as the motivation for this study.

Companies that have succeeded in managing the performance of their supply chains thought about supply chain as a whole and sought results shown in the revenue growth, asset utilization and cost reduction, in other words, the strategic themes. When talking about performance management, you cannot leave aside two concepts: effectiveness and efficiency. Both are components of performance, which are addressed in different ways according to the subject or discipline to be investigated. (Corrêa, 2010) In the recent past, there has been an increase in the global awareness about hazardous waste generation and disposal owing to legislations that were passed in numerous countries. Europe was the leader in executing this legislation ensuring that the product enterprises will take accountability of reverse logistics of all the product wastage that generates from any supply chain activity. In this regard, a Green Logistics initiative came into enforcement and had defined a detailed procedure for manufacturers and suppliers to get used to color coding systems to recognize various kind of waste recyclable and green waste (Badenhorst, 2013).

Reverse logistics is gaining momentum worldwide due to global awareness and consequences of resource depletion and environmental consequences. Since the reverse logistics can be used in almost every industry, it can occur in many forms, depending on the area of deployment. There are growing concerns on the impact of waste electric and electronic equipment (WEEE) on the natural environment in recent years. Many governments are looking for an efficient and effective way to minimize the impact of WEEE on the environment. Meanwhile, they are starting to require corporations especially EEE manufacturers to take more responsibilities on take-back, disassembly, remanufacturing, reuse and recycle the end-of-life product in a rational manner. (Udin, 2012)

The growing environmental concern worldwide, forced companies to engage in reverse logistics, such as re-use of products and materials and recycling. Reverse logistics operations in a supply chain may be considered as an introduction to innovative services of a company's portfolio. They may have an important impact on a firm's strategic performance in terms of market effectiveness, as well as, internal cost efficiency. Through RL innovation, it may be possible to expand revenue through market growth due to account customization, service augmentation, and improved customer satisfaction. Reverse logistics is becoming an area of competitive advantage. (CSCMP, 2010).

Scarcity of resources, increasing international markets regulatory pressures and environmental-based trade barriers has forced manufacturers to realize the importance of improving their environment and to implement sustainable practices that reuse/recycle critical resources (Lai and Wong, 2012; Udin, 2012). While many companies have yet to recognize the strategic potential of efficient reverse logistics, it is clear that the tide is beginning to turn. There is more interest in reverse logistics now than ever before. Firms are beginning to make serious investments in their reverse logistics systems and organizations. (Moturi et al, 2013). Since RL is a growing area in Kenya there is need to study its impact on the supply chain to provide stakeholders and decision makers with information they require to determine whether: the adoption of RL is helping achieve enterprise objectives, and whether or not to adopt RL as part of their supply chain. (Moturi et al, 2013)

According to NEMA (2011), manufacturing industries in Kenya have been dragging their feet in adopting RL logistics, HP on the other hand has been successful in its adoption not only here but

globally. Managers and stakeholders in the Manufacturing industry (as with any business venture) are mainly concerned with the bottom line, so before adopting any change to their supply chain two main questions need to be answered: what effect will it have on performance?, and if positive what are the success factors adoption of RL. These are the answers that this study seeks to find. HP is one of the world's largest technology companies and has one of the industry's most extensive supply chains. It provides hardware, software and services to consumers, small- and medium-sized businesses (SMBs) and large enterprises, including customers in the government, health and education sectors. It specializes in developing and manufacturing computing, data storage, and networking hardware, designing software and delivering services. Part of this process includes facilitating the return and repair of products when necessary. Major product lines include personal computing devices, enterprise and industry standard servers, related storage devices, networking products, software and a diverse range of printers and other imaging products. (HP, 2014

Vittorio (2014) noted that multinational corporations have traditionally conducted facility audits to make sure their supply chains are complying with local regulations and their own supplier standards. But many facilities lack the technical skills and management expertise to meet those standards. To fill the gap in local expertise, these companies are providing more training and education programs to help suppliers learn how to manage a range of environment, health and safety (EHS) issues. The companies are also implementing new tools to track their suppliers' performance.

HP has been working with its suppliers on social and environmental responsibility (SER) issues for more than a decade. The company assesses social and environmental risks in its supply chain based on location, procurement category, company information and external stakeholder reports, including a pollution database run by the non-profit Institute of Public & Environmental Affairs in China. (HP, 2014) According to Moturi et al (2013), there is a need to assess impact of reverse logistics adoption on organization on supply chain performance. The analysis of supply chain performance is important for two main reasons; to enable stakeholders make decisions on whether their RL approaches are helping organizations achieve their objectives or not and take correctives measures and to provides stakeholders who would wish to adopt RL make informed decisions on adoption (including whether or not to adopt RL in their supply chain). (Moturi et al, 2013).

Statement of the Problem

According to Pollock (2010), traditionally, organizations have focused on improving their forward logistics activities; most have not treated the reverse logistics process with the same care and diligence afforded to traditional areas of logistics. Achieng (2011) indicated that most manufacturing firms in Kenya often focus on forward logistics and as a result, they tend to overlook the importance of RL activities and its potential of improving the firm's and supply chain's performance. Recently RL has received increasing attention from both the academic world and Industries because of competition and marketing motives, direct economic motives and environmental concerns, as well as strategic and managerial implications. (Jayant, Gupta and Garg 2012; Nikolaou and Evangelinos 2013). With legislative measures tightening up and a growing concern for the environment to use materials effectively and efficiently, organizations do not have any choice but to engage in reverse logistics practices. (Wang, Zhou and Ren 2010),

RL has become a necessity in the electronics manufacturing industry; due to legislations and environmental concerns governments obligate them to recycle and take back their damaged or aged products, many firms look for new possibilities to create and improve their return systems in order to gain a competitive advantage. In other words, many companies are now looking into reverse logistics in order to optimize their return flows and gain momentum. (Abdullah and Yaakub, 2014). Achieng (2011), noted that, given the tightness of margins in many organizations, the improved management of returns can have a significant impact on the bottom-line performance both business and logistical. (Cullen, Bernon and Grost 2010). According to Hudson (2004), reverse logistics accounts for 3-4% of a company's total logistics costs and argues that companies can save up to 10% from their annual logistics bill by implementing an efficient reverse logistics system. Twenty percent of this amount is saved in labour costs and the remaining eighty percent is saved in lowered freight costs and reduced pipeline inventory. Understanding these impacts is crucial in the adoption of RL; as such this research seeks to bring out the impact of RL on supply chain performance within the manufacturing sector.

General Objective

This study seeks to assess the effects of reverse logistics adoption on supply chain performance with a special focus on HP Kenya.

Specific Objectives

i. To establish whether product returns on reverse logistics adoption affects supply chain performance of HP Kenya
ii. To find out what impact product repairs on reverse logistics adoption have on supply chain performance of HP Kenya
iii. To evaluate the influence of End of Life management on reverse logistics adoption on supply chain performance of HP Kenya
iv. To investigate whether product repackaging on reverse logistics adoption affects supply chain performance of HP Kenya

Literature Review

Ssocial Development Theory

Stein and Valters (2012) indicated that the theory of social development is a conglomeration of theories about how desirable changes in society are to be best achieved. Development needs to begin not with goals and policies to promote development, but with knowledge of the essential nature and characteristics of development itself, for development is not a set of policies or programs or results. It is a process, not a program. Many factors influence and determine the outcome of this process. There must be a motivating force that drives change, some essential preconditions for the change to occur, or barriers that obstruct the process, a variety of resources such as capital and technology, which contribute to the process, along with several types and levels of infrastructure that support the development. This study uses theory of social development as a theoretical base to explain the nature of reverse logistics development and adoption that originated from the process of sustainable development (Stein and Valters, 2012; Retolaza, 2011).

Firms today have increasingly accepted their responsibility for environmental and social issues as a precondition for doing business, especially in the implementation of corporate social responsibility and sustainable supply chain management. Infrastructures are needed to make the activity possible. For example, the development of sustainability is supported by various infrastructures such as the approaches of closed-loop economy, the different framework of

legislation, the principles of extended producer responsibility, the awareness of society, and the investments of technologies and resources at different levels (Stein and Valters 2012; Midgley, 2013). In theory of development, an organization is the collective subconscious knowledge becoming an instrument of work through the pioneering conscious individuals. The growth of that organization is defined as the development, in which it converts its resources, powers, capabilities, and skills into social and economic results with higher performance and innovations (Jacobs et al. 2007).

In their book, Lange P. et al (2012) noted that research on organizational structure has also indicated that logistics innovations and capabilities play an important role in business performance of firms. Thus, efficiency and effectiveness of reverse logistics may have important impacts on firms' strategic performance in terms of customer satisfaction, cost reduction, and improved profitability. It has occurred in practice because of firms' changes of awareness, strategies, and resource investments for environmentally oriented reverse logistics management and customer services in doing business (Lange P. et al, 2012).

Institutional Theory

The institutional environment is defined as an entity that lies outside the boundaries of the organization. It influences organizational outcomes by imposing constrains on firms' operations and demanding adaptation of firms' processes in order to survive. Institutional theory is recognized through the pressures of social, cultural, political, and legal sector as main factors influencing the operation of organizations (Yang and Sheu, 2011). Furusten, (2013) indicated that according to the institutional approach under organizational field, there are three mechanisms of pressures by which imitations (isomorphism) in structure and processes between organizations are motivated: coercive, mimetic, and normative. Coercive isomorphism derives from formal and informal pressures carried out on organizations by other organizations upon which they depend. Such forces can be exerted through persuasion, invitation to join shared behavioral models, laws and regulations, and government mandates. Coercive forces are typically given to governmental authorities by issuing laws and regulations. Mimetic isomorphism is a firm's standard response to environmental uncertainty by imitating themselves as other organizations, e.g. using lean or agile manufacturing in production, Just-In-Time in

sourcing, and Efficient Customer Response in distribution. Normative isomorphism arises from the high degree of socialization and interaction that often occurs between members of the same organizational environment. When these members interact, they reinforce and spread norms of behavior among themselves (Furusten 2013; Miles, 2012).

Resource-based Theory

The Resource-based View (RBV) is considered as one of the most influential theories in strategic management. The term ‘‘resource’’ is broad in nature, in that it refers to not only physical (tangible) assets, such as equipment, plants, and location, but also to intangible assets, such as management skill, knowledge, and organizational assets(Dietrich and Krafft, 2012). Resource-based theory views the firm as a bundle of idiosyncratic resources and assets, which emphasizes the use of rate, valuable, in-imitable and un-substitutable resources to gain sustainable competitive advantage. Sehgal (2010) noted that resource-based view investigates the importance of internal resources in determining firm actions to create and maintain a competitive advantage and improve performance. However, only possessing such resources does not guarantee the development of competitive advantage or the creation of value. To obtain superior performance, firms must effectively manage, allocate, and exploit resources. More specifically, firms that are able to correctly match resources to specific programs and events or to environmental opportunities are more likely to develop capabilities that result in better performance. (Sehgal, 2010)

There are always problems with the lack of management information that does not provide a complete view of resources of a firm to make allocation and exploitation. The effective and efficient allocations and management of resources are asserted to be a key factor influencing firm performance (Sehgal, 2010; Zacharia et al. 2011).

Mellewigt and Nothnagel (2011) in their empirical research found that new literature approaches have extended the theoretical framework of the resource based theory that distinguishes between resources and capabilities, and identifies the relationship between them as the foundation for a long-term strategy. Capabilities are complex bundles of skills, assets, and accumulated knowledge exercised through organizational processes, which enable firms to coordinate activities and make use of their resources. Firms compete based on their resources and capabilities, and distinctive capabilities of firms are critical resources of sustained competitive

advantage and superior performance. Depending on resource allocations, firms may have strategies to improve capabilities, or develop relationships (e.g. outsourcing, strategic alliance, or joint venture) to implement reverse logistics efficiently (Mellewigt and Nothnagel 2011; Taylor et al. 2012).

Empirical Review

For a company that accepts return as a strategy to gain customer loyalty through repeat buyers, reverse logistics is a fundamental process to recover re-usable for gaining additional revenue which inherently reduces cost of goods. Other than completing the supply chain loop so that products are handled at the benefit of environment, it is also important that products are recovered to cater to demand of after sales services so that cost of purchasing parts can be minimized (Rogers et al., 2010). According to Yang et al, (2011), the cost, knowledge and inconsistent inputs are factors that inhibit the development of reverse logistics among consumer electronics manufacturers in environmental and operational performance, such as environmental regulatory compliance, improved customer relations, assets recovery, cost containment, improved profitability and reduced inventory investment.

Reverse logistics requires integration of various business functions especially product design department to maximize the value of recoverables. As sales growth is not applicable to disposal, only environmental outcome and profitability as performance indicators are measured, because disposal is a cost-oriented activity that reflects firms' environmental responsibility (Khor and Udin, 2012).

Managing new and used returns allows an organization to influence environmental well-being but at the same time, provides an opportunity for the organization to recover some cost of inventories. Manufacturers not only create demand for cleaner products in existing and secondary market but also develop long term consumer relationship that sets barriers for competitors. Moreover, some companies are utilizing online business portal, such as eBay and Amazon to build the market for remanufactured products across the globe.

Profitability of recoverable assets is an enabler for disposition strategies to attain economic performance (Yang et al, 2011; Rogers el al, 2010).

Research Methodology

The descriptive research design used will outline the situation in respect to the variable being investigated. This means of research design makes it possible for data to be collected effectively without any manipulation on the research context. The research design seeks to outlay the goals of the research by stipulating practical issues that are of focus to this study (Saunders et al, 2009). Primary data will be used for this study and the data was collected by administering a questionnaire, otherwise known as a structured scheduled interview that were hand delivered and or also sent by e-mail. The questionnaire was designed as per the objectives of the study based on information obtained from secondary sources.

Since surveys make it possible to study a population too large to observe directly, it presents an excellent mechanism to collect original data. According to Babbie and Mouton (2008), the careful selection of a probability sample will provide a group of respondents whose characteristics could mirror those of the larger population. Validity is defined as the degree to which a test or measuring instrument actually measures what it purports to measure or how well a test or a meaning instrument fulfils its function (JESR, 2012).Questions in the questionnaire were made based on literature review and frame of reference to ensure the validity of the result. For quality control, a pre-test of the research instruments to establish their validity was done. To ensure validity of the research instrument, the researcher used expert raters (some of who are part of the population) and research supervisors.
The rated findings were used to calculate content validity index (CVI) using the formula:

CVI = K/N

Where K = Total number of items in the questionnaire declared valid by both raters / judges.

N = Total number of items in the questionnaire

The computed CVI of the instrument to be considered valid should have a minimum CVI recommended in the survey studies of 0.7 (Amin, 2005).

Reliability is the measure or the degree to which a research instruments grade some results after repeat trials. According to Saunders *et. al.*,(2009), reliability refers to the degree to which data collection method or methods will yield consistent findings, similar observations would be made or conclusions reached by other researchers or there is transparency in how sense was made from the raw data. Number of different steps will be taken to ensure the reliability of the study: The same type of questions were used for all the respondents in order to increase the reliability. The theories that have been selected for the study were clearly described and research question will be formulated based on the previous theory.

Data was collected based on the frame of reference that was drawn from the discussed theories. The objective is to make sure that if another investigator follows the same procedures, the same conclusions would be made. (Cooper and Schindler, 2010)

Data Analysis/Findings

The questionnaire was addressed to this group on the virtue of their organizational position that enables them to provide the information required by the researcher. Permission and consent was sought from the management who briefed the respondents on the purpose of the study and the importance of responding truthfully to the best of their knowledge and directed them to fully cooperate.

Organization Level	Frequency	Percentage
Strategic	4	4
Tactical	24	21
Operational	36	36
Support	35	35
Total	100	100

Working Experience of Respondents

Majority of the respondents (36%) as indicated in table 4.2 had worked for HP-Kenya for four years or less and 30% for between five and nine years. This indicates that they had worked long

enough in the organization to understand the inner workings of their supply chain and would be in a position to provide the right information.

Experience (Years)	Frequency	Percentage
0 – 4	36	36
5 – 9	30	30
10 – 14	21	21
15 and above	13	13
Total	100	100

Respondents Education Level

Majority of the respondents, 54%, had attained undergraduate degrees with 10 mostly in the top level management having post graduate degrees as indicated in table 4.3. Most of the respondents with diploma education were working at the operational and support level of the organization.

Education Level	Frequency	Percentage
Diploma	36	36
Undergraduate Degree	54	54
Post graduate degree	10	10
Total	100	100

Product Returns

Product Returns includes refurbishment, re-use and remanufacturing and play a key role in Reverse Logistics; the researcher sought to find out the influence of product returns on supply chain performance. According to the survey and as indicated in table 4.4 product returns has significant influence on HPs supply chain performance according to 83% of the respondents.

Response	Frequency	Percentage
Very high	26	26
High	57	57
Moderate	15	15
Very low	2	2

Total	100	100

Product Repairs

According to the survey, 58% of the respondents were of the opinion that generally product repairs have had a high and very high impact on the company's supply chain performance. However 24% felt that its impact was moderate and the rest, 18% said the impact was very low as presented in table 4.6.

Response	Frequency	Percentage
Very high	21	21
High	37	37
Moderate	24	24
Very low	18	18
Total	100	100

In regards to the product repair variables influence on the supply chains performance, the researcher determined that its adoption has led to increased customer satisfaction and loyalty according to 75% of the respondents; also 72% of the respondents felt that product repairs have high, and very high impact on increased and improved after sales service. However, 56% and 50% of the respondents were neutral about the influence that product repair factors of improved product quality and strategic outsourcing as presented in table 4.7.

Product Repackaging

The survey indicated that according to 55% of the respondents that product repackaging had significant influence on performance of supply chain, however 9% of them felt that it did not have any impact as shown in table 4.8.

Table 4.8: Impact of product repackaging on performance of supply chain

Response	Frequency	Percentage
Very high	4	4
High	51	51

Moderate	36	36
Very low	9	9
Total	100	100

Product repackaging adoption led an increase in customer satisfaction and improved relationship according to 80%; a reduction in warehouse costs according to 74%; an increase in the number of faultless delivery according to 60% and reduction in orders fulfillment life cycle time according to 50% of the respondents as indicated in table 4.9 below.

ANOVA Statistics

Table 4.14: ANOVA Statistics

Dependent variable: Supply chain performance

		Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Product returns	Between Groups	91.46	1	91.46	3.857	.037
	Within Groups	163.047	99	1.6469		
	Total	175.376	100			
Product repairs	Between Groups	124.477	1	124.477	11.746	.001
	Within Groups	540.488	99	5.4594		
	Total	664.964	100			
Product repackaging	Between Groups	110.520	1	110.520	7.880	.007
	Within Groups	715.306	99	7.2253		
	Total	825.827	100			
End-of-life management	Between Groups	117.5364	1	117.5364	3.630	.021
	Within Groups	321.594	99	3.2484		
	Total	3850.5954	100			

ANOVA analysis was carried out to determine whether there was significant relationship between the reverse logistics variables with supply chain performance being the dependent variable. The analysis was done at 5% significance level. It was established that there was a statistically significant relationship between all the reverse logistics variables with all of them

having a significance value that is lower than the thresh hold value of less than 0.05 as indicated in table 4.14. It can be therefore concluded that all the reverse logistics factors affect supply chain performance individually and also as a result of their interaction

Discussion

This study was conducted at HP-Kenya and was aimed at establishing the effects of reverse logistics adoption on supply chain performance in the manufacturing industry. The researcher formulated research questions based on specific objectives that were to be answered by the study to help achieve the main research objective. Primary and secondary data were used for this study, the questionnaires used for primary data collection from employees who were involved in HPs supply chain management in the various organization levels. The summary of the research findings is presented under the key thematic areas discussed below.

Product returns are typically the first step in the reverse logistics flow. Customers return products for a number of reasons. An item may be defective, damaged, and seasonal, fails to meet expectations or simply represents excess inventory. Product Returns includes refurbishment, re-use and remanufacturing and play a key role in Reverse Logistics; in regards to its influence on supply chain performance the study showed that 83% felt that it was significant. The key product returns variables that had greatest impact on supply chain management were determined to be; improved long term consumer relationship, increment in recovery of cost of inventories and improved capacity utilization

When the products are returned and the faults are not too severe, manufacturers identify the failure and repair, refurbish or remanufacture the product to like-new condition and return it to stock. . Alternately, at end of life, manufacturers may harvest various functional components for re-use. This may be to advance sustainability efforts, recoup costs or both.

The study indicated that majority of the respondents (58%) agreed that generally product repairs have had a high impact on the company's supply chain performance. Product repair variables that highly impacted the supply chain performance were; increased customer satisfaction and loyalty, increased and improved after sales service.

Conclusions

Reverse logistics adoption has a significant impact on the supply chain performance. The ability of a firm or organization to handle the processing of product and material returns has quickly become key and critical logistics process. Increased competition caused by globalization and rapid technological advances has driven organizations to address and make efforts to improve efficiency and performance of their supply chain. An effective and standardized reverse logistics process can give a firm the necessary competitive advantage to move above peers and competitors, and possibly capture larger market share within their industry because of their superior process and being able to meet the demands of the customers.

Generally the research established that reverse logistics adoption has a significant impact of the supply chain performance in the manufacturing industry. The research also established that all the reverse logistics variables had a statistically significant impact on supply chain performance both independently and as a result of their interaction. The correlation analysis showed that three variables; product returns, End of Life (EOL) Management and product repairs were highly correlated and therefore had the most significant influence on supply chain performance both independently and as a result of their interaction.

The way an organization handles reverse logistics process is also important not only in determining the success of the adoption but also its influence in the supply chain. As such firms should try as much as possible to tailor make their processes to best suit their unique needs, they should address reverse logistics issues preferably with technologies they have developed "in house", and create their own systems and procedures to handle returns considering an overlap between the consumers' needs and those of the organization.

From the research findings it was established that that reverse logistics has a significant impact on supply chain performance; whether this impact is positive or negative depends on the success of its adoption and implementation. The respective organizations should therefore carry continually assess their reverse logistics approaches periodically and make the necessary corrective measures to ensure that they reap the maximum benefits of its adoption

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Reference

Abdullah, N. A and Yaakub, S., (2014). Reverse logistics: pressure for adoption and the impact on firm's performance. *International Journal of Business and Society*, Vol. 15 No. 1, 2014, 151 – 170

Achieng, S.O., (2011). *Information Integration on supply chain management in the food processing firms in Kenya*. Unpublished MBA Project, University of Nairobi.

Aino, V., (2010). *E-waste: impacts, challenges and the role of government*, service providers and the consumer's workshop. Communication Commission of Kenya. Nairobi –Kenya,

Badenhorst, A., (2013). A framework for prioritizing practices to overcome cost-related problems in reverse logistics, *Journal of Transport and Supply Chain Management* 7(1), Art. #113, 10 pages. http://dx.doi. org/10.4102/jtscm.v7i1.113

Cullen, J., Bernon, M. & Grost, J., (2010). *Tools to manage reverse logistic*, Research executive summaries
series6(3),18,retrievedon25thAugust2014,fromhttp://www.cimaglobal.com/Documents/Thought_leadership_docs/cid_ressum_tools_manage_ reverse_logistics_apr2010.pdf

Dietrich, M., &Krafft J. (Eds.)., (2012). *Handbook on the Economics and Theory of the Firm*. Cheltenham (UK). Edward Elgar Publishing.

Elmas G. & Erdoğmuş F., (2011). *The importance of reverse logistics*. International journal of business and management studies Vol 3, No 1, and 2011 ISSN: 1309-8047.

Huscroft, K., (2010). *The Reverse Logistics Process in the Supply Chain and Managing Its Implementation.* Auburn University. Auburn, Alabama.

Jayant, A., Gupta, P. and Garg, S.K. (2012). *Perspectives in reverse supply chain management (R-SCM): A state of the art literature review*, Jordan Journal of Mechanical and Industrial Engineering 6(1), 87–102.

Kurien, P. & Qureshi, N., (2011). *Study of performance measurement practices in supply chain management*. International Journal of Business, Management and Social Sciences. Vol. 2, No. 4, 2011, pp. 19-34.

Mellewigt, T. &Nothnagel, K. (2011).*Empirical research within resource-based theory*: A Meta-Analysis of the Central Propositions.

Moturi et al, (2013). *Electronic Waste Management in Nakuru Municipality, Kenya: An Environmental Health Risk.* International Journal of Innovative Research and Studies. Vol 2 Issue 10

Pollock, W.K., (2010). *Driving return process directly to the bottom line*, Reverse Logistics Magazine, 21th end., 5(3), 8–12, viewed 29 June 2011, from www.RLmagazine.com

Rogers et al., (2010). *Creating Value through Product Stewardship and Take-Back, Sustainability Accounting*, Management and Policy Journal, 1 (2), 133-160.

Udin, Z. (2012). *Impact of Reverse Logistics Product Disposition towards Business Performance in Malaysian E&E Companies*. Journal of Supply Chain and Customer Relationship Management. Journal of Supply Chain and Customer Relationship Management. IBIMA Publishing.

Wang, P., Zhou, G. & Ren, J., (2010). *Research on structure of reverse logistics network*, International Conference of Logistics Engineering and Management 2010 (ICLEM 2010) proceedings 1(5), 336–362, Chengdu, China.