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Contributions of Green Supply Chain Management Practice on Performance of Steel Manufacturing Companies in Kenya

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Abstract
The main purpose of this study was to examine the contributions of Green supply chain management practice on performance of Steel Manufacturing Companies in Kenya which are the key contributors to the economic development of the country. The metrics for measuring the company's performance were the product quality and customer satisfaction. The descriptive research design was used in the formulation of knowledge on the contributions of Green supply chain management practice on the performance of Steel manufacturing Companies in Kenya and provided solutions to areas that needed improvement. Structured questionnaires and oral interviews research techniques was used to get primary data from the senior managers in production department, marketing department, Information Technology department and Supply chain department while scheduled interviews was used for firm's procurement managers and observation checklists was used for comparison of records. Analytical research method was used to analyze secondary data and ex-post facto research design was used to report things the way they are. Both quantitative and qualitative research techniques were used during data presentation using inferential statistics to draw conclusions from the nominal measurement scale. Purposive sampling technique was used to identify and select eligible participants for the study. The null hypothesis formulated was that there is significant relationship between green supply chain management practice and the performance of steel manufacturing Companies in Kenya. The sample size was determined using Cochran sampling frame for large population. The Spearman's Coefficient of correlation was used to measure the degree of association between the pair of rankings N objects and the null hypothesis was tested by use of F- ratio using a two way Fisher's Analysis of Variance [ANOVA] on assumption of the homogeneity of the variance of the sample that is normally distributed at 95% confidence interval. The study revealed that Green Supply Chain management practice statistically significantly predicted the performance of Steel Manufacturing Companies in Kenya, F (1, 242) = 40.516, $p < .05$, $R^2 = .143$. The analysis further revealed that there is a significant and a moderate positive correlation between Green Supply Chain Management practice and the performance of Steel Manufacturing companies in Kenya ($r = 0.379$, $p < 0.01$). The study recommends that the Steel manufacturing companies in Kenya to incorporate the Green supply chain management practice in their business operations for the enhancement of their performance.
Keywords: Green Supply chain management, Steel Manufacturing Companies in Kenya, Supply chain performance

1.0 Introduction

Green supply chain management has emerged as an important organizational philosophy to achieve corporate profit and market share by lowering the environmental risks and impacts while raising the ecological efficiency in the organizations and their partners (Van Hock & Erasmus, 2000). Zhu et al., (2005) suggested that to stay competitive in the market, the managers should improve their environmental compliance which has been setup by the authority, addressing the environmental concern of the customer and mitigate the environmental impact of their products and services. Developing environmental sound policies and strategies on supply chain helps the organization to address market needs and provide a clear understanding of other supply chain member's priorities.

The rise in greenhouse emissions and pollution of the environments by firms has precipitated the need for organizations to realign their supply chain operations with a view of conserving the scarce resources. Environmental issues have been increasingly integrated into international trade and consumers worldwide are increasingly demanding environmentally friendly products (Anbumozhi & Kanda, 2005). Manufacturing companies are differentiating themselves by developing green supply chain networks within their organizations and also with their customers and suppliers. Allen (2010) asserts that greening the supply chain ultimately leads to competitiveness and economic performance. The manufacturing companies have shifted their environmental management approaches from just the end-of-pipe control and treatment of waste to the one that embraces avoidance of environmental harm through entire product life cycle (Handfield *et al.,* 2005). 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).

Dheeraj and Vishal, (2012) discussed green procurement, green manufacturing and materials management, green distribution and marketing and reverse logistics as major components of GSCM practice. The Manufacturing companies have incorporated these green supply chain initiatives to help in eliminating waste along entire value streams. Green procurement is an environmentally-conscious purchasing initiative that tries to ensure that the purchased products or materials meets environmental objectives set by the purchasing firm that involves the reduction, reuse and recycling of materials in the process of purchasing (Salam, 2008). Procurement and supply chain managers are now considering the issues of sustainability in their purchasing of inputs in addition to the traditional purchasing criteria of cost, quality and delivery (Lambert & Cooper, 2000). For them to ensure green manufacturing, companies are now using inputs with relatively low environmental impact that are highly efficient and the one that generate little or no waste in their production processes.

Green manufacturing is associated with clean production method, efficient technology, reduced raw materials costs, reduced environmental and improved corporate image by ensuring low pollution during manufacturing processes (Al-Odeh & Smallwood, 2012). It is designed to minimize the environmental impact in the manufacturing processes of products (Tan, et al., 2002). Firms can effectively practice green manufacturing practices through the use of solar energy, recycling of raw materials and utilize biodegradable energy sources in their manufacturing operations (Amemba et al., 2013). While reverse logistics focuses mainly on the role of logistics in product returns, source reduction, recycling, materials substitution, reuse of materials, waste disposal, repair and remanufacturing (Nimawat & Namdev, 2012).

Manufactured products must reach the customers in time and they should be informed about the availability of the product and the capacity of the organization to deliver the right products that meet the environmental concerns of the customer. Green distribution is achievable through green packaging, green transportation and logistics (Nimawat & Namdev, 2012). Ninlawan et al., (2010) assert that Green packaging should involve downsized packaging and use of green packaging materials. The design and construction of storage facilities must meet the requirements of non-polluted environment while strengthening maintenance of good humidity, corrosion, waterproofing among other factors (Zhang & Zheng, 2010). The sustainability of greening process can be achieved when the manufacturing companies share information with their suppliers on the best practice of ensuring environmental compliance during the manufacturing processes through identification and elimination of environmental risks (Barasa, 2014).

Manufacturing companies in developing countries in which Kenya is also included are now increasingly Supply chain management practices in their business operations to ensure that they also compete favorably in the dynamic global market. Kenyan steel manufacturing companies have been exposed to global competition with the liberalization of the East African regional markets that were key importers of the Kenyan Steel products. The steel manufacturing companies from developed counties like China, Korea, Japan, USA and Russia have ensured that they compete in terms of cost, quality, technology, customer satisfaction and other competitive strategies as they pursue to achieve competitive advantage over the Kenyan Steel products. They are also able to adjust to complex consumer demands and global regulatory systems that require the organizations to operate in sustainable manner. Apart from stiff competition from these companies, Kenyan Steel manufacturing Companies faces the challenges of high cost of raw materials, poor transport network, high taxation, price volatility and high cost of energy that hinder them to compete favorably (KAM, 2012). With considerable empirical research on supply chain management as well as models aimed at solving problems experienced by business firms, managers in most organizations are trying to implement the important supply chain management concepts to ensure that they achieve the combined benefits of improved cost, flexibility, dependability and quality (Hayes *et al*., 2005). Although a number of studies have been done on the concept and context of Green Supply chain, there is limited information within the context of Steel Manufacturing industry in Kenya. These studies didn't explore the contributions of green supply chain management practice on performance of steel manufacturing companies in Kenya and this research aimed to fill this gap.

2.0 Literature review

2.1 Supply Chain Management Theory

Supply chain has its roots in Porter's (1985) value chain, which is the set of processes a firm uses to create value for its customers. Although originally described as a chain, supply chain can nowadays be defined as the network of organizations that are involved through upstream and downstream linkages in the different processes and activities that produce value in the form of products and services in the hands of the ultimate customer (Christopher, 2005). The chain involves two or more legally separated organizations that are linked together by material, information or financial flows and includes the ultimate customer. The objectives of the supply chain are to provide service to customers, achieve low operating costs and minimize the assets in the chain (Skjøtt - Larsen *et al.,* 2007). Many companies are now looking at securing cost, quality, technology and other

competitive advantages as strategies to pursue in a globally competitive environment and to achieve this many manufacturers are focusing on their supply chain management practices.

Supply chain management is an important multi-disciplinary topic in modern business management and research. It enhances organizational productivity and profitability through a revolutionary philosophy to managing the business with sustained competitiveness (Gunasekaran et al., 2004). Supply chain management emphasizes the overall and long-time benefit of all parties in the supply chain through co-operation and information sharing (Yu *et al*., 2001). Simchi-Levi et al. (2009), define SCM as a set of approaches used to efficiently integrate suppliers, manufacturers, warehouses and stores so that products are produced and distributed at the right quantities, to the right locations, and at the right time in order to minimize system-wide costs while satisfying service-level requirements.

Supply chain management aims at linking each element of the manufacturing and supply processes from raw materials acquisition, processing of goods and up to the final end users of the product. It focuses on how firms utilize their suppliers' processes, technology and capability to enhance competitive advantage. Supply Chain Management has the objective of governing all parts of the supply chain as a unit, instead of single organizational elements, in order to achieve increased competitiveness (Stadtler & Kilger, 2008). Since satisfying customer needs is the central purpose of any business (Doyle & Stern, 2006), this framework reflects the notion that customer focus in terms of satisfying needs and providing timely service is a key driving force of effective supply chain management. It seeks improve performance through better use of internal and external capabilities in order to create a seamlessly coordinated supply chain, thus elevating inter-company competition to inter-supply chain competition (Lummus *et al.,* 2003).

2.2 The Lean Supply Chain Theory

Lean supply chain management is a set of organizations directly linked by upstream and downstream flows of products, services, finances and information that collaboratively work to reduce cost and waste by efficiently and effectively pulling what is required in meeting the needs of the individual customer. Lean thinking in the supply chain is the use of lean principles to align activities across corporate functions within the firm and to manage business relationships with customers and suppliers (Lambert 2008). The core concept of lean thinking is the Japanese term *muda* exemplified by the practices of Japanese motor manufacturing (Lysons & Farrington, 2012). Muda means waste or any human activity that consumes resources but creates no value. In the lean paradigm, activities that consume resources but generate no redeeming value in the eyes of the consumer are waste that must be eliminated (Womack & Jones, 2003). Manrodt and Vitasek (2008), defined lean as a systematic approach to enhancing value to the customer by identifying and eliminating waste through continuous improvement by flowing the product at the pull of the customer in pursuit of perfection It calls for organizations to analyze business processes systematically to establish the value adding processes and identify the incidence of this waste (Harrison & Van Hoek, 2011). Lean Supply chain seeks to reduce wastes found any-where in the supply network, standardizes processes across traditional, vertical organizations, and optimizes core resources. The non-value adding activities in manufacturing companies includes overproduction, waiting wastes, inappropriate processing, unnecessary inventory, unnecessary motion by operators and waste due to defects.

Lean Supply chain emphasizes on utilization of less time, less space, less inventory and even less money to produce products. It basically focuses on the elimination of seven types of wastes that are overproduction, waiting, transportation, inventory, defective units and over-processing. Lean production is an integrated activity in SCM designed to achieve high-volume, flexible production using minimal inventories of raw materials. It is derived from the need to increase product flow velocity through the elimination of all non-value adding activities (Arnheiter and Maleyeff, 2005). Lean production is based on the premise that nothing will be produced until it is needed. It is implemented throughout the supply chain with the signal moving backward from the customer all the way back to the most basic raw materials (Davis and Heineke, 2005). The main objectives of implementing the lean supply chain in an organization is improve flexibility, reduced cost, high inventory turns, shorter lead time and defect prevention. Lean supply chains seek to create customer-winning value at the lowest cost through the real-time synchronization of product/service needs with the optimum supplier. Borac *et al.* (2010), lean has become a strategic method for gaining competitive advantage and even for survival not just for manufacturers but also for retailers and wholesalers.

The most popular example of lean manufacturing is the Toyota Production System that attributes supply chain success to ability to achieve economies of scale in manufacturing and procurement based on small batch size production units (Holweg, 2005). Lean supply chains consider cash-to-cash cycle times as a critical measure of performance. The longer it takes to convert inventories into cash the more working capital is required and any reduction in this measure will mean the release of working capital and hence a reduction in cost (Christopher & Gattorna, 2005).

2.3 Supply Chain Integration Theory

Integration is a process of interaction and collaboration in which companies in a supply chain work together in a cooperative manner to achieve mutually acceptable outcomes (Pagell, 2004). Kim and Narasimhan (2002) asserts that supply chain integration links an organization with its customers, suppliers and other channel members by integrating their relationships, activities functions, processes and locations. According to Lambert (2004), successful supply chain management requires cross-functional integration of key business processes within the company and across the network of companies that consist of the supply chain. Organizations must integrate their operations with trading partners in order to sustain competitive advantage for the whole supply chain (Lambert & Cooper, 2000). Power (2005) asserts that integration involves the cooperation, collaboration, information sharing, trust, partnerships, shared technology and a fundamental shift away from managing individual functional processes to managing integrated chains of processes. Kwon and Suh (2004) consider supply chain integration to be a strategic tool that aims to reduce costs and thus increase customer and shareholder value. Supply chain integration is a good approach for improving business performance in a highly competitive market (Narasimhan, Jayaram, & Carter, 2001). Frohlich and Westbrook (2001) assert that the highest levels of integration with both suppliers and customers have the highest correlation with high levels of an organization's performance.

The major challenge in supply chain integration is to coordinate activities across the supply chain so that the enterprise can improve performance by reducing costs, increasing service levels, reducing the bullwhip effect, better utilization of resources and effectively responding to changes in the market place (Simchi-Levi *et al.,* 2009). Chopra and Meindl (2015) argues that supply chain coordination occurs when all the different stages of supply chain work toward the objective of maximizing total supply chain profitability rather than each stage devoting itself to its own profitability.

3.0 Research Methodology

3.1 Research Design

Descriptive survey design was adopted in conducting this study. Creswell (2013) asserts that a descriptive research design is used when data are collected to describe persons, organizations, settings or phenomena. The design also has enough provision for protection of bias and maximized reliability (Kothari, 2012). It was appropriate for this study because it allowed the collection of information for independent and dependent variables using interview and questionnaires (Orodho, 2009). The descriptive approach was appropriate for this study not only in validating finding but also in the formulation of knowledge and providing solutions to the problems. The researcher used this approach since it involves data collection, measurement, classification, analysis, comparison and interpretation to provide report summary such as measures of central tendency and correlation between variables.

The research design also enabled the study to combine both quantitative and qualitative research approaches in assessing the contributions of Green supply chain management practice on performance of Steel Manufacturing Companies in Kenya. The mixed research design that consist both qualitative and quantitative approaches allows researcher to collect information from the people on their habits, opinions, attitudes and any other educational or social issues (Namusonge, 2010). Quantitative approach strives for precision by focusing on items that can be counted into predetermined categories and subjected to statistical analysis (Simiyu, 2012). Mugenda and Mugenda, (2008) asserts that qualitative methods can be used to gain more in depth information that may be difficult to convey quantitatively. The qualitative data were obtained by interviewing the procurement managers while quantitative data were obtained by administering the questionnaire to members of procurement department, Information Technology department, marketing department and production department.

3.2 Target Population

Population is defined as the entire group of people or things of interest that the researcher wishes to investigate (Sekaran & Bougie, 2010).The population of this study was all registered steel manufacturing companies in the republic of Kenya. Kenya has 258 registered steel products manufacturers (Africainvestor, 2011).The target population of this study were all employees working in the 32 Steel manufacturing companies in Kenya

3.3 Sample and Sampling Technique

The purposive sampling technique was used to identify and select eligible Steel manufacturing companies and the departments to be included in the study. Purposive sampling allows the researcher to use cases that have the required information with respect to the objectives of his or her study (Mugenda & Mugenda, 2008). Out of 258 registered steel manufacturing companies in Kenya, the researcher purposively sampled 32 companies for the study based on the theoretical assumption that the distribution is assumed to be normally distributed with a sample size of a above 30 objects The sample size was determined using Cochran (1977) sampling frame for large population number. Sample Size = $z^2pq/e^2 = (1.96)^2(0.5)(0.5)/(0.05)^2 = 384$ where z= 1.96, p = 0.5, q = 0.5

and e = 0.05. The sample size to participate in this research was to be 384 respondents and each company was to contribute 12 respondents in the study as shown in the table 3.1. The sample size selected depends on what researcher wants to know, the purpose of the study, what is at stake, and what can be done with available time and resources (Paton, 2002). Simple random sampling was used to select participants from each department in the company. The sample size of 384 is more than the generally recommended sample size of 100 cases for statistical data analysis (Alreck *et al.,* 2004).

3.4 Data Collection Methods

This study used the questionnaires and interview guides in collecting the primary data while secondary data were obtained from journals, textbooks, Internet and Kenya association of Manufacturer magazines. Face to face in-depth interview was conducted to collect information from the Procurement Managers that helped to get a complete and detailed understanding of the contributions of green supply chain management practice on the performance of Steel manufacturing companies in Kenya. Mugenda & Mugenda (2008) asserts that questionnaire is designed to address specific objective, research question or test hypothesis. This study used questionnaire because of its ability to collect large amount of information in a reasonably quick space of time and also is made the analysis is data simpler based on the research objective of the study. In addition, all questions were standardized and anonymity of the respondent was quarantined for the purpose of increasing the response rate. This mix of sources allowed for additional cross-checking of the findings for the purpose of evaluating the internal consistency and to increase reliability.

3.5 Validity and Reliability

Validity is the criteria for how effective the design is in employing methods of measurement that captures the data for the purpose of addressing the research questions. To ensure the results of the study reflect similar outcomes elsewhere and be generalized to other populations or situations, the researcher used triangulation to enhance the external validity of the research instrument. This research used interviews and questionnaire as primary data and research journals, textbooks and other public documents as secondary data. By combining data sources and methods triangulation opens the way for more credible interpretations (Decrop, 2004). Content and criterion related validity was achieved by consultations with supervisors and experts in instrument development. Views and comments from these stakeholders were used to upgrade the instrument. The use of supervisors and experts opinion enhanced content and criterion related validity.

The reliability of an instrument refers to its ability to produce consistent and stable measurements. The goal of reliability is to minimize the errors and biases in a study (Yin, 2003). To ensure the reliability of the instrument Cronbach's Alpha was used to test the reliability of the proposed constructs. Known for its stability and flexibility, Cronbach's alpha is a function of internal consistency or interrelatedness of items (Tavakol & Dennick, 2011). The alpha can take any value from zero (no internal consistency) to one (complete internal consistency).

3.6 Data Processing and Analysis

The researcher examined all the questionnaires for completeness and consistency and then categorized all the items before coding. The collected data was analyzed using SPSS version 20 (Statistical Package for Social Science) as the researcher obtained data using a standard questionnaire. Quantitative technique was used to code qualitative data. Trochim (2004) asserts that qualitative data can be coded quantitatively without detracting from the qualitative information. Descriptive statistics was used to examine the characteristics of the population. It enabled the researcher to meaningfully describe a distribution of scores using statistics that is depends on the type of variables in the study and the scale of measurement. Mugenda and Mugenda (2008) assert that descriptive statistics enable the researcher to describe distribution of scores. Variable aggregation for different variables was undertaken in facilitation of further statistical analysis. The researcher applied "Collapsing Response" method in analyzing responses from a Likert scale measurement. This is done by adding the 'strongly agree' responses with the 'agree' responses and also adding the 'disagree' responses with 'strongly disagree' (Gwavuya, 2011).

The correlation analysis was carried out between the variables of the study using Pearson correlation coefficient. This was to test whether there existed interdependency between Information sharing practice and performance of steel manufacturing companies in Kenya while regression analysis is used to shows the percentage of the total variation of the dependent variable that can be explained by the independent variables and was assessed using the coefficient of determination (R^2) which is used for judging the explanatory power of the linear regression of dependent variable on independent variables. R^2 is a measure of the goodness of fit of the regression line to the observed sample values of dependent and independent variables. The R^2 can range from 0.0 to 1.0, with 1.0 showing a perfect fit that indicates that each point is on the line (Carver *et al.,* 2009).In this study the regression model was as follows;

$Y = \beta 0 + \beta_1 x_1 + \varepsilon$ (Ott & Longnecker, 2010)
Where;
Y = Represents the dependent variable; Performance of Steel Manufacturing Company
B_0 = Constant of the Model
β_1, is the regression coefficient
ε = Random Error of the Model
X_1 = Green Supply Chain practice

4.0 Research Findings

Table 4.1 shows the linear regression model summary on the contributions of Green Supply chain Management practice on the performance of steel manufacturing companies in Kenya for R and R^2 values as 0.379 and 0.143 respectively. The R value of 0.448 represents the moderate positive linear relationship between Green supply chain management practice and the performance of Steel manufacturing companies in Kenya. The R^2 indicates that explanatory power of the independent variable Green supply chain management practice is 0.143. This means that about 14.3% of the variation in performance of Steel manufacturing Companies in Kenya is explained by the model hence about 85.7% of the variation in the dependent variable is unexplained. It implies that the dependent variable is influenced by other independent variables.

Table 4.1: Model Summary for GSCM practice

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.379[a]	.143	.140	.80746

a. Predictors: (Constant), GSCM Practice

The ANOVA test revealed that the variable Green Supply Chain management practice statistically significantly predicted the performance of Steel Manufacturing Companies in Kenya, F (1, 242) = 40.516, $p < .05$, $R^2 = .143$ as shown in table 4.2.

Table 4.2: ANOVA[a] (F-Test) Analysis for GSCM practice

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	26.416	1	26.416	40.516	.000[b]
	Residual	157.781	242	.652		
	Total	184.197	243			

a. Dependent Variable: Performance of Steel Manufacturing Companies in Kenya
b. Predictors: (Constant), GSCM Practice

From the analysis in table 4.3, the linear regression model for Green supply chain management practice, $Y = \beta 0 + \beta_1 x_1 + \alpha$ Where; Y = Performance of Steel Manufacturing Company in Kenya; $\beta 0$, β_1, α = Coefficient of Performance of Steel manufacturing company and X_1 = Green Supply chain Management practice is $Y = 2.288 + 0.359X_1 + \alpha$.

Table 4.3: Coefficients[a] for GSCM practice

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.288	.206		11.111	.000
	GSCM Practice X_1	.359	.056	.379	6.365	.000

a. Dependent Variable: Performance of Steel Manufacturing Companies in Kenya

The findings in this research are in agreement with previous research by Jamal (2009) whose findings showed that green supply chain management practices have positive contribution to organization performance. He argued that incorporating GSCM practices in the organizations help improve the performance. Findings are also similar to an empirical research conducted by Amemba *et al.* (2013) which established that the adoption of green manufacturing leads to enhanced production efficiency and reduced wastage leading to better performance of the organization.

5.0 Conclusion

The results indicate that there is significant relationship between green supply chain management practice and the performance of Steel manufacturing companies in Kenya. This is supported by regression analysis results with F (1, 242) = 40.516, $p < .05$, $R^2 = .143$. Correlation analysis results also indicates that there is a significant and a moderate positive correlation between Green Supply Chain Management (GSCM) practice and the performance of Steel Manufacturing companies in Kenya ($r = 0.379$, $p < 0.01$) and from the descriptive analysis, majority of the respondents, 72.5% agreed that Green supply chain management Practice contributes to performance of Steel Manufacturing Companies in Kenya.

Steel manufacturing companies in Kenya should adopt Green supply chain management practice by ensuring the use of inputs with relatively low environmental impacts in the production processes so that the

company not only realize cost savings but also achieves highly efficient outputs with little or no wastage or pollution. The Steel Manufacturing companies should optimize their packaging processes and this will help them to minimize waste in terms of space and easy transportation. They should develop a policy on green supply Chain Management Practices to guide their suppliers and the Company on Green Supply Chain Management. The policy should clearly state when and how the environmental audit should be conducted and ensures that company's environmental standards are incorporated in their selection and evaluation criteria of their suppliers. There should be a clear system for environmental monitoring to ensure the chain members comply with specific environmental standard or codes and they should only procure materials from environmentally certified suppliers through ISO 14000 and 14004.

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