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Reverse Logistics Practices and Their Effect on Competitiveness of Food Manufacturing Firms in Kenya

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Abstract: Increased global warming and environmental degradation, has caused concern for governments, societies and business organizations even in Kenya. Kenya's, manufacturing industry is one of the main contributors to economic growth. Unfortunately, it has also caused environmental deterioration. Consequently business managers have increasingly begun to realize the need to be environmentally accountable for their activities. Reverse logistics is a green supply chain management practice that enables companies to manage wastes and improve their competitiveness as their environmental efficiency is enhanced. This research aims to examine the relationship between reverse logistics and competitiveness of food manufacturing firms in Kenya. To fully understand this issue the research investigates the reverse logistics practices adopted by the various companies and then examines whether these practices have any effect on firm competitiveness of food manufacturers in Kenya. A cross- sectional survey was conducted among 130 food manufacturing firms that are listed in the Kenya Association of Manufacturers directory. The response rate was 73.8%. Primary data was collected through questionnaires. Factor analysis was used examine the construct validity while multivariate liner regression was employed to test criterion validity. The results of this research indicated that, the adoption of reverse logistics practices would enhance the competitiveness of Kenya's food manufacturing firms. Further this study found that due to lack of awareness on the importance of sustainability, there is a low level of adoption of reverse logistics practices in Kenya. This study recommends that organizational managers should appreciate the environmental issues and adopt reverse logistics practices. This is important as it would curb waste, enhance cost savings thus increasing competitiveness. This study further recommends that the government and all stakeholders in the manufacturing sector should carry out public awareness campaigns on the importance of environmental conservation as it would encourage the locals to become active drivers towards the adoption of reverse logistics practices.

Keywords: Green Supply Chain, Reverse Logistics, Firm Competitiveness, Food Manufacturing Firms, Kenya

1. Introduction

Today with the increase in global warming, air pollution and environmental degradation, environmental issues have become a prevalent concern for governments, societies and business organizations. Most of the environmental problems are considered to emanate from business organizations. Consequently greening the supply chain has become necessary as managers have increasingly begun to realize the need to be both environmentally and socially accountable for their activities. Green Supply Chain Management (GSCM) is a relatively new concept that is becoming popular among manufacturers as both environmental and social issues are increasingly being recognized as management issues (Luthra, Kumar, Kumar & Haleem, 2011). Green supply chain can be defined as the integration of environmental concerns into the inter-organizational practices of Supply chain management (SCM) including reverse logistics (Sarkis, Zhu & Lai, 2011).

Reverse logistics is the process of retrieving the product from the end consumer for the purposes of capturing value or proper disposal. Activities include collection, combined inspection/

selection/ sorting, re-processing/ direct recovery, redistribution, and disposal. Management of wastes in the outbound function such as reverse logistics and waste exchange can lead to cost savings and enhanced competitiveness. Increased globalization has greatly increased competition and this has brought about a growing demand flexibility and cost efficient systems by companies. Through the management of wastes in reverse logistics and waste exchange, companies can enhance their competitiveness as their environmental efficiency is enhanced (Ashby *et al.* 2012).

Reverse logistics activities differ from those of traditional logistics. Reverse logistics networks have some generic characteristics related to the coordination requirement of two markets, supply uncertainty, returns disposition decisions, postponement and speculation (Amemba et al., 2013). Reverse logistics practices vary from one industry to another. Industries where returns form a larger portion of operational cost tend to have better reverse logistics systems and processes in place (Hawks, 2006). To improve their own environmental supply chain performance, organizations need to interact with the government, suppliers, customers, and even competitors. Cooperation with suppliers and customers has become extremely important for organizations' to close the supply chain loop (Zhu et al., 2008).

The Kenyan manufacturing sector has remained as an important contributor to the Kenyan economy. The food manufacturing sector alone accounts for 70 percent of the industrial sector's contribution to GDP (Kenya National Bureau of Standards, KNBS, 2012). The sector is predominantly agro-processing, with manufacture of food, tobacco, beverages and textile accounting for over 34.0 per cent of total sectoral value added. (KIPPRA, 2013). This is in contrast to newly industrialized countries where their food manufacturing sector constitutes only a small share. Kenya's manufacturing sector suffers from limited value addition and diversification, high cost of inputs and low competitiveness and yet this sector has a high potential in employment creation and poverty alleviation in the country (Bigsten *et al.,* 2010). Recently there has been a shift towards export oriented manufacturing as the main thrust of Kenya's industrial policy seeing that the country aims to increase the share of products in the regional market from 7% to 15% and develop niche products for existing and new markets (KIPPRA, 2013).

Manufacturing firms are perceived to play an important role in the implementation of sustainable options. These requires a comprehensive means to reduce pollution through identification and eliminating the sources of pollution at every stage of the product life cycle that include raw material extraction, transportation, manufacturing, product use, recycling, and disposal (Matos & Hall, 2007). In order to take up environmental responsibility, organizations are increasingly being urged to reuse, remanufacture and recycle products so as to reduce harmful effects on the environment (Chung & Wee, 2010). In a competitive environment, when a company accepts product returns it creates an edge over its competitors. Previous studies indicate that studies on reverse logistics have been carried out in various industries such as the automobile (Zhu, Sarkis & Lai, 2006), electrical and electronics industry (Wang, 2014), the construction industry (Ojo, Mbohwa & Akinlabi, 2013) and among ISO 14001 companies in the UK (Murphy, 2012), India (Dheeraj & Vishal, 2012), Malaysia (Rozar, Mahmood, Ibrahim & Razik, 2015), Nigeria, South Africa and Kenya (Okello & Were, 2014). By neglecting companies with different ISO certifications it has prevented a holistic approach to environmental management. This study sought to fill this contextual gap by considering firms in the food manufacturing sector that have other ISO certifications in addition to ISO 14001.

This research aims to examine the relationship between reverse logistics and competitiveness of food manufacturing firms in Kenya. To fully understand this issue the research investigates the reverse logistics practices adopted by the various companies and then examines whether these practices have any effect on firm competitiveness of food manufacturers in Kenya. This study will assist different parties involved in food manufacturing to achieve a practical synopsis of reverse logistics implementation.

2. Literature Review

2.1. Reverse Logistics

Reverse logistics can be defined as the return of products by customers to the original company with the purpose of recovering and potentially generating value from any unused products or components. Murphy (2012) defines it 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 or creating value or proper disposal. Reverse logistics "closes the loop" of a typical forward supply chain and includes reuse, remanufacturing, and/or recycling of materials into new materials or other products with value in the marketplace. The idea is to eliminate or minimize waste such as energy, emissions, chemical or hazardous and solid wastes (Ashby *et al*., 2012). When suppliers are encouraged to take back packaging materials it is a form of reverse logistics that is capable of greening the supply chain (Hasan, 2013) and this reduces the amount of packaging materials that enters into the waste system.

A study carried out by Zhu et al. (2005) concluded that to stay competitive in the market, managers should improve their environmental compliance that has been setup by the authority, address the environmental concern of the customer and mitigate the environmental impact of their products and services. Choi & Zhang (2011) conducted a study on green logistics and business performance in China and found that some organizations have found a match between environmental considerations and profitability. Studies done by Ashby, *et al.* (2012) further indicate that management of wastes in reverse logistics and waste exchange can lead to cost savings and enhanced competitiveness as a firm's

environmental efficiency is enhanced. They further point out that reverse logistics provide maximum utilisation of used products, where every output is returned to natural systems or becomes an input for manufacturing another product. In so doing reverse distribution aggressively targets at reducing materials and resources in the forward system so that as less materials flow back, reuse is possible and recycling

The above studies agree on the fact that reverse logistics lead to cost savings which enhances firm competitiveness. The various researches also concur on the parameters of reverse logistics which parameters will be used in this study. These parameters are waste product recycling, reuse of parts and components, remanufacturing and product reuse.

2.2. Theoretical Review: Social Network Theory

Social network theory (Rowley, 1997), is a theory that applies to a variety of levels of analysis from small groups to entire global systems. The social network theory (SNT) is important when examining the structure of inter-organizational relationships in a supply chain which has been brought about by the increased interlinked decision making approaches (Carter, Ellram, & Tate, 2007). The SNT is one that measures the number of ties in a network that links actors together. It also measures the position of an individual firm in relation to the flow of information. As network centrality increases however, the organization's ability to resist external pressures also increases (Zhu & Liu, 2010). Accordingly, if an organization has many branches, customers and suppliers, and there is a general awareness in the public, it is likely to be under greater pressure to adopt GSCM practices. The adoption of GSCM practices for such a firm will thus be more or less reactive (Maignan & Mcalister, 2003 as cited in Sarkis *et al*., 2010).

Although it could be argued that constructs of SNT can largely help analysts explore relationships between supply chain members at both levels, there have been very few studies that employ this theory in the supply chain management context (Carter *et al*., 2007; Sarkis *et al.,* 2010; Varsei *et al.,* 2014). Social networks enable efficient application of sustainability practices in which a firm can benefit from its central position to champion and monitor green supply chain initiatives (Vurro, Russo, & Perrini, 2009) through both "hard" material/money flow and "soft" alliances and sharing-of-information types of ties (Borgatti & Li, 2009, p.19). Social networks being multidimensional enable organizations to achieve higher environmental success when they cooperate with suppliers (Sarkis *et al*., 2010). A firm that desires to review its supply chain should consider having information sharing mechanisms that will increase its supply chain density as well as enable it undertake GSCM initiatives (Varsei *et al.,* 2014).

Studies done to relate the relationship between GSCM to its environment indicate that there is an environmental dimension between customers, suppliers and the organization. Different organizations have different attributes and thus using the notion of centrality, this study will seek to show that organizations can control the products they take- back for re-use from their customers thus reducing harmful effects on the environment, and this has the effect of greening the whole supply chain leaving the choices of adoption more in the control of the organization.

The social network theory proposes that the position of a firm in the social network enables it to control the flow of information. The centrality of the firm in question, gives it room to proactively adopt GSCM practices. A firm that has a greater number of locations and customers is also likely to be under greater pressure to adopt GSCM practices. Reverse logistics "closes the loop" of a typical forward supply chain and includes reuse, remanufacturing, and/or recycling of materials into new materials or other products with value in the marketplace. In so doing a firm tends to increase efficiency by reducing the costs of acquiring virgin raw materials, thus increasing its profit margins.

2.3. Conceptual Framework

The conceptual framework was developed on the basis of the extensive literature review on the theory and reverse logistic practices. From the review of the empirical research Fig 1 shows the model and hypothesis identified for the study.

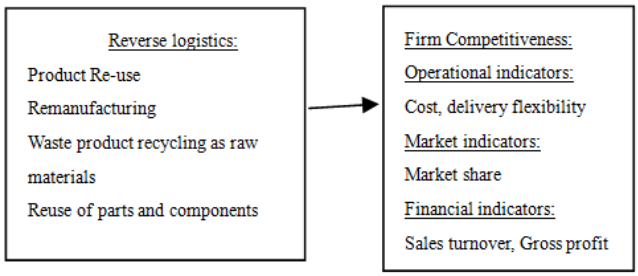

Figure 1. *Conceptual Framework (Author, 2015).*

3. Research Methodology

3.1. Research Design

This study in particular adopted a descriptive cross-sectional survey research design which can be used to collect data and make deductions about a population at a given time (Lavrakas, 2008). The food manufacturing companies that were included in this study consisted of those that were listed in the KAM directory 2014 and were strictly food processors or manufacturers. Thus of the one hundred and eighty one registered companies only one hundred and thirty companies were food manufacturers or processors and these made the target population. This study used a census survey approach for data collection. For populations of less than 1000 it is often necessary to conduct a census so as to achieve a high degree of statistical confidence in the survey results (Zhang, 2009).

Reverse logistics was measured using the variables from literature. The variables are waste product recycling, reuse of parts and components, remanufacturing and product reuse. Firm competitiveness is measured by operational, financial and market indicators. This data had to be normalized in order

to have the same range of values for each of the inputs and be able to compare and analyze the relationship between reverse logistics practices and firm competitiveness.

3.2. Data Collection

The study used primary data which was collected using semi-structured questionnaire. The questionnaire administered contained Likert type questions as well as both open and closed ended questions so as to provide enough and accurate information in line with the objective of the study. They also gave the respondents a chance to give their views freely without any limitations.

3.3. Validity and Reliability

In order to test the reliability of the instruments, internal consistency techniques were applied using Cronbach's Alpha. Upon analysis of this data, the reliability coefficient for the factors was found to be 0.781 which showed a strong acceptable level of internal reliability (Bryman, 2008; Sekaran & Bougie, 2010).

Table 1. *Types of reverse logistics.*

Company reverse logistics	%
Company product take backs	
Packaging materials	20.8
Containers	10.4
Unsold products	5.2
End-of –life products	9.4
None	54.1
Re-use options engaged in	
Re-use of assemblies	7.3
Re-use of components	11.5
Re-use of raw materials	22.9
System re-use	7.3
None	51.0
Product recovery practices	
Repairing	10.4
Refurbishing	5.2
Remanufacturing	8.3
Recycling	29.2
None	46.9

4. Data Analyses, Empirical Results and Interpretation

4.1. Descriptive Analyses

Use of recycling materials has been considered as an environmentally friendly activity (Kinoti, 2012). Waste product recycling also contributes to cost savings. This study thus sought to find out the extent of cost savings that waste product recycling contributed. The results indicated that in more than 50% of the companies the use of reverse logistics had led to a reduction of costs in acquiring new/virgin raw materials. Of the companies that practiced waste product recycling, 35.4%, experienced minimal savings on their production costs- less than 10%, while 27.1% saved to an extent of between 10 – 20%. Waste product recycling is encouraged by having collection points close to consumers. All the public organizations, 79.7% of the privately owned companies and 69.2% of the Multinational companies did not have any collection points that encouraged consumers to bring back old and unused goods. However, all the Parastatals had collection points. Of the companies that had collection points, the collection points were generally inconvenient to the consumers in nearly all the companies. Only 17.7% of the companies had the collection points very convenient to the consumers while in 8.3% of the companies, their collection points were moderately convenient to the consumers. The situation was however different in relation to the companies for in 21.9% of the companies the collection points were very convenient whereas in 4.2% of them the points were moderately convenient.

4.2. Correlational Analyses

Correlational analyses was conducted to test the relationship between reverse logistics and firm competitiveness. The results indicated that firm competitiveness was positively and significantly influenced when a company managed the reverse flow of materials, environmental packaging and distribution ($r=0.697$, $p<.001$). Other aspects of reverse logistics that were highly significant included a company's integration of suppliers into the supply chain ($r=.590$, $p<.001$), a company's assurance of proper utilization of raw materials ($r=.590$, $p<.001$), buying repairable products by companies ($r=.545$, $p<.001$) making use of recycled raw materials by companies ($r=.531$, $p<.001$). Firm competitiveness was moderately influenced by a company's active recycling program ($r=0.483$, $p<.001$), a company's redesign of logistical systems ($r=0.483$, $p<.001$) and the application of reverse channels allowing customers to return the products ($r=0.400$, $p<.001$).

4.3. Factor Analyses

Factor analyses was further carried out on the reverse logistics constructs and all indicators had factor loadings above 0.5 with the exception of 'The company manages reverse flow of material, environment -packaging and distribution thus increasing sales'. The KMO value for reverse logistics in this study was approximately 0.821 which is above the suggested minimum of 0.5 and the Bartlett's test of sphericity was significant (χ^2 (36) = 346.25, $p<.05$). This implies that the study sample was good for factor analysis procedure as recommended by Tabachnick and Fidell (2007). The indicators for revere logistics items were found to explain 61.54% of the total variance in the data.

The nine logistics variables loaded into two factors. Six items loaded on Factor 1 and consisted of a company's redesigning the logistical systems for greater environmental efficiency, improved financial performance due to reverse logistics, buying repairable products thus increasing the market share, assuring proper utilization by customers, integrating suppliers into the supply chain to reduce costs and improve customers services as well as allowing consumers to return used products and packaging materials. Three items loaded on Factor 2 and

comprised of companies having active recycling program, company's control of the environmental risk associated with suppliers operation and companies' use of raw materials.

4.4. Hypothesis Testing

The stepwise regression method was used to investigate the relationship between firm competitiveness and reverse logistics attributes. Stepwise regression is used as a semi-automated process of building a model by successively adding or removing variables based solely on the *t*-statistics of their estimated coefficients. The hypothesis to be tested was;

H_{01}; Reverse logistics do not positively influence firm competitiveness among food manufacturing firms in Kenya.

The regression model capturing the hypothesized relationship between reverse logistics and firm competitiveness was presented in the following equation;

$$FC=\beta 0+\beta 1X1+\beta 2X2+\beta 3X3\ldots\ldots\ldots+\beta 9X9+\varepsilon \quad (1)$$

where FC is firm competitiveness.

$\beta_0 \ldots\ldots \beta_9$ =coefficients.

X_1 =redesigning logistical systems.

X_2 =financial performance.

X_3 =buying repairable products.

X_4 =proper utilization of materials.

X_5 =integrating suppliers into the supply chain.

X_6 =applying reverse channel systems.

X_7 =active recycling program.

X_8 =control of environmental risks.

X_9 =use of recycled raw materials.

ε=Error term.

During the stepwise linear regression the variables picked were "The company has integrated suppliers in the supply chain in order to reduce costs and improve customer services", "the company has an active recycling program for materials in all sections which has contributed to reduced cost of production" and ''The company assures proper utilization of materials by customers enhancing market share''. The equation for establishment of the effect of reverse logistics on firm competitiveness when confined to the standardized coefficient, therefore,

$$FC=.635+.413X_5+.308\ X_7+.217\ X_4$$

This model demonstrates that when all variables are held constant, the value of firm competitiveness would be 0.635. However, holding other factors constant a unit increase in the integration of suppliers into the supply chain to reduce costs would lead to an increase of 41.3% in firm competitiveness, a unit increase in the recycling program would increase firm competitiveness by 30.8% and a unit increase assuring proper utilization of materials by customers enhances market share and thus firm competitiveness by 21.7%.

Table 2. *Model Summary.*

Model	R	R R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.635[a]	.403	.396	.59128	.403	58.063	1	86	.000
2	.724[b]	.524	.513	.53117	.121	21.564	1	85	.000
3	.742[c]	.550	.534	.51937	.026	4.906	1	84	.029

Table 3. *Regression Results of Reverse Logistics on Firm Competitiveness.*

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.161	.245		4.744	.000
	The company has integrated suppliers in the supply chain in order to reduce costs and improve customer services (X_5)	.505	.066	.635	7.620	.000
2	(Constant)	.715	.240		2.978	.004
	The company has integrated suppliers in the supply chain in order to reduce costs and improve customer services (X_5)	.423	.062	.531	6.802	.000
	Reverse logistics and outbound logistics: the company has an active recycling program for materials in all sections which has contributed to reduced cost of production (X_7)	.212	.046	.363	4.644	.000
3	(Constant)	.635	.237		2.673	.009
	The company has integrated suppliers in the supply chain in order to reduce costs and improve customer services (X_5)	.329	.074	.413	4.432	.000
	The company has an active recycling program for materials in all sections which has contributed to reduced cost of production (X_7)	.180	.047	.308	3.839	.000
	The company assures proper utilization of materials by customers enhancing market share (X_4)	.154	.070	.217	2.215	.029
	F- statistic					34.238
	R^2					.550
	Adjusted R^2					.534

a. Dependent Variable: firm competitiveness.

The model fitness found that 40.3% of a firm's competitiveness is explained by the integration of suppliers into the supply chain (R^2=.403 Adjusted R^2=.396). Model 2 shows that when a company incorporates an active recycling program in addition to integrating suppliers firm competitiveness increases by 12.1%. Model 3 shows that when a company includes the assurance of proper utilization of materials by customers, firm competitiveness is enhanced by an additional 2.6%. (R^2 change=.026, Adjusted R^2=.534, p=.029).

Results from this research finding indicate that reverse logistics therefore have a statistically significant influence on the competitiveness of food manufacturing firms. The coefficient of 'The company has integrated suppliers in the supply chain in order to reduce costs and improve customer services (X_5)' has a t-statistic of 4.432 with a p value<.001. The coefficient of (X_7), 'the company has an active recycling program for materials in all sections which has contributed to reduced cost of production' has a t-statistic of 3.839 and a p value<.001 while the coefficient of (X_4) 'The company assures proper utilization of materials by customers enhancing market share' has a t-statistic of 2.215 with a p-value<.05. The impact of reverse logistics on firm competitiveness is thus statistically significant at a significance level of $\alpha=0.05$ since $p<0.05$. This means that there is a statistically significant relationship between reverse logistics practices and firm competitiveness.

The H_0 is therefore rejected while H_a is accepted that, "Reverse logistics has a statistically significant positive influence on the competitiveness of food manufacturing firms.

5. Conclusion

Based on the findings of this study the following conclusions were made; there is a positive relationship between Reverse logistics practices; assurance of proper utilization of materials by customers, having an active recycling program in all sections of a company, integrating suppliers into a company's supply chain to reduce costs and firm competitiveness. Organizations that practiced reverse logistics experienced reduced costs of production thus enhancing firm competitiveness.

Firms under research claimed to have adopted reverse logistics mainly as a result of pressure from the government and other industrial players. However, there was no connection between the adoption and the practice of the same as many firms did not even have collection points to facilitate collection of used packaging from their customers. This study recommends that measures to facilitate collection of used packaging and expired products should be instituted within the country. This can be done by having collection points where customers could drop off used containers and expired products. These measures would complete the reverse logistics loop fully, thereby reducing the firms' negative environmental impact. This study further recommends that the government and all stakeholders in the manufacturing sector should carry out public awareness campaigns on the importance of environmental conservation as it would encourage the locals to become active drivers towards the adoption of reverse logistics practices.

Recommendation for Further Studies

Areas of further research identified by this study include an investigation of reverse logistics as it affects economic, environmental and social performance of manufacturers. Additionally, the supporting role of organizational culture in the adoption of reverse logistics should be pursed further.

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