Green Procurement and Responsiveness of Large-Scale Manufacturing Firms in Nairobi City County, Kenya

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Abstract
Over the past decade, the manufacturing sector has undergone rapid growth, contributing significantly to environmental degradation through increased effluent emissions. These developments have heightened concerns about public health and environmental sustainability. Despite the recognized importance of sustainability, initiatives such as green procurement remain underutilized in mainstream supply chain management. This study investigates the impact of green procurement on the responsiveness of large-scale manufacturing firms in Nairobi City County, Kenya, with a focus on the chemical and metal manufacturing sectors. The study specifically aimed to assess the effects of supplier assessment, reverse logistics, lean supply chains, and electronic procurement on firm responsiveness. Grounded in the Transaction Cost Economics (TCE) theory and the Resource-Based Theory (RBT), the research employed a descriptive design to explore green procurement practices among registered manufacturing firms in Nairobi. The study population consisted of 490 procurement staff, from which a sample of 220 respondents was selected using proportionate stratified random sampling, guided by Yamane's formula. Data was gathered through structured questionnaires, then cleaned, coded, and analysed using both descriptive and inferential statistical techniques. The results revealed that firms prioritize sustainable procurement by selecting suppliers that provide environmentally friendly and reusable products, thereby reducing waste and pollution. Additionally, findings showed that reverse logistics and lean supply chain practices positively influence responsiveness, while electronic procurement presented integration challenges that limited its effectiveness. The study concludes that sustainable procurement practices are essential for enhancing firm responsiveness and environmental responsibility. It recommends that manufacturing firms strengthen supplier assessment processes, expand waste management and recycling efforts, and adopt lean manufacturing principles. Furthermore, the National Environment Management Authority (NEMA) is encouraged to support digitalization of procurement systems, establish monitoring frameworks for environmental impact, and incentivize firms to adopt green technologies in their e-procurement strategies.

Keywords: Green Procurement, Supplier Assessment, Reverse Logistics, Lean Supply Chain, E-Procurement

Introduction

Amid growing global environmental concerns, businesses are under increasing pressure to adopt sustainable practices, especially in procurement. Green procurement—integrating environmental and social considerations into purchasing decisions—is becoming an essential aspect of corporate sustainability strategies (Kozuch et al., 2024). The manufacturing sector, a major contributor to environmental degradation, faces mounting expectations to adopt eco-friendly procurement processes that minimize waste, reduce carbon emissions, and enhance resource efficiency (Haleem et al., 2023).

In Kenya, manufacturing is a key driver of economic development, contributing significantly to GDP and employment. However, challenges such as high operational costs, stringent environmental regulations, and market competition necessitate innovative approaches like green procurement to boost firm responsiveness (Were, 2016). Green procurement practices—such as supplier assessment, reverse logistics, lean supply chains, and electronic procurement—are critical to improving supply chain performance and sustainability (Gachau & Moronge, 2018). This study aimed to examine the impact of green procurement on the responsiveness of large-scale manufacturing firms in Nairobi City County. It investigates how supplier evaluation ensures environmental compliance, how reverse logistics enhances efficiency, how lean supply chains reduce lead times, and how electronic procurement promotes transparency and agility. The findings provide strategic insights for firms and policymakers to improve sustainability and responsiveness through green procurement.

Background of the Study

As global concern for environmental sustainability grows, there has been a significant rise in regulations mandating firms to adopt eco-friendly practices, a trend projected to continue (Meow, 2021). Environmental considerations are becoming central to corporate strategies, compelling businesses to integrate green procurement into their operations. This shift is also driven by increased resource demand stemming from consumerism and energy crises, leading to resource depletion and the need for alternative, sustainable materials (Esan, Ayaji & Olawale, 2024). Green procurement, which involves incorporating environmental and social factors into purchasing decisions, has become an essential strategy in manufacturing firms' supply chain management (Nazir et al., 2024). Firms now seek to align their procurement strategies with sustainable development goals and stakeholder expectations (Chen, Chang & Huang, 2020).

Globally, the importance of green procurement is acknowledged in policy frameworks such as those set by the European Union (Caramia, Kainuma & Altobelli, 2021), and international awareness has increased since the 1992 Rio de Janeiro Conference (Lin & Hjelle, 2021). Governments in the US, Japan, and Europe have advanced green initiatives, prompting firms to integrate sustainability (Montag, Klünder & Steven, 2021). In China, green procurement has gained traction through corporate leadership and employee engagement, though challenges like costs and supplier resistance persist (Liu, Chen & Zhu, 2023; Ali, 2024). Indonesia and Malaysia have seen top management driving environmentally conscious supplier practices and embedding sustainability across supply chains (Parmawati et al., 2023; Lee & Wu, 2023). Supplier assessment remains a vital aspect of maintaining procurement responsiveness and sustainability (Quyen, 2020). In Sub-Saharan Africa, green procurement is emerging, with South Africa leading in regulatory practices and policy development (Dyanti & Ncanywa, 2022; Ngcobo, Mafini & Okoumba, 2022; Kashyap et al., 2022). A study in East Africa showed a significant correlation between green procurement and firm responsiveness (Nyachomba & Achuora, 2022). In Kenya, the manufacturing sector is key to Vision 2030, yet recent years have witnessed slow progress due to climate issues, high costs, and stiff competition. The 2017 plastic bag ban affected production volumes, reinforcing the need for sustainable alternatives (KAM, 2025). Firms are under growing pressure to adopt green procurement due to consumer demand for environmentally friendly products (Sarhaye, 2017).

Despite its potential, research on green procurement's impact on firm performance and integration into supply chain management is limited. This study seeks to address this gap by evaluating how green procurement enhances responsiveness in Nairobi's large-scale manufacturing sector. Green procurement has many benefits, including lower emissions, waste reduction, and improved biodiversity (Mugoni, Kanyepe & Tukuta, 2024). It also boosts customer satisfaction, profitability, and competitiveness (Osei et al., 2023; Liu et al., 2024).

Responsiveness, the ability of firms to adapt to market needs, is enhanced through streamlined procurement, lean practices, and collaboration (Panya et al., 2021; Dalal et al., 2024; Chauhan et al., 2022; Rezaei & Fallah Lajimi, 2018). Large manufacturing firms—characterized by automation and mass production (Quyen, 2020)—remain vital to Kenya's economy (KAM, 2025; Vision 2030, 2017). However, challenges such as rising production costs and environmental damage persist (KNBS, 2022; Fayshal, 2024), making green procurement essential for sustainability and operational efficiency (Okogwu et al., 2023).

Statement of the Problem

The manufacturing sector has expanded rapidly over the past decade, contributing significantly to environmental degradation through increased emissions and effluent discharges (Kiongo et al., 2021). Industrial waste has become a major source of pollution, threatening public health and economic development. Prolonged exposure to industrial pollutants has been associated with serious health conditions, prompting global scientific and policy communities to express concerns over the impact of such pollution on ecosystems and human well-being (Manisalidis et al., 2020).

Despite numerous sustainability initiatives, green procurement has not been fully integrated into mainstream supply chain management. Although it offers clear environmental and operational benefits, many large-scale manufacturing firms have been slow to transition from traditional procurement practices to sustainable alternatives (Khan et al., 2022). Manufacturing industries continue to emit high levels of carbon dioxide, contributing to the destruction of aquatic ecosystems and air pollution, which has been linked to respiratory illnesses (Nazir et al., 2024). Nonetheless, the adoption of green procurement strategies remains sluggish among large manufacturers (Kimario et al., 2023). Prior studies have identified key factors influencing green procurement effectiveness—such as cost, resource availability, ICT infrastructure, and leadership support (Kimira, Getuno & Kiarie, 2016)—but have not explored its impact on responsiveness in Nairobi's large manufacturing firms. Pembere (2017) demonstrated that green procurement enhances supply chain performance, yet failed to address its influence in environmentally sensitive areas. Similarly, Ajibike et al. (2020) investigated leadership and institutional influences in Malaysia's construction industry but overlooked sector-specific challenges in manufacturing. These gaps indicate a lack of focused research on how green procurement affects firm responsiveness within Kenya's manufacturing sector. This study seeks to fill that void by examining the responsiveness of large-scale manufacturing firms in Nairobi to green procurement practices, addressing the central question: Do green procurement strategies improve responsiveness in Nairobi's large-scale manufacturing sector?

Literature Review

This study adopted a deductive research approach by reviewing and applying existing theories relevant to green procurement and firm responsiveness. The two central theoretical frameworks used are Transaction Cost Economics Theory (TCET) and Resource-Based Theory (RBT).

Transaction Cost Economics Theory (TCET)

Transaction Cost Economics Theory (TCET), introduced by Ronald Coase (1937) and expanded by Williamson (1981), explains the efficiency of transactions in firms. TCET evaluates whether firms should outsource or conduct activities in-house based on cost efficiency. Ketokivi and Mahoney (2020) reinforce this view, proposing that firms minimize transaction costs through mechanisms like green procurement, which improves service efficiency, waste reduction, and quality. Green procurement aligns with TCET as it reduces transaction inefficiencies and meets market expectations for sustainable practices (Ngari, 2018).

Resource-Based Theory (RBT)

Resource-Based Theory (RBT), developed by Edith Penrose (1959) and expanded by Barney and Clark (2023), asserts that competitive advantage stems from a firm's internal resources that are valuable, rare, and difficult to imitate. Mailani et al. (2024) emphasize leveraging exclusive resources to create lasting competitive advantage. RBT is applicable to green procurement, where sustainable practices become valuable resources that improve service delivery and brand differentiation. Although Nason and Wiklund (2015) critique RBT's assumption of fixed resources, the theory remains effective in explaining how green procurement creates long-term value and performance improvement. The integration of TCET and RBT allows this study to explore how cost-effective transactions and unique sustainable capabilities collectively influence firm responsiveness and competitiveness.

Supplier Assessment and Firm Responsiveness

Empirical studies show a shift from traditional supplier evaluation based solely on cost and quality to incorporating environmental performance. Abuzaid et al. (2024) and Islam & Polonsky (2020) found that evaluating green suppliers improves quality, cost-efficiency, and competitiveness. Anvarjonov et al. (2024) and Lee & Wu (2023) established a positive link between green supplier evaluations and responsiveness. Althaqafi (2023) highlighted how supplier assessment enhances the ability to meet dynamic customer demands. In Kenya, Biyogo and Miroga (2018) showed that supplier evaluation significantly impacts supply chain responsiveness. However, methodological issues in these studies limit generalizability.

Reverse Logistics and Firm Responsiveness

Reverse logistics involves recovering, reusing, and recycling products, reducing environmental harm while improving cost-efficiency. Mishra and Singh (2023) linked reverse logistics with customer satisfaction and sustainability. Ebenezer and Zhuo (2019) found it enhances competitive advantage and responsiveness. In Kenya, Ayoroh and Somba (2023)

recommended practices like repackaging to reduce material costs. Kimaru and Moronge (2017) advocated for stricter policies to improve adoption. Gicuru (2023) and Mutuku and Moronge (2020) also confirmed reverse logistics improves responsiveness and firm competitiveness.

Lean Supply Chain and Firm Responsiveness

Lean supply chain practices eliminate waste, streamline production, and improve responsiveness. Lee & Wu (2023) and Moyo & Jeke (2019) confirmed the benefits of lean supply for performance. Istimaroh et al. (2023) and Ali (2024) noted that lean strategies enhance agility and responsiveness. Aljoghaiman et al. (2022) found similar outcomes in Saudi Arabia. In Nigeria, Oluwaseyi (2024) reported lean methods increased sales and reduced waste. Murira and Muli (2022), however, found limited impact from just-in-time practices, suggesting a need for quality-focused lean implementation. Karani et al. (2021) reported lean supply explained 60.7% of responsiveness variance in Kenyan firms.

Electronic Procurement and Firm Responsiveness

E-procurement uses ICT platforms for supplier selection, order processing, and post-purchase evaluations, enhancing efficiency and transparency (Singh & Chan, 2022). Amoah (2024) emphasized collaboration for timely deliveries. Despite its potential, adoption remains low. Tiwari et al. (2019) noted limited use in Malaysia, with e-tendering being the most common. Boakye et al. (2019) observed only 24% penetration in Ghana's mining sector. Chirchir (2018) stressed the role of SCM strategies in supporting e-procurement adoption. Design constraints and infrastructural limitations hinder wider use and effectiveness.

Gaps in Green Procurement Literature

Many studies fail to comprehensively link green procurement with responsiveness, especially in large-scale manufacturing. Orfanidou et al. (2024) identified moderate adoption in Greece but noted contextual limitations. Kimira et al. (2016) assessed green procurement at Unilever Kenya, focusing on cost and ICT but not responsiveness. Pembere (2019) examined NSE-listed firms, excluding LSMFs. Waris (2019) and Ajibike et al. (2020) studied leadership influences in non-manufacturing sectors. Fiati (2020) confirmed benefits in Ghana but lacked insights on LSMF challenges. Ambrer & Javer (2020) and Anane (2020) explored financial impacts in tourism and utilities but overlooked manufacturing responsiveness. This review reveals a clear gap in understanding the effect of green procurement on the responsiveness of large-scale manufacturing firms in Kenya. The integration of supplier assessment, reverse logistics, lean

supply chains, and electronic procurement within the TCET and RBT frameworks presents a comprehensive lens for evaluating sustainable procurement's impact on operational efficiency and competitiveness. This study addresses this gap by exploring how these green procurement dimensions influence responsiveness in Nairobi's large-scale manufacturing sector.

Research Methodology

The study adopted a descriptive research strategy, suitable for analysing and reporting the relationships between green procurement and responsiveness in large-scale manufacturing firms (LSMF) in Nairobi City County, Kenya. Descriptive research is designed to present accurate information on the current state of a phenomenon and is often used to draw inferences about a population's characteristics. The researcher was able to examine participant demographics and the connection between supply chain responsiveness and green procurement practices thanks to the design.

The target population consisted of procurement staff from the large-scale manufacturing firms in Nairobi County, Kenya. These firms were selected because they are major sources of industrial effluents. According to the Kenya Association of Manufacturers (KAM), there were 98 large-scale manufacturing firms in Nairobi City, County in 2023. The unit of observation was the 490-procurement staff employed in these companies, as they were directly involved in implementing green procurement practices. The breakdown of the population is as follows:

Table 1: Target Population

Population	Number
Top procurement managers	98
Middle-level procurement managers	184
Procurement officers	208
Total	**490**

The study used a proportionate sampling technique, with respondents selected from each category using simple random sampling. Using Yamane's (1967) formula, 220 respondents made up the sample size, which comprised:

Table 1: Sample Size

Population	Number

Top procurement managers	44
Middle-level procurement managers	83
Procurement officers	93
Total	**220**

This sampling technique ensured that the study represented the different levels of procurement staff.

Data was collected through semi-structured surveys, which included Likert scale questions to measure respondents' views, feelings, and beliefs. Three sections comprised the questionnaire: Part A gathered background information, while subsequent sections addressed the study variables. This instrument was chosen for its ability to collect detailed and structured data from a broad population. Before data collection, ethical clearance was obtained from the university's ethics committee and a research permit was sought from the relevant authorities. To administer the surveys, two research assistants were employed and trained. The researcher and assistants visited the manufacturing firms, explained the study's objectives, and ensured that participants understood the instructions for completing the questionnaires. After gathering the data, the questionnaires were reviewed for completeness and correctness.

To guarantee the reliability and validity of the research tools, a pilot study was carried out in Kiambu County, which is similar to Nairobi in terms of industrial activities. The pilot study involved at least 10% of the total sample size (i.e., 10 participants) from large manufacturing firms in Kiambu. The researcher was able to test the questions' readability and spot any possible problems with the survey tool thanks to the pilot. The study employed content validity, which was ensured by consulting with supervisors, peers, and faculty members. Discussions around the content of the questionnaire ensured that it was relevant to the research questions and accurately addressed the topic. This validation process confirmed the research instrument's ability to capture relevant data. Cronbach's Alpha was used to gauge how reliable the research tools were. It was anticipated that the instruments' reliability coefficient would be at least 0.70, which is regarded as appropriate for data collection instruments in social science research. An instrument is considered more reliable if its Cronbach's Alpha value is higher.

The collected data was first cleaned and coded, then analyzed using both descriptive and inferential statistics. Descriptive statistics, including percentages, means, standard deviations,

and frequencies, were used to summarize the characteristics of the research variables. Inferential statistics, specifically multiple linear regression analysis, were applied to examine the relationship between LSMF responsiveness and green procurement practices. The following regression model was used:

$Y=\beta0+\beta1X1+\beta2X2+\beta3X3+\beta4X4+€$

Where:

Y = Responsiveness

($\beta1X1$) = Supplier selection

($\beta2X2$) = Supplier development

($\beta3X3$) = Lean supply chain

($\beta4X4$) = E-procurement

€ = Error term

($\beta0$) = Regression coefficients

The regression analysis aimed to determine how the independent variables influenced the dependent variable, which is responsiveness.

Strict ethical guidelines were followed throughout the study to protect participant confidentiality and rights. The study clearly explained the study's goals to participants and obtained approval from the National Commission for Science, Technology, and Innovation. Participants were given consent forms and told they could leave the study at any time without facing any repercussions. The study maintained high standards of confidentiality, with all collected data stored securely and protected from unauthorized access. Participants' data was handled with integrity, and they were assured that their personal information would not be shared or misused.

Research Findings

The research gathered data from 220 procurement staff members, with a response rate of 90%, yielding 197 completed questionnaires. According to the demographic analysis, 51% of respondents were over 35 years of age. On gender analysis, 60% of respondents were male. The majority had bachelor's degrees (55%) and had been employed at their current companies for 5–10 years (40%). Cronbach's Alpha values, which were all above 0.7, validated the study's reliability and showed strong reliability for the following variables: responsiveness, lean supply chains, supplier assessment, reverse logistics, and electronic procurement. Validity was ensured through expert feedback and questionnaire revisions. The sample comprised 45% procurement officers, 38% middle-level procurement managers, and 17% top procurement

managers. The data was processed in SPSS and analyzed using descriptive and inferential statistical techniques, such as ANOVA, regression, and correlation analysis. The findings are expected to provide insights into green procurement responsiveness on large manufacturing firms in Nairobi City County, Kenya. The analysis addresses four main objectives, each evaluating a specific aspect of the supply chain: supplier assessment, reverse logistics, lean supply chain, and electronic procurement.

Table 3: Demographic data of the Study

Demographic	Category	Frequency	Percent
Gender	Male	118	60
	Female	79	40
Age	Below 25 years	14	7
	26-35 years	82	42
	Above 35 years	101	51
Years of experience	Below 5 years	74	38
	5-10 years	78	40
	Above 10 years	45	23
Education level	College level	79	40
	Bachelors level	108	55
	Masters level	10	5
Position in company	Top procurement manager	34	17
	Middle level procurement manager	75	38
	Procurement officer	88	45

Source: Field data (2024)

The first objective assessed how supplier evaluation influences the responsiveness of firms. Respondents were asked about the selection of suppliers based on environmental sustainability. The majority, 61%, indicated that they selected suppliers dealing with environmentally friendly products to a great extent, with a mean score of 4.15, reflecting a strong commitment to green practices. Additionally, firms placed emphasis on ensuring eco-friendly packaging and collaborating with suppliers to design sustainable products. These practices were rated highly, with mean scores of 4.31 and 4.42, respectively. Evaluating vendors for pollution-free and reusable products had the highest mean score of 4.56, indicating that firms prioritize environmental sustainability in their supplier assessments.

Table 4: Supplier Assessment

Statements	N	Mean	Std. Dev.	VSE	SE	ME	GE	VGE
The manufacturing firm selects suppliers that deal with products that are environmentally friendly	197	4.15	0.61	0	0	12	61	27
The manufacturing firm ensures that the assessed vendor's packaging materials used have no or minimal effect on the environment	197	4.31	0.60	0	0	7	54	39
The manufacturer makes use of supplier collaborations to design eco-friendly products to attain sustainability in operations	197	4.42	0.55	0	0	3	52	45
The manufacturing firm assesses vendors that deal with products that cause no pollution to the environment and are easily re-usable	197	4.56	0.52	0	0	1	42	57
The manufacturing firm assesses vendors that produce products that are reusable and hence cause little pollution	197	4.42	0.57	0	0	4	50	46
The manufacturing firm ensures the firm sources raw materials and goods from suppliers who adhere to green initiatives	197	4.25	0.56	0	0	6	62	31

Source: Field data (2024)

The second objective explored the impact of reverse logistics on firm responsiveness. Respondents were asked about their firms' practices related to waste disposal, recycling, and product returns. A significant 50% of respondents noted that their firms adopted safe waste disposal practices to a great extent, with a mean score of 4.39, indicating strong commitment to environmental sustainability. Waste recycling and efficient product returns were also prioritized, with mean scores of 4.25 and 4.35, respectively. The highest mean score, 4.59, was

recorded for timely and efficient product delivery, which enhances customer satisfaction while reducing environmental impact.

Table 5: Reverse logistics

Statements	N	Mean	Std. Dev.	VSE	SE	ME	GE	VGE
The organisation ensures safe waste disposal to enhance environmental sustainability.	197	4.39	0.59	0	0	6	50	45
The firm ensures necessary steps in waste product recycling.	197	4.25	0.53	0	0	5	65	30
The organisation has elaborate logistics returns to ensure a clean environment.	197	4.35	0.56	0	0	4	57	39
The organisation has an elaborate manufacturing cycle.	197	4.36	0.61	0	0	7	50	43
The organisation ensures products are delivered in time, as per customer specifications and quantities.	197	4.59	0.55	0	0	3	35	62

Source: Field data (2024)

The third objective assessed how lean supply chain practices influenced responsiveness. The majority of respondents indicated that waste minimization was a central part of their production processes, with a mean score of 4.33. Furthermore, firms emphasized eco-design strategies and energy-efficient production processes, which were rated highly, with mean scores of 4.54 and 4.27, respectively. A commitment to environmentally friendly processes was also evident, with a mean score of 4.45. The study also found that firms fostered positive relationships with suppliers, distributors, and customers to ensure the sustainable utilization of products, with a mean score of 4.16.

Table 6: Lean Supply Chain

Statements	N	Mean	Std. D	VSE	SE	ME	GE	VGE
The manufacturing firm incorporates wastes minimization in the production of goods	197	4.33	0.58	0	0	6	56	39

The manufacturing firm ensures that the product and process design minimize wastes on the environment	197	4.54	0.50	0	0	0	46	54
The manufacturer ensure that production processes incorporate energy efficient measures and minimizes on wastes	197	4.27	0.58	0	0	7	59	34
The manufacturer ensures processes that are carried out by the firm are environmentally friendly	197	4.45	0.55	0	0	3	50	48
The manufacturing company establishes and sustains positive connections with various partners like suppliers, distributors, and customers to enhance the sustainable utilization of products.	197	4.16	0.51	0	0	6	72	22

Source: Field data (2024)

The fourth objective examined the role of electronic procurement in improving responsiveness. The findings revealed that 51% of respondents reported using ICT in procurement processes to a great extent, with a mean score of 4.38. This suggests that electronic procurement practices significantly contribute to enhancing efficiency and reducing operational costs. The results indicate a transformative effect of ICT on procurement, improving overall responsiveness within firms.

Table 7: Electronic procurement

Statements	N	Mean	Std. Dev.	VSE	SE	ME	GE	VGE
Green procurement through supplier assessment improves the levels of flexibility of your firm to customer needs	197	4.42	0.55	0	0	3	52	45
Green procurement through reverse logistics improves the levels of flexibility of your firm to customer needs.	197	4.56	0.52	0	0	1	42	57
Green procurement through lean supply chain improves the levels of flexibility of your firm to customer needs	197	4.42	0.57	0	0	4	50	46
Green procurement through e-procurement improves the levels of flexibility of your firm to customer needs	197	4.25	0.56	0	0	6	62	31
the process of selecting a supplier increases the timely of product and service delivery	197	4.39	0.59	0	0	6	50	45
Enhancing suppliers' capabilities for sustainable practices increases efficiency in delivering products and services.	197	4.25	0.53	0	0	5	65	30
Green purchasing via efficient supply chain enhances timely delivery of goods and services.	197	4.35	0.56	0	0	4	57	39
The use of e-procurement for green purchasing enhances the	197	4.36	0.61	0	0	7	50	43

timely delivery of goods and services.								
Green procurement improves the level of reliability of firms to the customer needs and requirements.	197	4.59	0.55	0	0	3	35	62
Green procurement helps firms improve their reliability and responsiveness to customer needs.	197	4.33	0.58	0	0	6	56	39
Green procurement helps in resilience in production	197	4.54	0.50	0	0	0	46	54
Green procurement adoption helps firms to be financially resilient.	197	4.27	0.58	0	0	7	59	34
Green procurement adoption improves resilience in market share which facilitates improved responsiveness to customer needs.	197	4.45	0.55	0	0	3	50	48
Aggregate Mean		**4.40**						

Source: Field data (2024)

A Summary of The Research Findings, Conclusions, and Recommendations

The study revealed that supplier assessment significantly and positively affects the responsiveness of chemical and metal manufacturing firms in Nairobi. These firms prioritize sustainability in their supplier selection by favoring those offering environmentally friendly and reusable products, thus minimizing pollution and waste. The firms also scrutinize vendors' packaging materials to ensure minimal environmental impact and collaborate with suppliers to develop eco-friendly products. Furthermore, raw materials and goods are sourced from suppliers that adhere to green initiatives, reinforcing the firms' sustainable operations.

Reverse logistics and responsiveness were found to be positively and significantly correlated. The firms implement waste disposal practices and recycle waste products to

promote environmental sustainability. Detailed logistics returns are established to maintain a clean environment, and the firms adhere to an elaborate manufacturing cycle, ensuring the timely delivery of products that meet customer specifications and quantities.

According to the study, chemical and metal manufacturing companies became more responsive when they implemented a lean supply chain strategy. These firms focus on waste minimization by designing products and processes that reduce environmental impact. Energy-efficient production measures are incorporated, and the firms maintain strong relationships with various partners, including suppliers, distributors, and customers, to enhance the sustainable use of products. The study concludes that chemical and metal manufacturing firms in Nairobi are increasingly prioritizing sustainability. They choose suppliers committed to environmentally friendly and reusable products, ensure that packaging materials cause minimal environmental impact, and collaborate with suppliers to design eco-friendly products. The firms also engage in waste management and recycling practices, using reverse logistics and lean supply chains to minimize waste, reduce energy consumption, and establish positive relationships with partners to enhance sustainability. Additionally, the firms leverage ICT in electronic procurement to monitor spending, streamline operations, and reduce unnecessary delays for customers.

It is recommended that firms continue to prioritize sustainability by strengthening their supplier assessment processes. This includes not only ensuring that suppliers adhere to environmental standards but also regularly evaluating their sustainability practices. Greater collaboration with suppliers is recommended to design innovative, eco-friendly products and materials, which can contribute to reducing pollution and waste. Partnerships that promote green initiatives should be further strengthened to foster a more sustainable manufacturing ecosystem. Manufacturing firms should expand their waste disposal and recycling practices by investing in advanced technologies and systems that ensure waste is handled sustainably. Collaboration with waste management experts can help firms develop comprehensive waste-to-resource systems, which could be integrated into logistics returns and manufacturing cycles. Additionally, firms should adopt more environmentally efficient transportation solutions for timely product delivery to minimize environmental impact.

Firms are encouraged to expand the adoption of lean supply chain practices, with a focus on eco-design. This ensures that products are designed to meet customer needs while minimizing environmental impact throughout their lifecycle. Building stronger ties with distributors and

consumers can help encourage a circular economy by encouraging the recycling and sustainable use of products. National bodies such as NEMA should incentivize the adoption of lean practices across the sector and encourage the integration of eco-design principles.

The study recommends that firms enhance their use of electronic procurement to optimize operations and reduce unnecessary expenses. Continuous updates to procurement systems are necessary to ensure the use of the most efficient technology available. Environmental authorities such as NEMA can support firms by providing guidelines and incentives for adopting green technologies in their procurement processes. Businesses may be able to make sure that their procurement choices support sustainability objectives with the aid of these incentives.

Future studies could look at how green procurement practices affect manufacturing companies' competitiveness and financial performance over the long run. Examining the long-term effects of these practices on market share, cost reductions, and profit margins would be beneficial. In order to accomplish sustainability objectives, more research could examine how cutting-edge technologies like blockchain, artificial intelligence, and the Internet of Things can optimize reverse logistics and lean supply chains. Expanding the study to include manufacturing firms outside Nairobi and across different sectors could help determine whether the findings are consistent. A comparative analysis could also identify sector-specific challenges and opportunities for enhancing green procurement practices. Furthermore, more research could look at how government regulations and policies encourage the use of green procurement practices, specifically how local and national laws, incentives, and environmental standards affect businesses' sustainability choices.

Conclusion

This study concludes that green procurement significantly influences the responsiveness of large manufacturing firms in Nairobi City County, Kenya. Supplier assessment, reverse logistics, and lean supply chain practices contribute positively to operational efficiency, waste reduction, and sustainability. Conversely, e-procurement may hinder responsiveness if not supported by effective technology and integration systems.

The results emphasize the importance of prioritizing sustainable procurement, investing in waste management infrastructure, and fostering strong supplier relationships. Supplier

assessment ensures environmental compliance, while reverse logistics enables material reuse and minimizes ecological harm. Lean supply chains help optimize resources, lower costs, and improve operational agility. While e-procurement can enhance transparency and cost-effectiveness, it requires reliable digital infrastructure and systems integration to deliver expected benefits.

Policy support is vital for advancing green procurement. Government and regulatory bodies should establish incentives and enforce guidelines encouraging firms to adopt environmentally responsible practices. Companies must also invest in training and upskilling procurement personnel to effectively implement green procurement strategies. Future research should examine the long-term strategic benefits of green procurement, including impacts on brand equity and customer loyalty. Additional areas include AI integration in sustainable supply chains, the influence of organizational culture, and the adoption of circular economy principles to promote closed-loop, waste-reducing procurement models.

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