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ROLE OF GREEN SUPPLY CHAIN PRACTICES ON THE PERFORMANCE OF GOVERNMENT MINISTRIES IN KENYA: A CASE OF MINISTRY OF INDUSTRIALIZATION AND ENTERPRISE DEVELOPMENT

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Abstract: The study aimed at establishing the role of green supply chain practices on performance of the ministry of industrialization and enterprise development in Kenya. The specific green supply chain practices were material sourcing, green packaging, waste management systems and eco-design manufacturing. The study relied on primary data collected by administering 135 questionnaires where 108 were filled and returned. Pearson correlation was applied in the study to establish the relationship between the study variables. The findings indicated that material sourcing and performance of ministry of industrialization and enterprise development have a positive significant association (r=.313, p=0.001) ; green packaging and performance of ministry of industrialization and enterprise development was positive and significant (r=.329, p=0.000); waste management system and performance of ministry of industrialization and enterprise development was positive and significant (r=.345, p=0.000) ; Eco-design manufacturing and performance of ministry of industrialization and enterprise development was also established to be positive and significant (r=.295, p=0.000).

Key Words: *Material Sourcing, Green Packaging, Waste Management Systems, Eco-Design, Performance*

Introduction

Environmental concern in the industrial have been one of the concerns that with most people and the need to address the problem with SCM (Sheu *et al.,* 2005). Global warming around the world have contributed to changes in buying behaviour amongst people. Increase in sensitivity amongst consumers in regard to products they consume and the resultant environmental effects have forced companies to adopt the concept of GSCM by producing green products. A supply chain is made up of parties engaged in fulfilling the request of customers either directly or indirectly. The chain includes the suppliers, manufacturers, retailers, transporters, customers and warehouses. According to Chopra *et al.,* (2004), the supply chain comprises of the functions involved in customers request fulfillment which includes customer service, marketing, new product development, distribution, operations and finance.

Srivastava (2007) described GSCM as integrating environment thinking into SCM, including selection and material sourcing, design of a product and the process of manufacturing, final product delivery to consumers and management of product's end-of life after elapsing of useful life. Ninlawan *et al.* (2010) categorizes GSCM into four components: i) Green procurement which involves the purchase of products that are environmentally friendly, ii) Green distribution which involves environmental thinking in green design, green packaging and eco-labeling, iii) Green manufacturing; involves use of raw materials with low impacts on environment and iv) Reverse Logistics which entails the planning process in process inventory, and implementation of effective raw materials flows, finished goods and related information from the consumer to the point of origin for the purpose of creating value.

A green supply chain involves the usage of inputs that are friendly to the environment and processing them into final products that can be recycled and improved. Green SCM entails a decision-making process with several processes (Zeng *et al.,* 2010). The processes are; i) Environmental costs identification within the process, ii) Opportunities determination that yields cost savings and reduces impacts on environment, iii)Benefits calculations pertaining to the proposed alternatives and iv) Implementation and monitoring of the improvement solutions (Patrick *et al.,* 2007). GSCM is a method of redesigning supply chain whose aim is to remanufacture and recycle the process of production which entails minimization of total impacts on environment of a firm in the entire production process and also in the entire product's life cycle (Purba *et al.,* 2005). According to Hsu and Hu (2008), GSCM is defined as method that improves performance of products and processes in respect to requirements on environmental regulations.

Emphasis on corporate activities that are environment-friendly in today's business world has been increasing and many companies are uplifting the green SCM. The increase in pollution and greenhouse emissions to the environments by manufacturing firms have necessitated organizations to align their operations on supply chain aiming at conserving scarce resources. GSCM is seen as an approach that aims improving products and processes performance in respect to environmental regulations requirements (Hsu & Hu, 2008). The rise in demands by customers to be supplied with services and goods that does not damage the environment triggers managers to make manufacturing related decisions that support coordination and integration of processes friendly to the environment in the supply chain (Vachon & Klassen, 2007). Consequently, an abrupt rise on legislation, concerns and environmental movements in the past ten years, togetherness in formulating issues on pollution on environment together with developments industries need to be jointly addressed with SCM which will contribute to the initiatives of GSCM (Sheu *et al.,* 2005).

According to Lin and Wang (2011) GSCM is improvement in impact of environment achieved by managing components, raw materials and processes as they flow from suppliers in form of raw materials heading to manufacturers for processing and lastly to customers as final products. GSCM has increased mindset on environmental conscious to SCM and has now been introduced to many manufacturing processes that are final (Aref *et al.,* 2005). GSCM practices has erupted as a crucial new innovation that focus on helping organizations in designing win-win strategies that enhances objectives achievement in profits and market share and by lowering anticipated risks and impacts on the environment while at the same time raising their efficiencies ecologically (Van & Hock, 2000). GSCM has a number of benefits to organizations that range from reducing costs, to supplier integration in participating in the processes of decision making that aim at promoting environmental innovations (Bowen *et al.,* 2001; Hall, 2003; Rao, 2002). However, the practice of GSMP is bounded by challenges as Ryder Centre of SCM (2008) notes which includes inadequacy of technology required to support companies and their steps of going green and processes in business required to capture data needed in the supply chain hence making use of the existing technology, the trade-off between green requirement and practices that are lean and failure in integrating supply chain optimal efforts with GSC efforts (Wilkerson, 2010).

Statement of the Problem

Over the past two decades, the monetary GDP contribution by the industrial sector has been oscillating between 15-16% where out of the percentage, 105 is accounted for by manufacturing sector. The contribution of manufacturing sector to GDP averaged at 5.5% annually between 2003 and 2007. However in 2008, the sector contributed only 3.8 per cent in the past 5years attributed to global economy slowdown, post elections violence and other challenges on the economic such as depreciation of the Kenya shilling, low productivity levels high inflationary pressures, high costs of production and unfair competition from cheap imports and counterfeits products. Government ministries experience major challenges in the execution of efficient procurement. In Kenya, procurement consumes 45% of the national budget. Importantly, public procurement accounts for a huge proportion of total expenditures by government in Kenya (Public Procurement Oversight Authority, 2016). Kshs. 534 billion is spent by the government on procurement per year (PPOA, 2016). However, a loss of 17% is encountered annually by the government which translates to close KSh. 121 billion which is attributed to inflated quotations in procurement (PPOA, 2016). According PPOA (2016), most of the tendered products/services in many government ministries have a mark-up of 60 per cent on the market prices. The inefficiency and ineptness of overall procurement efficiency in many government ministries contributes to loss of over Ksh.50 million annually.

Sari and Yanginlar (2015) sought to investigate the relationship between practices in green logistics and performance of firms in Turkish healthcare organizations and concluded that practices in green logistics positively supports firm performance measured as operational, economic, and environmental performances. The study focused on health care organizations thus presenting a conceptual gap. The study also was based on Turkey and thus presenting a contextual gap. The current study focused on ministry of industrialization and enterprise development.

Baskaran, Nachiappan and Rahman (2012) conducted study on sustainability of supplier evaluation in Indian textile sector using the grey approach and concluded that evaluation of suppliers is a managerial process of making decisions and addresses how suppliers can strategically be selected to enhance the sector's competitive advantage. The study focused on Indian textile suppliers' sustainability thus presenting a conceptual gap. The current study focuses in green supply chain practices. Therefore, the current study sought to fill the knowledge gaps by establishing the role of green SCP on the performance of the MIED.

Objectives of the Study

1. To determine the influence of material sourcing on performance of the ministry of industrialization and enterprise development in Kenya.
2. To examine the influence of green packaging on performance of the ministry of industrialization and enterprise development in Kenya.
3. To determine the influence of waste management systems on performance of the ministry of industrialization and enterprise development in Kenya.
4. To assess the influence of eco-design manufacturing on performance of the ministry of industrialization and enterprise development in Kenya.

Literature Review

Theoretical Review

The theories underpinning the study are Theory of Planned Behavior, Theory of Constraints, Resource Based Theory and Transactional Cost Theory. The Theory of Planned Behavior (TPB) was postulated by Ajzen and Fishbein (1980) and assumes that behavioural intention determines behaviour. Behavioural intention is influenced by an individual's attitude in performing a behaviour, and the people important to the person approving or disapproving the behaviour. This theory offers a clearly defined model /structure that enable the investigation of the influence that personal, attitudes and cultural volitional and determinants control have on the intentions of consumers to buy products that are environmental friendly.

The Theory of Constraints (TOC) was proposed by Goldratt (1984) and it aims at implementing and initiating breakthrough by focusing on inhibitors that prevent a system from realizing high levels of performance. The theory states that every firm have a performance constraint (Simatupang et al., 2004). According to Santos et al (2010), integrating supply chain partners and their homogeneous actions contributes to improvement resulting from a combination of supply and demand. With high requirements in the market, logistics processes become more complicated. Primo and Flores (2008) affirmed that, requirement in the market complicates logistics directed at realizing a competitive advantage.

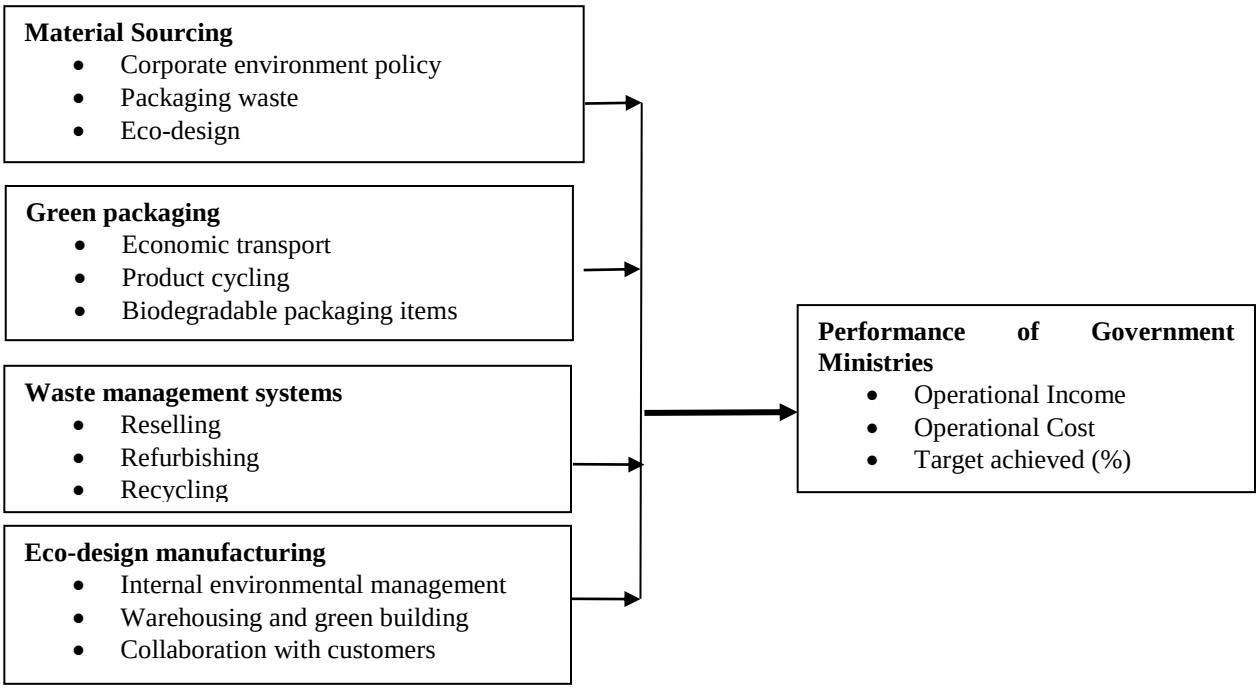
According to Simatupang et al., (2004), many business related entities aims at making currently and also in the future. Necessary conditions to be met for a continuous operation of the system might have been developed by other stakeholders. The application of TOC acted as a motivator to managers in identifying the inhibitors that hindered goal achievement which entails identifying necessary conditions and solutions to curb the hindrances (Cyplik, *et al.,* 2009). In the current study, the TOC is useful in explaining relationship between adoption of green procurement and performance of the ministries in Kenya. The ministry can identify challenges that undermine its

ability of implementing GSCP. The theory anchors objective 2 which aim at examining the influence of green packaging on performance of MIED in Kenya.

The Resource Based View (RBV) theory was proposed by Penrose (1959) and argues that the competition in firms is determined by their resources endowment and capabilities. The RBV states that firms' competition of firms is based on capabilities and resources. The theory is used in the current study in evaluating the availability of green distribution resources to government ministries and to establish the possibility of a correlation between the resources and performance of a firm. The theory contributes to the study as it advocates for prudent use of scarce resources. For the development of waste management systems and eco-design manufacturing, the ministry of industrialization and enterprise development requires sufficient resources.

Transactional Cost Theory was proposed by Doglal North in 1990. In this research Cost of Transaction Economics provided a useful prototype. Antonio (2004) opined that public procurement is a function regulated by rules and inhibited by law dictated timelines. The participants in making decisions have limited information. Reforms in the public procurement translate to change to electronic based procurement systems from manual procurement processes These changes focus majorly on legal and organization structures aiming at transforming the manual system to a modernized, faster and cost-effective structures for carrying daily procurement business.

Conceptual Framework



Independent Variables **Dependent Variable**

Figure 1: Conceptual Framework

Empirical Review

A study by Hervani *(*2005) sought to explore GSCM activities comprising of purchasing, green design, production, manufacturing/processing, recycling, material source and marketing. GSCM is the act of combining SCM and environmental thinking by selecting and sourcing material, manufacturing, designing a product, delivering the final product to consumers and managing the life cycle of a product. Choi and Hwang (2015) conducted a study to assess the impacts of green SCMP on firm's performance and focused collaborative capability roles. The study used hierarchical regression in analyzing data acquired from 230 manufacturers from South Korean manufacturers. The results revealed that implementation of GSCM practices had a positive impact on a firm's performance in respect to finances and environment. The results further indicated that firms expect improvements of performance in finances after seeking synergistic effects which entails involving their GSCM partners in the implementation process.

A study by Hoejmose *et al*. (2013) focused on finding out the adoption of green practices in the hotel industry. The findings indicated that the scrutiny of stakeholders pressurizes restaurants to use green practices aiming at achieving green capability. Additionally, a firm that adopts the green practices attracts new customers, satisfies it already existing and improves its image which places the firm at a better market position. Similarly, implementation of these steps by firms aims at achieving savings on consumption economy. In China, Zeng *et al* (2010) focused on establishing the importance of green practices in a business. The study findings showed that green practices requires less financial investments but ends up providing economic benefits. For instance, efficiencies in energy consumption, water usage and waste recycling methods culminate to subsequent reduction in cost of operations. Similarly, a study by Tseng and Chiu (2010) to establish the influence of green supply chain practices on performance showed that the process of implementing strategies on environmental management by enterprises is done to enhance green image rather than to avoid regulations and penalties. The current study lays its focus on incorporations of sustainability concepts towards performance of environment from the level of organization to the levels of supply chain.

Schatteman (2010) conducted a study to establish how green supply chain practices affect performance of an organization. The study findings indicated that products return is attributed to manufacture recall, retail overstock, unsatisfactory quality, warranty claims, usage or installation problems, faulty processing order, end of life cycle of a product and product replacement. A survey conducted by PWC (2008) pointed out that the products that are returned normally goes through processes of recovery which involves product sorting, materials/product acquisition, products recovery, testing, materials/product collection and depending on the nature of the final state of a product , redistribution of product follows or sales or disposal. Amemba *et al.* (2013) conducted a study to establish the effect of reverse logistics on performance of an organization. The findings showed that networks in reverse logistics relates directly with coordination of requirements, speculation, disposition of returns, supply uncertainty and postponement. Activities in reverse logistics entail collection of products that have been recovered and redistribution already processed goods. Amemba *et al.* (2013) revealed activities in reverse logistics should be environmental responsive.

Bhadauria (2012) on her study revealed that GSCM practices adoption of by organizations involved in manufacturing contributes to performance improvements on both the environment and economy which positively impacts the general performance of operations. Organizational performance is enhanced by improved performances of operations. Federica *et el* (2012) on their study revealed that identification of constructs depends on inter and intra organizational environmental practices, institutional drivers and performance measures, causal

relationships existing between and within the constructs. A study by Perotti, (2012) concluded that adaptation levels of GSCP is constrained on economic, operational and environment investigated together with their associated performance benefits to the company. Some players have started to show proactive attitudes on adoption of GSCP and have benefited substantially in economic and environmental performance. On the contrary, Ghobadain and Holt (2009) in their study revealed that average manufactures perceived greater pressures of improving performance of their environment through internal drivers and legislations.

Baskaran, Nachiappan and Rahman (2012) conducted a study on Indian textile sector and focused on sustainability of suppliers' evaluation. The study used the grey approach and targeted sixty-three suppliers drawn from clothing and textile industries comprising of ancillary suppliers and garment manufacturers in India. The study found out that firms initially focused on conventional evaluation criteria in areas of quality, price and delivery time but in recent times firms in the textile sector are moving towards integrating environmental factors in making decisions on supplier selection. The study concluded evaluation of suppliers is a managerial process of making decisions and seeks to address supplier selection modes to enhance organizations' competitive advantage.

Research Methodology

The study employed descriptive research design. The unit of observation were the Procurement Manager, the Quality Assurance Manager, Logistics Manager, procurement officers and junior staff in ministry of industrialization and enterprise development. According to MIED (2017), there were 201 staff in the ministry. The sample size of 135 for this study was acquired by the used of Yamane (1967) formula.

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

Where: n = sample size, N = population size, e = the level of precision and 1 = Constant

The information and data gathered by use of questionnaires were first sorted and verified on completeness. Data from questionnaires that were correctly filled was coded then tabulated and finally analyzed by use of SPSS V22. Descriptive statistics (standard deviations and means) were used to describe characteristics of variables whereas inferential statistics (regression analysis and Pearson correlation) were also used to analyze relationships between study variables. The study used the following regression model:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \epsilon$$

Where ; Y= Performance of Ministries, X_1 = Material sourcing, X_2 =Green packaging, X_3 = Waste management systems, X_4 = Eco-design manufacturing, ϵ = error term, β_0 which is the constant term and t $\beta_i = {}_1 \ldots {}_4$ were regression coefficients.

Research Findings

The study administered 135 questionnaires to respondents and 108 of them were dully filled and returned accounting for 80% success. The response rate achieved was satisfactory in making study conclusions. Bailey (2000) asserts that a response rate of 50% is considered adequate for analyzing and publishing while a response rate greater than 70% is considered very good.

Descriptive Analysis

The study's first objective was to determine the influence of material sourcing on performance of the ministry of industrialization and enterprise development in Kenya. Respondents were asked to indicate their level of

agreement with statements on material sourcing on performance of the ministry using a scale of 1 to 5 where Strongly Agree=5; Agree=4; Neutral=3; Disagree=2 and Strongly Disagree =1. For interpretation purposes of 4 and 5 were jointly regarded as agree, 1 and 2 were jointly regarded as disagree while 3 remained neutral. The results of the findings are presented in Table 1. Majority of respondents disagreed with the statement that the company restraints itself from procuring products with harmful substances (Mean = 2.4). Respondents also disagreed that the company avoids procurement products/goods with environmental risks which that would expose the company to losses or damages (Mean = 2.2). On average it was established that respondents agreed that the company chose suppliers with technical capability on environmental practices in order to have quality products (Mean = 3.90). The study also sought to find out whether the company considers aspects such as cost, service, supplier's profile, quality, and risk in selection and evaluation of suppliers in procurement process. Results further showed that on average, the respondents did not agree to the statement (Mean = 2.00). Finally, on the statement that the selection of suppliers on green procurement practices influenced firm competitiveness, a majority ((Mean = 4.40) agreed to the statement. The findings are consistent with Srivatava (2007) and Hevani *et al. (*2005) and who argued organizations are now embracing material sourcing practices to reduce wastage and improve performance.

Table 1 : Material Sourcing

Material sourcing	Mean	SD
The company restraints itself from procuring products with harmful substances	2.4	1.2
The company avoids procurement products/goods with environmental risks which that would expose the company to losses or damages	2.2	1.1
The company chose suppliers with technical capability on environmental practices in order to have quality products	3.9	1.0
The company considers aspects such as cost, service, supplier's profile, quality, and risk during selection and evaluation of suppliers in procurement process.	2.0	0.8
The selection of suppliers on green procurement practices influenced firm competitiveness to a great extent	4.4	0.6
Average	**2.98**	**0.94**

Green Packaging

The study's second objective was to examine the influence of green packaging on performance of the ministry of industrialization and enterprise development in Kenya. Respondents were asked to indicate their level of agreement with statements on green packaging on performance of the ministry using a scale of 1 to 5 where strongly Agree=5; Agree=4; Neutral=3; Disagree=2 and Strongly Disagree =1. For interpretation purposes of 4 and 5 were jointly regarded as agree, 1 and 2 were jointly regarded as disagree while 3 remained neutral. The results of this study are as depicted in Table 2. The results shows that respondents disagreed on the statement that the company uses environmental friendly packaging materials like biodegradable packaging material (Mean = 2.20). Furthermore, respondents disagreed that the company Promotes and adopts returnable packaging methods

(Mean = 2.00). The respondents further did not agree that the company communicate with suppliers regarding packaging materials (Mean = 2.40). The study results further revealed respondents agreement on the statement that the company encourages environmental friendly transportation. i.e. well serviced vehicles which minimize air and noise pollution (Mean = 4.00). Finally, on the statement the material used in packaging are biodegradable, a majority (Mean = 2.50) disagree to the statement. The findings concurs with Hoejmose *et al*. (2013) and Zeng, Meng, Yin, Tam and Sun (2010) who argued that among the green packaging practices to be adopted by organizations is friendly packaging, returnable packaging and environmental friendly transport.

Table 2 : Green Packaging

Green Packaging	Mean	SD
The company uses environmental friendly packaging materials e.g. biodegradable packaging material	2.20	1.30
The company promotes and adopts returnable packaging methods	2.00	1.10
The company communicate with suppliers regarding packaging materials	2.40	1.30
The company encourages environmental friendly transportation. i.e. well serviced vehicles which minimize air and noise pollution	4.00	1.10
The material used in packaging are biodegradable	2.50	1.40
Average	**2.62**	**1.24**

Waste Management Systems

The study's third objective was to determine the influence of waste management systems on performance of the ministry of industrialization and enterprise development in Kenya. Respondents were asked to indicate their level of agreement with statements on waste management on performance of the ministry using a scale of 1 to 5 where strongly Agree=5; Agree=4; Neutral=3; Disagree=2 and Strongly Disagree =1. For interpretation purposes of 4 and 5 were jointly regarded as agree, 1 and 2 were jointly regarded as disagree while 3 remained neutral. The results of this study are as depicted in Table 3.

On the statement that the company has system to recover faulty products, on average, the respondents did not agree to the statement (Mean = 2.20). The respondents did not agree the company recovers waste materials and used up materials (Mean = 2.40). The respondents did not agree that the company uses materials for packaging that can be reused and recycled for other purposes (Mean = 2.20). Further, the respondents disagree that the company makes purchases on products that have been recycled have an offer in the market as compared to new products (Mean = 2.30). Finally, on the statement that the company offers instructions on reusing products and packaging materials where necessary to consumers, on average the respondents did not agree to the statement (Mean = 2.20). The findings are consistent with Chicarelli (2006) and Schatteman (2010) who argued that organizations are currently adopting various waste management systems to improve their performance.

Table 3 : Waste Management Systems

Waste Management Systems	Mean	SD
The company has system to recover faulty products	2.20	1.20
The company recovers waste materials and used up materials	2.40	1.30
The company uses materials for packaging that can be reused and recycled for other purposes	2.20	1.30
The company makes purchases of products that have been recycled have an offer in the market as compared to new products	2.30	1.30
The company offers instructions on reusing products and packaging materials where necessary to consumers	2.20	1.20
Average	**2.26**	**1.26**

Eco-Design Manufacturing

The study's forth objective aimed at to assessing the influence of eco-design manufacturing on performance of the ministry of industrialization and enterprise development in Kenya. Respondents were asked to indicate their level of agreement with statements on waste management on performance of the ministry using a scale of 1 to 5 where strongly Agree=5; Agree=4; Neutral=3; Disagree=2 and Strongly Disagree =1. For interpretation purposes of 4 and 5 were jointly regarded as agree, 1 and 2 were jointly regarded as disagree while 3 remained neutral. The results of this study are as depicted in Table 4. On the statement that the company keeps on **tracking, reporting and reducing the energy use**, a majority (mean = 2.40) disagree to the statement. Further, respondents disagreed that the company is adhering to Global Reporting Initiative framework (Mean = 2.40). Respondents however agreed on the statement that the company sets reduction goals (Mean = 2.20) and that the company keeps on **tracking, reporting and reducing the water use** (Mean = 3.60). Finally on the statement that company keeps on tracking, reporting and reducing wastes and emissions, a majority (Mean = 2.30) disagreed with the statement The findings are consistent with Zhu *et al.* (2008); Bhadauria (2012); Victor *et al.*, (2012) who indicated that organizations have decided to adopt eco-design practices to improve organizational performance.

Table 4: Eco-Design Manufacturing

Eco-Design Manufacturing	Mean	SD
The company keeps on **tracking, reporting and reducing the energy use**	2.40	1.20
The company is adhering to Global Reporting Initiative framework	2.40	1.30
The company have **set reduction goals**	4.10	0.90
The company keeps on **tracking, reporting and reducing the water use**	3.60	1.20
The company keeps on **tracking, reporting and reducing wastes and emissions**	2.30	1.20
Average	**2.96**	**1.16**

Performance of the Ministry of Industrialization and Enterprise Development

The results of this study are as depicted in Table 5. Majority of the respondents disagreed that the organization achieves maximum productivity (Mean = 2.30). A majority (Mean = 2.30) disagreed that the organization incurs minimum costs in manufacturing (Mean = 2.30). It was also established that the respondents indicated that company receives minimum complaints on quality (Mean = 2.20). On whether the company uses its current capacity optimally, a majority (mean = 2.40) disagreed that the company emits minimum wastes into the environment, majority of the respondents objected that the company emits minimum wastes into the environment (Mean = 2.00).

Table 5 : Performance of the ministry of industrialization and enterprise development

Performance	Mean	SD
The company achieves maximum productivity	2.30	1.30
The company incurs minimum costs in production	2.30	1.30
The company receive minimum complaints on quality	2.20	1.20
The company uses its current capacity optimally	2.40	1.30
The company emits minimum wastes into the environment	2.00	1.30
Average	**2.24**	**1.28**

Correlation Analysis

The results indicated a significant positive relationship between material sourcing and performance of the ministry (r=.626, p=0.000).The results concurs with Choi and Hwang (2015) material sourcing influences firm performance. The correlation results also revealed a significant positive relationship between green packaging and performance of the ministry (r=.635, p=0.000). The study findings agree with Amemba *et al.* (2013) that rearranged loading patterns and better packaging reduces materials usage and increases trailers and warehouse utilization. Results further indicated a significant positive association between waste management system and performance of the ministry (r=.587, p=0.000). The results agree with Amemba (2013), the most environmentally friendly waste management strategies is reuse strategy. The results also showed a significant positive association between eco-design manufacturing and performance of the ministry (r=.559, p=0.000). The results are in agreement with Bhadauria (2012) that GSCM practices adoption by organizations in manufacturing sector leads to improvements in both economic and environmental performance which culminates to general performance on operations.

Table 6: Correlation Coefficients Matrix

		Performance	Material sourcing	Green packaging	Waste management system	Eco design manufacturing
Performance	Pearson Correlation	1.000				
Material sourcing	Pearson Correlation	.626**	1.000			
	Sig. (2-tailed)	0.000				
Green packaging	Pearson Correlation	.635**	.643**	1.000		
	Sig. (2-tailed)	0.000	0.000			
Waste management system	Pearson Correlation	.587**	.225*	.261**	1.000	
	Sig. (2-tailed)	0.000	0.019	0.006		
Eco design manufacturing	Pearson Correlation	.559**	.397**	.329**	.234*	1.000
	Sig. (2-tailed)	0.000	0.000	0.001	0.015	

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

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

Inferential Analysis

It was shown that Material sourcing, green packaging, waste management systems and eco design manufacturing, was found to satisfactorily explain performance of the ministry as shown by R- square of 71.9%. This means that material sourcing, green packaging, waste management systems and eco design manufacturing accounts for 71.9%

of the variations in performance of the ministry. The results concurs with Zhang (2010) who conceptualizes reverse logistics in terms of waste management and recycling in a step wise process; 1) collection 2) classification 3)processing 4)packaging 5)handling 6)storage 7)distribution to treatment facilities that are specialized for processing repairs of failed and faulty products and 8) return of packaging materials and all these processes influence firm performance.

Table 7 : Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
	.848	.719	.708	.36807

The ANOVA results are presented in Table 6. According to the results, the model connecting independent and dependent variables was statistically significant. This implies that material sourcing; green packaging, waste management systems and eco design manufacturing are good predictors of performance of the ministry. The conclusion was supported by calculated F statistics of 65.850 and a p value 0.000<0.05. The findings for F calculated (65.850) was also compared against the F critical value of 2.46. Since the F calculated (65.850) was greater than F critical (2.46), the model is significant.

Table 8 : Analysis of Variance

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	35.683	4	8.921	65.850	.000
	Residual	13.954	103	.135		
	Total	49.637	107			

The coefficients of regression analysis presented in table 9 revealed material sourcing and performance of the ministry have a significant and positive association (r=.313, p=0.001).The study findings agree with that of Srivastava (2007) material sourcing influenced the manufacturing process and final product delivery to the consumers. The results also revealed that green packaging and performance of the ministry have a significant positive association (r=.329, p=0.000).The study findings concurs with that of Ninlawan *et al.* (2010) use of green packaging materials and green packaging through downsized packaging influences firm performance.

The results also revealed that waste management system and performance of the ministry have a significant positive association (r=.345, p=0.000).The results concurs with that Chicarelli (2006) that waste management system influenced the performance of supply and procurement companies. The results also showed that eco-design manufacturing and performance of the ministry have a significant positive association (r=.295, p=0.000).The findings concurs with that Yanginlar and Sari (2015) who found that eco-design manufacturing influenced the firm performance of healthcare organizations in Turkey on their investigations on perceived relationship between green supply and health care performance.

Table 9: Regression of Coefficient

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.864	.212		4.078	.000
Material sourcing	.313	.090	.245	3.467	.001
Green packaging	.329	.080	.285	4.106	.000
Waste management system	.345	.048	.393	7.163	.000
Eco design manufacturing	.295	.062	.276	4.764	.000

Conclusion

It can also be concluded that green packaging influence the performance of the ministry. Green packaging has a positive association with performance of the ministry. Green packaging entails use of green packaging materials and downsized packaging. Further, it can be concluded that concluded that waste management systems influence the performance of the ministry. Waste management systems have a positive association with performance of the ministry. Waste management systems entail the planning process in process inventory, and implementation of effective raw materials flows, finished goods and related information from the consumer to the point of origin for the purpose of creating value.

Finally, it can be concluded that eco-design manufacturing influence the performance of the ministry. Eco-design manufacturing systems have a positive relationship with performance of the ministry. Eco-design manufacturing involves usage of inputs with low impacts on environment, are of high efficiency and generates minimum or no pollution or waste. Eco-design manufacturing leads to gains in production efficiency, reduction on costs of raw material, improved corporate image and reduced occupational and environmental safety expenses.

Recommendations

The study recommends the adoption of material sourcing during production. Material sourcing allows the reduction, recycling and reuse of materials in the purchasing process. It also enables the acquisition of services and products that minimizes impacts on environment. The ministry of industrialization and enterprise development should go for green packaging. This therefore points out the need to cooperate with vendors to standardize packaging and in encouraging the adoption of returnable packaging methods. Rearranging loading patterns and better packaging can reduces usage of materials, increases utilization of space both trailers and in warehouse and reduces the required handling. The corporation should adopt Green Distribution Practices that include Green design which entails use of ECDs and LCAs aiming at developing and understanding product design affect environmental compatibility and waste reduction. The study further recommends eco-labeling as another practice of Green Distribution which entails offering a description pertaining to the environment impacts of a product on its use and its manufacturing process.

The study recommends the adoption of effective waste management techniques. Waste management system demands for organizational abilities to execute reversal logistics on customers' flow from suppliers to create an

avenue for identification of inventory deemed unnecessary by customers and formulating a timely cost effective way of returning the inventory to suppliers. Techniques in systems of waste management should involve flow of information to enable a company to initiate green and lean logistics which contributes to competitive advantage. The firm should also incorporate reverse logistics activities in waste management that include processing returned merchandise, seasonal inventory, salvage, restock, recalls and screening merchandise that are defective. The study recommends the implantation of eco-design manufacturing. By promoting eco design as an activity a firm is able to integrate environmental aspects in designing and developing products, and the integrated activities contribute to continuation in improvement in the performance of environment of the entire product through technological innovation. Eco-design manufacturing leads to reduced expenses on environmental and occupational safety, lowered costs of raw material, improved image of corporate and gains in production efficiency.

Conflict of Interest

No potential conflict of interest was reported by the authors

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