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EFFECT OF GREEN SUPPLY CHAIN PRACTICES ON PERFORMANCE OF LARGE CHEMICAL MANUFACTURING FIRMS IN NAIROBI COUNTY KENYA

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Abstract

Purpose: Social and political concerns about the environment in Kenya have increased in the recent years. Recently, they year 2017, the Kenyan government has established a new environmental management and natural resources Act, this study acknowledges that the that success in the environmental protection can contribute to the building of a positive image for customers and provide many new opportunities to expand business thus improving the overall performance of a firm. The growing importance of GSCM are driven mainly by the escalating deterioration of the environment for instance diminishing raw material resources, overflowing waste sites and increasing levels of pollution. Therefore, there was need to establish the effect of GSCM practices on performance and provide policy recommendations that can help salvage the poor performance recently witnessed in the manufacturing sector. The study specifically focused on green purchasing practices, waste management practices, green distribution practices and ICT.

Methodology: This study adopted a descriptive survey design. The target population consisted of 63 large chemical manufacturing firms licensed by the Kenya Association of manufacturers. The data collection instrument was a questionnaire and secondary data collection template. The study used correlation and regression to achieve the specific objectives.

Findings: The study findings showed that green purchasing practices, waste management practices, ICT and green distribution practices positively and significantly influence the performance of large chemical manufacturing firms in Kenya.

Policy recommendation: The study recommends large chemical manufacturing firms in Kenya to ensure they have green manufacturing system. There is also need for manufacturing firms to have well-established environmental compliance policies. There is also need to have technological support for the design of recyclable products. Further there is need for the

manufacturing firms to conduct the distribution of their products using returnable packaging materials.

Key Words: *Green Purchasing, Waste Management, ICT, Green Distribution, Performance*

Introduction

Manufacturing firms just like other organizations throughout the world are increasingly becoming aware of the danger posed by environmental issues such as global warming, carbon emissions, toxic substance usage, and resource scarcity. It is this worrying realization that has had policy makers and activists advocate for going green, and many organizations including manufacturing firms throughout the world have responded to this by adopting green supply chain practices (Xie& Breen, 2012). Supply chain is a process of converting raw-materials into final products that are then delivered to the consumer. This process involves extraction and exploitation of the natural resources. Businesses are increasingly becoming aware of the importance of environmental sustainability since emissions and wastes created by the production process has caused significant global warming and acid rain problems that have increased the social cost of production. Green chain supply practices are therefore desirable reactive measures designed regulatory and proactive strategic policies (Kumar & Chandrakar, 2012).

Manufacturing firms just like most other firms can no longer effectively compete in isolation of their suppliers, customers and other entities in the supply chain. Since 1980s, firms have realized the benefits of collaborative relationships within and beyond their own organization. Manufacturing firms are now working together to improve the integrative processes of supply chain management and accelerate the benefits available through successful implementation (Testa&Irlado 2010). According to Dyllick and Hockerts (2002), green supply chain management has emerged as an important component of the environment and supply chain strategies for a number of manufacturing firms and they have been aiming at integrating environmental concerns in their business operations and in interactions with their stakeholders in embracing environmental sustainability into business strategies.

Dyllick and Hockerts(2002) define green supply chain practices as approaches used to design and or redesign the supply chain (SC) to incorporate practices that minimize the impact of a firm`s activities on the environment not only from start to finish of a supply chain but also from the beginning to the end of a product's life cycle for the purposes of improving the long term performance of the manufacturing firm and the supply chain. Therefore a green supply chain involves the use of environmentally friendly inputs and transforming them into products that can improve or be recycled within the existing environment. Green marketing involves all the activities required to deliver the final product to the consumer. Itmay involve packaging, transportation, location analysis, inventory management and warehousing. The manufacturing firms have to consider a mode of transport with less carbon print, better packaging methods like recyclable containers, well designed warehouses and improved inventory management skills (Sarkis, 2012). Green marketing focuses on the green products like hybrid vehicles and the greening of processes like reducing carbon prints. These practices are geared towards reducing the impact of the product to the environment (Sarkis, 2012).

In India, both manufacturing and service organizations consider the impact production processes have on the environment and the economic viability of the firm as well as on the environmental performance (Chopra & Meindl, 2004). In the UK, the production phase has a critical role in ensuring that products and services are environment protective in nature; prevention of pollution at source during the production process and adoption of clean production practices (Pagell, Wu& Murthy, 2007). In Malaysia, a lot of efforts are being put into minimizing environmental footprints of the manufacturing industry to enhance environmental protection and sustainable development (Abdullah, 2016).

Statement of the problem

Social and political concerns about the environment in Kenya have increased in the recent years. Recently, the Kenyan government has established a new environmental management and natural resources Act, that aims to ban the use, manufacture and importation of all plastic bags used for commercial and household packaging, a move which was faced by huge protests from the manufacturers (Mwiti, 2017). According to Green *et al.* (2010), in the context of the deteriorating environment, GSCM stands for innovations in supply chain management and industrial purchasing. Srivastava (2010) argue that success in the environmental protection is contributes to the building of a positive image for customers and provide many new opportunities to expand business thus improving the overall performance of a firm.

In the recent times, the performance of manufacturing firms in Kenya has scored poorly. The sector's contribution to the GDP has stagnated at an average of 10 per cent for more than ten years with a growth of 3.1 percent, significantly lower than the overall economic growth of 5.0 percent (WB, 2016). KAM (2016) reiterates that the declining performance is disturbing for business and indicates eroded competitiveness and compromises the government's aspirations of 20% growth that can enable Kenya to become prosperous. The growing importance of GSCM is driven mainly by the escalating deterioration of the environment for instance diminishing raw material resources, overflowing waste sites and increasing levels of pollution, (Srivastava, 2010). However, it is not just about being environment friendly; it is about good business sense and higher profits. In fact, it is a business value driver and not a cost centre, (Wilkerson, 2015).

With increase in environmental concerns during the past decade, a consensus is growing that environmental pollution issues accompanying industrial development should be addressed together with supply chain management, (Sheu, Chou & Hu, 2015). However, there was a need for more research in the area as most of the previous studies haven't focused on GSCM. There was need to establish the effect of GSCM practices on performance of Large chemical Manufacturing firms and provide policy recommendations that can help salvage the poor performance recently witnessed in the manufacturing sector. This study was therefore timely.

Research Objectives

i. To determine the effect of green purchasing practices on performance of large chemical manufacturing firms in Nairobi County Kenya
ii. To establish the effect of waste management on performance of large chemical manufacturing firms in Nairobi County Kenya

iii. To examine the effect of ICT on performance of large chemical manufacturing firms in Nairobi County Kenya
iv. To find out the effect of green distribution practices on performance of large chemical manufacturing firms in Nairobi County Kenya

Literature Review

Theoretical Review

Supply Chain Operations Reference (SCOR)

According to Council of Supply Chain Operations Reference (2010), the Supply Chain Operations Reference (SCOR) model provides a unique framework that links performance metrics, processes, best practices, and people into a unified structure. The framework supports coordination between supply chain partners and enhances the effectiveness of supply chain management, technology, and related supply chain improvement activities(Agrawal, et al., 2009).SCOR metrics provide the basis for an organization to measure how successful it is in achieving its desired objectives (SCC, 2012). The key success of SCM will rely on the incorporation of the activities of the supply chain, meaning cooperation, information flow and organization throughout the entire supply chain.

Resourced Based View Theory

The RBV theory of the firm emphasizes that valuable, rare, imperfectly imitable, and non-substitutable resources create a competitive edge, (Melville, Kraemer and Gurbaxani, 2004). Cardeal and Antonio (2012) explained that the resource based view (RBV) considers certain resources and notes that a competitive edge is founded on Valuable, Rare, Inimitable resources and Organization (VRIO).These resources include assets, capabilities, organisational processes, information, grouped as tangible or intangible resources. The RBV highlights that the environment may create a barrier that affects the competitive business edge and hence the need for businesses to leverage on the environmental advantages in order to be ahead of competition (Hart, 1995). Pralahad and Hamel (1994) promoted the theory of core competences. Competences represents what a company is able to excel (Prahalad and Hamel, 1994), however, the core competencies represents a set of abilities that a company can leverage to outperform peers in the market place (Lawson and Lorenz, 1999). Under the Resource Based View, it is important that companies channel resources to leverage their core competences.

Transaction Cost Economics Theory

The transaction cost economics theory was first proposed by Williamson in 1981 and later expounded by Sarkis (2011). The theory explores how much effort and cost is required for two entities to complete an economic exchange or transaction which includes searching costs, bargaining costs and control costs. Concerning environmental practices, information costs are associated with learning about new technologies, ideas, competitive landscapes, and even determining the costs of acquiring competency in a given arena (Tate et al. 2011).Bargaining costs accumulate primarily due to the time and effort involved in bargaining and developing an agreement (Tate et al. 2011). Time spent on bargaining activity reduces the time available for primary functions (Pearce 1997).

Institutional Theory

The proponents of the institutional theory were Di Maggio and Powell in 1983.Institutional theory posits that external pressures strongly affect organizational decision making for instance GSCM practices as firms operate in a way that meets social and legal regulations (Tate et al. 2011). Pressures from stakeholder's such as governments, customers, competitors, communities and environmental interest groups, and industry associations are likely to dictate environmentally responsible behaviour, (Delmas & Toffel, 2004). The pressures for environmental sustainability vary along the supply chain (Hall 2000). Large, high-profile firms are under considerable pressure from external stakeholders to improve their environmental performance, whereas smaller suppliers or suppliers far upstream from the final consumer have fewer apparent incentives (Hall 2000; Lee et al. 2014).Greening a supply chain is a potentially effective mechanism to improve a firm's record on corporate social responsibility, to abate reputational risks, to reduce wastes and to increase the flexibility to respond to new environmental regulations (Simpson et al. 2007).

Conceptual Framework

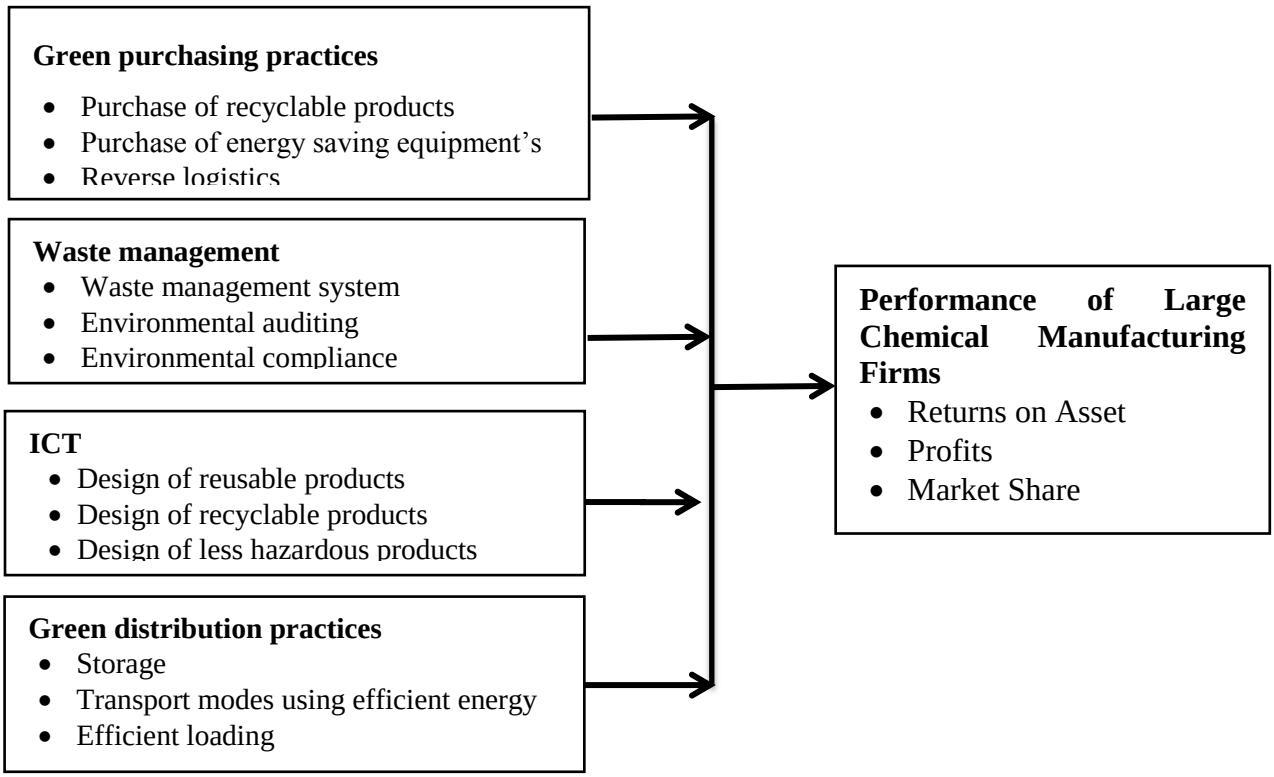

Figure 1: Conceptual Framework

Green purchasing practices

According to Hsu and Hu (2012), Green supply Chain Management (GSCM) is defined as an approach to improve performance of the process and products according to the requirements of the environmental regulations. Wang and Lin (2011) defined GSCM as the improvement in environmental impact which is achieved by the management of raw materials, parts/components and processes from suppliers to manufacturers to customers. Xie and Breen, (2012) described GSCM as integrating environment thinking into Supply Chain Management, including product design, material sourcing and selection, manufacturing process, delivery of the final product to the consumers and end-of life management of the product after its useful life. GSCM has increased an environmentally conscious mindset to supply chain management and has been introduced into many final manufacturing processes (Colicchia et al, 2011).

Waste management Practices

Waste production and management is a strategic issue for all countries, because it relates to social, economic and environmental aspects. Being able to combine socially responsible behaviour, economic convenience and environmental sustainability would be desirable, but there are different players involved (citizens, businesses, public entities) and their needs can conflict (Klassen, 2010). Companies are becoming increasingly concerned about the environment. This concern is best illustrated in their adoption of environmental management systems. Zhu, Cordeiro, & Sarkis, (2012) suggest two forms of environmental management: internal (green production) and external (green supply chain management). While green production aims to achieve greenness and sustainability at the manufacturing stage, green supply chain management pursues the same goal by making strategic decisions by cooperating with external partners (Gotschol, Giovanni, & Vinzi, 2014). These two aspects of environmental management, though having different focuses, aim to reduce the negative environmental impacts of firms' activities.

ICT

The use of Green ICT reduces the cost of every product from raw material to distribution because the product can be reused or re-manufactured and disposal of the product can benefit some other process because components can be used in manufacturing of different products. According to Gu in 2013, green ICT practices can be looked at not only from a technical perspective but more importantly from an economic point of view, and not only in terms of short-term return on investments (ROIs) but also on long-term ones, (Gu, 2013). Eco-design also is a GSCM practice which needs that manufacturers design products that minimize consumption of materials and energy, that facilitate the reuse, recycle, and recovery of component materials and parts, and that avoid or reduce the use of hazardous products within the manufacturing process. Eco-design and Packaging will include packaging design for reduced environmental impact, packaging re-cycle or re-use and use of biodegradable materials (Green *et al*, 2012).

Green distribution practices

Distribution refers to the movement of a product from the production stage to the customer in the supply chain. Many countries have put in place programs with a purpose of reducing the quantity of packaging that enter the misuse flow so as to tackle the environmental effect of packaging,

(Hasan, 2013). As a result, governments have adopted environmental policies and regulation frameworks in their administration. As a result, more eco-friendly activities are being embraced by various industries such as the integration of design for the environment into their products (Murphy, 2012) and the use of sustainable distribution practices. Manufacturers therefore must appreciate the requirements and ensure that their products conform to the regulations. Green distribution consists of green packaging. Packaging features such as size and materials used, influence distribution because of their effect on the transportation features of the product. According to Ninlawan *et al*. (2010) green packaging involves downsized packaging and use of green packaging materials. They also point out the need to cooperate with vendors to standardize packaging, encourage and adopt returnable packaging methods, promote recycling and reuse of packaging materials. This study incorporated both reverse logistics aspects and distributional aspects in green distribution. The green distribution aspect should only involve getting goods to the consumers.

Research Methodology

This study adopted a descriptive survey design. The study targeted 63 chemical manufacturing firms. KAM (2016) report indicates that there were 63 chemical manufacturing firms as at 2016. The large scale chemical manufacturing firms were identified in this study because they are likely to exhibit elaborate GSCM strategy in their chain supply compared to their small or medium sized counterparts. The study adopted a census approach since the population was small. The supply chain managers or the procurement managers were requested to respond to the questionnaire. The study used both primary and secondary data. The data collected was analyzed using both descriptive and inferential statistics. Descriptive statistics describes data by percentages, frequencies, means, and standard deviations while inferential statistics was carried out using correlation and regression analysis. The model of the study was presented in a linear equation form. The overall equation was:

$$\mathbf{Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + e}$$

Where: Y = Performance of Large chemical Manufacturing Firms, X_1 = Green Purchasing Practices, X_2= Waste Management Practices, X_3 = ICT, X_4 = Green distribution Practices, e = Error term and α= regression constant

Results

A total of 52 filled questionnaires were returned out of the 63 that were distributed, yielding a 82% percent response rate. However, 11 questionnaires were completely not responded to by the targeted respondents (representing 18%).

Demographics Characteristics of the respondents

The respondent's years of experience and their age was established. The experience in the manufacturing sector was established to link their industry know-how to the concept under study. The respondent's age was established so as to establish the distribution of top management positions according to age.

Table 1 Demographic Characteristics

Demographic Characteristic	Category	Percentage
Age Bracket	Between 18-25 Years	5%
	Between 26-35 Years	16%
	Between 36-45 Years	31%
	Above 45 Years	48%
Duration in the Company	Less than 4 Years	21%
	4 to 8 Years	42%
	More than 8 Years	37%

Green Purchasing Practices

The study sought to determine the effect of green purchasing practices on performance of large chemical manufacturing firms in Nairobi County Kenya. The study asked the respondents to rate the extent to which they agree or disagree with the statements on green purchasing practices based on five point Likert scale where; 1 = strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = strongly agree. The findings of the study are as indicated in Table 2.

The results of the study indicated that 39.7% of the respondents strongly agreed with the statement that the purchases recyclable products, those who indicated agree were also 39.7%, those who neither agreed nor disagreed were 13.8% while 6.9% of them disagreed. Moreover, majority 81% of the respondents strongly agreed that the company purchases energy saving equipment's while only 19% of them neither agreed nor disagreed. Additionally, results of the study revealed that majority 86.2% of the respondents indicated that they strongly agree with the statement that the company allows for reverse logistics by accepting products back from consumers while only 13.8% of them indicated agree. Further, the findings of the study revealed that 15.5% of the respondents strongly agreed with the statement that company purchases products that have been stamped by reliable eco-labels, 27.6% of them indicated agree, those who neither agreed nor disagreed were 39.7% while those who indicated disagree were 6.9% and 10.3% of them indicated strongly disagree. Finally, results of the study showed that majority 86.2% of the respondents indicated that they strongly agree with the statement that company corporate with suppliers to ensure standard packaging while only 13.8% of them indicated agree.

The implication of the findings of the study is that the respondents agreed that green purchasing practices affects the performance of large chemical manufacturing firms in Nairobi County Kenya as indicated by a mean of 4.36. The responses given by the respondents were less varied as shown by a standard deviation of 0.71. The results concur with the findings of study by Kyalo (2015) which showed that manufacturers utilize lean production, use biodegradable materials and total quality management in their operations.

Table 2 Green Purchasing Practices

Statement	1	2	3	4	5	Mean	Std Dev
The company purchases recyclable products	0.0%	6.9%	13.8%	39.7%	39.7%	4.12	0.90
The company purchases energy saving equipment's	0.0%	0.0%	19.0%	0.0%	81.0%	4.62	0.79
The company allows for reverse logistics by accepting products back from consumers	0.0%	0.0%	0.0%	13.8%	86.2%	4.86	0.35
The company purchases products that have been stamped by reliable eco-labels	10.3%	6.9%	39.7%	27.6%	15.5%	3.31	1.14
The company cooperate with suppliers to ensure standard packaging	0.0%	0.0%	0.0%	13.8%	86.2%	4.86	0.35
Average						**4.36**	**0.71**

Waste Management Practices

The study sought to establish the effect of waste management on the performance of large chemical manufacturing firms in Nairobi County Kenya. The study asked the respondents to rate the extent to which they agree or disagree with the statements on waste management practices based on five point Likert scale where; 1 = strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = strongly agree. The findings of the study are as indicated in Table 3. The results of the study indicated that 37.9% of the respondents strongly agreed with the statement that the company has a well-functioning waste management system, those who indicated agree were also 27.6%, those who neither agreed nor disagreed were 13.8% while 12.1% of them disagreed and only 8.6% of them strongly disagreed. Moreover, majority 48.3% of the respondents strongly agreed that the company has well-established environmental compliance policies, 20.7% of them neither agreed nor disagreed, 22.4% of them indicated disagree and only 8.6% strongly disagreed.

Additionally, results of the study revealed that majority 62.1% of the respondents indicated that they strongly agree with the statement that the company conducts environmental auditing, 13.8% of them indicated agree, those who neither agreed nor disagreed were 6.9% while 12.1% of them disagreed and 5.2% indicated strongly disagree. Further, the findings of the study revealed that 31% of the respondents strongly agreed with the statement that company has a well-functioning waste recycling system, 13.8% of them indicated agree, those who neither agreed nor disagreed were 27.6% while those who indicated disagree were 17.2% and 10.3% of them indicated strongly disagree. Finally, results of the study showed that 13.8% of the respondents indicated that they strongly agree with the statement that company has a well-functioning carbon footprint

to monitor emission of gases into the environment, majority 44.8% of them indicated agree, those who neither agreed nor disagreed was 27.6% while only 3.4% of them indicated disagree and 10.3% of the respondents strongly disagreed.

The implication of the findings of the study is that the respondents agreed that waste management practices affects the performance of large chemical manufacturing firms in Nairobi County Kenya as indicated by a mean of 3.67. The responses given by the respondents were varied as shown by a standard deviation of 1.31. The results agree with the findings of a study by Bartolacci, Zigiotti, and Diem, (2015) which indicated a statistically significant positive correlation between the level of DW and firm performance.

Table 3 Waste Management Practices

Statement	1	2	3	4	5	Mean	Std Dev
The company has a well-functioning waste management system	8.6%	12.1%	13.8%	27.6%	37.9%	3.74	1.32
The company has a well-established environmental compliance policies	8.6%	22.4%	20.7%	0.0%	48.3%	3.57	1.49
The company conducts environmental auditing	5.2%	12.1%	6.9%	13.8%	62.1%	4.16	1.28
The company has a well-functioning waste recycling system	10.3%	17.2%	27.6%	13.8%	31.0%	3.38	1.36
Companies has a well-functioning carbon footprint to monitor emission of gases into the environment	10.3%	3.4%	27.6%	44.8%	13.8%	3.48	1.11
Average						**3.67**	**1.31**

ICT

The study also sought to examine the effect of ICT on performance of large chemical manufacturing firms in Nairobi County Kenya. The study asked the respondents to indicate the extent to which they agree or disagree with the statements on ICT based on five point Likert scale where; 1 = strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = strongly agree. The findings of the study are as indicated in Table 4. The findings of the study revealed that that 32.6% of the respondents strongly agreed with the statement that the company has a technology support for design of reusable products, those who indicated agree were also 32.6%, those who neither agreed nor disagreed were 12.1% while 8.6% of them disagreed and only 13.6% of them strongly disagreed. Moreover, majority 46.6% of the respondents strongly agreed that the company has well-established environmental compliance policies, 13.8% of the respondents

indicated agree, 25.9% of them neither agreed nor disagreed, 3.4% of them indicated disagree and 10.3% strongly disagreed. Also, the results of the study revealed that majority 56.9% of the respondents indicated that they strongly agree with the statement that the company has a technology support for design of less hazardous products, 25.9% of them indicated agree, those who neither agreed nor disagreed were 6.9% while 6.9% of them disagreed and only 3.4% indicated strongly disagree.

Further, the findings of the study revealed that 12.1% of the respondents strongly agreed with the statement that employees in the company have technological know-how in managing changes in design procedures, 56.9% of them indicated agree, those who neither agreed nor disagreed were 6.9% while those who indicated disagree were 13.8% and 10.3% of them indicated strongly disagree. Finally, results of the study showed that 36.2% of the respondents indicated that they strongly agree with the statement that company has a technology support for design of products that use less energy, majority 25.9% of them indicated agree, those who neither agreed nor disagreed was 10.3% while only 20.7% of them indicated disagree and 6.9% of the respondents strongly disagreed.

The implication of the findings of the study is that the respondents agreed that ICT affects the performance of large chemical manufacturing firms in Nairobi County Kenya as indicated by a mean of 3.76. The responses given by the respondents were varied as shown by a standard deviation of 1.27. The results agree with the findings of a study by Abbas 2014) which showed that Green ICT practices have a positive influence on SCM and they play a major role in influencing the organization on their economic growth and preserving the environment.

Table 4: ICT

Statement	1	2	3	4	5	Mean	Std Dev
The company has a technology support for design of reusable products	13.8%	8.6%	12.1%	32.8%	32.8%	3.62	1.39
The company has a technology support for design of recyclable products	10.3%	3.4%	25.9%	13.8%	46.6%	3.83	1.34
The company has a technology support for design of less hazardous products	3.4%	6.9%	6.9%	25.9%	56.9%	4.26	1.09
Employees in the company have technological know-how in managing changes in design procedures	10.3%	13.8%	6.9%	56.9%	12.1%	3.47	1.19
The company has a technology support for design of products that use less energy	6.9%	20.7%	10.3%	25.9%	36.2%	3.64	1.35
Average						**3.76**	**1.27**

Green Distribution Practices

The study sought to find out the effect of green distribution practices on performance of large chemical manufacturing firms in Nairobi County Kenya. The study asked the respondents to indicate the extent to which they agree or disagree with the statements on green distribution practices based on five point Likert scale where; 1 = strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = strongly agree. The findings of the study are as indicated in Table 5. The findings of the study revealed that that 20.7% of the respondents strongly agreed with the statement that the company has systems to ensure well usage of the available storage space, those who indicated agree were also 50%, those who neither agreed nor disagreed were 8.6% while 13.8% of them disagreed and only 6.9% of them strongly disagreed. Moreover, majority 81% of the respondents strongly agreed that the transport modes of the company are designed to use energy efficiently while 19% of the respondents neither agreed nor disagreed. Also, the results of the study revealed that majority 79.3% of the respondents indicated that they strongly agree with the statement that the company uses efficient loading mechanisms to save space while 20.7% of them agreed. Further, the findings of the study revealed that 81% of the respondents strongly agreed with the statement that Distribution of products is done using returnable packaging materials, 19% of them neither agreed nor disagreed. Finally, results of the study showed that 79.3% of the respondents indicated that they strongly agree with the statement that there is efficient utilization of the warehousing space while only 20.7% of them indicated agree.

The implication of the findings of the study is that the respondents agreed that Green distribution practices affect the performance of large chemical manufacturing firms in Nairobi County Kenya as indicated by a mean of 4.49. The responses given by the respondents were less varied as shown by a standard deviation of 0.71. The results agree with the findings of a study by Muma *et al.* (2014) which revealed that Green Distribution has positive effect on environmental performance.

Table 5 Green distribution practices

Statement	1	2	3	4	5	Mean	Std Dev
The company has systems to ensure well usage of the available storage space	6.9%	13.8%	8.6%	50.0%	20.7%	3.64	1.17
The transport modes of the company are designed to use energy efficiently	0.0%	0.0%	19.0%	0.0%	81.0%	4.62	0.79
The company uses efficient loading mechanisms to save space	0.0%	0.0%	0.0%	20.7%	79.3%	4.79	0.41
Distribution of products is done using returnable packaging materials	0.0%	0.0%	19.0%	0.0%	81.0%	4.62	0.79
There is efficient utilization of the warehousing space	0.0%	0.0%	0.0%	20.7%	79.3%	4.79	0.41
Average						**4.49**	**0.71**

Performance of Large Chemical Manufacturing Firms

The market share in terms of the percentage of the market covered for the large chemical manufacturing firms was established and indicated in a trend analysis from the year 2012 to the year 2016. The results indicate an unsteady increase in the market share from 2012 to 2016. The market share increased from 9% in 2012 to 11% in 2013. Results indicate a decrease in the market share to 10% in 2014 but it steadily increased to 12% and 14% in 2015 and 2016 respectively.

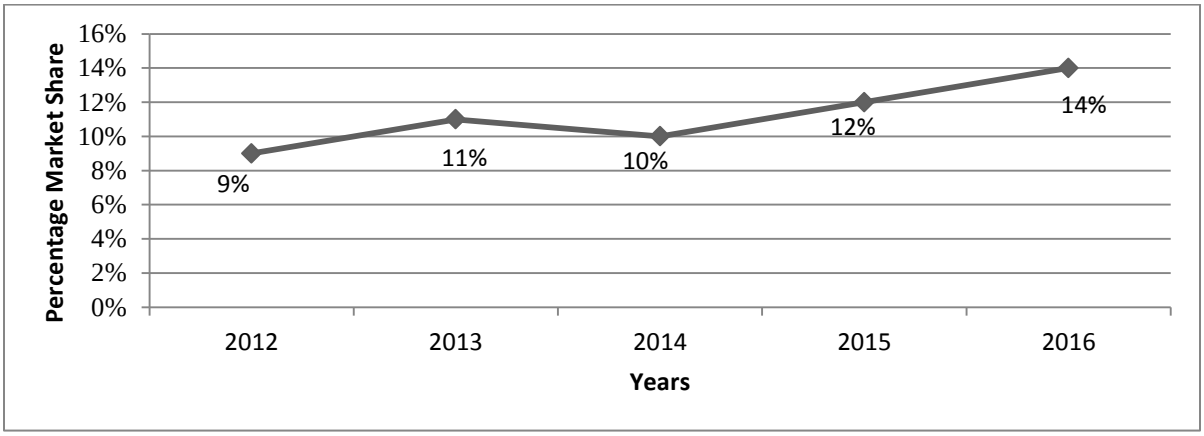

Figure 2: Trends for Market Share

The returns on investment for the large chemical manufacturing firms was established and indicated in a trend analysis from the year 2012 to the year 2016. Results indicate a steady increase in the returns on investment from 2012 to 2015. Returns on investment increased from 13.23 billion shillings in 2012 to 19.12 billion shillings in 2015. Results indicate a slight decrease in returns on investment in 2016 to 18.23 billion shillings.

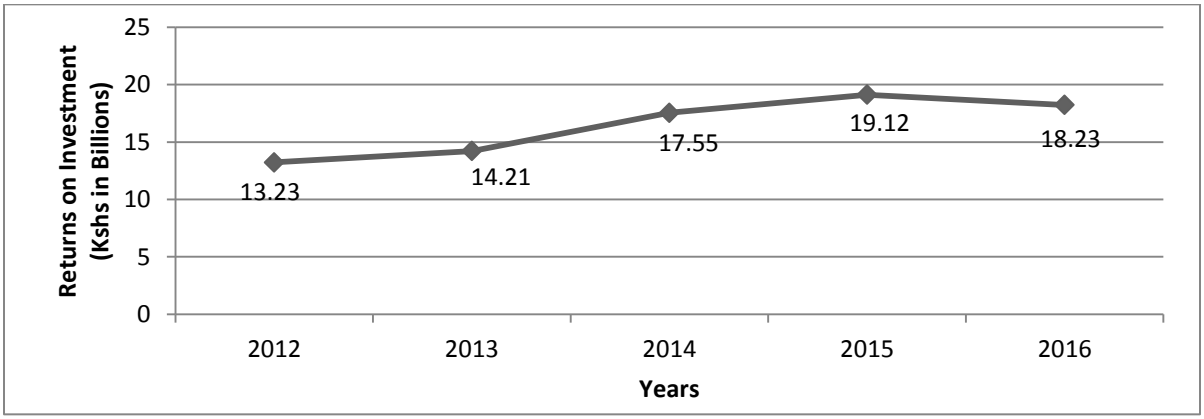

Figure 3: Trends for Returns on Investment

The profits before tax in billion shillings for the large chemical manufacturing firms was established and indicated in a trend analysis from the year 2012 to the year 2016. The results indicate a steady trend from the year 2012 to 2016. Profits before tax steadily increased from

14.23 billion shillings to 20.11 billion shillings in 2015 but it slightly decreased in 2016 to 20.03 billion shillings.

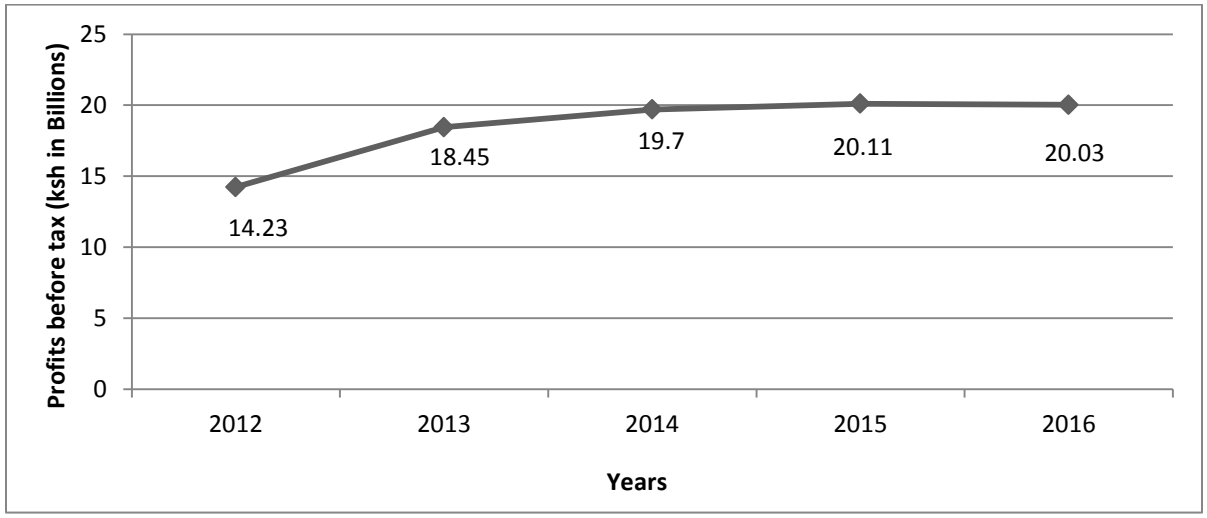

Figure 4: Trends for Profits before Tax

The returns on assets in billion shillings for the large chemical manufacturing firms was established and indicated in a trend analysis from the year 2012 to the year 2016. The results indicate an unsteady trend from the year 2012 to 2016. Return on assets steadily increased from 0.03 billion shillings in 2012 to 0.34 billion shillings in 2014 but it significantly dropped in 2015 to 0.09 billion shillings and subsequently improved in 2016 to 0.11 billion shillings.

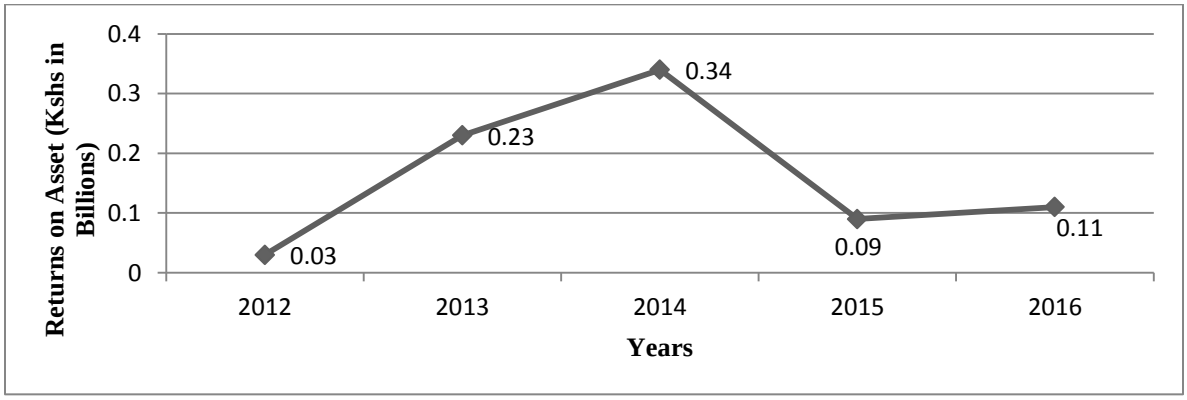

Figure 5: Trends for Returns on Asset

Correlation analysis

The summary of the correlation analysis results shows that there was a strong positive and significant association between green purchasing practices and the performance of large chemical manufacturing firms in Nairobi County Kenya as shown by a Pearson coefficient of 0.577 and significance level of 0.000. This shows that an increase in green purchasing practices such as practicing green manufacturing system, purchasing energy saving equipment's by the company, purchasing products that have been stamped by reliable eco-labels, cooperating with suppliers to ensure standard packaging and allowing for reverse logistics by accepting products

back from consumers leads to a positive and significant effect on the performance of large chemical manufacturing firms in Nairobi County Kenya. The study findings are consistent with the findings of a study by Blomea, Hollosby and Paulrajac (2013) which indicated that green supplier development has a direct impact on supply chain performance.

The findings of the study also revealed that waste management practices had a positive and significant relationship with the performance of large chemical manufacturing firms in Nairobi County Kenya as shown by a Pearson coefficient of 0.324 and significance level of 0.013. This shows that an increase in waste management practices such as a well-functioning waste management system, well-established environmental compliance policies, conducting environmental auditing, well-functioning waste recycling system and well-functioning carbon footprint to monitor emission of gases into the environment leads to a positive and significant effect on the performance of large chemical manufacturing firms in Nairobi County Kenya. The study results agree with the findings of a study by Kimeu, (2015) which revealed that, the model administered had a moderate explanatory power of the effect of waste management on hotel operational performance.

Moreover, the findings of the study also revealed that ICT had a positive and significant association with the performance of large chemical manufacturing firms in Nairobi County Kenya as shown by a Pearson coefficient of 0.461 and significance level of 0.000. This shows that an increase in ICT practices such as availability of technological support for design of reusable products, having technology support for design of recyclable products as well as design of products that use less energy, technology support for design of less hazardous products and employees' technological know-how in managing changes in design procedures leads to a positive and significant effect on the performance of large chemical manufacturing firms in Nairobi County Kenya. The study results agree with the findings of a study by Swalehe and Chepkulei (2016) which revealed that green eco-design practices adoption was at the planning or implementation stage as most of the manufacturing firms had considered adoption.

Finally, the findings of the study showed that green distribution practices had a strong positive and significant effect the performance of large chemical manufacturing firms in Nairobi County Kenya as indicated by a Pearson coefficient of 0.619 and significance level of 0.000. This shows that an increase in the presence of systems to ensure well usage of the available storage space, designing transport modes of the company to use energy efficiently, using efficient loading mechanisms to save space, distribution of products using returnable packaging materials and efficient utilization of the warehousing space green distribution practices such as leads to a positive and significant effect on the performance of large chemical manufacturing firms in Nairobi County Kenya. The results of the study agree with the findings of a study by Kankanit (2015) which revealed that green distribution have significant effect on competitive performance. The results further showed that green manufacturing and green distribution have positive and significant effect to economic and operational performance.

Table 6: Correlation analysis

Correlations		Green purchasing	Waste management	ICT	Green distribution	Performance
Green purchasing	Pearson Correlation	1				
	Sig. (2-tailed)					
Waste management	Pearson Correlation	0.049	1			
	Sig. (2-tailed)	0.715				
ICT	Pearson Correlation	0.19	-0.091	1		
	Sig. (2-tailed)	0.153	0.495			
Green distribution	Pearson Correlation	.508**	0.101	.496**	1	
	Sig. (2-tailed)	0.000	0.449	0.000		
Performance	Pearson Correlation	.577**	.324*	.461**	.619**	1
	Sig. (2-tailed)	0.000	0.013	0.000	0.000	
	N	52	52	52	52	52

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

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

Regression Model Estimation

To establish the effect of green supply chain practices on performance of large chemical manufacturing firms in Nairobi County Kenya, the study used a multivariate ordinary least square regression model. The results for model summary are as shown in Table 7. The study findings showed that green purchasing practices, waste management practices, ICT and green distribution practices all account for 60.8% of the variation in the performance of large chemical manufacturing firms in Kenya. This is shown by a by an R-square value of 0.608. Regression results also show that R was 0.780 that shows that the correlation between the independent variables and the dependent variable was positive.

The results of the study revealed that the overall regression model linking green purchasing practices, waste management practices, ICT, green distribution practices and the performance of large chemical manufacturing firms in Kenya was significant as indicated by F statistic (4,47) as indicated by (0.000) significance level which was less than 0.05 at 5% level of significance. F calculated is 20.572 while f critical was 2.569. F calculated was greater than the F critical (20.572>2.546), this showed that the overall model was statistically significant at 5% significance level. The results of the study are as shown in table 7.

Table 7: Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.780	0.608	0.579	0.2711

	Sum of Squares	df	Mean Square	F	Sig.
Regression	6.048	4	1.512	20.572	.000
Residual	3.895	47	0.073		
Total	9.943	51			

Dependent Variable: Performance
Predictors: (Constant) Predictors: (Constant), Green distribution, Waste management, Green purchasing, ICT

The study also used regression coefficients to establish the effect of each variable that is green purchasing practices, waste management practices, ICT, green distribution practices and the performance of large chemical manufacturing firms in Kenya as indicated in table 8.

The summary of the results shown in Table 8 revealed that green purchasing practices had a positive and significant effect on the performance of large chemical manufacturing firms in Kenya (β=0.385, Sig=0.000). This implies that an increase in the include practicing green manufacturing system, purchasing energy saving equipment's by the company, purchasing products that have been stamped by reliable eco-labels, cooperating with suppliers to ensure standard packaging and allowing for reverse logistics by accepting products back from consumers leads to 0.385 unit effect in the performance of large chemical manufacturing firms in Kenya. The results are consistent with the findings of a study by Pembere (2016) which revealed that the adoption of green procurement practices improves the supply chain performance.

Moreover, the findings of the study also showed that waste management practices had a positive and significant influence on the performance of large chemical manufacturing firms in Kenya (β = 0.158, Sig = 0.001). This implies that an increase in well-functioning waste management system, well-established environmental compliance policies, conducting environmental auditing, well-functioning waste recycling system and well-functioning carbon footprint to monitor emission of gases into the environment leads to 0.158 unit effect on the performance of large chemical manufacturing firms in Kenya. The findings agree with the findings of a study by Sroufe (2013) which indicated a positive relationship between an EMS, the environmental practices a firm engages and operations performance measures.

Further, the findings of the study also revealed that ICT had a positive and significant effect on the performance of large chemical manufacturing firms in Kenya, (β = 0.161, Sig = 0.005). This implies that an increase in the availability of technological support for design of reusable products, having technology support for design of recyclable products as well as design of products that use less energy, technology support for design of less hazardous products and employees' technological know-how in managing changes in design procedures leads to 0.161 unit effect on the performance of large chemical manufacturing firms in Kenya. The findings

agree with the findings of a study by Eltayeb, Zailani, and Ramayah (2011) which indicated that GSCM practices had influence on organizational performance outcome in which eco-design had a direct link to the firm's internal performance.

Finally, the findings of the study also showed that green distribution practices had a positive and significant effect on the performance of large chemical manufacturing firms in Kenya ($\beta = 0.273$, Sig = 0.034). This implies that an increase in the presence of systems to ensure well usage of the available storage space, designing transport modes of the company to use energy efficiently, using efficient loading mechanisms to save space, distribution of products using returnable packaging materials and efficient utilization of the warehousing space leads to 0.273 unit effect on the performance of large chemical manufacturing firms in Kenya. The findings agree with the findings of a study by Mwaura *et al* (2016) which indicated that technology has greatly influenced distribution techniques with more firms using the internet as a distribution channel.

Table 8: Regression coefficients

Predictor	Beta	Std. Error	t	Sig.
(Constant)	0.260	0.480	0.541	0.591
Green purchasing	0.385	0.102	3.781	0.000
Waste management	0.158	0.045	3.506	0.001
ICT	0.161	0.055	2.916	0.005
Green distribution	0.273	0.125	2.179	0.034
Dependent Variable: Performance				

The final optimal regression model of the study is as presented:

Performance of large Chemical manufacturing firms in Kenya = 0.260 + 0.385 Green purchasing + 0.158 Waste management + 0.161 ICT + 0.273 Green distribution

Conclusions

The study concluded that green purchasing positively and significantly affect the performance of large chemical manufacturing firms in Kenya. An increase in the practice of green manufacturing system, purchasing energy saving equipment's by the company, purchasing products that have been stamped by reliable eco-labels, cooperating with suppliers to ensure standard packaging and allowing for reverse logistics by accepting products back from consumers positively influences the performance of large chemical manufacturing in Kenya. The study also established that waste management practices positively and significantly influence the performance of large chemical manufacturing firms in Kenya. Having a well-functioning waste management system, well-established environmental compliance policies, conducting environmental auditing, a well-functioning waste recycling system and a well-functioning carbon footprint to monitor emission of gases into the environment positively influences the performance of large chemical manufacturing in Kenya.

The study further concluded that ICT positively and significantly affect the performance of large chemical manufacturing firms in Kenya. Having more technological support for design of

reusable products, having recyclable products, products that use less energy, less hazardous products and employees' technological know-how in managing changes in design procedures positively influences the performance of large chemical manufacturing in Kenya. Lastly, the study concluded that green distribution practices positively and significantly affect the performance of large chemical manufacturing firms in Kenya. Presence of systems to ensure well usage of the available storage space, designing transport modes of the company to use energy efficiently, using efficient loading mechanisms to save space, distribution of products using returnable packaging materials and efficient utilization of the warehousing space positively and significantly influences the performance of large chemical manufacturing in Kenya.

Recommendations of the study

The study recommends large chemical manufacturing firms in Kenya to ensure they have green manufacturing system. There is also need for large chemical manufacturing firms to purchase energy saving equipment's. There is also need for firms to purchase products that have been stamped by reliable eco-labels. The study also recommends large chemical manufacturing firms to cooperate with suppliers to ensure standard packaging. Lastly, the study recommends manufacturing firms to allow for reverse logistics by accepting products back from consumers.

The study recommends large chemical manufacturing firms in Kenya to ensure they have a well-functioning waste management system. There is also need for manufacturing firms to have well-established environmental compliance policies. There is also need for manufacturing firms to conduct environmental auditing. The study recommends large chemical manufacturing firms to ensure they have a well-functioning waste recycling system. The study further recommends large chemical manufacturing firms in Kenya to ensure that they have a well-functioning carbon footprint to monitor emission of gases into the environment.

The study recommends large chemical manufacturing firms in Kenya to ensure they have technological support for design of reusable products. There is also need to have technological support for the design of recyclable products. Moreover, there is need for large chemical manufacturing firms to design products that use less energy. The study further recommends firms to provide technological support for design of less hazardous products. Lastly, the study recommends large chemical manufacturing firms to ensure their employees' have technological know-how for managing changes in design procedures. The study recommends large chemical manufacturing firms in Kenya to put in place systems to ensure well usage of the available storage space. There is also need to design transport modes for the company to use energy efficiently. Moreover, the study recommends large chemical manufacturing firms in Kenya to use more efficient loading mechanisms to save space. Further there is need for the manufacturing firms to conduct the distribution of their products using returnable packaging materials. Lastly, the study recommends large chemical manufacturing firms to efficiently utilize their warehousing space.

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