

INFLUENCE OF PRODUCT REVERSAL RATE AND VALUE RECOVERY MANAGEMENT ON SUPPLY CHAIN PERFORMANCE OF AGRO-BASED PROCESSING INDUSTRIES IN NAKURU COUNTY, KENYA

Redempta Ndinda Mawia

Master of Science in Procurement & Contract Management Student,

Jomo Kenyatta University of Agriculture and Technology, Kenya

redemptamawia@yahoo.com

Elton Kipkorir Langat 

Supply Chain Management Lecturer, Kabarak University School of Business, Kenya

eltonkipkorir@gmail.com

Abstract

Firms find it difficult to accurately estimate reversal rate of products due to consumer characteristics, regulations and market dynamics. Reverse logistics cannot be avoided since products at the end of a supply chain always have a chance to flow backward due to products recalls and warranties. This is bound to reconfigure the supply chain as on one hand, firms may try to avoid overstocking and overproducing as this may lead to higher recall rates if the market fails to absorb the products. On the other hand, the suppliers need to be maintained by the firm either by contract or through mutual understanding As such; most have not reconfigured their supply chains to accommodate reverse flow of goods. Therefore, the main objective of this study was to examine the effects of reverse logistics management on supply chain performance of agro-based processing industries in Nakuru County. Specifically, the study sought to establish the influence of product reversal rates; decisions on product value recovery on supply chain performance of Agro-based processing industries in Nakuru County. The study adopted descriptive cross sectional survey and targeted 26 agro-based firms in Nakuru County from which a sample of 84 respondents

comprising the overall managements, logistics managers, sales managers, stores managers and accounts managers was derived using simple random sampling. Data was collected through questionnaires and analyzed using both descriptive and inferential statistical methods. The findings revealed that product reversal rates significantly influenced to the supply chain performance of agro-based processing industries in the area. Further, it was established that product end-of-life management practices as carried out in the agro-based processing industries in the area did not significantly influence the supply chain performance of agro-based processing industries. Finally, the findings revealed that product reversal contingencies were significant to supply chain performance of agro-based processing industries in the area.

Keywords: Reverse Logistics Management, Product Reversal Rates, Product Value Recovery Decisions, Supply Chain Performance

INTRODUCTION

Business trends in the present day emerging networked world are as much about process as they are about products. This is because market forces, driven by the speed of communications that electronic networks now make possible, are making product life cycles shorter and shorter. Customer tastes and requirements change quickly; therefore, product inventories are always in danger of becoming obsolete. The current production paradigm is being increasingly characterized by shorter product life cycles and a market defined by varying consumer tastes. This puts pressure on firms to recall their products in order to reprocess them to recover their value or safely dispose of them (Nyarega, 2015).

To counter this trend, companies are building up their expertise and efficiencies in the process of designing and building new products and in the process of delivering and servicing existing products (Ho, Choy, Lam & Wong, 2012). Companies that develop higher skill levels in these areas are clearly better able to ride the waves of change and profit from developments in the markets they serve (Zhu, Alard & Schoensleben, 2007). The discipline of reverse logistics is as relevant to a business' bottom-line as the usual management of procurement, logistics and spend analysis. Companies that can well manage the flow of goods back through their supply chain will have many more benefits, such as creating additional revenue, reducing operating costs, and minimizing the opportunity costs of defective or out-of-date products (Waithaka, 2012).

Research Objectives

- i. To establish the influence of product reversal rates on supply chain performance of agro-based processing industries in Nakuru County
- ii. To assess the influence of product value recovery decisions on supply chain performance of agro-based processing industries in Nakuru County

Research Hypotheses

HO₁: There is no significant influence of product reversal rates on supply chain performance of agro-based processing industries in Nakuru County

HO₂: There is no significant influence of product value recovery decisions on supply chain performance of agro-based processing industries in Nakuru County

LITERATURE REVIEW

Resource Based View

Resource-based view has been developed in work by Barney (1986), Teece (1988), and Teece & Pisano (1994), for analyzing firm behavior and competitive strategy (Mowery, Oxley & Silverman, 1998). The RBV contends that distinctive resources and capabilities of firms are the key sources of sustained competitive advantage (Lynch, Keller & Ozment 2000). This premise appears to be supported by logistics and SCM research (such as Lynch et al., 2000). According to Barney (1991) resources can be classified into organizational capital resources, physical capital resources and human capital resources. Capabilities can be defined as the skills a firm needs to take full advantage of its assets. Capabilities are complex bundles of individual skills, assets and accumulated knowledge exercised through organizational processes that enable firms to co-ordinate activities and make use of their resources (Olavarrieta & Ellinger, 1997).

Tibben-Lembke (2002) describes the three generic strategies for competing in the marketplace as low-cost leadership, differentiation and focus. One avenue of creating a competitive advantage with differentiation is through building a brand reputation (Grant, 1991). An organization may choose to focus on implementing reverse logistics practices to expose the negative environmental performance of its competitors. In this way, the organization can cut a niche for its products. Developing and implementing reverse logistics practices can only be achieved through creating environmentally responsible policies and investing in the necessary equipment and training. Creating a competitive advantage through implementing reverse logistics practices would lead to improved market share and consequently higher profit margins (Fortes, 2009) have attempted to take this further and build models of the procurement system. In this study, the contingency theory draws its relevance from the fact that reverse logistics need

adequate contingency planning to absorb the usually indeterminate reverse flows of products. Therefore, the theory is expected to provide insight into the contingency workings of Imported Furniture Distributing Firms.

Product Reversal Rate and SCM in agro-processing firms

Reverse logistics is the management of returned and recyclable goods. It is a pervasive and important business activity. Petersen and Kumar (2009) estimated return rates to be greater than 25% of total sales which accounts for approximately \$100 billion in lost sales in US and a reduction in profits by 3.8% per retailer or manufacturer. Gustavsson and Otterdijk (2011) estimated global food losses and waste to 1.3 billion tons of food per year, corresponding to 95-115 kg/year per capita in Europe and North America and between 6 and 11 kg/year in Sub-Saharan Africa and South/Southeast Asia. Household wastes are about 14-26% of food sales in USA and almost 27% in UK whereas the percentage of food products returns was 1.2% to 1.8% of total sales in 2010 (Nestle, 2011; Terreri, 2010).

The strong drive for reverse logistics is fueled by current patterns of customer behavior which result in volatile food markets and shorter product life cycles. Beyond returns of faulty goods, liberal returns policies shape competition in many markets including online retailing, which is another indicator of a growing demand for reverse logistics. Today's consumer cannot help but be aware of food recalls with the 24x7 media coverage and the power of social networking to both spread the news and influence the brand. In a Harris Interactive poll, consumers indicated that 55% would switch brands temporarily following a recall, and 15% said they would never purchase the recalled product and 21% would avoid purchasing any brand made by the manufacturer of the recalled product. A 2010 U.S. Grocery Supplier survey seems to validate these intentions.

In the year following the large spinach and peanut recalls, almost three-quarters of consumers stopped purchasing those products out of safety concerns, dropping to one-quarter in the second year (Terreri, 2010). Product recalls, have also been a supply chain phenomenon in other countries and have, in fact been increasing over the years, for example, in 1973 in the UK, the Triumph Toledo, Triumph 1500 and Triumph Dolomite were the subject of the UK's largest vehicle recall to date (Woodall, 2011). The recall affected 103,000 cars and involved the replacement of a front radius strut in the front suspension assembly, addressing a risk that the component might break and render the car impossible to steer. The manufacturers stated they had replicated the alleged defect by driving the car into a solid kerb at between 10 and 15 mph (16–24 km/h). Despite undertaking the recall, they insisted that the condition could only "arise through misuse".

Product Value Recovery and SCM in agro-processing firms

Product recalls are increasing. In 1988, the U.S. Consumer Product Safety Commission was involved in some 221 recalls covering about 8 million product units. Five years later, in 1993, those numbers had risen to 367 recalls covering about 28 million product units. Recalls for both new and established products occur all too often, and they can have serious repercussions. In some cases, they have destroyed brands and even companies. In the United States, roughly 20 percent of everything that is sold is returned to the manufacturer (Rogers & Tibben-Lembke, 2008). It is more expensive than is commonly recognized, costing companies approximately US \$100 billion per year in the United States alone (Klappich, 2008).

Costs associated with returned goods represent anywhere from 8 percent to 15 percent of a company's top line (Aberdeen Group Inc, 2006). In fact, the cost of processing a return can be two to three times that of handling the original outbound shipment (Banerji, 2011). Product returns exact a toll not only on a company's financial performance but also on its image and sales. In 2007, for instance, about 60 percent of Americans avoided certain food brands because of a recall (Saad, 2007). This suggests that a large percentage of consumers may have a negative view of brands associated with returns. Clearly, the product recall rates are bound to increase as consumers have more choice, new consumer protection regulations are passed and quality standards are increased (Brito & Dekker, 2003).

The most affected industries are the manufacturing sectors especially the motor vehicle industry and the consumer electronic industry, the pharmaceutical industry and the food processing industry (Bolo & Wainaina, 2011). The product recall decisions and the effects of their dynamics on the supply chain are bound to be different as, for example, in the manufacturing sector, the product rehabilitation or reconditioning save for the electronic products is a viable option leading to less waste.

Conceptual Framework

According to Kothari (2004) a conceptual framework is a diagrammatic representation of variables deemed important in a study.

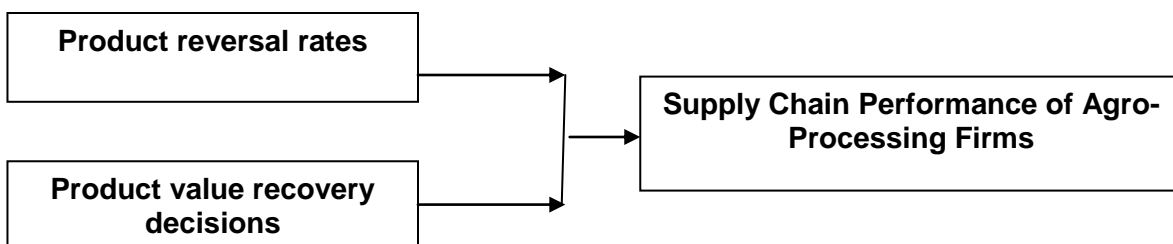


Figure 1: Conceptual Framework

Figure 1 suggests that certain factors in the reversed supply chain logistics set-up can explain the performance of imported furniture distribution firms. In particular, their transportation capabilities when retrieving rejected products can significantly affect the performance of their firms. Storage or warehousing constraints are expected to be a limiting factor that can significantly affect the performance of imported furniture distribution firms.

Limitations of the study

During the research some of the sampled respondents were reluctant to participate in the study where in some instances respondents completely rejected to divulge the requisite information. However the researcher assured respondents that the study was for academic purpose and that their identity would be concealed. In the case of research instrument, since it contained close ended questions and some respondents were unable to give their open opinions. Regarding this, it was ensured that the instrument contained questions that comprehensively addressed study objectives.

RESEARCH METHODOLOGY

Research Design

Bryman and Bell define a research design as the overall blueprint that defines how the research is to be conducted. It is about the strategies that are used for making of key decisions in the course of the research. Various options are often available to the researcher. They include the descriptive explanatory, the exploratory, cross sectional studies, case study or longitudinal research designs. In order to select the most effective design for a given research, the most important factor to put into consideration is the objective or the purpose of the study.

Research Philosophy

The study adopted a descriptive cross-sectional survey design which is suitable for the study because it enables the collection of data from several respondents from the same point. Cooper and Schindler (2000) explain that cross-sectional surveys are studies aimed at determining the frequency (or level) of a particular attribute, in a defined population at a particular point in time.

Therefore, using this design, it made it possible to determine the performance of the variables under consideration among the different firms in the study and this permitted the researcher to make statistical inference on the broader population and generalize the findings to real life situations and thereby increase the external validity of the study.

Target Population

The target population for the study is defined by Best and Kahn (2008) as all individuals bearing similar characteristics of interest to the researcher. The researcher got the information from Kenya association of manufacturers (KAM) directory 2014. Nakuru being an area that is highly dependent on agriculture, Nakuru County alone is home to over twenty-six such firms (A list of the registered food manufacturing or processing firms operating in Nakuru County is given in the sampling frame obtained from the Nakuru County Government registry, 2017). This study targeted the management from various departments in these firms among them the overall management, the logistics manager, sales manager, stores manager and accounts manager. Therefore, the entire population under consideration in this study was 156 persons.

Sampling Frame

The derived sample size was then distributed in the sampling frame as shown in Table 1.

Table 1: Target Population and Sample Size

Respondent type	Population	Sample size
Overall Management	26	19
Logistics Managers	26	19
Sales Managers	38	27
Stores Managers	40	29
Accounts Managers	26	19
Total	156	112

Sample Size and Sampling Technique

Mugenda & Mugenda (2003) observed that the purpose of sampling is to secure a representative group which enable the researcher to gain information about an entire population when faced with limitations of time, funds and energy. The sample size for this study was computed using the simplified formula proposed by Yamane (1967) for proportions where confidence level is 95% and $P \geq 0.5$ are assumed. Thus the sample size was calculated using the formula;

$$n = \frac{N}{1 + N(e^2)}$$

Where, N is the population and $e = 0.05$ is the level of precision (Yamane, 1967). Therefore, the sample size is sample was given by $n = 156/1+156(0.05)^2 = 112.23$ which was rounded off to 112 respondents.

Data Collection Instruments

This study utilized two types of data: primary data and secondary data. Questionnaires were administered as the main instruments of collecting data from the respondents, that is, primary data. The main advantage of using questionnaires is that the researcher will be able to collect all the completed questionnaires within a short period of time (Kothari, 2004). They also save on time, are confidential, have increased access to populations and eliminate interviewer bias (Fowler, 1993).

The questionnaires used in this study contained closed ended questions that were measurable on a Likert scale. They were divided into sections according to the research objectives. Secondary data was obtained through data collection sheets. Using this sheets, data on supply chain inventories and specifically reversed goods was captured.

ANALYSIS AND FINDINGS

Table 2: Multiple Linear Regression Analysis Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.712 ^a	.507	.482	2.37043

a. Predictors: (Constant), Product reversal rates, Product value recovery

The regression analysis in table shows that the relationship between the dependent variable and all the independent variables pooled together had a model correlation coefficient = 0.712. The adjusted r-square ($R^2 = 0.507$) indicates that the model could explain upto 50.7% variations in the supply Chain performance of the agrobased firms in the area. It also suggests that the model could improve when more predictive variables were incorporated into the model.

ANOVA Test

The results of the ANOVA performed on the independent and dependent variables are summarized in Table 3 indicate that there is a significant difference between means of variables predicting reverse logistics management and the one describing supply chain performance among agro-based firms in Nakuru County ($F_o = 8.447 > F_c = 2.50$; $\alpha < 0.05$; $df = 4, 79$; $p = 0.000$).

Table 3: Summary of ANOVA

	Unstandardized		Standardized	t	Sig.
	Coefficients		Coefficients		
	B	Std. Error	Beta		
(Constant)	2.010	4.759		.473	.638
Product Reversal Rates	.444	.084	.407	5.295	.000
Product Value Recovery	.175	.103	.161	1.751	.001

a. Dependent Variable: Supply Chain Performance

Hypotheses Testing Results

HO₁: There is no significant influence of product reversal rates on supply chain performance of agro-based processing industries in Nakuru County

From the beta values in Table 3, it was evident that there was a significant relationship ($\beta = 0.407$, $p < 0.05$) between the variables. Therefore, we reject the null hypothesis and conclude that product reversal rates influenced supply chain performance of agro-based processing industries in Nakuru County. These findings agree with those of Atasu et al., (2008) whose study found that determining product reversal rates was crucial to managing the supply chain.

The second hypothesis was tested under the null hypothesis;

HO₂: There is no significant influence of product value recovery decisions on supply chain performance of agro-based processing industries in Nakuru County

The multiple regression results in Table 3 indicate that there was a significant relationship between the two variables ($\beta = 0.161$, $p < 0.05$). Consequently, we reject the null hypothesis and conclude that product value recovery decisions significantly influenced supply chain performance of agro-based processing industries in Nakuru County. These findings concur with those of Bolo and Wainaina (2011) who found a significant linkage between product recovery decisions and supply chain decisions. Indeed, some companies were using reverse logistics as a strategic tool to differentiate themselves from their competition and influence the supply chain.

CONCLUSIONS

Based on the results of the study, it can be concluded that product reversal rates were important to the supply chain performance of agro-based processing industries in the area and significantly influenced it. The firms had instituted distribution cycles to help manage product reversals at a lower cost. The product reversal decisions were, however, not done on mutually agreed terms but rather as a marketing strategy. It can also be concluded in relation to product

value recovery decisions that these value recovery decisions had a considerable influence on supply chain performance of agro-based processing industries in the area. Product value recovery decisions were made on the basis of availability of technology, costs, timing and storage.

RECOMMENDATIONS

Concerning the influence of product reversal rates and recovery rate on supply chain performance, it emerged that fewer companies took measures to inform their customers in advance so as to ensure they emplace the rejected products in the designated area during the distribution cycles. Therefore, the study recommends that the firms develop working arrangements with their clients so as to enable them inform each other on the reversal of products.

In relation to the product value recovery decisions and supply chain performance of agro-based processing industries. It was established that costs considerations were not given top priority when recovering product value in the firms. As such, the study recommends that the firms should carry out comprehensive cost evaluation of product value recovery so as to enable them increase the value of the recovered products so they could perform better in the market.

REFERENCES

- Achieng, S.O., (2011). Information Integration on supply chain management in the food processing firms in Kenya. Unpublished MBA Project, University of Nairobi.
- Abdullah, N. qdb I8.A. & Yaakub, S., (2014). Reverse logistics: pressure for adoption and the impact on firm's performance. *International Journal of Business and Society*, 15 (1), 151 – 170
- Aberdeen Group Inc., (2006). Revisiting Reverse Logistics in the Customer-Centric Service Chain
- Amemba,C.S.,Nyaboke, P.G.,Osoro,A.& Mburu, N. (2013). Elements of green supply chain management. *European Journal of Business and Management*, 5 (12), 51-61.
- Ashby, A., Leat, M. & Hudson-Smith, M. (2012). Making connections: a review of supply chain management & sustainability literature. *Supply Chain Management: An International Journal*, 17 (5), 497–516.
- Atasu, A. & Cetinkaya, S. (2006). Lot sizing for optimal collection and use of remanufacturable returns over a finite life-cycle, *Production and Operations Management*, 15(4), 15
- Atasu, A., Guide, D.V. R. & Van Wassenhore, L. N.(2008). Product reuse economics in closed-loop supply chain research. *Production and Operations Management*, 17(5), 483-496.
- Azevedo, S. G.,Carvalho, H., & Cruz Machado, V. (2011). The influence of green practices on supply chain performance: a case study approach. *Research Part E: Logistics and Transportation Review*, 47(6), 850-871.
- Banerji, S.(2011)."Revisiting Returns," *American Executive*
- Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99 120.
- Barney, J. B. (1986). Strategic factor markets: Expectations, luck, and business strategy. *Management Science*, 32(10), 1231-1241.
- Bolo, A. Z. & Wainaina, G.(2011). An empirical investigation of supply chain management best practices in large private,does your organization in Kenya. *Prime Journal of Business Administration and Management*, 1(2), 2-3.

- Brito, P. & Dekker, R.(2003). A framework For Reverse Logistics, Econometric Institute Report EI 2001-38, Erasmus University Rotterdam, the Netherlands
- Choi, Y.& Zhang, N. (2011).Assessing the sustainable performance of Chinese Industrial sector. African Journal of Business Management, 5 (13), 5261-5270.
- Cruz-Rivera, R. & Ertel, J.,(2009).Reverse logistics network design for the of end-of-life vehicles in Mexico. European Journal of Operational Research, 196 (3), 930–939.
- Daskin, M.S. (2003).Facility location in supply chain design. Working Paper No. 03-010, Department of Industrial Engineering and Management Sciences, Northwestern University, Illinois.
- Dowlatsahi, S. (2005). A strategic framework for the design and implementation of remanufacturing operations in reverse logistics, International Journal of Production Research, 43(16), 3455-80.
- Du, Y. Cao, H. Liu, F. Li, C. & Chen, X. (2012).“An integrated method for evaluating the remanufacturability of used machine tool,” J. Clean. Prod., 20, 82-91,
- Eltayeb, T. K., Zailani, S., & Ramayah, T. (2011). Green supply chain initiatives among certified companies in Malaysia and environmental sustainability: Investigating the outcomes. Resources, Conservation and Recycling, 55(5), 495-506.
- Fortes, J. (2009).Green supply chain management: a literature review. Otago Management Graduate Review, 7(1), 51-62.
- García Rodríguez, F. J., Castilla Gutiérrez, C.,& Bustosflores, C. E.(2012).Implementation of reverse logistics as a sustainable tool for raw material purchasing in developing countries: The case of Venezuela. International Journal of Production Economics, 11(6), 67-81
- Gitau, P. (2010). Effect of reverse logistics on performance in beverage industry a case of East African Breweries Limited, Unpublished MSc (Bachelor of Purchasing & Supplies Management) Project report, JKUAT; Nairobi, Kenya.