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INFLUENCE OF PRODUCT REVERSAL CONTINGENCIES ON SUPPLY CHAIN PERFORMANCE OF AGRO-BASED PROCESSING INDUSTRIES IN NAKURU COUNTY

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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 establish the influence of product reversal rates of 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 product reversal contingencies 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: **Product Reversal Contingencies and Supply Chain Performance.**

1. INTRODUCTION

Business trends in the present day emerging networked world are as much about process as they are about products. 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 reprocess them to recover their value or safely dispose of them (Nyarega, 2015). 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). However, despite the relative progress in the area, the sector faces several challenges mostly emanating from environmental concerns and product marketing. For the most part, the agro-based processing sector is mainly and characterized by poor road network infrastructure and storage conditions, volatile labor resources and weak linkages to other sectors which together mean that the supply chains are generally not highly

dependable (Mwatsuma et al., 2013). Only 5% of processed items, such as pharmaceuticals, are in skill-intensive activities (KIPPRA, 2013). In addition, various regulatory institutions are demanding that processing and manufacturing industries comply with several regulatory requirements (KAM, 2014). Most of these regulations deal with safe disposal of products, their containers and processing agents. Marketing conditions are also posing serious challenges as they lower the guarantee that the products will be fully absorbed into the market, therefore, necessitating reversal of products.

1. Statement of the Problem

It is becoming clear in the present business environment that 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. Clearly, the reversal rate of products cannot be accurately estimated due to consumer characteristics, regulations and market dynamics. 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. Moreover, most firms' supply chains are configured in the forward direction with little or no consideration being given to reverse flow of goods. It has been shown that overlooking this aspect of the supply chain could lead to lost opportunity costs in terms of value recovery (Eltayeb et al., 2011) and consumer confidence (Langat, 2012). However, its exact impact on the supply chain performance has not been thoroughly explored. Supply chain performance is critical to the industrial sector as it among other things determines the costs and the rates at which goods will be supplied to the market. Scholars have conducted studies to relate reverse logistics with various components of organizational performance such as; environmental performance, social performance and economic performance (Amemba et al., 2013), however, there are limited studies on the effect of reverse logistics on supply chain management. In addition, most of these firms have focused extensively on the manufacturing sector and the electronic industry with little attention being given to the processing industries most of whose products are agricultural based most of which have short shelf lives and are, therefore, perishable. Therefore, the present study sought to examine the influence of reverse logistics on supply chain performance of agro-based processing industries in Nakuru County.

2. Objective of the Study

To evaluate the influence of product reversal contingencies on supply chain performance of agro-based processing industries in nakuru county

3. Research Hypotheses

In conducting the study the following hypothesis was tested

Ho: There is no significant influence of product reversal contingencies on supply chain performance of agro-based processing industries in nakuru county

2. LITERATURE REVIEW

1. Theoretical Review

Contingency Theory: Contingency theory claims that there is no best way to organize a corporation, make decision or to lead a company. The theory sought to formulate broad generalizations about the formal Structures organizations typically associates with or best fit the use of different technologies. The theory states that the optimal course of action within an organization set up should consider the internal and external environment of a business. In this study, the theory draws its relevance that reverse logistics need adequate contingency planning and asessment to absorb the usual determinate reverse flows of products. Hence, the theory is expected to provide view into the contingency workings of imported goods from Distributing Firms connecting with manufacturer firms.

Theory of Constrains: wastes minimization is an important aspect principle in lean manufacturing strategy. The process eliminates wasteful activity which deteriorates the performance of the company and also creates efficiency across company's processes. Hence, company can make efficient use of its recourses are at a greater pack of reaping greater incomes in terms of good quality and quantity of resources. (Dettmer, 1997) describes the cause of system constraints as well as provides methods to resolve them. Recognition and elimination of barriers will make a company utilize its resources in terms of ensuring the right amount of resources are used as inputs in the production process to maximize the output hence reducing wastes. With is key facts been in place, It puts emphasis on the interconnected nature of operational activities within the stipulated organization set up (Ashmos & Huber, 1987).

According to this theory, organizations activities are connected with each other across an organization set up, all other needs needed by organization will be improved respectively. Theory describes efficiencies on the role of processes across organization in order to eradicate them and make it possible to recognize inefficiencies anr grow towards efficiency.

2. Empirical Review

Reverse logistics is a typical forward supply chain that does the closure of the loop and also includes, remanufacturing, recycling or reuse of materials into new materials in the marketplace. In greening the supply chain suppliers are encouraged to take back packaging materials as a form of reverse logistics in completion of the whole process, This has reduced the amount of packaging materials that enters into the waste system hence minimizing the waste output product. The main purpose of this is to eliminate or reduce waste such as emissions, chemical or hazardous energy, and solid wastes (Ashby et al., 2012). Economist like Choi and Zhang (2011) conducted a study on business performance on green logistics in China and the findings revealed that organizations have found a match between environmental considerations and profitability. Other Studies done by scholar Ashby, et al. (2012) indicated that management of wastes in reverse logistics lead to cost savings and upgraded competition as a firm's environmental efficiency has been enhanced. Further it has been pointed out that reverse logistics provide a maximum utilization of used products of orgazition. Firms in the handmade sector should implement an information system and be in constant communication with their customers, who play a dual role as buyers of their products and as input suppliers, therefore, greater contact can help reduce uncertainty. García-Rodríguez, Castilla-Gutiérrez and Bustos-flores (2012) studied the implementation of reverse logistics as a sustainable tool for raw material purchasing in developing countries focusing on Venezuela. The results reveal purchasing raw materials through reverse logistics is mainly determined by the "some contingency factors of "information and technological communication systems.

3. METHODOLOGY

1. Research Design ,Target Population And Sampling

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 uses 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.

2. Research Instruments and data collection and analysis

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. Reliability is the measure of the consistency of the results from the tests of the instruments. It is a measure of the degree to which a research instrument yields consistent results or data after repeated trials. Test-retest of the instruments will be done on the instruments to establish their reliability. The responses from the two administrations were then correlated using the Pearson's moment correlation formula and a correlation coefficient of 0.890 was established. According to Fraenkel and Wallen (2000), as a rule of thumb, a proposed psychometric instrument should only be used if a value of 0.70 or higher is obtained on a substantial sample. The instrument was therefore considered highly reliable for the study.The results confirmed data reliability for the independent variables and therefore they were retained .the questionnaire accepted for the study purposes. The researcher obtained an introduction letter from the school of postgraduate studies of JKUAT that was then presented to management of various youth Group for the data collection exercise. Data analysis was done with the aid of the computer software Statistical Package for Social Scientists (SPSS) version 24. Descriptive statistical measures such as, frequencies, percentages were used to give glimpse of the general trend of the data. Inferential statistics involving the use of correlation analysis were then used to determine the nature of the relationship between variables at a generally accepted conventional significant level of $P \leq 0.05$ (Gall, Borg & Gall, 2003). In addition, multiple regression analysis was employed to determine other characteristics of the variables such as the overall contribution of the

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independent variable to the dependent variable and also rank the variables according to the order of their importance. Multiple regression analysis was applied to analyze the relationship between dependent variable and independent variable (Sekeran, 2003). The beta (β) coefficients for each independent variable generated from the model were used to test each of the hypotheses under study. The regression model used in the study is shown below:

$$\mathbf{Y = \beta_0 + \beta_1 X_1 + \varepsilon} \quad \textbf{(i)}$$

Where;

Y= Supply Chain Performance of Agro-Based Processing Firms, β_0 =constant,$\beta_1 + \beta_3$ = weights crested from the variables X_3 = Product Reversal Contingencies, ε is the estimated error of the model that has a mean of zero at constant Variance

4. RESULTS AND DISCUSSIONS

1. Response Rate and reliability test

The high questionnaire response rate (75%) resulted from the method of administration of the instrument, which was in this case self-administered. This was acceptable according to Mugenda and Mugenda (2003). This method also ensured that the respondents' queries concerning clarity were addressed at the point of data collection; however, caution was exercised so as not to introduce bias in the process. Test-retest of the instruments was done on the instruments to establish their reliability. The responses from the two administrations were then correlated using the Pearson's moment correlation formula and a correlation coefficient of 0.890 was established. According to Fraenkel and Wallen (2000), as a rule of thumb, a proposed psychometric instrument should only be used if a value of 0.70 or higher is obtained on a substantial sample. The instrument was therefore considered highly reliable for the study.

2. Demographic analysis

That majority (51%) of the respondents were male although the high proportion of females indicated that a significant number of young women who are working in the firms. The results also indicate that majority (36%) of the respondents were aged between 29 – 33 years of age. Concerning the level of education, the results indicate that majority (41%) of the respondents had diplomas as their highest academic qualifications although there was also a considerable number with post graduate qualifications. Majority (44%) of employees of the firms have worked in the firms for more than two years.

3. Product reversal contingencies on supply chain performance of agro-based processing industries

The study also sought to determine the influence of product reversal contingencies on supply chain performance of agro-based processing industries in Nakuru County, this was the fourth objective. A 5 point Likert scale was used to rate responses of this variable and it ranged from; 1 = strongly disagree to 5 = strongly agree. The closer the mean score on each score was to 5, the more the agreement concerning the statement. A score around 2.5 would indicate uncertainty while scores significantly below 2.5 would suggest disagreement regarding the statement posed. The findings are presented in Table 4.

Table 4.: Product reversal contingencies on supply chain performance

Statement	SA Freq(%)	A Freq(%)	N Freq(%)	D Freq(%)	SD Freq(%)	Mean	Std. Dev
We have convertible warehouses for retrieved products	22(26)	34(41)	13(16)	9(11)	5(6)	3.71	0.847
We always source for warehouses depending on the estimated backflow of goods to keep the costs low	8(10)	35(42)	17(20)	21(25)	3(3)	3.76	0.83
We do have quarantine mechanisms in our warehouses to avoid product mix ups and contamination	19(23)	30(36)	9(11)	17(20)	8(10)	3.43	0.96

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We have configured our transport systems for goods reversal	12(14)	18(21)	5(6)	50(59)	0	2.81	0.752
We have a dedicated transport facility for reversal of goods	17(20)	14(17)	8(9)	39(46)	7(8)	2.65	0.799
We usually outsource warehouses for our returned goods	26(31)	41(49)	16(19)	1(1)	0	4.1	0.738
We usually outsource transportation whenever necessary	16(19)	39(46)	11(13)	10(12)	8(10)	3.52	0.784
We ensure all our outsourcing partners are fully aware of our requirements	18(22)	41(49)	15(18)	7(8)	3(3)	3.79	1.001
Aggregate Score						**3.21**	**0.839**

The results in Table 4.6 suggest that most firms had convertible warehouses for storing retrieved products (67%). However, most of the firms often sourced for warehouses depending on the estimated backflow of goods to keep the costs low (52%). The firms had also instituted quarantine mechanisms in their warehouses to avoid product mix ups and contamination (59%). Most firms claimed that they had not yet configured their transport systems for goods reversal (59%) and had also not dedicated transport facilities for reversal of goods (64%). However, most usually outsourced warehouses for their returned goods (80%), they also frequently outsourced transportation whenever necessary (65%). The findings also indicate that most firms always ensured all their outsourcing partners were fully aware of their requirements (71%). With a mean of 3.21, it is evident that most of the respondents were of the view that product reversal contingencies influenced supply chain performance of agro-based processing industries in the area.

4. Supply chain performance of agro-based processing industries in Nakuru County

Finally, the study sought to determine the status of the supply chain performance of agro-based processing industries in Nakuru County. A 5 point Likert scale was used to rate responses of this variable and it ranged from; 1 = strongly disagree to 5 = strongly agree. The closer the mean score on each score was to 5, the more the agreement concerning the statement. A score around 2.5 would indicate uncertainty while scores significantly below 2.5 would suggest disagreement regarding the statement posed. Table 2 shows results of this examination.

Table 2: descriptive statistics of Supply chain performance of agro-based processing industries in Nakuru County

Statement	SA Freq(%)	A Freq(%)	N Freq(%)	D Freq(%)	SD Freq(%)	Mean	Std. Dev
Our suppliers are often notified in advance when there is variation of orders due to product reversals	9(11)	45(54)	5(6)	17(20)	8(9)	3.6	0.576
We set our supply demands along a margin determined by the estimated product reversal rates	21(25)	35(42)	17(20)	8(10)	3(3)	3.76	0.83
We have configured our supply systems to just in time type to enable us make economic quantity ordering	12(14)	31(37)	12(14)	19(23)	10(12)	3.18	0.748

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Our product retrieval and recovery costs are normally within the range of the normal supplies	17(20)	39(46)	14(17)	8(9)	7(8)	3.65	0.799
Through successful product recovery, we are able to raise our profit margins substantially	15(18)	37(44)	14(17)	9(11)	8(10)	3.49	0.925
Through product reversals, we have been able to boost our customer loyalty	32(38)	42(50)	6(7)	4(5)	0	4.2	0.805
Product recovery has improved our supply chain stability	6(7)	13(15)	13(15)	29(35)	24(28)	2.38	0.716
Our company sales volumes have increased due to management of reverse logistics	19(23)	30(36)	9(11)	17(20)	8(10)	3.43	0.96
Aggregate Score						**3.461**	**0.795**

The findings in Table 2 indicate that most of the suppliers to the firm were often notified in advance whenever there was anticipated variation of orders due to product reversals (65%). The firms set their supply demands along margins determined by the estimated product reversal rates (67%). Most firms had configured their supply systems to just in time type to enable them make economic quantity ordering (51%). The firms' product retrieval and recovery costs were normally within the range of the normal supplies (66%) and through successful product recovery, they were able to raise their profit margins substantially (62%). The findings also indicate that through product reversals, most firms had been able to boost their customer loyalty (88%). However, there were doubts on whether product recovery had improved the firms' supply chain stability (63%). Nevertheless, the firms' sales volumes had increased due to management of reverse logistics (59%).

Further, the aggregate score Mean = 3.461 suggests that the supply chain performance of the agro-based processing industries was good for the most part owing to reverse logistics management.

5. Correlation Analysis

In this subsection a summary of the correlation analyses is presented. It seeks to first determine the degree of interdependence of the independent variables and also show the degree and strength of their association with the dependent variable separately. These results are summarized in Table 3.

Table 3: Summary of Correlations

		Product reversal rates	Product value Recovery	End-of-Life Management	Reversing Contingencies	Supply Chain Performance
Reversing Contingencies	Pearson Correlation	0.033	0.133	0.419	1	Reversing Contingencies
	Sig. (2-tailed)	0.763	0.227	0.742		
	N	84	84	84	84	
Supply Chain Performance	Pearson Correlation	.611**	.408*	0.116	.213	1
	Sig. (2-tailed)	0	0.016	0.006	0.02	
	N	84	84	84	84	84

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

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The study sought to determine whether product reversal contingencies on supply chain performance of agro-based processing industries in Nakuru County. The correlation analysis in Table 3 indicates that there was indeed a significant relationship ($r = 0.213$, $p \leq 0.05$) between the variables. This finding suggests that the relationship between the variables was not efficient implying that the firms did not have adequate contingencies on product reversals.

6. Regression Analysis

Multivariate regression analysis was used to determine the multiple regression model hypothesized in chapter three held. It was also used to determine how the independent variables influenced the dependent variable collectively. The analysis was also meant to establish the extent to which each independent variable affected the dependent variable in such a collective set up and which were the more significant factors. The results are summarized in Table 4

The study used simple OLS Regression analysis. The independent variable was financial capacity and the dependent variable was Accessibility of the preferential public procurement opportunities. Univaritae regression analysis involved calculation of coefficient of determination (R^2), Analysis of Variances (ANOVA) and regression coefficients

Table 4: 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 contingencies

The regression analysis in Table 4 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.

Table 5: Summary of ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	189.856	4	47.464	8.447	.000[b]
Residual	443.894	79	5.619		
Total	633.750	83			

a. Dependent Variable: Supply Chain Performance

b. Predictors: (Constant), Product reversal contingencies

The results of Table 5 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 ($F_{o'} = 8.447 > F_c = 2.50$; $\alpha < 0.05$; $df = 4, 79$; $p = 0.000$). This finding confirms that the model predicted by Table 4.9 and shows it is indeed significant a result that also agrees with Choi and Zhang (2011) and Wainaina (2014) on the effect of product reversal on manufacturing firms.In order to determine which of the reverse logistics variable was more important when it came to the supply chain performance among agro-based firms in Nakuru County, the beta value was used. The results are given in Table 6 provides a summary of the multiple linear regression analysis correlation coefficients.

Table 6: Coefficients[a] of the Linear Regression

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2.010	4.759		.473	.638
Reversing Contingencies	.358	.117	.279	3.494	.000

a. Dependent Variable: Supply Chain Performance

Supply Chain Performance=2.010 + 0.0358(product reversal contigencies)

It can be deduced from the findings in Table 6 that, the Product reversal contingencies was not significant in the model ($\beta = 0.279$, $p < 0.05$) The study therefore establishes that product reversing Contingencies influence supply chain management in agro-based processing firms in Nakuru County.

7. Hypothesis Tests

H01: The results from the linear regression analysis suggest that there was indeed a significant relationship between the two variables ($\beta = 0.279$, $p < 0.05$). This led to the rejection of the null hypothesis and, subsequently, the adoption of the view that product reversal contingencies significantly influenced supply chain performance of agro-based processing industries in Nakuru County. These findings support those of Kleineidam et al. (2010) who established that most firms had not yet reconfigured their supply chain systems and thus the introduction of reverse logistics was considerably impacting their performance.

5. CONCLUSION

1. Conclusion

The findings revealed that most firms had convertible warehouses for storing retrieved products, however, most still often sourced for warehouses depending on the estimated backflow of goods to keep the costs low. The firms had also instituted quarantine mechanisms in their warehouses to avoid product mix ups and contamination. Most firms claimed that they had not yet configured their transport systems for goods reversal and had also not dedicated transport facilities for reversal of goods. However, most usually outsourced warehouses for their returned goods, they also frequently outsourced transportation whenever necessary. The findings also revealed that most firms always ensured all their outsourcing partners were fully aware of their requirements. It was also evident that product reversal contingencies significantly influenced supply chain performance of agro-based processing industries in Nakuru County.

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