



**ROLE OF SUSTAINABLE SUPPLY CHAIN MANAGEMENT PRACTICES ON PERFORMANCE OF MANUFACTURING FIRMS. A CASE OF UNILEVER KENYA LIMITED**

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**ABSTRACT**

*To remain globally competitive Kenya has to manage and sustain her environment and natural resource base (UNDP, 2018). Manufacturing firms are no exception to this. The manufacturing sector is an important pillar in the Kenyan economy and a key contributor to the country's gross domestic product. It also has a big impact on the society and environment. Organizations that have sustainability at the heart of their operations have reaped great benefits. Research has it that 65% of firms that were at a more advanced stage of implementing sustainability in their supply chains noted that they had improved their brand reputation. This research aimed to determine the role of sustainable supply chain management practices in the performance of manufacturing firms in Kenya. It was guided by the following specific objective; to determine the role of eco-design and cleaner production and green packaging in the performance of these firms. The resource based theory and Ecological Modernization Theory provided theoretical foundation. The population of the study was 102 respondents from which a sample of 81 was drawn. Proportionate stratified random sampling was used to determine the sample sizes in each stratum. Data was analyzed both descriptively and inferentially. Correlation analysis was used to determine the presence of multicollinearity in the data and also to determine the degree & direction of the relationship between the study variables. Regression analysis was used to determine the relationship between the independent and dependent variables. The study concluded that eco design, cleaner production and green packaging are significant predictors of manufacturing firm performance. The study recommended hiring of innovative employees to aid eco design and cleaner production initiatives.*

**Key Words;** Eco-Design and Cleaner Production, Green Packaging, Performance, Manufacturing Firms

## INTRODUCTION

In a recent survey conducted with the DNV GL Business Assurance customer base, covering a broad range of industries including food, transport and metals, and featuring professionals from top management, quality, certification and environmental management found out that Half of businesses still feel like beginners in managing sustainability in their supply chains, yet 65% of those that are more advanced say it has improved their brand reputation (Buisit, 2018). Those able to tackle it in a strategic and holistic way can manage their risks better and reap benefits, while responding to legislative, stakeholder and global demands.

The impact of manufacturing operations on the environment could also be classified as; waste (all forms), energy use, and resource use (material consumption) and as a result, manufacturing organizations should develop procedures that concentrate on operations analysis, continuous improvement, measuring, and objectives, that lead towards green supply chain (Rothenberg, Pil & Maxwell, 2001). The important issue is that of making an attempt to seek out procedures to fulfill the consumptions demand of product during this growing international market, whereas promoting positive ecological and social impacts throughout the worth chain (Hervani, Helms & Sarkis, 2005). There's a paradigm shift from the recent notion of 'development versus environment' to a brand new read during which higher environmental berth is important to sustain development.

The current wave of economic process has raised the requirement for firms to externalize additional of the production activities. Systems use an internal management tool, which suggests the new trend would depart environment problems planned poorly if managed this manner (Christopher, 2016). New emphasis should be placed on environment supply chain management practice and extended producer

responsibility by running in parallel with new initiatives on social responsibility and fairer mercantilism relationships (Van Weele, 2010). Any organization may be a member of some reasonably supply chain or network and also the varied production, marketing or sourcing choices it makes results in a myriad of implications for its supply chains, together with implications for its natural environment.

Manufacturers and service suppliers are coming back under increased scrutiny concerning environmental performance for his or her products. Not solely should their product meet user wants for quality and value, they need to address the environmental considerations of society at large (Darnall, Jolley & Handfield, 2008). The state and trend of environmental degradation (from restrictive, consumer, and ethical standpoints) was vocation for modification in manufacturing philosophy. Although ISO 14000 is indicative of the shift in environmental philosophy, it focuses solely on procedures and systems and says nothing on discharge standards, limits, or check strategies (Emblemsvåg & Bras, 2012). Thus the notion that greening of supply chains may be a response to a brand new challenge on manufacturing and production enterprises worldwide. The challenge is to develop ways in which during which industrial development and environmental protection will symbiotically exist (Zhu, Geng, Fujita & Hashimoto, 2010).

Environmental design has implications for the commercial design of product, for instance, solar-electric equipment, wind electricity generators or maybe innovative automobiles which might function alternatives for energy (Corbett & Klassen, 2006). A firm that employs GSCM can embrace in its decisions; screening of suppliers for environmental performance, operating collaboratively with them on green design initiatives and providing coaching and data to create suppliers environmental management capability (Albino, Balice & Dangelico, 2009).

Environmental methods within profit organizations could also be thought of as a collection of tips that the corporations define to retort to current internal and/or external pressures and/or to anticipate future evolution of the competitive environment, of regulators and of the customer's wants (Gavrinski, Klassen, Vachon & do Nascimento, 2011). So every firm in keeping with its own strategic orientation decides whether or not to incorporate environmental factors into the method of strategy formation. Consequently the company's environmental culture represents one in all the foremost necessary determinants within the definition of the environmental ways that depends on the company's history, the fields wherever it operates and also the country during which it's the headquarters or its plants (Rao & Holt, 2005).

Developing countries face substantial environmental burdens as a part of supply chains since they need been used as some extent of disposal of end-of-life product for international organizations and developed countries. For instance, the end-of-life product are shipped to developing countries, comparable to China and Kenya, wherever these developing countries don't have the infrastructure or tools on the market to worry for the end-of-life product, inflicting bigger environmental burden on these nations (Zhu & Sarkis, 2006). Aboard focal firms, supplier firms need to boot support sustainability practices adoption to avoid any circumstance which will end in loss of business.

Green structure culture values upon that companies could also be positioned include; the requirement for companies to include environmental issues throughout the whole organization, such considerations ought to be thought of throughout the worth chain, economic goals ought to be tempered, spirituality, morality, size and futurity ought to be embraced and also the setting ought to be afforded intrinsic valuation and respect (Srivastava, 2007). The U.S environmental protection agency for instance

offers help inside their green suppliers' network aiming at suppliers and producers to assist them eliminate waste, economize and scale back their eco-impact. Thus, the increasing consciousness of sustainable development and adaptive of production with ecosystem conservation have fostered the adoption and implementation of EMS (Albino, Balice & Dangelico, 2009).

Manufacturing in Kenya largely constitutes formal and informal firms. A few large formal enterprises and small and medium-sized enterprises (SMEs) play an important role in manufacturing, as does the informal sector. According to Were (2016), the strongest subsectors in formal manufacturing in Kenya include: agro-industry (food and beverages), textiles in the Export Processing Zones (EPZs), pharmaceuticals, sectors related to construction, such as cement and metals, and high-end furniture.

Unilever is one of the world's leading fast moving consumer goods companies. It offers products across foods, home and personal care categories. Unilever sells in over 150 countries and manufactures in more than 70 countries. Its products are used by consumers 150 million times per day. The group operates in Europe, the Americas, Asia and Africa. It is headquartered in London, the UK, and employed 174,000 people as of December 2008. In order to achieve sustainable and profitable growth Unilever recognize the importance of selecting the right people for an organization that is fit for growth and winning. Undertaken by a culture in which performance would be in alignment of the goals and values of an organization. Unilever is a dynamic, flexible, agile and diversified business with human resource that is motivated through performing well at work.

### **Statement of the Problem**

Sustainability has been a buzzword in the recent past with governments, government agencies, corporations as well as individuals seemingly caught

in a hastened hurry to implement sustainability measures. To remain globally competitive Kenya has to manage and sustain her environment and natural resource base (UNDP, 2018). Being the environment capital of the world offers further impetus for sustainability measures. The manufacturing sector is an important pillar in the Kenyan economy and a key contributor to the country's gross domestic product. It also has a big impact on the society and environment. Organizations that have sustainability at the heart of their operations have reaped great benefits. In a recent study across Europe, Asia and America, conducted by quality assurance and risk management firm DNV GL, with GFK Eurisko and Sedex.Euro found out that 65% of firms that were at a more advanced stage of implementing sustainability in their supply chains noted that it had improved their brand reputation. Wang (2017) found that firm's internal SSCM practices have a positive impact on firm's environmental performance and social performance. Moreover, environmental performance and social performance are positively related to economic performance.

According to financial statements Unilever's financial fortunes have been dwindling with a turnover growth of 10% in 2015, 1.0% in 2016 and 1.9 % in 2017 (Unilever, 2017). Sales growth has also dipped from 4.1% in 2015 and 3.1% in 2017. Sustainable supply chain management practices may provide the solution to these dwindling fortunes.

Studies conducted on sustainable supply chain practices and performances have relied on diverse research methods. For instance Hassan (2013) conducted a study on sustainable supply chain management practices and operational performance that used a case study, while Wang (2017) utilized a survey of Chinese firms. Mulwa (2015) studied the influence of SSCMPs on the performance of United Nations Agencies while Osiemo et al studied these practices in local supermarkets.

It is against this backdrop of different methodologies, financial challenges at Unilever and lack of empirical studies that the researcher carried out the study on the role of sustainable supply chain management practices on the performance of manufacturing firms in Kenya, case study of Unilever Kenya limited. To achieve this, the study was guided the following specific objectives;

- To find out the role of eco-design and cleaner production in the performance of manufacturing firms.
- To determine the role of green packaging in the performance of manufacturing firms.

## **LITERATURE REVIEW**

### **Theoretical Framework**

#### **Resource Based Theory**

The resource-based View of the firm (RBV) and the interrelated capabilities approach which represent a dominant stream of research in strategic supply chain management over the last decade have been prominent in the supply chains' literature. Provides a critical review of the large literature on the RBT and suggests areas where it can be applied to strategically-oriented supply chain performance research. The RBV represents the underlying theoretical support for one of the central propositions of strategic supply chain management: that distinctive sustainable supply chain management practices are source of sustainable competitive advantage and superior performance (Denis, 2012).

This study therefore adopts the resource based view theory which was introduced by Wernefrlt (1984) and Barney (1991). The theory holds that organizational supply chain performance is determined by the manner in which companies deploy, manage and position their internal resources and capabilities. These resources need in valuable, rare and imperfectly imitable and not substitutable. Resources

and capabilities are a bundle of tangible and intangible assets that include information and knowledge the firm controls, its management skills and the organizations routines and processes (Barney, 1991). The RBV takes the company as the primary unit of analysis and differences in performance between firms are due to difference in the way firm resources and capabilities are employed. According to Demirbag *et al.* (2006), viewing supply chain relationships and processes as resources satisfies all four resource criteria in the resource-based view perspective, namely (Barney, 1991): value; rareness; uniqueness (inimitability); and non-substitutability. Intangible resources have become especially important in real-life market settings, with heterogeneous demand across and within industries, the existence of information asymmetries, and heterogeneous and not perfectly mobile resources (Hunt & Morgan, 1995). The two assumptions for RBV theory were, resources and capabilities were heterogeneously distributed among firms; and resources and capabilities were imperfectly mobile, which made firms' differences remained stable over time (Li, 2011). The resource-based view (RBV) of firms mainly emphasized their internal strengths and weaknesses, in contrast to industrial organization economics which focused on firms' external opportunities and threats.

The RBV had been used in the strategic literature for the analysis of business performance. It was important to highlight that the RBV had recently been employed in supply chain management studies to examine the supply chain resources and capabilities on supply chain performance (Yang, Wang, Wong & Lai, 2008). Yang, Wang, Wong and Lai, (2008) from supply chain literature, argued that the RBV theory was an appropriate theory for supply chain management, measurement and performance research.

### **Ecological Modernization Theory**

Ecological modernization theory (EMT) has its underpinnings in sociological theory and has been further developed into policy and organizational theories (Spaargaren & Mol, 1992). As a systematic eco-innovation theory, EMT is geared towards jointly achieving industrial development and environmental protection through innovation and technological development, or modernity (Janicke, 2008, Murphy & Gouldson, 2000). EMT has been widely used to explain environmental planning by governments and the restructuring of production by major manufacturers (Murphy, 2000). Even though it exists with many dimensions and characterizations, one view of EMT has at least two dimensions which can influence green supply chain management (GSCM) research and practices. The first dimension concerns the new politics of pollution, which examines the evolution of regulations and policies and their effects on environmental innovation. The other dimension concerns technological innovation which suggests that manufacturers can overcome barriers to innovation and thus gain operational opportunities for performance improvements (Murphy and Gouldson, 2000).

New politics is concerned with environmental policy choices and changes (Gouldson & Murphy, 1998). In this dimension, EMT suggests that ecological regulations and policies can motivate GSCM practices amongst manufacturers. To promote GSCM related practices, proper institutional arrangement and a legal framework by government are needed (Kassolis, 2007). Some researchers have argued that EMT is the basis of environmental policy integration (Gibbs, 2000), and such environmental policy is necessary for GSCM development (Berger *et al.*, 2001).

Alternatively, the practice of GSCM is consistent with the concept of environmental innovation from the EMT view, that is, manufacturers implement GSCM through hard (e.g., cleaner production equipment) and soft (e.g., increased

supplier collaboration in eco-design) technological innovations (Zhu et al., 2010c). Industrial ecology, of which GSCM is an important aspect, can help to achieve sustainable development as an important ecological modernization concept (Huber, 2000).

## **Empirical Review**

### **Eco-Design and Cleaner Production and performance of manufacturing firms**

Eco-design is outlined as a collection of project practices whose aim is at the creation of eco-efficient merchandise and processes; the idea was developed by the world Business Council for sustainable Development (WBCSD) at the Rio, it's a proactive method that is incredibly elaborated and entailing. It influences all the stages of a life cycle of merchandise including: material extraction, production, packaging, distribution, use, recovery, and utilization (Jeswiet & Hauschild, 2005). It's a new approach to product design and it involves characteristic environmental aspects connected with the merchandise and together with them within the design process of product development (Nowosielski, Spilka & Kania, 2007).

Karlsson and Luttrupp (2006) outlined it as a property solutions of product and services changes that scale back negative sustainability and maximize positive sustainability and impacts economic, environmental, social and moral throughout and on the far side the life-cycle a product. Fiskel and Wapman (1994) outlined Eco-design as a method that considers design performances with regard to environmental, health and safety over the merchandise and process entire life cycle. Eco-design is one in every of the practices of GSCM and is understood by different names that includes; design for environment, green design, environmentally acutely aware design, life cycle design, clean design and sustainable design. It always takes place early within the product's design

stage and thus makes sure the environmental consequences of life cycle of the product are documented before the process of manufacturing (Gheorghe & Ishii, 2008).

Eco-innovation has become one among the vital strategic tools to get sustainable developments in manufacturing industries owing to the increasing environmental pressure. Within the past, investment in environmental activities was thought about as the replacement, nonetheless, the strict environmental regulations and widespread environmentalism have modified the competitive rules and patterns for firms. With the rising importance of eco-innovation since the late nineteen nineties, researchers have addressed eco-innovation from completely different views. First are those studies that determine factors that drive eco-innovation and therefore the performance outcomes arising from eco-innovation, with Kammerer (2009) and Dangelico and Pujari (2010) being the more modern examples of this class.

Second are people who determine the scale of eco-innovation, with Hermosilla et al. (2010) together recent article during this class. Third cluster of studies is expounded with the measure of eco-innovation (Cheng & Shiu, 2012). Kemp and Pearson (2008) outline eco-innovation because the production, assimilation or exploitation of a product, production method, service or management or business strategies that's novel to the organization (developing or adopting it) and which ends, throughout its life cycle, during a reduction of environmental risk, pollution and alternative negative impacts of resources use (including energy use) compared to relevant alternatives. Similarly, Jin et al., (2008) recommend that it involves each introduction of a good/service that's new or considerably improved and reduces negative impacts on the environment.

The goal of eco-innovation is to systematically align and implement this strategy throughout the supply chain, from new product and service development to

consumption (Huber, 2008). Eco-innovation (green innovation) may be classified into 3 main categories: eco-product innovation, eco-process innovation and green managerial innovation. During this study, we have a tendency to be examined in the eco-product innovation and eco-process innovation. Eco-product implementation brings regarding environmental enhancements to existing eco-products or the development of recent eco-products (Cheng & Shiu, 2012).

Eco-process implementation involves the development of existing production processes or the addition of recent processes to scale back environmental impact (Cheng & Shiu, 2012). Cleaner Production (CP) was referred to as the most popular strategy in achieving an economical use of natural resources and pollution hindrance. From the attitude of thinking, CP may be well defined because the use of key ideas within the overall interference, eco-efficiency, environmental methods, and full life cycle and etc. As integrated management strategies and preventive environmental approach, implementation of CP has with success providing the promising advantages with a large vary of implication to the manufacturing companies, staff and environment.

Correct CP practices by manufacturing companies can manufacture the economic and environmental advantages, and basis for the conclusion of circular economy. CP may be dilated and applied as a thought for method improvement and might be integrated in any processes for higher environmental performances. Today, most manufacturing companies have created a major effort within the implementation of CP. nonetheless; differing kinds of efforts on CP can give completely different implication. Result from the implementation of CP will served because the basis for improving the performance or potency. The progressively cost of environmental, operations, market, regulatory, voluntary initiatives and international standards was a crucial measures for the implementation of CP.

However, some producing companies are still reluctant to require additional aggressive and proactive actions towards CP attributable to perceived lack of proof that the impact of CP exceed the costs required in implementing this strategy. As a set of management and analytic processes that permits the management to enhance their environmental performance, this paper brings type an exploratory discussion supported the literature that focuses on the impact from CP implementation. This was supposed to provide an overview on the impact and benefit offered from the implementation of CP practice.

### **Green Packaging and performance of manufacturing firms**

High competition has driven organizations to think about the final word outcome of their practices in terms of structure performance (Dentchev, 2004), from that green supply chain practices (GSCPs) aren't exempt. Today's business managers have realized the importance of the effective implementation of environmental strategies and green supply chain practices as a vital issue for firm performance (Masoumik et al., 2014). Morgan Polls (2006) showed that majority of customers are environmental acutely aware regarding the environment. Previous studies additionally recommend that buyers who are willing to get green product are, in general, acutely aware regarding the environmental drawback, involved regarding the environment and believe that it's vital to be environmentally friendly (Laroche et al., 2001).

Green packaging that is that the specific phenomena in most instances must do with appropriate packaging that reduces environmental harm. Green packaging show the reflection of environmental considerations in financial terms that are intrinsic and transferable to the customer. Green communication fosters a positive image and conveys a business firm's concern towards the environment and therefore the public (Ottman, 1998). Packaging provides advantages for

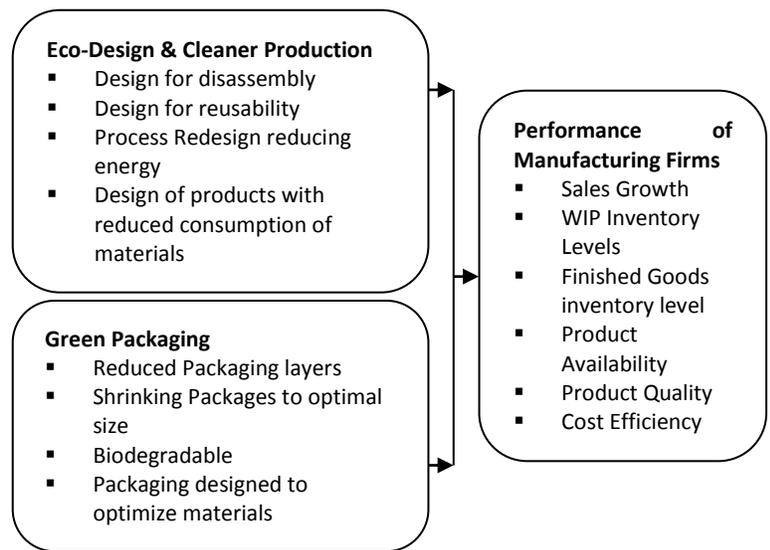
firms additionally as for customers. For example the surface of packaging is a communication platform for all types of knowledge. This includes info like product ingredients, price, usage information and alternative info that's relevant for customers. Besides it serves marketing strategies as an instrument to extend attractiveness of items to consumer leading to less stock going unsold.

Packaging will additionally control the scale and amount of a product. This is often useful for firms so as to manage inventory and manage the logistics of their product assortment. Moreover it improves the efficiency of product distribution and may thus lead to higher profit margins for firms. Previous studies found that individuals interact in environmental behavior as a results of their need to resolve environmental drawback, to become role models and a belief that they'll help to preserve the environment (McCarty & Shrum, 2001). Though these studies give some insights into what motivates customers to interact in green behaviors, it couldn't make sure that these motivations really result in consumers' green behaviors (e.g., recycling behavior) and particularly to green product buying behavior.

What is more, most of those studies rely upon self-reported information. These considerations raise queries relating to consumers' actual green behaviors, since customers could solely claim to be green as a result of social acceptance and peers pressure (Kalafatis et al., 2009). Green packaging strategies become a lot of advanced and involve greater levels of relationship investment (Simpson & Samson, 2010). Within green packaging practices, recoverable product environments, and therefore the design of those product and materials, became a progressively vital phase of the general push in industry towards environmentally acutely aware manufacturing and logistics for increased competitive advantage. The Kenyan manufacturing sector, as well as food, beverages and tobacco, remains the most important part of the manufacturing industry. In

terms of structure, economic contributions, and performance within the manufacturing sector, this sector is that the most vital and largest comprising of businesses, encompassing everything from small family organizations to giant international firms.

### Conceptual Framework



**Independent Variables**

**Dependent Variables**

**Figure 1 Conceptual Framework**

**Source: Author (2018)**

### METHODOLOGY

The study adopted a case study research design. This helped the study to monitor the behavior of the variables and hence present an opportunity to challenge theoretical assumptions. The researcher targeted a population of one hundred and two (102) employees which was drawn from four department of supply chain (Supply Planning, Procurement, Demand Planning, Distribution Requirement Planning & Material Requirement Planning). The formula as provided by Yamane (1967) was used to calculate the sample size and obtained a sample of 81 employees. Data was collected mainly through questionnaires. In this study, the quantitative data was collected and analyzed by calculating response rate with descriptive

statistics such as mean, standard deviation and proportions using Statistical Package for Social Sciences (SPSS) version 24. Inferential data analysis was carried out and correlation analysis to determine the strength and the direction of the relationship between the dependent variable and the independent variables. The general linear regression model for this study was:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \epsilon$$

Where; Y= Performance of manufacturing firms

$\beta_0$ = Constant, intercept

$\beta_i$  is the coefficient for  $X_i$  ( $X_i=1,2$ )

$X_1$ = Eco design and Cleaner Production

$X_2$ = Green Packaging

$\epsilon$  = Error Term

## FINDINGS

A response rate of 84% response rate was achieved. Majority (48%) of the respondents had 5- 9 years of experience, middle managers(48%), working under distribution requirement planning (36%) and had Bachelor's degrees (58.82 %.)

## Descriptive Statistics

### Eco Design and Cleaner Production

Eco-design and cleaner production is outlined as a collection of project practices whose aim is at the creation of eco-efficient merchandise and processes; the idea was developed by the world Business Council for sustainable Development (WBCSD) at the Rio, it's a proactive method that is incredibly elaborated and entailing. Majority of respondents agreed to a large extent that the firm focuses on Process Redesign with an aim of reducing energy consumption in the production plants as shown by a mean of 3.8043, that the firm focuses on designing products that can be reused for other purposes as shown by a mean of 3.7667 , that the firm actively designs products for disassembly as shown by a mean of 3.5000 and finally the firm designs its products so as to reduce consumption of materials as shown by a mean of 3.1087. The findings are in line with that of Fiskel & Wapman (1994) who outlined Eco-design as a method that considers design performances with regard to environmental, health and safety over the merchandise and process entire life cycle.

**Table 1: statements regarding to Eco-design and cleaner production on performance of manufacturing firms**

Statement	Mean	Std_Dev
Our firm focuses on Process Redesign with an aim of reducing energy consumption in our production plants	3.8043	.3394
Our firm focuses on designing products that can be reused for other purposes	3.7667	.2508
Our firm actively designs products for disassembly	3.5000	.1606
Our firm Designs its products so as to reduce consumption of materials	3.1087	.1488

\*means of above 2.5 indicate a very strong significance of the statements to the statements. It means most respondents agreed with the statements. The insignificant deviation from the mean confirms the validity of the statements

### Role of Green Packaging

Analysis of the means and standard deviations revealed that a majority of the respondents agreed to a large extent that firm is committed to green packaging initiatives that focuses on shortening and optimizing initiatives as shown by a mean score of

2.626, Our firm focuses on reducing packaging layers to Reduce the impact on the environment as shown by a mean score of 2.529, that Our firm shrinks packages to optimal sizes as shown by a mean score of 2.5131, that Our firm uses biodegradable materials when it is possible and applicable as shown by a

mean score of 2.5101 and finally Our packaging is designed to optimize use of materials as shown by a

mean score of 2.5024. The findings were indicated in table 2.

**Table 2: Extent of agreement with the following statements regarding to Role of Green Packaging on performance of manufacturing firms**

Statements	Mean	Std Dev.
Our firm is committed to green packaging initiatives focuses on shortening and optimizing initiatives	2.626	0.387
Our firm focuses on reducing packaging layers to Reduce the impact on the environment	2.5279	0.350
Our firm shrinks packages to optimal sizes	2.5131	0.252
Our firm uses biodegradable materials when it is possible and applicable	2.5101	0.243
Our packaging is designed to optimize use of materials.	2.5024	0.167

\*means of the above 2.5 indicate a very strong significance of the statements to the statements. It means most respondents agreed with the statements. A smaller SD represents data where the results are very close in value to the mean. The larger the SD the more variance in the results. The insignificant deviation from the mean confirms the validity of the statements.

### Firm Performance

A majority of respondents agreed to a large extent that the firm’s market share had grown big as shown by a mean of 4.6; that the firm’s sales had increased as shown by a mean of 4.4; that finished goods inventory had reduced with a mean of 4.3; that the

firm’s work in progress inventory levels have reduced by a mean of 4.0; and that products are readily available in the right place, time and in the right quantity as shown by a mean of 3.7 as indicated in table 3.

**Table 3: Respondents level of agreement with statements regarding to firm performance**

	Mean	Stdev
firm’s market share has grown big	4.6	0.3
Our firm’s sales have increased	4.4	0.2
Our firm’s finished goods inventory levels have reduced	4.3	0.3
Our firm’s work in progress inventory levels have reduced	4.0	0.3
Our products are readily available in the right place, time and in the right quantity	3.7	0.1

\*means of above 2.5 indicated a very strong significance of the statements to the statements. It means most respondents agreed with the statements. A smaller SD represents data where the results are very close in value to the mean. The insignificant deviation from the mean confirms the validity of the statements

### Correlation and Regression Analysis

In this study pearson correlation was carried out to determine how the research variables related to each other. Eco design and firm performance (r= 0.876) indicated a strong positive linear relationship. (Roth 2009). A correlation analysis for the green packaging was conducted to find out how green packaging

correlated with firm performance. Pearson correlation coefficient was r=0.870. This is a clear in indication that green packaging has a positive correlation with firm performance.

A linear regression analysis was used test the relationship between the independent variables and the dependent variable. The results presented also

shows that taking all other independent variables at zero, a unit increase in eco design and cleaner production leads to a 0.395 increase in firm

performance; a unit increase in green packaging leads to 0.450 increase in firm performance.

**Table 4: Coefficients of Linear Regression**

Model		Unstandardized Coefficients		Standardized Coefficients			Correlation
		B	Std. Error	Beta	T	Sig.	
1	(Constant)	.241	.056		2.503	.015	
	Eco Design & Cleaner Production	.395	.093	.537	4.235	.003	.876
	Green Packaging	.450	.104	.665	5.268	.002	.870

a. Dependent Variable: Performance of manufacturing firms

### CONCLUSIONS

On Eco-design and cleaner production on performance of manufacturing firms, the study concluded that there is a firm focus on Process Redesign with an aim of reducing energy consumption in the production plants and that there is product design is such that the products can be reused for other purposes. It was also determined that there is active design of products so as to reduce consumption of materials. There was a positive correlation between eco design and manufacturing firm performance. Regression analysis showed that Eco design and cleaner production is statistically significant in predicting manufacturing firm performance

On the extent of agreement with statements relating to green packaging on performance of manufacturing firms, the study concludes that firm is committed to green packaging initiatives focuses on shortening and optimizing initiatives and that the firm focuses on reducing packaging layers to reduce the impact on the environment. There was positive correlation between green packaging and manufacturing firm

performance. With an increase in green packaging resulting in an increase in performance

### RECOMMENDATION

Furthermore, the study recommends the hiring of employees who are innovative—who have the skill and the vision to redesign products, processes, and business models and who understand the business context this is a critical success factor with regards to eco design

Moreover the research recommends sensitization on green packaging as it became apparent that there was lukewarm response as regards these statements. Further the study recommends for a good relationship with customers and suppliers so as to implement sustainable practices across the provision chain by promoting advantage and creating profits

### Recommendations for Further Research

Further the role of a community oriented culture can also be investigated where organizations first understand that they are part of a larger community and that their actions impact the community and that they are money making machine as second.

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