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**INFLUENCE OF GREEN SUPPLY CHAIN ON PERFORMANCE OF  
MANUFACTURING FIRMS IN KENYA**

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## **ABSTRACT**

*The study sought to determine the influence of green supply chain practices on organizational performance of manufacturing firms in Kenya. The target population for the study was the senior staff in supply chain, operations and finance or equivalent managers in the 563 manufacturing organizations listed by KAM. The sampling technique was stratified random sampling in based on the 14 sectors as identified by KAM. Using Yamane formula, the study sampled 312 respondents from 104 firms. The data collection instrument was a structured questionnaire. Data analysis was done using descriptive statistics and inferential statistics. The statistical tests were also done in the study. Presentation of data was in form of charts and tables as deemed appropriate. The study found out that green supply chain and organizational performance were moderately correlated,  $r = .567$ ,  $p < .05$ . From regression analysis, an  $R^2$  value for the relationship between green supply chain and performance was 0.322 indicating that 32.2% of the variation in performance could be attributed to changes in green supply chain in the manufacturing firms of Kenya. The study also found that most of the organizations had implemented architectural designs which allowed natural lighting leading to conservation of energy hence increase in profitability. Also, majority of the organizations had waste management policies in their organizations, meaning that they were conscious of environment impact of waste on performance. The study therefore concluded that for the organizations to realize more value from green supply chain, it was prudent to implement more policies such as use of biodegradable packaging materials and energy generation which will improve performance. The study recommended that the firms needed to invest in the three R's of waste management, that is, reusing, recycling and reducing wastes. It was also recommended that organizations needed to devise architectural designs that are more eco-friendly, use energy efficient machines and equipment as well as focus on improving reverse logistics by investing on returnable containers.*

**Keywords:** Green supply chain, organizational performance, manufacturing firms, KAM, supply chain

## **INTRODUCTION**

### **Background**

Green supply chain enhances the economic advantages such as economy of production, increasing competitive advantage and increasing profit (Andic, Yurt & Baltacıoglu, 2012). Further, Laosirihongthong, Adebajo and Choon Tan (2013) added that there is a positive relationship between adopting GSCM practices and enhanced reputation and brand image of an organization. Green supply chain enhances the economic advantages such as economy of production, increasing competitive advantage and increasing profit.

Corporate social responsibility, internal organisational policies, and board and top management support have been reported to be the most important drivers in green supply chain while culture, costs and government legislations have been identified as the barriers with the greatest impact (Niemann, Kotze & Adamo, 2016). In addition, a study by Ravi and Shankar (2015) in India adopted reverse logistics as a result of economic benefits associated with the practice and determined that reverse logistics is one of the most important strategic management decisions that can assist organization improve its productivity.

Some of the institutional procedures that have been identified to contribute to reverse logistics implementation include the government, customer, and competitor pressures (Ye, Zhao, Prahinski & Li, 2013). The study similarly argued that product recovery has a significant positive impact on both economic and environmental performance, product return had a negative impact on the firms' economic performance and no effect on the firm's environmental performance. This could be attributed to the fact that their customers returned products purchased and therefore reverse logistics should be viewed as a critical process by organizations so as to improve performance. Ebrahiem and Eldin (2015) also found that only a few operators are aware of the waste management practices although the compliance level was high due to the institutional procedures.

Generally, the adoption of GSCM practices by manufacturing organizations leads to improved environmental performance and economic performance, which, in turn, positively impact

operational performance and by extension, organizational performance (Green, Zelbst, Meacham & Bhadauria, 2012). However, Laosirihongthong, Adebajo and Choon Tan (2013) postulated that reverse logistics did not have a significant impact on GSCM performance and there was need to improve on the legislation and regulation of green practices for enhancing environmental, economic, and performance.

### **Statement of the Problem**

Manufacturing sector has in the recent past experienced performance issues which the study wishes to resolve. The main problems identified by the study include the trade imbalance, drop in GDP and closure of international manufacturing firms in Kenya. The problem has led to reduced government annual GDP, unemployment, inflation and imbalance of trade resulting to weakening and instability of the currency as a result of increased imports. Kenya had been a priority investment destination in Africa but current stagnation in performance has led to international organizations preferring other African countries such as Egypt, South Africa and Nigeria (Lee, Thomas, & Wilson, 2016).

The study postulates that the performance problem may be as a result of poor implementation of supply chain contemporary practices. Supply chain contributes significantly to the development and growth of organizations, more than any other single department in the organization (Christopher, 2016). The study therefore assessed whether by adopting green supply chain practices, manufacturing firms could improve their operations and subsequently improve their performance.

### **Objective**

The study sought to determine the influence of green supply chain on performance of manufacturing firms in Kenya.

## **LITERATURE REVIEW**

### **Theoretical Review**

#### **Theory of Lean Six Sigma**

Lean six sigma theory is an approach for improving efficiency through complexity and cost reduction. Lean six sigma principles follow sequential steps that target the reduction of costs and increase in profits as well as identifying opportunities for increasing collaboration (Pyzdek & Keller, 2014). Sehwal and DeYong (2003) asserts that this theory can be used as an analytical tool to define both facilitating and hindering factors that shape customer satisfaction and prevent corporations from achieving their financial and operational goals. Lean six sigma is a methodology that relies on a collaborative team effort to improve performance by systematically removing waste, combining lean manufacturing/lean enterprise and Six Sigma to eliminate the eight kinds of waste: transportation, inventory, motion, waiting, over production, over processing, defects, and skills (Devane, 2004).

Salah, Rahim and Carretero (2010) suggest that leading consulting firms such as McKinsey, Deloitte, Bain & Company, and Booz Allen have reported that the Lean Six Sigma methodology provides the foundation upon which they evaluate a company's performance using organizational design, product quality, supply chain management, logistics, innovation, finance, market share, and customer satisfaction. According to Palagyi, Hamelynych, Mehta and Roussel (2003), the use of Lean six sigma provides techniques to evaluate measure and improve areas within a company that are inefficient or have poor outcomes, such as costs untimely delivery of products and delivery of damaged goods.

The theory of lean sigma six was useful in the study in the measurement of the organizations performance in terms of product quality, supply chain management, logistics, and innovation, finance and market share. The theory was also in line with the objective on green supply chain where it helped the study determine the various ways adopted the manufacturing firms in eliminating wastes in transportation, inventory, logistics, production and defects. The theory was also linked to the study objective on lean supply chain through combination of lean manufacturing and lean enterprise.

### **Empirical Literature Review**

Niemann, Kotze and Adamo (2016) in their study on the drivers and barriers of green supply chain management implementation in the Mozambican manufacturing industry, identified four drivers and eight barriers that affect the adoption of green supply chain. The study adopted a

qualitative approach in form of semi-structured interviews with one senior manager in eight different organisations in the industry. The study found that corporate social responsibility, internal organisational policies, and board and top management support were the most important drivers while culture, costs and government legislations were identified as the barriers with the greatest impact.

Ravi and Shankar (2015) in their attempt to investigate the current status of reverse logistics practices used on four sectors of Indian manufacturing industry, adopted a survey method and argued that firms give more importance to the aspect of reverse logistics. The study found that Indian companies adopted reverse logistics as a result of economic benefits associated with the practice. The study also found that reverse logistics is one of the most important strategic management decisions that can assist organization improve its productivity.

Ye, Zhao, Prahinski and Li (2013) investigated the effects of three institutional pressures on top managers' posture towards reverse logistics implementation: government, customer, and competitor pressures. The study surveyed 209 manufacturers of Pearl River Delta in China and found that although product recovery had a significant positive impact on both economic and environmental performance, product return had a negative impact on the firms' economic performance and no effect on the firm's environmental performance. The study also found that 6% of customers returned products purchased and therefore reverse logistics should be viewed as a critical process by organizations so as to improve performance.

Ebrahiem and Eldin (2015) investigated waste management practice among restaurants in Petaling Jaya city, Malaysia with reference to the compliance, awareness on waste management, and incorporating these findings on waste management practice. The study was done using two approaches; survey to study the compliance of the restaurants to the Local Government Act (LGA) 1976 and questionnaire. The study found that only a few operators were aware of the waste management practices although the compliance level was high.

Guerrero, Maas and Hogland (2013) in their study on the solid waste management challenges for cities in developing countries noted that recycling has become part of life in many developed countries such as Denmark, Japan, Germany and Singapore. The objective of the study was to determine the stakeholders' action/behavior that have a role in the waste management process

and to analyze influential factors on the system, in more than thirty urban areas in 22 developing countries in 4 continents. The study used secondary data obtained from scientific literature and existing data bases. The study found that recycling performance indicators involved environmental, economic and social issues. The authors recommended that these indicators needed to reflect the industrial ecology ambition of closing material and energy loops, reflect the function and the performance of the system, reflect global environmental concern or business value, be relevant, understandable, meaningful and useful for decision-makers, support system-oriented decision makers and define data and methods for measurement.

## **RESEARCH METHODOLOGY**

The study used a descriptive research design because the study aimed at presenting the findings of the study by observing and describing the behavior of the subjects without influencing them in any way. This study used positivism research philosophy. Positivism research philosophy reflects the belief that reality is stable. Positivist belief that hypothesis developed from existing theories can be tested by measuring observable social realities, thus positivism is derived from natural sciences. The target population for the study was all the manufacturing organizations listed by KAM. According to KAM Directory (2016), there were 563 listed manufacturing firms in Kenya. These firms formed the target population and were the unit of analysis in the study. The unit of observation were the top managers in the three key departments (procurement, operations and finance) of the manufacturing firms listed by KAM. Therefore the targeted unit of observation was 1689 managers.

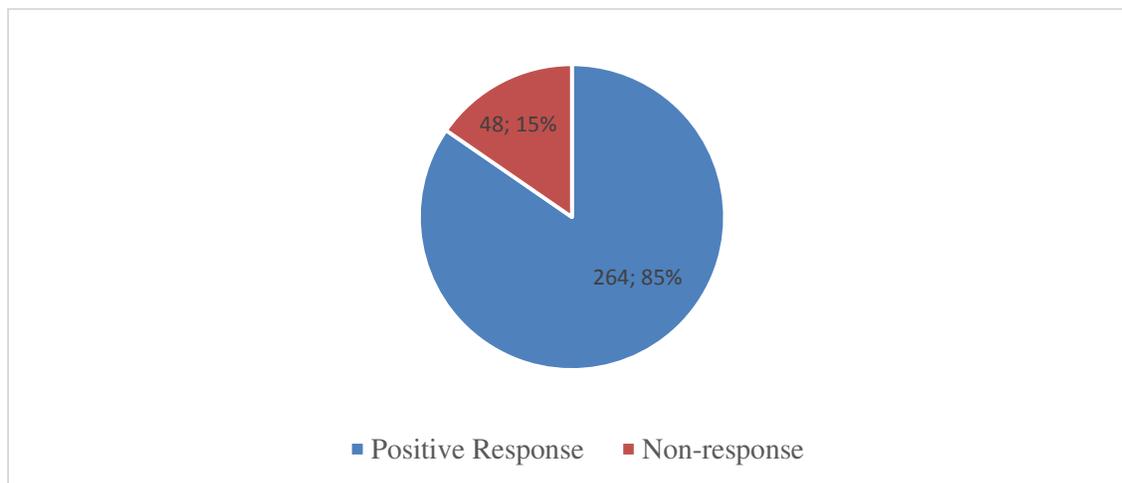
The sampling frame for this study was the registered organizations listed in the Kenya Association of Manufacturers directory (2016). The study used stratified random sampling technique to select a sample from 1689 senior managers from the 563 listed manufacturing firms in Kenya. The study selected three senior managers from procurement, finance and operations department in each organization. The study also divided the population into 14 strata based on the sectors in the manufacturing firms and sample size of 312 obtained using Yamane formula distributed accordingly as per strata.

The study used both primary and secondary data. Primary data was obtained from a structured questionnaire to collect data from 312 manufacturing firms listed by KAM. Secondary data was

gathered from existing literature, periodicals, journals, government publications, financial statements and websites containing relevant information. The study used a questionnaire to collect data. The questionnaires were self administered. The researcher made use of research assistants who were adequately trained prior to questionnaire administration.

## **RESEARCH FINDINGS AND DISCUSSION**

The study sought to collect data from 312 managers in the manufacturing firms listed by KAM in Kenya. However, the study did not realize 100% response as there were non-response incidences during data collection. Therefore, out of the targeted 312 managers, 264 gave adequate information required for analysis. The study hence realized a response rate of 84%. As shown in Figure 1. This response rate is good in accordance to Garg and Kothari (2014) who posited that a response rate of more than 70% is good to conduct data analysis.

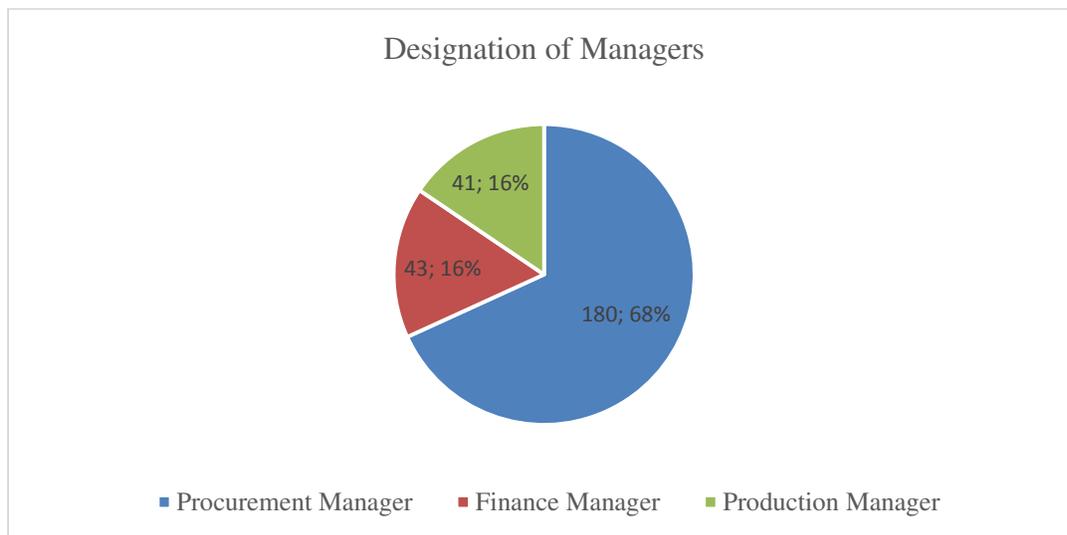


**Figure 1: Response Rate**

### **Demographic Information**

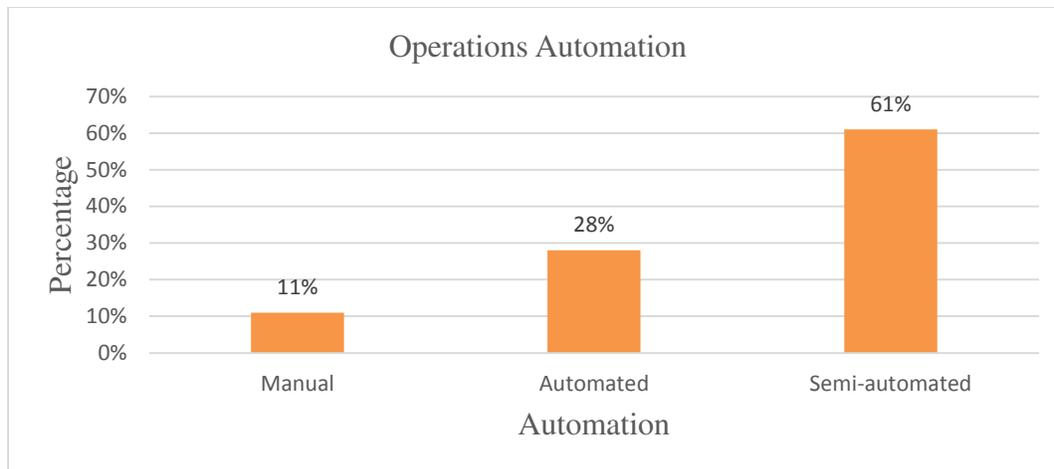
The study sought to determine the general characteristics of the respondents who participated in the study. The general information sought was the designation of the managers and the way the operation in the firms were carried out. The findings are presented in this section. The demographic information was sought in order to assist the researcher in determining whether the respondents of the study were a representative sample of the target population for generalization purposes.

The findings of the study indicate 68% of the respondents were procurement managers while finance and operations managers tied at 16% as indicated in Figure 2. The study used designation of managers in the procurement, finance and production departments to obtain information related to supply chain because they were knowledgeable in the subject area line with other scholars in such as Magutu, Aduda and Nyaoga (2015) and Ye, Zhao, Prahinski and Li (2013).



**Figure 2: Designation of Managers**

The study also sought to determine how the manufacturing carried out their operations. The findings of the study indicated that 61% of the firms used semi-automated operations, 28% used fully automated operations and 11% used manual types of operations. The findings on operations automation are shown in Figure 3. The study used automation to determine the level of skills and use of technology in the manufacturing firms as postulated by Mathur, Dangayach, Mittal and Sharma (2011).



**Figure 3: Automation of Operations**

### **Descriptive Findings**

The study sought to determine the influence of green supply chain practices on performance of manufacturing firms. Means, standard deviations and variances were used to give the findings under this objective. The means were interpreted as follows; A mean value of 0-1 implied the majority of the respondents agreed to the statements to a very small extent, a mean value of 1.1-2.0 implied the respondents agreed with the statements to a small extent, a mean value of 2.1-3.0 implied the respondents neither agreed nor disagreed with the statements, a mean value of 3.1-4.0 means that the respondents agreed to the statements to a great extent and a mean of 4.1-5.0 implied the respondents agreed with the statements to a very great extent.

The findings indicate that the mean values obtained for the majority of the items were above 3.0 indicating that the majority of the respondents agreed with the statements. The standard deviations and variance for all items was more than 1.0 indicating that the responses were varied across the means obtained. The findings of the study indicated the respondents agreed that organizations had put in place a waste management policies ( $M = 3.82, SD = 1.176$ ) and that were architectural designs of the firm which allowed natural lighting ( $M = 3.89, SD = 1.061$ ). However, the respondents neither agreed nor disagreed that the organizations were able to generate energy from its waste products ( $M = 2.73, SD = 1.529$ ). The findings are shown in Table 2.

**Table 1: Influence of Green Supply Chain Practices on Performance**

	N	Mean	Std. Deviation	Variance
The organization has a recycling plant to maximize on its by-products	264	3.57	1.312	1.721
The organization has an efficient reverse logistic management system.	264	3.55	1.129	1.275
There is a waste management policy in the organization	245	3.82	1.176	1.383
The organization uses returnable containers for distribution of the products.	264	3.67	1.138	1.295
The packaging materials used are biodegradable	242	3.30	1.044	1.090
The organization has a treatment plant for waste management	235	3.53	1.381	1.908
The architectural design of the firm allows natural lighting	264	3.89	1.061	1.125
The organization is able to generate energy from its waste products	245	2.73	1.529	2.339
All electrical equipment and tools are energy efficient	264	3.23	1.136	1.291

Performance in the study was measured using three constructs namely profitability, market share and return on assets. Profitability was analyzed using income after tax in the organizations for the years 2011 – 2015. Minimum values, maximum values, means and standard deviations were used to present the findings. The results show a general cyclical trend with the minimum value being -2481 and maximum value of 16967367. In the year 2011, a mean value of 1172659.53 was obtained, which increased to 1427401.89 and 1478541.32 in the year 2012 and 2013 respectively. The mean value however dropped to 1329520.89 in 2014 and increased to 2437625.91 in 2015 as shown in Table 2.

**Table 2: Profitability**

	N	Minimum	Maximum	Mean	Std. Deviation
Profitability 2011	245	-2481	9023660	1172659.53	1875074.673
Profitability 2012	244	-22465	11186113	1427401.89	2480298.637
Profitability 2013	245	1104	11517327	1478541.32	2179802.735
Profitability 2014	245	3371	12567395	1329520.89	1920153.248
Profitability 2015	245	2743	16967367	2437625.91	3265348.228

Market share was analyzed using the sales for the year 2011 – 2015. There was a cyclical trend in market share as mean values oscillated across the years. The highest mean value was recorded in 2015 (4498060.20) while the lowest value was obtained in 2011 (2021026.55). However, there was increment in sales in 2012(3318930.85) followed by a drop in 2013 and 2014 (2474236.94 and 2313870.27 respectively) then an increase in 2015. The findings on market share are as shown in Table 3.

**Table 3: Market Share**

	N	Minimum	Maximum	Mean	Std. Deviation
Market Share 2011	264	71706	37236591	2021026.55	2867904.951
Market Share 2012	264	38663	76284575	3318930.85	7951121.348
Market Share 2013	264	125636	87621402	2474236.94	5605723.362
Market Share 2014	264	31892	93120277	2313870.27	5808506.908
Market Share 2015	264	148600	140240088	4498060.20	9309669.316

Return on assets (ROA) is an indicator of how profitable a company is relative to its total assets. Return on Assets was therefore obtained by comparing the average total assets employed by the organization and the net income realized in the respective years. Generally, the findings indicate a general increment on ROA over the five year period across all the manufacturing firms in Kenya. The findings are as shown in Table 4.

**Table 4: Return on Assets**

	N	Minimum	Maximum	Mean	Std. Deviation
ROA2011	263	.000000	1.600000	.31921954	.227448829
ROA2012	264	.000000	1.478400	1.09544184	.107720421
ROA2013	264	.000000	1.990000	1.32460375	.264933213
ROA2014	264	.054100	2.149000	1.40995832	.275261491
ROA2015	264	.102400	2.376900	1.49805880	.299609178

The study used profitability, market share and ROA to measure organizational performance of manufacturing firms in line with Carroll, Johansen and Mouritsen (2011) who operationalized performance in terms of market share, return on investment, growth of sales, profit margin on sales, growth of market share and growth of return on investment. Other scholars who have also used these measure include Odalo, Njuguna and Achoki (2016) and Ahi and Searcy (2015).

### **Inferential Statistics**

Inferential statistics was done using correlation and regression analysis. Correlation analysis was done using Pearson correlation coefficient while regression analysis was done using the fitness model, ANOVA and regression coefficients.

### **Correlation Analysis**

Findings of the study indicate that green supply chain and organizational performance of manufacturing firms in Kenya had a Pearson coefficient of 0.567. The significant value was obtained as ( $p = .000$ ) which was below 0.05 at 1 tailed test conducted in the study. This implies that there was a moderate positive significant relationship between green supply chain and organizational performance. These findings are in concurrence with Laosirihongthong, Adebajo and Choon Tan (2013) who found that there was a positive relationship between adopting green supply chain management practices and performance of an organization. Further, Andic, Yurt and Baltacioglu (2012) agreed that green supply chain enhances performance through increasing economy of production, increasing competitive advantage and increasing profit.

**Table 5: Correlation for Green Supply Chain Practices and Performance**

		Organizational Performance
Green Supply Chain	Pearson Correlation	.567 <sup>**</sup>
	Sig. (1-tailed)	.000
	N	264

<sup>\*\*</sup>. Correlation is significant at the 0.01 level (1-tailed).

### Statistical Tests

The study found that green supply chain had a KMO value of 0.630 and Bartlett's test,  $\chi^2(36, N = 264) = 1935.747, p = .000$ . The test results indicate that green supply chain met KMO threshold of 0.6 and Bartlett's Test of Sphericity threshold of  $<0.05$ . The study therefore concludes sampling was adequate for green supply chain variable. The findings are shown in Table 6.

**Table 6: KMO and Bartlett's Test for Green Supply Chain**

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.630
Approx. Chi-Square		1935.747
Bartlett's Test of Sphericity	df	36
	Sig.	.000

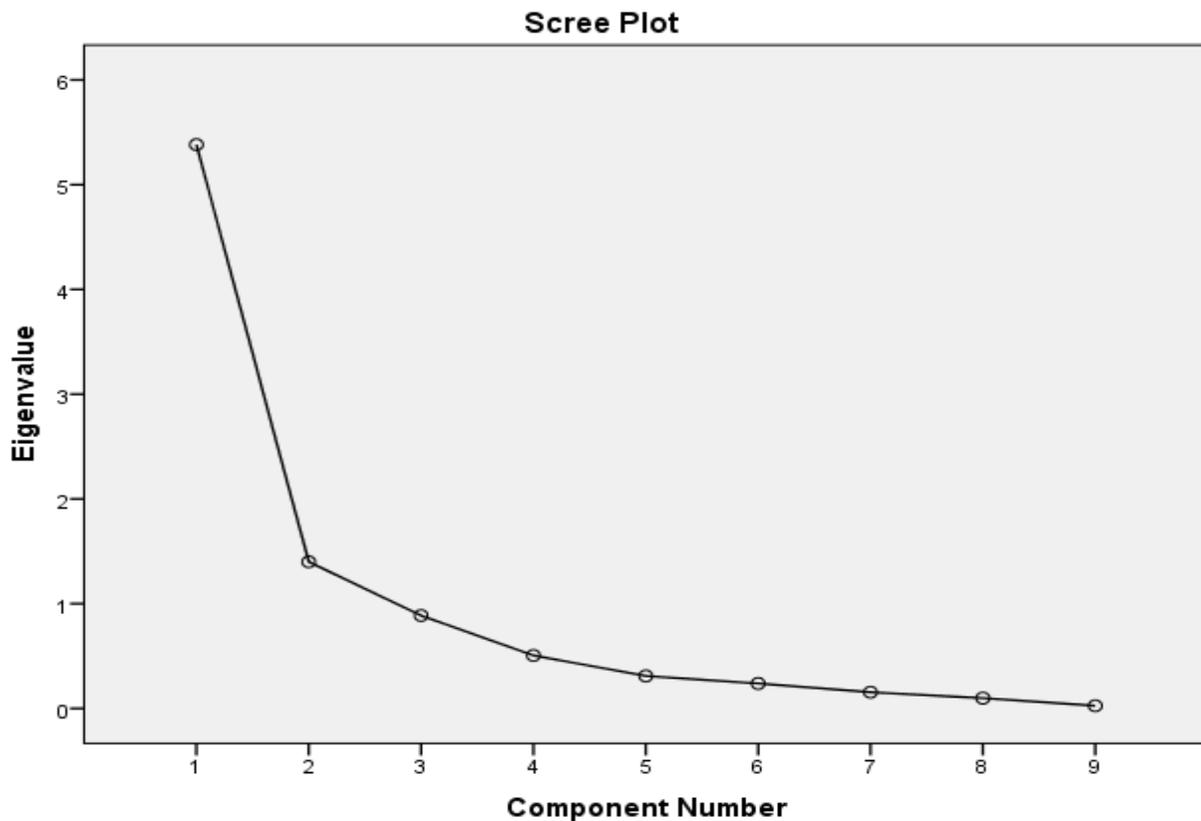
The study further conducted the factor loading analysis to determine the number of variables that were retained. The study found that the first two factor had Eigenvalues of more than 1 representing 75.352% of the total variance explained while the remaining seven factors had Eigen values of less than 1. Further, the first factor accounts for 59.803% of the variance in green supply chain and the second factor accounts for 15.549% of the variance. All the remaining factors were found to be insignificant and therefore were dropped. The findings are shown in Table 7.

**Table 7: Total Variance Explained for Green Supply Chain**

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.382	59.803	59.803	5.382	59.803	59.803
2	1.399	15.549	75.352	1.399	15.549	75.352
3	.887	9.854	85.206			
4	.505	5.616	90.822			
5	.310	3.443	94.265			
6	.238	2.641	96.906			
7	.155	1.718	98.624			
8	.099	1.095	99.720			
9	.025	.280	100.000			

Extraction Method: Principal Component Analysis.

A scree plot was obtained which indicated that two factors had Eigenvalues of more than 1 as shown in Figure 4.



**Figure 4: Scree Plot for Green Supply Chain**

The study sought to determine the factor loadings for green supply chain. The findings obtained indicate that “The organization is able to generate energy from its waste products” had the highest factor loading in the first component with 0.905 while “All electrical equipment and tools are energy efficient” had the highest factor loading in the second component with 0.886 as shown in Table 8.

**Table 8: Component Matrix for Green Supply Chain**

	Component	
	1	2
The organization has a recycling plant to maximize on its by-products	.890	.212
The organization has an efficient reverse logistic management system.	.931	.061
There is a waste management policy in the organization	.819	.406
The organization uses returnable containers for distribution of the products.	.748	.125
The packaging materials used are biodegradable	.783	.275
The organization has a treatment plant for waste management	.911	.218
The architectural design of the firm allows natural lighting	.415	.510
The organization is able to generate energy from its waste products	.905	.042
All electrical equipment and tools are energy efficient	.246	.886

Extraction Method: Principal Component Analysis.

a. 2 components extracted.

Durbin - Watson statistic test was applied to determine whether there is a significant relationship between the dependent and the independent variable and whether the relationship is linear or not. The study adopted a significant deviation from linearity of greater than 0.05 to imply that the relationship between the independent variable is linearly dependent and vice versa.

The findings indicate that there was a linear relationship between green supply chain practices and performance. Green supply chain had a significant deviation from linearity of 0.098, which is above 0.05 threshold set by the study. The findings are shown in Table 9.

**Table 9: Linearity Test**

			Sum of Squares	df	Mean Square	F	Sig.
Organizational Performance * Green Supply Chain	Between Groups	(Combined) Linearity	63.793	4	15.948	42.350	.000
		Deviation from Linearity	50.990	1	50.990	135.401	.000
			12.803	3	4.268	11.333	.098
	Within Groups		97.536	259	.377		
Total			161.330	263			

Normality test was done using Shapiro–Wilk test and Kolmogorov Tests. The study conducted normality test at 95% confidence interval for mean where the p-value was compared to determine whether to reject the null hypothesis meaning that data was either normally distributed (greater than 0.05) or not (less than 0.05).

The findings indicate that green supply chain had Shapiro-Wilk p value of 0.051 and Kolmogorov-Smirnov p value of 0.063, which is higher than the significant value of 0.05 as shown in Table 10.

**Table 10: Normality Test**

	Green Supply Chain	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Organizational Performance	2.000	.310	21	.063	.784	21	.051
	3.000	.399	88	.000	.643	88	.000
	4.000	.296	99	.000	.813	99	.000
	5.000	.490	55	.000	.490	55	.000

Homoscedasticity test was carried out to determine the circumstance in which the variability of a variable is equal across the range of values of a second variable that predicts it. This was

achieved through use of homogeneity tests. When the level of significance associated with Levene statistic is more than 0.05 at 5% significance level, then the variances are homogenous.

From the study findings of test for homogeneity, the probability associated with the Levene Statistic for green supply chain is 0.055, which is more than 0.05 testing at 5% significance level, which implies that the variances are homogenous. The findings are shown in Table 11.

**Table 11: Test of Homogeneity of Variance**

	Levene Statistic	df1	df2	Sig.
Green Supply Chain	3.817	4	259	.055

Multicollinearity in the study was determined using the variance inflation factors (VIF) and tolerance values. The parameters of VIF value of between 1 and 10, usually shows that there are no multicollinearity issues in the data while VIF value of greater than 10 or less than 1, indicate presence of multicollinearity issues.

The study found out that green supply chain had VIF value of 1.533, more than 1 and less than 10, hence no multicollinearity issues in the study. The findings are indicated in Table 12.

**Table 12: Multicollinearity Test**

	Collinearity Statistics	
	Tolerance	VIF
Green Supply Chain	.652	1.533

### **Regression Analysis**

The study purposed to determine the relationship between green supply chain practices and performance of manufacturing firms in Kenya. To fulfil this aim, the study conducted regression analysis and interpreted the coefficient of determination to find the relationship between green supply chain and performance in manufacturing firms in Kenya. Further, the study compared the

F value with p value to determine the appropriateness of the model. The results are shown in Table 13.

Table 13: Regression Results for Green Supply Chain

<b>Model Summary</b>									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.567 <sup>a</sup>	.322	.319	.76507	.322	124.177	1	262	.000

a. Predictors: (Constant), Green Supply Chain

<b>ANOVA<sup>a</sup></b>						
Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	72.685	1	72.685	124.177	.000 <sup>b</sup>
1	Residual	153.358	262	.585		
	Total	226.044	263			

a. Dependent Variable: Organizational Performance

b. Predictors: (Constant), Green Supply Chain

<b>Coefficients<sup>a</sup></b>						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	2.509	.161		15.602	.000
1	Green Supply Chain	.469	.042	.567	11.143	.000

a. Dependent Variable: Organizational Performance

The model gives the findings on the influence of green supply chain on performance. The R<sup>2</sup> value for the relationship between supply chain and performance was 0.322 which implied that 32.2% of the variation in performance could be attributed to changes in green supply chain in the manufacturing firms of Kenya. The study further conducted ANOVA to test for the reliability of the regression model. The significant value was 0.000 which is less than 0.05 at 95% confidence level. The F value was 124.177 implying that the model was reliable in predicting the relationship between green supply chain and performance. The study used the coefficients table to test hypothesis. Therefore, the following alternative hypothesis was tested;

*H<sub>a1</sub>: Green supply chain practices have a positive significant influence on performance of manufacturing firms.*

According to the findings shown in Table 13, green supply chain had coefficients ( $\beta = .567$ ,  $t = 11.143$ ,  $p = .000$ ). The significant value obtained was less than 0.05 set by the study, similar to the t value which was more than 1.96 at 5% significant level. The results therefore imply that there was a positive significant relationship between green supply chain and organizational performance in the manufacturing firms of Kenya. Based on the findings, the study rejects the null hypothesis and therefore confirm that green supply chain practices have a positive significant influence on performance of manufacturing firms.

The findings obtained in the study agree with the findings of Mitra and Datta (2014) who studied the adoption of green supply chain management practices and their impact on performance in the Indian manufacturing firms. Results of data analysis showed that supplier collaboration for environmental sustainability had a positive impact on environmentally sustainable product design and logistics, which in turn was positively related to competitiveness and economic performance of the firm. The findings of the study also agree with those of Green Jr, Zelbst, Meacham and Bhadauria (2012) who determined that the adoption of GSCM practices by manufacturing organizations led to improved environmental performance and economic performance, which, in turn, positively impacted operational performance. Further, the findings are in line with those of Yu, Chavez, Feng and Wiengarten (2014) who determined that there was a significant and positive relationship between GSCM and operational performance in terms of flexibility, delivery, quality and cost.

Based on the ordinary least square model;  $Y = \beta_0 + \beta_1 X_1 + \epsilon$  for the ordinary least square model, the ordinary least model therefore will be;  $Y = 2.509 + 0.469 X_1 + 0.161$  which implies that a unit increase in green supply chain will lead to 46.9% increase in performance. This implies that green supply chain is an important practice that should be adopted by organizational in order to achieve improved performance.

## **Conclusion**

The study found that green supply chain had a positive influence on performance of manufacturing firms in Kenya. The study found that most of the organizations had implemented architectural designs which allowed natural lighting leading to conservation of energy hence increase in profitability. Also, majority of the organizations had waste management policies in their organizations, meaning that they were conscious of environment impact of waste on performance. The study therefore concludes that for the organizations to realize more value from green supply chain, it's prudent to implement more policies such as use of biodegradable packaging materials and energy generation which will improve performance.

## **Recommendations**

Although the findings on green supply chain were positive towards improving performance of manufacturing firms, the study identified areas that needed improvement such as energy generation from waste products, use of energy saving techniques, use of biodegradable materials for packaging and improvement on their reverse logistics. The study therefore recommended that the firms should further invest in the three R's of waste management, that is, reusing, recycling and reducing wastes. It is also recommended that organizations need to devise architectural designs that are more eco-friendly, use energy efficient machines and equipment as well as focus on improving reverse logistics by investing on returnable containers.

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