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GREEN PROCUREMENT PRACTICES AND PERFORMANCE OF CEMENT MANUFACTURING FIRMS IN MACHAKOS COUNTY, KENYA

[1] Mwatha Florence Mwende, [2] Dr. Ndeto Charles

[1]Masters Student, Jomo Kenyatta University of Agriculture and Technology
[2]Lecturer, Jomo Kenyatta University of Agriculture and Technology

ABSTRACT

Cement manufacturing firms play a crucial role in the economic development of Kenya by contributing significantly to the infrastructure and construction sectors. However, cement manufacturing firms in Kenya face several challenges that impact their performance. According to the Kenya National Bureau of Statistics (KNBS), in 2022, the cost of manufacturing cement increased by 13% from the previous year due to a surge in the cost of coal and electricity. In the same year, Bamburi Cement, one of the leading manufacturers in Kenya, reported a 9% drop in profits, primarily attributed to high energy costs and the weakening of the Kenyan Shilling, which increased the cost of importing raw materials The general objective of the study is to assess the effect of green procurement practices on performance of cement manufacturing firms in Machakos County, Kenya. Specifically, the study sought to establish the influence of sustainable sourcing on performance of cement manufacturing firms in Machakos County, Kenya, and to determine the effect of green packaging on performance of cement manufacturing firms in Machakos County, Kenya. This study was guided by: Stakeholder Theory and The Diffusion of Innovations Theory. The study used a descriptive research design. The target population in this study was 126 procurement and logistics officers working in seven cement manufacturing firms namely. The study employed a census approach to collect data from the all the 112 respondents mainly involved in the management of distribution. Descriptive statistics such as frequency distribution, mean (measure of dispersion), standard deviation, and percentages were used. Inferential data analysis was conducted by use of Pearson correlation coefficient, and multiple regression analysis. The relationship between the study variables was tested using multivariate regression models. The study results were presented through use of tables and figures. The study concludes that sustainable sourcing has a positive and significant effect on performance of cement manufacturing firms in Machakos County, Kenya. Further, the study concludes that green packaging has a positive and significant effect on performance of cement manufacturing firms in Machakos County, Kenya. Based on the findings, the study recommends that the management of cement manufacturing firms in Kenya should integrate locally available alternative raw materials. By sourcing these materials from nearby industries, cement firms can reduce their dependency on traditional raw materials like limestone, thereby lowering transportation costs, minimizing environmental degradation, and decreasing carbon emissions.

Key Words: Green Procurement Practices, Sustainable Sourcing, Green Packaging, Performance of Cement Manufacturing Firms

Background of the Study

Cement manufacturing firms are companies involved in the production of cement, a key building material used in construction. These firms typically operate in industries related to the extraction, processing, and blending of raw materials like limestone, clay, and gypsum to produce various types of cement, including ordinary Portland cement, white cement, and blended cement. Cement manufacturing firms play a critical role in the global construction industry and the development of infrastructure (Masudin, *et al*, 2020). As one of the most important materials in construction, cement is used in a wide range of applications, from residential buildings to large-scale infrastructure projects like bridges, roads, and dams. Cement manufacturing companies are at the heart of this production process, providing the necessary material for the creation of concrete, which is the backbone of modern construction. The demand for cement is closely linked to urbanization, industrialization, and economic development, making these firms key contributors to national and global economies (Nande & Vhankate, 2022).

One of the primary roles of cement manufacturing firms is the production of high-quality cement. They do this by extracting and processing raw materials like limestone, clay, and gypsum, which are then mixed and heated in kilns to form clinker, the main ingredient of cement (Kozuch, *et al*, 2024). This process requires significant expertise and precision to ensure the resulting cement meets various strength, durability, and consistency standards. Cement firms must also adapt to changing construction needs by offering different types of cement products tailored for specific projects, such as high-strength cement for skyscrapers or specialized cement for coastal construction. Cement manufacturing firms are increasingly focusing on sustainability (Mitra, *et al*, 2024). The cement production process is highly energy-intensive and generates significant carbon emissions, contributing to global climate change. To address this, many companies are investing in cleaner technologies, such as alternative fuels and carbon capture methods, to reduce their environmental impact. Some firms are also working to improve the energy efficiency of their operations by optimizing kiln processes or using waste materials in production. By doing so, these companies contribute not only to the construction industry but also to the global effort to mitigate climate change (Kennedy & Emmanuel, 2020).

Cement firms also drive innovation within the construction sector. They invest in research and development to create more durable, cost-effective and eco-friendly cement alternatives. For example, some firms are developing blended cements that use less energy-intensive materials or are incorporating industrial byproducts like fly ash and slag to reduce the carbon footprint of their products (Anane, 2020). The research into more sustainable production methods and materials helps the industry respond to growing demands for environmentally conscious building practices. By playing a leading role in these innovations, cement manufacturing firms shape the future of construction in a rapidly changing world. Cement manufacturing firms contribute to job creation and economic development, particularly in regions where construction is booming (Munezero & Ndolo, 2022). From direct employment in factories to ancillary services like transportation and logistics, cement firms support a wide range of jobs. Their operations also stimulate local economies through the procurement of raw materials and the construction of new facilities. In this sense, cement companies are integral not only to the construction industry but also to broader economic development in both emerging and developed markets (Magunda, 2020).

Green procurement practices refer to the process of purchasing goods, services, and materials that have a lower environmental impact throughout their life cycle compared to traditional alternatives. These practices focus on selecting products that are environmentally sustainable, from the way they are sourced, produced, and transported to how they are used and disposed of (Kipuyo, 2020). The goal of green procurement is to minimize the environmental footprint

of purchasing decisions and contribute to sustainability goals. Sustainable sourcing is a key practice in ensuring that the raw materials, goods, and services a company purchases are responsibly obtained, with minimal negative environmental and social impacts (Oyedokun & Garba, 2022). Green packaging focuses on reducing the environmental impact of packaging materials, favoring recyclable, biodegradable, or reusable options over single-use plastics. This study aimed to assess the effect of green procurement practices on performance of cement manufacturing firms in Machakos County, Kenya.

In Indonesia, Masudin, *et al* (2020) found no significant effects on middle management staff, awareness, and corporate responsibility on the implementation of green procurement in educational institutions. At the same time, there is a significant impact of green supply approaches such as ISO certification and eco-design product strategy on adopting green procurement. Nande and Vhankate (2022) in India found that green procurement can prove to be a contributing factor and a great subject in understanding sustainability performance. Kozuch, *et al* (2024) in Germany found a positive correlation exists between the introduction of green procurement measures and organizational performance. Introduction of green procurement practices has a positive effect on organizations' overall economic performance.

In Ghana, Anane (2020) found that both Ghana Water Co. Ltd and Bayport Savings and Loans Plc as indicated that challenges in practicing green procurement spanned from lack of top management support, lack of cooperation from the staff, weak knowledge on green procurement, little knowledge on relevance of green procurement, the cost of fully implementing green procurement, lack of supplier cooperation. Munezero and Ndolo (2022) in Rwanda found that green procurement had significant positive relationship with performance of state corporations in Rwanda indicating that a unit increase in green procurement would lead to a unit increase in performance of state corporations in Rwanda. In conclusion enhancement of green procurement would lead to improvement in performance of state corporations. The study concluded that green procurement is positively related to performance of state corporations.

Cement manufacturing firms in Kenya play a crucial role in the country's construction and infrastructure development. The sector is vital to the Kenyan economy, providing employment and contributing significantly to the Gross Domestic Product (GDP). The demand for cement has been growing steadily due to rapid urbanization, infrastructural projects, and increased construction activities in both residential and commercial sectors (Mburu & Getuno, 2022). The key players in Kenya's cement industry include well-established companies such as Bamburi Cement, East African Portland Cement Company (EAPCC), and Athi River Mining (ARM) Cement. Bamburi Cement, part of the LafargeHolcim group, is the largest producer of cement in the country, holding a substantial market share (Nyaberi & Nyaloti 2024). The company operates modern plants that utilize advanced technology to produce high-quality cement. EAPCC, on the other hand, has been in operation since 1933 and is known for its production of Blue Triangle cement. ARM Cement, which has since been rebranded to National Cement Company, is another major producer that has continued to expand its capacity in the face of increasing competition (Sarhaye & Marendi, 2021).

Statement of the Problem

Cement manufacturing firms play a crucial role in the economic development of Kenya by contributing significantly to the infrastructure and construction sectors. The demand for cement in the country is closely linked to ongoing infrastructure projects, such as roads, bridges, residential buildings, and commercial complexes (Sarhaye & Marendi, 2021). As one of the key building materials, cement is integral to Kenya's ambition to achieve Vision 2030, which focuses on economic growth and development. These firms also generate employment opportunities and drive economic activity, both directly within the industry and indirectly

through the supply chain. As a result, the cement manufacturing sector is vital to Kenya's industrialization efforts and overall economic performance (Gachau & Moronge, 2023).

Cement manufacturing firms in Kenya face several challenges that impact their performance. The profitability of cement manufacturers in Kenya has been under pressure due to rising input costs, particularly energy, and raw materials. According to the Kenya National Bureau of Statistics (KNBS), in 2022, the cost of manufacturing cement increased by 13% from the previous year due to a surge in the cost of coal and electricity (Wambui & Chege, 2024). In the same year, Bamburi Cement, one of the leading manufacturers in Kenya, reported a 9% drop in profits, primarily attributed to high energy costs and the weakening of the Kenyan Shilling, which increased the cost of importing raw materials. Additionally, the high transport costs due to Kenya's infrastructure limitations make it expensive to distribute cement, impacting profit margins. In 2021, the cement sector's average profit margin was reported to be just 5%, which is significantly low for such capital-intensive industries (Mburu & Getuno, 2022).

The competitive landscape in Kenya's cement industry has intensified, resulting in fluctuating market share for different firms. The Kenya Association of Manufacturers (KAM) reported that in 2020, Bamburi Cement saw its market share drop from 22.5% to 21.1% in the wake of increased competition from both local and international cement manufacturers. New entrants such as National Cement (owned by Devki Group) and Dangote Cement have contributed to the disruption of market shares in the local market (Nyaberi & Nyaloti 2024). The same report also highlighted that imports of cement increased by 8% in 2020, which further diluted the market share of local manufacturers. This growing market saturation means that cement manufacturers are under pressure to improve their production efficiency and differentiate their products to retain or grow their market share (Sarhaye & Marendi, 2021).

Customer satisfaction within the cement sector is closely tied to product quality, reliability, and service. According to a 2021 survey by the Kenya Association of Manufacturers (KAM), 64% of consumers cited quality and consistency as their primary factors when choosing cement brands (Gachau & Moronge, 2023). Additionally, a report from Bamburi Cement revealed that customers' preference for sustainable and eco-friendly products was growing, with an estimated 40% of buyers willing to pay a premium for environmentally friendly cement. This reflects the increasing demand for sustainability in consumer choices, putting pressure on manufacturers to adopt green procurement practices. Cement manufacturers who fail to meet customer expectations on quality and sustainability face the risk of losing market share (Wambui & Chege, 2024).

The implementation of green procurement practices in cement manufacturing firms can have a significant impact on their overall performance. Adopting green procurement can improve the operational efficiency of firms (Mburu & Getuno, 2022). Various studies have been conducted in different parts of the world on green procurement practices and firm performance. For instance, Nyaberi and Nyaloti (2024) researched on green procurement practices and organizational performance of logistics and supply chain companies. Sarhaye and Marendi (2021) conducted a study on the role of green procurement on organizational performance of manufacturing firms and Gachau and Moronge (2023) investigated on the influence of green procurement practices on supply chain performance in humanitarian organizations. However, none of these studies focused on sustainable sourcing and green packaging on performance of cement manufacturing firms in Machakos County, Kenya. To fill the highlighted gaps, the current study sought to assess the effect of green procurement practices (sustainable sourcing and green packaging) on performance of cement manufacturing firms in Machakos County, Kenya.

Objectives of the Study

General Objective

The general objective of the study is to assess the effect of green procurement practices on performance of cement manufacturing firms in Machakos County, Kenya

Specific Objectives

i. To establish the influence of sustainable sourcing on performance of cement manufacturing firms in Machakos County, Kenya
ii. To determine the effect of green packaging on performance of cement manufacturing firms in Machakos County, Kenya

Theoretical Framework

Stakeholder Theory

Stakeholder Theory is a framework in management and ethics that emphasizes the importance of considering all parties affected by a company's actions, not just its shareholders. Developed by Edward Freeman (1984), the theory posits that businesses operate within a network of relationships that includes various stakeholders—such as employees, customers, suppliers, communities, and investors. By acknowledging these stakeholders and their interests, organizations can create more sustainable and ethically sound business practices (Angila, 2020). The central idea is that businesses should strive to create value for all stakeholders rather than focusing solely on maximizing shareholder profit. A key aspect of Stakeholder Theory is the identification and prioritization of stakeholders based on their influence and the significance of their interests. Stakeholders can be categorized into primary and secondary groups. Primary stakeholders are those whose direct involvement is essential for the company's survival, such as employees and customers (Macharia, Gladys & Njeri, 2020). Secondary stakeholders may include groups like the media, advocacy organizations, and government entities, which can influence or be affected by the organization's activities. Understanding the dynamics among these different stakeholders helps organizations make informed decisions that consider a wider array of perspectives and potential impacts (Kosgei & Kagiri, 2020). Stakeholder Theory also highlights the ethical responsibility of businesses to engage with their stakeholders transparently and fairly. This engagement fosters trust and collaboration, which can lead to better outcomes for all parties involved. The theory suggests that businesses should actively seek feedback from stakeholders and incorporate their views into decision-making processes. By doing so, companies not only enhance their social license to operate but also strengthen their long-term viability and reputation (Temesgen & Chaneyalew, 2020). This theory was used to establish the influence of sustainable sourcing on performance of cement manufacturing firms in Machakos County, Kenya

The Diffusion of Innovations Theory

Innovation Diffusion Theory (IDT) is a framework that seeks to explain how new ideas, practices, and technologies spread within and between social systems. Developed by Rogers (1962), the theory emphasizes the process by which innovations are communicated over time among the members of a social group (Kariuki, Ngugi & Mburu, 2021). At its core, IDT identifies several key elements that influence the adoption of innovations, including the characteristics of the innovation itself, the communication channels used to disseminate information, the social system in which the innovation is introduced, and the individual adopter's characteristics (Peter Patrick & Samson, 2022). One of the central components of IDT is the attributes of innovations, which are factors that determine how likely an innovation is to be adopted. Rogers identified five key attributes: relative advantage (the perceived benefits of the innovation compared to existing solutions), compatibility (how well the innovation aligns with existing values and practices), complexity (the perceived difficulty of using the

innovation), trialability (the ease with which the innovation can be tested), and observability (the visibility of the innovation's results to others). These attributes play a critical role in shaping perceptions and, consequently, the rate of adoption among potential users (Kariuki, Ngugi & Mburu, 2021).

Another significant aspect of IDT is the adoption process, which occurs in several stages: knowledge, persuasion, decision, implementation, and confirmation. During the knowledge stage, potential adopters become aware of the innovation. In the persuasion stage, they form opinions about the innovation, which can lead to a decision to adopt or reject it (Henry, Dennis & Wycliffe, 2023). Implementation involves putting the innovation into practice, and confirmation is the stage where adopters seek reinforcement of their decision, either strengthening their commitment or leading to discontinuance if the innovation does not meet expectations. IDT also emphasizes the importance of social networks and communication channels in the diffusion process. Innovations are often spread through interpersonal communication among peers, opinion leaders, and early adopters who influence others within their social networks. This social aspect highlights that the diffusion of innovations is not merely a linear process but rather a complex interplay of individual choices and social dynamics (Nabbosa, 2020). This theory was used to determine the effect of green packaging on performance of cement manufacturing firms in Machakos County, Kenya.

Conceptual Framework

A conceptual framework is a diagrammatic representation showing the relationship between the independent variables and the dependent variable (Creswell, 2019). In this study the independent variables are sustainable sourcing and green packaging while the dependent variable is performance of cement manufacturing firms in Machakos County, Kenya.

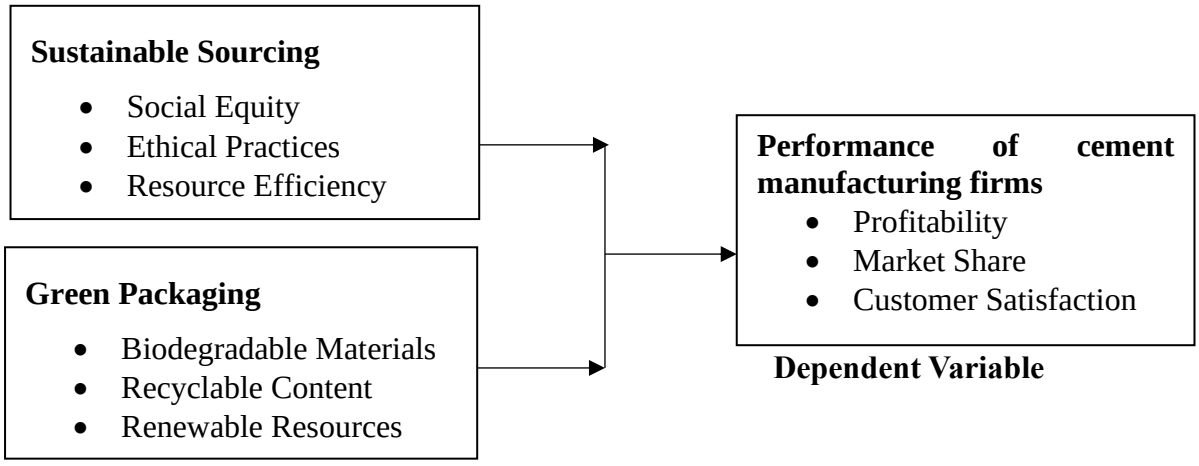

Figure 2. 1: Conceptual Framework

Sustainable Sourcing

Sustainable sourcing refers to the process of obtaining goods and services in a way that is environmentally responsible, socially beneficial, and economically viable. It involves selecting products, materials, and suppliers that prioritize practices like reducing environmental impact, conserving natural resources, promoting fair labor practices, and supporting local communities (Macharia, Gladys & Njeri, 2020). Sustainable sourcing aims to create a supply chain that meets the needs of the present without compromising the ability of future generations to meet their own needs. Social equity in the context of sustainable sourcing refers to the fair and just treatment of all individuals involved in the supply chain, particularly vulnerable communities and workers (Kosgei & Kagiri, 2020). This involves ensuring that laborers are provided with

safe working conditions, fair wages, and the opportunity to advance. It also includes promoting diversity and inclusion, addressing gender inequality, and ensuring that marginalized groups have equal access to opportunities. Social equity is essential in creating a sustainable supply chain that benefits everyone, not just businesses, fostering a more balanced and inclusive global economy (Temesgen & Chaneyalew, 2020).

Ethical practices in sourcing encompass the commitment to integrity, transparency, and respect for human rights throughout the supply chain. This includes avoiding exploitation of workers, prohibiting child labor, and ensuring that suppliers adhere to strict ethical standards. Ethical sourcing also involves choosing suppliers who engage in fair trade and prioritize humane treatment, environmental stewardship, and community well-being (Gerhard, *et al*, 2020). By embedding ethical considerations into procurement processes, businesses help drive positive social change and reinforce their own corporate social responsibility. Resource efficiency refers to the responsible use of natural resources, minimizing waste, and reducing environmental impact during the production and supply processes (Angila, 2020). Sustainable sourcing aims to optimize the use of materials, energy, and water to produce goods, ensuring that resources are used in a way that doesn't deplete them for future generations. This can involve using renewable resources, adopting recycling practices, and seeking ways to reduce emissions. By improving resource efficiency, businesses not only reduce their environmental footprint but also often lower operational costs, driving long-term sustainability and resilience in the supply chain (Macharia, Gladys & Njeri, 2020).

Green Packaging

Green packaging refers to the design, production, and use of packaging materials that are environmentally friendly, aiming to reduce the environmental impact associated with packaging. This includes using sustainable, recyclable, biodegradable, or reusable materials, as well as minimizing the overall amount of packaging used (César, *et al*, 2023). Biodegradable materials are substances that can break down naturally through the action of microorganisms such as bacteria, fungi, and algae over time (Peter Patrick & Samson, 2022). Unlike traditional plastics, which can take hundreds of years to decompose, biodegradable materials decompose more quickly and safely in natural environments, minimizing pollution and waste.

Recyclable content refers to materials that can be collected, processed, and reused in the production of new products. Common recyclable materials include paper, glass, metal, and certain types of plastic. Packaging or products made from recyclable content reduce the need for virgin materials, which can help conserve natural resources, lower energy consumption, and reduce greenhouse gas emissions (Nabbosa, 2020). Renewable resources are natural materials that can be replenished naturally over time, unlike finite resources such as fossil fuels or metals (César, *et al*, 2023). These resources are considered sustainable because they can be used without depleting the earth's supply, as long as they are managed responsibly. Using renewable resources in manufacturing and packaging can help reduce dependence on non-renewable resources, promote sustainable production practices, and mitigate environmental harm (Peter Patrick & Samson, 2022).

Empirical Review

Sustainable Sourcing and Organization Performance

Angila (2020) conducted a study on the sustainable sourcing strategies on organizational performance in south Nyanza sugar company limited Migori County, Kenya. South Nyanza Sugar Company located in Migori County is one such organization where the performance has never been stable. Organizations have devised various strategies to improve on the performance trends. One key strategy adopted by South Nyanza Company is supplier sourcing with an aim of ensuring that right sourcing strategy would give better procurement performance which in turn would lead to better organizational performance. The purpose of this research was

therefore to determine the effect of supplier sourcing strategies on organizational performance in South Nyanza Sugar Company Limited, Migori County, Kenya. The study concluded that open sourcing, single sourcing and partnership sourcing have no significant influence while multiple sourcing had significant influence on organizational performance

Kosgei and Kagiri (2020) conducted a study sustainable sourcingorganizational on the performance in selected companies of Kenyan energy sector sourcing of indirect items, market knowledge, stakeholder management and technological innovation on organizational performance of key players in the energy sector in Kenya. The research study applied a descriptive research design. The target population of this study was the staff working in Kengen, Kenya Power, Iber Africa and Wärtsilä Eastern Africa Limited offices in Nairobi. The study concludes that indirect purchasing has a significant effect on the organizational performance of key players in the energy sector

Temesgen and Chaneyalew (2020) conducted a study on the sustainable Sourcing on Organization Performance: The Case of Ethiopian Construction Works Corporation This study employed an explanatory research design with a quantitative approach. The study target population of ECWC is 105, with elements chosen using a census technique. A questionnaire was used as the primary data collection tool. The study's findings suggest that strategic sourcing supplier selection, buyer–supplier relationship, and contract management have a significant and positive effect on organizational performance. Therefore, all the hypotheses are supported by the data with a predictive of 43 percent of the variance in the dependent variable

Gerhard, *et al* (2020) conducted a study on the sustainable sourcing on organization performance— an information processing perspective In order to manage the integration challenge, firms have a number of tools, varying from centralization and formalization to cross-locational teams The aim of this paper is to complement prior research on global sourcing organizations, which is still rather scarce and more exploratory in nature. By extending the arguments of the information processing perspective of organizations to the global sourcing context, we seek to propel a theoretical discussion on integration in the global sourcing organization The higher the uncertainty induced by category characteristics, the higher the need for integration mechanisms with high information processing capacity

Green Packaging and Organization Performance

Peter Patrick and Samson (2022) conducted a study on the Green Packaging on Performance of Building and Construction Manufacturing Firms in Kenya This comes as the call for embrace sustainable development goals across all sectors is on the rise, and most companies stepping in to embrace sustainable practices as a way of minimizing costs, ensuring customer satisfaction, and conserving the environment. The paper has been anchored on the institutional theory. Through cross-sectional research design, the study surveyed 270 respondents drawn from the 54 building and construction manufacturing firms in Kenya. Primary data was collected using a questionnaire. The study concluded that through embrace of green packaging, performance of the manufacturing firms was obtained

Kariuki, Ngugi and Mburu (2021) conducted a study on the green packaging, green distribution and competitive advantage in the horticultural sector in Kenya Sustainable supply chain management has been at the stake of every organization that seeks to enhance the achievement of organizational goals. On the other hand, horticultural industry has been a key economic booster in the country for decade's s. The study found green packaging has positive influence on competitive advantage in the horticultural industry in Kenya. Green distribution had a positive influence on competitive advantage in the horticultural industry in Kenya a. The study concludes that green packaging is positively related to competitive advantage in the horticultural industry in Kenya

Nabbosa (2020) conducted a study on the green packaging on sales performance, a case study of Mukwano industries, industrial area Kampala-Uganda The study was conducted under the topic "Packaging and Sales Performance" and it had three objectives; to find out the effect of packaging on product quality, to find out how packaging contributes to sales performance and to establish the relationship between packaging and sales performance. The study found out that packaging in essentially used to present products from any external threats that could easily interfere with their state and get them destroyed. The study concluded that there is a significant relationship between packaging and sales performance. César, *et al* (2023) conducted a study on the green packaging and Organizational Performance in Companies of an Emerging Economy. Therefore, it is becoming more and more common for companies, especially in developed countries, to implement such practices as opposed to emerging economies where their implementation is very uncommon the results also indicate that companies give little or no importance to the circular economy practices as an innovation strategy that contributes to environmental care and better organizational performance The objective of this study was to examine the relationship between corporate sustainability and innovation moderated organizational performance in medium and large companies in Colombia.

RESEARCH METHODOLOGY

Research Design

The study used a descriptive research design. The descriptive research design is a type of research study design that is used to collect information on the current status of a person or on object (Mugenda, 2019). Information is collected without altering anything in the in the area of study; also known as observational studies. It can be either qualitative or quantitative in nature. This design was preferable for this study because it enabled the researcher to undertake a breadth of observations on phenomenon under study.

Target Population

This study targeted cement manufacturing firms in Kenya. According to KAM report (2023) there are seven cement manufacturing firms in Kenya namely; Bamburi Cement Limited, East Africa Portland Cement Company, ARM Africa Limited, Mombasa Cement, Savannah Cement, National Cement and Lafarge cement. This study targeted heads of departments and their deputies. The following departments were targeted Administration, Logistics, Procurement, Warehousing, Quality control, Marketing, Operations and Audit. The total target population was therefore 112 respondents

Table 1: Target Population

No	Department	No. of Respondents
1	Administration + deputy head	14
2	Logistics	14
3	Procurement	14
4	Warehousing	14
5	Quality control	14
6	Marketing	14
7	Operations	14
8	Audit	14
	Total	**112**

Sampling Frame

The unit of observation of the research consisted of procurement officers while the unit of analysis comprised of cement manufacturing firms namely: Bambara Cement Limited, Rhino Cement Foundation, East African Portland Cement Company, Mombasa Cement Company, Savanna Cement, Athi River mining Ltd and National cement company Ltd in Kenya. The

sampling frame is a comprehensive list of all sampling units from which a sample can be selected (Creswell, 2019).

Sample Size and Sample Technique

The study employed a census approach to collect data from the all the 112 respondents mainly involved in the management of distribution hence no sampling techniques was used. In a census survey, data are collected for all units in the population, if the population is small, a census may be preferable. This is because to produce estimates with small sampling error it may be necessary to sample a large fraction of the population.

Data Collection Instruments

This research used a questionnaire to collect primary data. According to Patton *et. al (*2019), a questionnaire is appropriate in gathering data and measuring it against a particular point of view. It provides a standardized tool for data collection. Structured questions were used to collect primary data from the field. Questionnaires were preferred because they are effective data collection instruments that allow respondents to give much of their opinions pertaining to the research problem (Dempsey, 2019). According to Kothari (2018), the information obtained from questionnaires is free from bias and researchers' influence and thus accurate and valid data was gathered. The preference for the questionnaire is based on the premise that it gives respondents freedom to express their views or opinions more objectively.

Pilot Test

According to Mugenda and Mugenda (2019), a pilot test is a small-scale preliminary study conducted to evaluate feasibility, duration, cost, adverse events, and improve upon the study design prior to performance of a full-scale research project. The study carried out a pilot study to pretest and validate the questionnaire. Cronbach's alpha methodology, which measures internal consistency, was used. The main aim of the pilot test is testing how reliable the data collection tool is. The study used a total of 11 individuals in the pilot test which represent 10% of target population. The pilot sample was not included in the final study.

Data Analysis and Presentation

The process where data is analyzed systematically and the process where the hypothesis is tested with the aim of acquiring some information is the process of analyzing data. Because of difficulty in analysing raw data collected from the field, cleaning, coding, entering, and analysing of the data was done first (Mugenda & Mugenda, 2019). Data from questionnaires were coded and analyzed using the latest Statistical Package for Social Sciences (SPSS) computer software. SPSS software was used because of its ability to appropriately create graphical presentations of questions, data for reporting and presentation. The analyzed data was presented in the form of frequency distribution tables, pie charts and bar graphs where appropriate. The study employed mixed methods data analysis by applying the use of descriptive and inferential statistics.

Descriptive statistics such as frequency distribution, mean (measure of dispersion), standard deviation, and percentages were used. Descriptive statistics therefore enables researchers to present the data in a more meaningful way, which allows simpler and easier interpretation (Singpurwalla, 2019). Inferential data analysis was conducted by use of Pearson correlation coefficient, and multiple regression analysis. Inferential statistic is used to make judgments about the probability that an observation is dependable or one that happened by chance in the study.

PRESENTATION, ANALYSIS AND INTERPRETATION OF DATA

Descriptive statistics

Sustainable Sourcing and Firm Performance

The first specific objective of the study was to establish the influence of sustainable sourcing on performance of cement manufacturing firms in Machakos County, Kenya. The respondents were requested to indicate their level of agreement on various statements relating to sustainable sourcing and performance of cement manufacturing firms in Machakos County, Kenya. The results were as presented in Table 2.

From the results, the respondents agreed that the firm ensures fair labor practices and wages across its supply chain (M=3.922, SD=0.618). In addition, the respondents agreed that the firm promotes diversity and inclusion within its sourcing operations (M=3.907, SD=0.813). Further, the respondents agreed the firm actively works to eliminate child labor and exploitation from its supply chain (M=3.891, SD=0.909).

From the results, the respondents agreed that the firm is transparent about the sourcing of its raw materials and products (M=3.886, SD=0.632). In addition, the respondents agreed that the firm works with suppliers to reduce environmental impact (M=3.830, SD=0.847). Further, the respondents agreed that the firm optimizes resource usage in sourcing (M=3.771, SD=0.849).

Table 2: Sustainable Sourcing and Firm Performance

	Mean	Std. Deviation
The firm ensures fair labor practices and wages across its supply chain.	3.922	0.618
The firm promotes diversity and inclusion within its sourcing operations.	3.907	0.813
The firm actively works to eliminate child labor and exploitation from its supply chain.	3.891	0.909
The firm is transparent about the sourcing of its raw materials and products.	3.886	0.632
The firm works with suppliers to reduce environmental impact.	3.830	0.847
The firm optimizes resource usage in sourcing.	3.771	0.849
Aggregate	**3.868**	**0.778**

Green Packaging and Firm Performance

The second specific objective of the study was to determine the effect of green packaging on performance of cement manufacturing firms in Machakos County, Kenya. The respondents were requested to indicate their level of agreement on various statements relating to green packaging and performance of cement manufacturing firms in Machakos County, Kenya. The results were as presented in Table 3.

From the results, the respondents agreed that the firm prioritizes biodegradable packaging to reduce environmental impact (M=3.894, SD=0.867). In addition, the respondents agreed that the firm ensures that its packaging materials break down naturally over time (M=3.836, SD=0.764). Further, the respondents agreed that the firm ensures its packaging can be easily recycled by consumers (M=3.811, SD=0.768).

From the results, the respondents agreed that the firm is committed to increasing the recyclable content in its packaging (M=3.796, SD=0.873). Further, the respondents agreed that the firm uses renewable resources for its packaging materials (M=3.698, SD=0.898). The respondents also agreed that the firm actively seeks to incorporate renewable materials into its packaging design (M=3.643, SD=0.678)

Table 3: Green Packaging and Firm Performance

	Mean	Std. Deviation
The firm prioritizes biodegradable packaging to reduce environmental impact.	3.894	0.867
The firm ensures that its packaging materials break down naturally over time.	3.836	0.764
The firm ensures its packaging can be easily recycled by consumers.	3.811	0.768
The firm is committed to increasing the recyclable content in its packaging.	3.796	0.873
The firm uses renewable resources for its packaging materials	3.698	0.898
The firm actively seeks to incorporate renewable materials into its packaging design.	3.643	0.678
Aggregate	**3.780**	**0.808**

Correlation Analysis

The present study used Pearson correlation analysis to determine the strength of association between independent variables (sustainable sourcing and green packaging) and the dependent variable (performance of cement manufacturing firms in Machakos County, Kenya). Pearson correlation coefficient range between zero and one, where by the strength of association increase with increase in the value of the correlation coefficients.

Table 4: Correlation Coefficients

		Firm Performance	Sustainable Sourcing	Green Packaging
Firm Performance	Pearson Correlation	1		
	Sig. (2-tailed)			
	N	96		
Sustainable Sourcing	Pearson Correlation	.809**	1	
	Sig. (2-tailed)	.003		
	N	96	96	
Green Packaging	Pearson Correlation	.886**	.127	1
	Sig. (2-tailed)	.000	.097	
	N	96	96	96

From the results, there was a very strong relationship between sustainable sourcing and performance of cement manufacturing firms in Machakos County, Kenya (r = 0.809, p value =0.003). The relationship was significant since the p value 0.003 was less than 0.05 (significant level). The findings are in line with the findings of Angila (2020) who indicated that there is a very strong relationship between sustainable sourcing and firm performance.

Further, the results revealed that there is a very strong relationship between green packaging and performance of cement manufacturing firms in Machakos County, Kenya (r = 0.886, p value =0.002). The relationship was significant since the p value 0.002 was less than 0.05 (significant level).The findings are in line with the findings of Peter Patrick and Samson (2022) that there is a very strong relationship between green packaging and firm performance.

Regression Analysis

Multivariate regression analysis was used to assess the relationship between independent variables (sustainable sourcing and green packaging) and the dependent variable (performance of cement manufacturing firms in Machakos County, Kenya)

Table 5: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.861	.741	.742	.10428

a. Predictors: (Constant), sustainable sourcing and green packaging

The model summary was used to explain the variation in the dependent variable that could be explained by the independent variables. The r-squared for the relationship between the independent variables and the dependent variable was 0.741. This implied that 74.1% of the variation in the dependent variable (performance of cement manufacturing firms in Machakos County, Kenya) could be explained by independent variables (sustainable sourcing and green packaging).

Table 6: Analysis of Variance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	114.108	2	57.054	626.967	.000[b]
	Residual	8.425	93	.091		
	Total	122.533	95			

a. Dependent Variable: performance of cement manufacturing firms in Machakos County, Kenya

b. Predictors: (Constant), sustainable sourcing and green packaging

The ANOVA was used to determine whether the model was a good fit for the data. F calculated was 626.967 while the F critical was 3.094. The p value was 0.000. Since the F-calculated was greater than the F-critical and the p value 0.000 was less than 0.05, the model was considered as a good fit for the data. Therefore, the model can be used to predict the influence of sustainable sourcing and green packaging on performance of cement manufacturing firms in Machakos County, Kenya.

Table 7: Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.294	0.077		3.818	0.000
	sustainable sourcing	0.382	0.098	0.381	3.898	0.000
	green packaging	0.375	0.098	0.374	3.827	0.001

a Dependent Variable: performance of cement manufacturing firms in Machakos County, Kenya

The regression model was as follows:

$$\mathbf{Y = 0.294 + 0.382X_1 + 0.375X_2 + \varepsilon}$$

According to the results, sustainable sourcing has a significant effect on performance of cement manufacturing firms in Machakos County, Kenya, β_1=0.382, p value= 0.000). The relationship was considered significant since the p value 0.000 was less than the significant level of 0.05. The findings are in line with the findings of Angila (2020) who indicated that there is a very strong relationship between sustainable sourcing and firm performance.

Furthermore, the results revealed that green packaging has significant effect on the performance of cement manufacturing firms in Machakos County, Kenya, β1=0.375, p value= 0.001). The relationship was considered significant since the p value 0.001 was less than the significant level of 0.05. The findings are in line with the findings of Peter Patrick and Samson (2022) that there is a very strong relationship between green packaging and firm performance.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The study concludes that sustainable sourcing has a positive and significant effect on performance of cement manufacturing firms in Machakos County, Kenya. Findings revealed that social equity, ethical practices and resource efficiency influences performance of cement manufacturing firms in Machakos County, Kenya.

Further, the study concludes that green packaging has a positive and significant effect on performance of cement manufacturing firms in Machakos County, Kenya. Findings revealed that biodegradable materials, recyclable content and renewable resources influences performance of cement manufacturing firms in Machakos County, Kenya.

Recommendations

The study recommends that the management of cement manufacturing firms in Kenya should integrate locally available alternative raw materials. By sourcing these materials from nearby industries, cement firms can reduce their dependency on traditional raw materials like limestone, thereby lowering transportation costs, minimizing environmental degradation, and decreasing carbon emissions.

Further, the study recommends that the management of cement manufacturing firms in Kenya should use biodegradable or recyclable cement bags made from eco-friendly materials such as kraft paper with water-based inks. This shift reduces environmental pollution and aligns with growing consumer and regulatory demands for sustainable practices.

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