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INFLUENCE GREEN MANUFACTURING TECHNOLOGIES ON THE PERFORMANCE OF OIL MARKETING COMPANIES IN KENYA

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ABSTRACT

Awareness and advocacy against the adverse effects of human activities on the environment and the need to mitigate the threats for a greener and safer world have birthed and consolidated many stakeholders. The recognition of a clean, healthy and sustainable environment as a universal human right by the United Nations General Assembly and the need to translate the initiatives into tangible progress to address the global climate crisis defined by devastating flooding, heatwaves and wildfires has escalated the awareness and the seriousness of the situation and urgency for action. Industries which constitute the highest percentage of environmental degradation more so in the oil and petroleum sector, are increasingly being put to task with their consumers as well as law enforcers and regulators to adopt and mainstream environmental conservation initiatives and green manufacturing practices using green raw materials. This study, therefore, sought to establish the influence of the use of green manufacturing technologies on the performance of oil marketing companies in Kenya. The study conducted involved a descriptive research design methodology with a closed-ended questionnaire administered to a census of key oil marketing companies. Only senior and middle management workers of 62 Oil marketing businesses who have strategic and tactical responsibilities were eligible to participate. The managers were drawn from the departments of; procurement, production, finance, quality control, and marketing departments. A census sampling approach was used to get 310 managers from oil marketing businesses who are well-equipped to give the necessary information. The collected data was quantitatively analyzed using SPPS Version 25.0 computer software application. Correlation analysis was applied to determine the relationship between the variables. The study concluded that most machines or tools which consume less energy, water and fuel are used and most of them are impact and life cycle assessment tools for manufacturing. The study recommends that there should be an improvement in; the use of machines or tools which consume less energy, water and fuel, and how they impact and life cycle assessment tools for manufacturing.

Keywords: *Green Manufacturing Technologies, Performance*

INTRODUCTION

In the 21st century, green supply chain management (GSCM) has become an increasingly challenging problem for enterprises. Providers and consumers in the

commercial and public sectors, as well as in states and non-state and non-governmental organizations, are placing an increasing emphasis on environmental effects throughout the manufacturing cycle of goods and solutions (Sharma et al., 2020). New management techniques and policies are being developed and implemented to include sustainable development practices into the company's business culture as a way to shift from reactive to proactive initiatives. Ecologically friendly supply chain management has lately come to the forefront of global business debate. As part of the agency's ongoing efforts to reduce costs while also improving environmental performance, the United States Environmental Protection Agency has issued a guidebook titled "The Lean and Green Supply Chain" (EPA). This handbook offers a step-by-step strategy for establishing a green supply chain that may be found in its title. The model that has been offered is the result of a program that involves cooperation across many sectors of US business, including trade groups, academic institutions, and government agencies. Green practices may be used by a corporation throughout the production process in various different ways to minimize the amount of energy and resource usage (Miroshnychenko, 2017).

Since a long time ago, several nations in Europe and Scandinavia, including some of those in Scandinavia, have implemented green public supply chain practices. For example, Sweden has been a major advocate of including environmental considerations into the public procurement process for a very long time (Nikbakhsh, 2009). Although participation in green public procurement (also known as GPP) is entirely optional, the legislative framework does make it possible for considerations other than price to be included into the procurement process. The Swedish Ministry of the Environment is in charge of sustainable procurement, and the Swedish Environmental Management Council (MSR) is in charge of the implementation of the Good Purchasing Practices (GPP).

The industrial sector in China has not given enough consideration to the preservation of the natural environment. As a direct consequence of this, the rate of resource utilization is poor, the level of pollution is alarming, and the consumption of resources is at an unsustainable level. The philosophy known as "Reduce, Reuse, and Recycle" has therefore been implemented by the government as a result. In addition, the government is pushing businesses to diversify into adjacent sectors such as sugar, paper, alcohol, cement, and ethanol, as well as to use the waste products of other industries as raw materials or for the creation of electricity. By employing trash from the upstream manufacturing process as raw materials in the downstream production of sugar, for instance, Guitang Group, a Chinese sugar factory, has been able to enhance their financial performance and minimize the amount of waste they produce (Zhu et al., 2018). In South Africa, GSCM principles are now being used in the transportation, car, and consumer products industries (Mafini & Muposhi, 2016).

The adoption of GSCM by businesses in Kenya may be attributed to a number of factors, including shifting client tastes, an improvement in society as a whole, and the need to comply with environmental standards. Customers have developed a heightened awareness of the significance of the protection of the environment. In addition to clients, there is a larger society that consists of workers and stakeholders, all of whom play a significant role in the development and implementation of GSCM. The Kenya Bureau of Standards (KEBS) is one of the quality and environmental regulations bodies in Kenya. KEBS is a national standards body with the overall mandate to promote quality standardization in industries and trade through the development of standards, conformity assessments through testing, calibration, and certification. Other quality and environmental regulations bodies in Kenya include the Environmental Protection Agency (EPA) and the National Environment Management Authority (NEMA). Its goal

is to create solutions based on standards, which will give customers both quality and trust in their purchases. An important environmental and bio safety regulatory body that is also represented on the National Bio-safety Committee is the National Environmental Management Authority (NEMA) (NBC). The Environmental Impact Assessment (EIA) and the Environmental Social Impact Assessment are the tools that are used for this purpose (ESIA).

Consumer concern about the environment, as well as compliance with federal, state, and non-governmental entities, have pushed businesses to explore methods to include GSCM techniques into their operations and product cycles to comply with federal environmental rules. Oil marketing companies were found to be major emitters of waste and consumers of natural resources in this study, therefore the researchers set out to see how much of a difference adopting a green supply chain made to the performance of those companies in Kenya. Sustainable practices may be used to design and/or re-architect the supply chain (SC) to integrate practices that minimize the environmental effect of a firm's operations not only from the beginning to finish of a supply chain but also starting to end of a product's life cycle (Srivastava, 2007). Examples of a green supply chain include using ecologically friendly inputs and transforming them into goods that can be improved upon or recycled within the present environment. Multi-step decision-making is required when managing a green supply chain. In the beginning, environmental expenses are identified, chances for cost savings and reduction in environmental effect are discovered, and benefits of the offered alternatives are calculated and implemented. Finally, the improvement solutions are implemented and monitored. Green supply chain management (GSCM) is a realistic solution for enterprises to decrease environmental impact while increasing operational performance, says Vanalle (2017). Organizations are currently benefiting from the deployment of Global Supply Chain Management (GSCM), which was first motivated by environmental degradation and depleting raw material supplies (Zhu et al., 2018).

To ensure the availability and price stability of petroleum products across Kenya, the Energy (Petroleum Pricing) Regulations, 2010 were enacted. The government now has control over the maximum prices for six petroleum products, determined through a formula established by the ERC. However, Oil Marketing Companies are currently debating the use of this formula. The Energy Regulatory Commission (ERC) has been succeeded by the Energy and Petroleum Regulatory Authority (EPRA), established under the Energy Act, 2019. EPRA's expanded mandate includes the regulation of upstream petroleum and coal, among other responsibilities.

Statement of the Problem

Climate change has posed an existential danger to mankind in recent years. It is a direct danger to the lives of humans as well as other species because of catastrophic weather patterns like floods or droughts as well as the spread of disease. Human economic activity's role in climate change has recently come under scrutiny. If nothing is done to slow it, climate change has the potential to end life as we know it on Earth by depleting life-sustaining resources like clean water and air, destroying ecosystems, and increasing the frequency and severity of natural calamities like disease epidemics (Fitzpatrick et al., 2017). A lack of strong green supply chain procedures in polluting areas like energy generation and distribution hinders academics in developing countries from assessing which methods work best to support high-performing businesses and advocating socially good adjustments. Adopting green practices offers several advantages, according to studies. First and foremost, it's a defense against the perils of global warming, such as the loss of natural resources. It may also be a source of economic advantage and provide

access to wealthy markets and special finance as well as a positive public image and permission from environmental regulatory agencies (Wanjohi, 2016).

Dissenting viewpoints exist on the advantages of being "green." However, research like Vanalle (2017), which found no significant connections between green supply chain management practices and firm performance, showed a favorable association between green supply chain management practices and organizational performance. Using a green supply chain, according to Srivastava (2007), is more expensive than it is worth. These expenses include, for example, the acquisition of new technology, a decline in productivity, and the hiring, education, and training of specialist personnel. The economic benefits of implementing a green supply chain have so far been unproven. But this does not imply that green initiatives have no special advantages in improving the performance of certain organizational tasks, such as procurement.

According to Nasiche (2014), the adoption of environmentally responsible purchasing practices in Kenya has been delayed, resulting in a lower diffusion rate. This may be due to a lack of knowledge on the impact of environmentally responsible public procurement procedures towards the overall profitability of the company. The results of the many research that were referenced were in disagreement with one another, as shown by the fact that studies conducted in various places came to varying conclusions. In light of these effects and worries, it was necessary to investigate the implementation of green supply chain management practices in the oil industry, taking into account the current state of affairs, empirical evidence from other regions of the world, and in an effort to find answers to the following questions: to what extent do green supply chain management practices influence the performance of oil marketing companies in Kenya?

Objectives

To establish the influence of use of green manufacturing technologies on performance of oil marketing companies in Kenya.

LITERATURE REVIEW

Green Supply Chain Theory

According to Srivastava (2007), the principal proponent of the Green Supply Chain Theory, supply chain management consists of green design, green buying, green manufacturing, green distribution, logistics marketing, and reverse logistics operations. GSCM processes include all phases of the product lifetime, including material procurement, manufacture, distribution, usage, and disposal. Srivastava (2007), essentially seeks to include a typology of green supply chain management activities, including green design, green buying, green manufacturing, green distribution, logistics marketing, and reverse logistics, into green supply chain theory. The theory explains how such practices help decision-making by providing the appropriate theoretical lenses for analyzing why and how certain GSCM activities are applied, as well as what practice-specific issues the theory addresses more effectively. The green supply chain model describes the GSCM processes analyzed in this research, including green raw materials, green production methods, green distribution, and green disposal.

Performance of Organization Theory

Additionally, this research was influenced by the theory developed by Thomas and Robert (2014) on the performance of an organization. The Theory claims that an organization's success is closely related to its adopted culture. As a result, successful firms have a corporate culture that emphasizes action, client proximity, environmental stewardship, entrepreneurship, productivity, value-based effort, simplicity, and efficient resource usage. Firms that provide an atmosphere where people may thrive are more likely to prosper, according to this maxim.

Empirical Review

To reduce the environmental impact of production, green manufacturing is a manufacturing method that uses renewable resources instead of fossil fuels (Hui, 2017). GSCM procedures, environmental-capable manufacturing forms, and several associated standards have become key approaches for enterprises to achieve profit and gain market share by reducing their natural influence and increasing productivity (Zhu et al., 2018). Natural conditions have had an influence on manufacturing processes. As a result of factors such as raw material impediment, common resource use, and concerns about the transfer of technical waste, corporations have been forced to audit their production processes (Dey, 2018). Developing a company's image may also be affected by inadequate environmental and supportability performance. In this regard, there has been a fundamental shift in the company, and in its supply chains: core organizations have been leading more efforts to address ecological difficulties, reducing natural threats, and extending their own and their business partners' eco-effectiveness (Zhu et al., 2018). It is more than a little consistency with present legislation that eco-productivity may be increased, considering diverse aspects. The reduction in raw material and energy consumption, as well as the reuse or reduction of waste in the manufacturing process, have all resulted in enormous financial gains. There was a generating process that had to be mindful of nature with the raw resources that were supplied (Tseng, 2014).

In the same way that environmentally friendly business practices are becoming more important across the supply chain, profitable business processes are now crucial for companies to use if they want to achieve both operational profitability and growth in the market. To the extent that this is possible, it endeavors to have a lesser impact on nature while still achieving much higher levels of output (Lean, 2016).

Nee and Wahid (2016) discovered that the performance of small and medium companies (SMEs) in Malaysia has a favorable and substantial association with the deployment of environmental management systems. The performance of Malaysia's small and medium-sized businesses was the primary focus of their investigation on the connection between environmental management systems and overall business success. The research, on the other hand, was carried out in Malaysia, and its major focus was on a wide range of elements, such as law and ISO systems, rather than the variables that were explored in this particular study. According to the findings of research that was carried out in the United States of America by Watson (2014) on the topic of the influence that implementing an environmental management system has on financial performance, it was discovered that implementing ISO 14001 standards is a common practice among competitive companies operating in modern business environments. The development of policies by an organization that foster social corporate ties may be of significant assistance to the enhancement of the environmental performance of a firm.

Sezen (2018) investigated the impact of green manufacturing and eco-innovation on companies' sustainability efforts in their study titled "Effects of green manufacturing and eco-innovation on sustainability performance. According to their findings, the applications of environmentally responsible manufacturing have a considerable beneficial influence on both performance and social performance. In addition to this, eco-process innovation has a major and beneficial influence on the overall sustainability of corporations. On the other hand, it was discovered that the invention of eco-friendly products did not have a substantial impact on any of the three categories of performance. According to the findings of the regression analysis, the three aspects of eco-process innovation have a substantial influence on the three dimensions of corporate sustainability performance. Their reasoning was that environmentally responsible production may result in decreased expenditures on raw materials, advances in

production efficiency, reduced expenditures on environmental and occupational safety, and a better company image. Everything mentioned above has the potential to boost performance.

Momanyi (2017) conducted research on the adoption of environmentally friendly manufacturing practices by food processing companies in Mombasa County, Kenya. The results of her study indicated that the adoption of environmentally friendly manufacturing practices had reached the implementation stage, as the majority of food processing companies had considered adopting these practices. According to the findings of the survey, the top three perceived advantages of implementing environmentally responsible manufacturing practices are a decrease in the amount of wastewater produced, a reduction in the number of environmental mishaps, and a reduction in the scrap rate.

METHODOLOGY

Due to the factual nature of the information sought, a descriptive research survey utilizing a quantitative data-gathering technique was judged acceptable (GSCM systems and processes). Only 62 enterprises having a market share of more than 2% and a tenure of more than five years, which is sufficient to indicate the existence of GSCM practices and a philosophy of GSCM, was taken into consideration.

Due to the nature of the research, only senior and middle management workers of Oil marketing businesses who have strategic and tactical responsibilities are eligible to participate. The managers were drawn from the departments of; procurement, production, finance, quality control, and marketing departments. Because of this, 310 managers from oil marketing businesses who are well-equipped to give the necessary information make up the research group. All 310 managers of oil marketing organizations were included in this research through the census approach.

While secondary data was also used to source for information on influence of GSCM practices in the performance of oil marketing companies in Kenya, primary data remained the main source of information for the study. To that end, the questionnaire was the main instrument, supported with secondary data.

The questionnaires was pre-tested on 2 oil marketing companies from the available 62 companies in the target population. The study employed quantitative data analysis method. Descriptive statistics such as mean and standard deviation was generated using the SPSS version 25.0 computer software. Frequencies and percentages are used to convey the essential properties of data. This study used the Pearson product-moment correlation coefficients to examine the possible connections among variables.

FINDINGS AND DISCUSSIONS

The total number of respondents was 310 managers. Out of these, 10 respondents were used in the pilot testing, while out of the remaining 300, 6 questionnaires were not returned.

Influence of green manufacturing technologies on Performance

The study aimed at establishing the influence of use of green manufacturing technologies on performance of oil marketing companies in Kenya.

Table 1: Influence of use of green manufacturing technologies on performance

	N	Min	Max	Mean	Std. Dev
We use machines or tools which consume less energy, water and fuel	294	3	5	4.13	.618
We have impact and life cycle assessment tools for manufacturing	294	2	5	3.54	.723
We carry risk assessment for energy and resource use	294	4	5	4.34	.473

We use environmentally friendly raw material	294	2	5	4.06	.860
We have an efficient process to reduce solid waste, air emissions and conserve energy and water	294	3	5	4.13	.495
We have an environmental management system	294	3	5	4.33	.594

Source: Field Data (2023)

The study found out that a (M=4.13, SD=0.618) of the respondents suggested that they use machines or tools which consume less energy, water and fuel, a(M=3.54, SD= 0.723) of the respondents suggested that they have impact and life cycle assessment tools for manufacturing, a (M=4.34, SD= 0.473) of the respondents suggested that they carry risk assessment for energy and resource use, a (M=4.06, SD= 0.860) of the respondents revealed that they use environmentally friendly raw material, a (M=4.13, SD= 0.495)of the respondents revealed that they have an efficient process to reduce solid waste, air emissions and conserve energy and water while a (M=4.33, SD= 0.594) of the respondents revealed that they have an environmental management system. The majority of the respondents suggested that they carry risk assessment for energy and resource use in the study carried out to establish the influence of green supply chain management practices on the performance of oil marketing companies in Kenya.

Performance within the Organization

The study determined the performance within the organization based on green supply chain management practices on the performance of oil marketing companies in Kenya.

Table 2: Performance within the Organization

	N	Min	Max	Mean	Std. Dev
7.1 Revenue	294	1	4	3.28	1.053
7.2 Sales volume	294	1	4	3.35	1.065
7.3 Market share	294	1	4	3.28	1.053
7.4 Brand reputation	294	1	5	3.74	1.175
7.5 Branch network	294	3	5	3.87	.616
7.6 Eco-effectiveness	294	3	5	4.00	.635
7.7 Customer satisfaction	294	3	5	3.74	.569
7.8 Employee stewardship	294	1	5	3.54	.951

Source: Field Data (2023)

A (M =3.28, SD= 1.053) of the respondents ascertained that revenue performance was influenced a (M=3.35, SD=1.065) of the respondents revealed that sales volume performance was affected, a (M=3.28, SD=1.053) of the respondents suggested that the market share performance was influenced, a (M= 3.74, SD=1.175) of the respondents revealed that brand reputation changed, a (M=3.87, SD=0.616) of the respondents suggested that the branch network increased, a (M=4.00, SD=0.635) of the respondents revealed that Eco-effectiveness increased, a (M=3.74, SD=0.569) of the respondents ascertained that customer satisfaction increased, a (M=3.54, SD= 0.951) of the respondents was influenced .Majority of the respondents revealed that the performance of Eco-effectiveness increased based on the study carried out to determine the influence of green disposal on green supply chain management practices on the performance of oil marketing companies in Kenya.

Correlations

A Pearson correlation analysis found that correlation is significant at the 0.01 level (2-tailed). There was a correlation of .541** between Green Manufacturing Technologies and performance, also it found out that the significant Sig. (2-tailed) was .000. where N was 294.

Table 3: Correlations between Green Manufacturing Technologies and Performance

		Green Manufacturing Technologies	Performance
Green Manufacturing Technologies	Pearson Correlation	1	.541**
	Sig. (2-tailed)		.000
	N	294	294
Performance	Pearson Correlation	.541**	1
	Sig. (2-tailed)	.000	
	N	294	294

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

Source: Field Data (2023)

Discussions

The results made it clear that businesses in this sector face environmental risks that vary a lot from one company to the next in how bad they are. These risks aren't made clear in a company's financial statements, and they aren't likely to be factored into the current market value. The finding was in line with Hui, (2017). GSCM procedures, environmentally friendly manufacturing forms, and several related standards have become important ways for businesses to make money and gain market share by reducing their environmental impact and making their workers more productive (Zhu et al., 2018).

In the same way that business practices that are good for the environment are becoming more important all along the supply chain, companies must now use profitable business processes if they want to make money and grow in the market. So far as this is possible, it tries to have less of an effect on nature while still getting a lot more work done (Lean, 2016). In this way, a green production process could be thought of as the best way to make something that either reduces or gets rid of chemicals that are bad for the environment.

The main focus of their study on the link between environmental management systems and overall business success was the performance of Malaysia's small and medium-sized businesses. On the other hand, the research was done in Malaysia, and it focused on a wide range of things like law and ISO systems rather than the variables that this study looked at. Watson (2014) did research in the United States to find out how implementing an environmental management system affects a company's financial performance. He found that most competitive companies in modern business environments follow ISO 14001 standards. A company's environmental performance may be improved by a large amount if an organization makes policies that encourage social corporate ties.

In a study called "Effects of green manufacturing and eco-innovation on sustainability performance," by Sezen (2018), they looked at how green manufacturing and eco-innovation affect a company's efforts to be sustainable. Based on what they found, how environmentally responsible manufacturing is used have a big positive effect on both performance and social performance. Eco-process innovation also has a big and positive effect on the overall sustainability of businesses. On the other hand, it was found that making products that are better for the environment didn't make a big difference in any of the three types of performance. The regression analysis showed that the three parts of

eco-process innovation have a big effect on the three parts of corporate sustainability performance. Their thinking was that environmentally responsible production could lead to lower costs for raw materials, more efficient production, less money spent on environmental and workplace safety, and a better image for the company. Everything above has the potential to make things better.

Conclusions

The study concludes that most machines or tools which consume less energy, water and fuel are used and most of them are impact and life cycle assessment tools for manufacturing. Also, most of them carry risk assessments for energy and resource use and also, they don't have environmentally friendly raw materials, they have processes to reduce solid waste, air emissions and conserve energy and water and have an environmental management system.

Recommendations

The study also concluded that there should be an improvement in; the use of machines or tools which consume less energy, water and fuel, and how they impact life cycle assessment tools for manufacturing. Also, more risk assessments for energy and resource use should be carried out. Each firm should have an environmental management system

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