

ENERGY EFFICIENCY AND PERFORMANCE OF LARGE MANUFACTURING FIRMS IN KENYA

¹Zawadi Mdasha, ²Dr. Paul Kariuki (PhD) & ³Dr. Peter Wanjohi (PhD)
¹Postgraduate student, Jomo Kenyatta University of Agriculture and Technology
^{2&3}Lecturers, Jomo Kenyatta University of Agriculture and Technology
*Email of the Corresponding Author: makiefrank@gmail.com

Publication Date: March 2024

ABSTRACT

Purpose of the study: The purpose of this study was to examine the relationship between energy efficiency and performance of large manufacturing firms in Kenya. Large Manufacturing firms are critical to the economic development of a nation and the wellbeing of its citizens. However, most of the large manufacturing firms in Kenya have recently recorded a decline in performance.

Research methodology: The study applied descriptive and correlational research designs. The target population was 499 and the sample size was 336 respondents selected through stratified and simple random sampling techniques. A questionnaire was designed, and experts in the fields of strategic management were used to determine the validity and reliability of the data collection instruments. The unit of analysis included large manufacturing firms, while the unit of observation included managers from middle level management and top-level management. The study used descriptive and inferential statistics to analyze the results with help of SPSS version 22.

Findings: The study found significant correlation between energy efficiency (0.499 and the performance of large manufacturing firms. The study found that energy Efficiency exhibited the strongest positive influence (Beta = 0.994, $p = 0.001$), accounting for 24.9% of the variance in firm performance ($R^2 = 0.249$).

Conclusion: The study concludes that energy efficiency positively influences the performance of large manufacturing firms in Kenya. The positive influence observed suggests that companies that prioritize energy efficiency measures, such as investing in renewable energy sources, implementing strategies to improve energy efficiency, and conducting regular energy audits, are more likely to achieve better overall performance outcomes.

Recommendations: The study recommends that large manufacturing firms in Kenya prioritize investments in energy efficiency initiatives as a strategic imperative for enhancing their performance. It is crucial for policymakers and industry stakeholders to support and incentivize the adoption of energy-efficient practices through targeted policies, financial incentives, and capacity-building initiatives to promote a more sustainable and resilient manufacturing sector in Kenya.

Keywords: *Energy efficiency, performance, large manufacturing firms, Kenya*

BACKGROUND OF THE STUDY

The manufacturing sector in Kenya is the third biggest industrial sector after agriculture and transport and communication (KPMG, 2020). It is the third leading sector contributing to GDP in Kenya. Although Kenya is the most industrially developed country in East Africa, the manufacturing sector constitutes merely 10 per cent of the industrial sector contribution to GDP (RoK, 2018). The growth in manufacturing industry has declined to 3.3 per cent in 2020 as compared to 4.4 per cent in the year 2019 mainly due to a challenging operating environment (KNBS, 2021). The manufacturing sector has high yet untapped potential to contribute to employment and GDP growth. As an important sector in the overall economic growth, manufacturing sector requires an in-depth analysis at industry as well as firm level. According to a report by KPMG (2018), Kenya's manufacturing sector's share in output has continued to decline in recent years. This has exposed a gap in the country's ability to achieve a fully industrialized economy by 2030. The report argues that there is still a lot of room for expansion in Kenya's manufacturing sector but for this to happen, reforms to the operating environment need to be made to factor in the influence of contingencies in the sector (KPMG, 2020).

Corporate environmental responsibility (CER) is a corporate social responsibility (CSR) component (Aslam, Rehman & Asad, 2020; Babiak & Trendafilova, 2020; Yang, Liu, Sun, & Zhang, 2021). The CER refers to the commitment and practice of firms to adopt responsible actions to protect and improve the natural environment (Nederhand & Klijn, 2019). CER plays a crucial role in improving environmental quality through corporate design for the environment, waste minimization, demand-side management, product stewardship and full-cost accounting, among others (Lee, Kim & Kook, 2021; Tasneem, Muhammad & Basit, 2021). Ienciu, Cardos and Muller (2021) state CER includes firms' commitment and adoption of responsible actions targeting environmental protection and improvement while achieving economic performance. The pollution and emissions signal ineffective use of resources (Schalk, 2021).

In Kenya, leading companies like Coca-Cola, Unga group limited, BAT and PZ Cussons are working to responsibly manage manufacturing emissions and improve energy efficiency per litre of product produced (McKinnon, 2020). They are driving collaboration throughout the supply

chain to reduce emissions associated with getting the products to the ultimate consumers. At these firms, waste prevention extends beyond reducing packaging material to optimizing packaging efficiency; increasing renewable material use; recovering packages for reuse; and increasing recycled material use (Bigsten, 2019). The long-term vision is to contribute meaningfully to the green economy in which materials are used and reused to provide ongoing value (McKinnon, 2020). Water quality and availability are vital to manufacturing businesses. Organizations are working to establish more water-sustainable businesses on a global scale, focusing on water stewardship efforts in areas where there is greatest impact, including improving water-use efficiency and reuse, managing wastewater, mitigating water risk and replenishing the water used in finished beverages (McKinnon, 2020).

The study examined the relationship between energy efficiency and performance of large manufacturing firms in Kenya. Energy efficiency is a paramount consideration in today's world, driven by environmental concerns and the need for sustainable energy practices (Aldieri, Kotsemir & Vinci, 2020). Several strategies and initiatives play a vital role in enhancing energy efficiency, as highlighted in various studies. One crucial aspect of improving energy efficiency is investing in renewable energy sources (Di Foggia, 2021; Jiang, Zhou & He, 2021; Macharia, Gathiaka, & Ngui, 2022). Renewable energy, such as solar, wind, and hydropower, offers a sustainable alternative to traditional fossil fuels. By transitioning to renewable energy sources, organizations and industries reduce their carbon footprint and dependency on finite resources. These investments contribute to a cleaner and more sustainable energy future while often providing cost savings in the long run. Implementing measures to improve energy efficiency within operations and processes is another vital strategy (Berner, Lange & Silbersdorff, 2022). This involves adopting technologies, practices, and behaviors that reduce energy consumption without compromising productivity or quality. Regular energy audits are instrumental in identifying areas for energy efficiency improvements (Kalantzis and Revoltella, 2019; Moon and Min, 2020). Energy audits involve a systematic evaluation of an organization's energy consumption patterns, identifying inefficiencies and opportunities for improvement.

STATEMENT OF THE PROBLEM

The manufacturing firms in Kenya have been experiencing a significant decline in performance. This downturn is evident in the sector's stagnated contribution to the country's GDP, growing at a mere 3.1 percent, significantly trailing the overall economic growth rate of 5.0 percent as reported by the World Bank in 2019. Specific instances exemplify this trend; East African Breweries Limited (EABL), a major player in the East African brewing industry, recorded a worrying 15% drop in profits and a 7% reduction in market share in the 2021/2021 fiscal year, compared to the preceding year, as noted by Baraza (2021). Similarly, East African Portland Cement reported substantial net losses of Ksh 3.4 billion in 2019 and 2.8 billion in 2020. Tata Chemicals Magadi Limited also faced financial struggles, reporting a loss of Ksh. 134,000,000 in 2020. These instances highlight a troubling pattern of financial underperformance within the sector.

The decline can be attributed to multiple underlying causes. The Kenya Association of Manufacturers (KAM, 2021) revealed that some firms are considering shutting down local operations and relocating to countries like Egypt due to diminishing profits. This move can be partly attributed to the dwindling export volumes in the sector, with a stark 62.8 percent decrease in cement export from 388.4 thousand tonnes in 2021 to just 144.3 thousand tonnes in 2018, as per the Kenya National Bureau of Statistics (KNBS, 2019). Furthermore, there was a noted decrease in cement production by 2.6 percent to 6,069.9 thousand tonnes in 2018 from 6,230.3 in 2021, accompanied by an increase in imports from 14.7 thousand tonnes in 2021 to 23.0 thousand tonnes in 2018. These statistics suggest a declining domestic manufacturing capability and competitiveness, which could be linked to issues in corporate environmental responsibility, forming the basis for this study.

Based on the reviewed studies, the knowledge gap exists that formed the basis of conducting the current study. For instance, Makori and Jagongo (2020) looked at only environmental accounting while the current examined the influence of energy efficiency on performance, thus a conceptual gap. Besides, Ienciu, Cardos, and Muller (2021) used environmental impact assessment as the study variable and thus presents a conceptual gap. A study by Menike (2020) was done in food, beverage and tobacco sector companies listed on the Colombo Stock Exchange, thus presenting a

contextual gap because the current study was done in manufacturing firms. Another study by Mwangi and Mwiti (2020) presented a conceptual gap because it only focused on voluntary financial disclosures. Moreover, Li, Cao, Zhang, Chen, Ren and Zhao (2021) focused on Chinese energy-intensive listed companies, thus a contextual gap. Nederhand and Klijn (2019) carried out a study on environmental regulations compliance in public-private partnerships, and thus contextual gap.

A study by Somjai, Fongtanakit and Laosillapacharoen (2020) utilized a descriptive research design, thus a methodological gap since the current study used both descriptive and explanatory research design. The explanatory research design is used to examine the relationship between variables. In addition, Kibogy (2021) used a descriptive research design, thus a methodological gap. Ntiamoah, Egyiri and Kwamega (2020) conducted the study in the banking sector, thus presenting a contextual gap. Furthermore, Muloli (2020) conducted the study in banks, thus a contextual gap. Thus, based on the reviewed studies, a knowledge gap existed in conceptual, contextual and methodological and this formed the basis of the current study.

STUDY OBJECTIVE

To identify the relationship between energy efficiency and performance of large manufacturing firms in Kenya.

RESEARCH HYPOTHESIS

H₀: Energy efficiency have no significant influence on performance of Large Manufacturing firms in Kenya.

LITERATURE REVIEW

THEORETICAL LITERATURE REVIEW

The study was anchored on efficiency theory. The efficiency theory was developed by Demsetz (1973) as alternative to the market power theory. The efficiency theory implies that better management and scale efficiency result in higher concentration of greater and soaring financial performance. Accordingly, the theory assumes that management efficiency increases profits, results in larger market share and improves market depth. Efficiency theory indicates that growing

profitability is positively correlated with efficiency and size. Thus, positive association between market depth and profit arise from lower cost, achieved through production efficiencies and increased managerial processes (Sikder, Eanes, Asmelash, Kar & Koetter, 2021). Efficiency theory assumes the most favourable production is achieved by economies of scale. Thus, maximum operational efficiency in the short run is achieved at output level in which all available economies of scale are employed efficiently (Odunga, Nyangweso, Carter & Mwarumba, 2020).

The efficiency theory holds significant relevance to the study aimed at identifying the relationship between energy efficiency and the performance of large manufacturing firms in Kenya. This theory posits that efficient management and scale efficiency lead to improved financial performance and concentration within firms. In the context of large manufacturing firms in Kenya, this theory provides a valuable framework to examine the implications of energy efficiency on their overall performance. Efficiency theory suggests that better management practices, which include optimizing energy usage and reducing waste, can result in higher profitability. Moreover, the efficiency theory's emphasis on economies of scale is pertinent to the study's objectives. It suggests that maximum operational efficiency is attained when a firm optimizes its output and utilizes economies of scale efficiently (Odunga, Nyangweso, Carter & Mwarumba, 2020). The study can investigate whether there is a positive correlation between the size of manufacturing firms and their ability to realize energy efficiency gains, thus contributing to improved overall performance.

CONCEPTUAL FRAMEWORK

Orodho (2020) defines conceptual framework as graphical or diagrammatical model that represents relationships between variables in the study. It is a road map the study intends to follow for examining answers to the problems raised by the research questions. Figure 1 illustrates the relationship between variables.

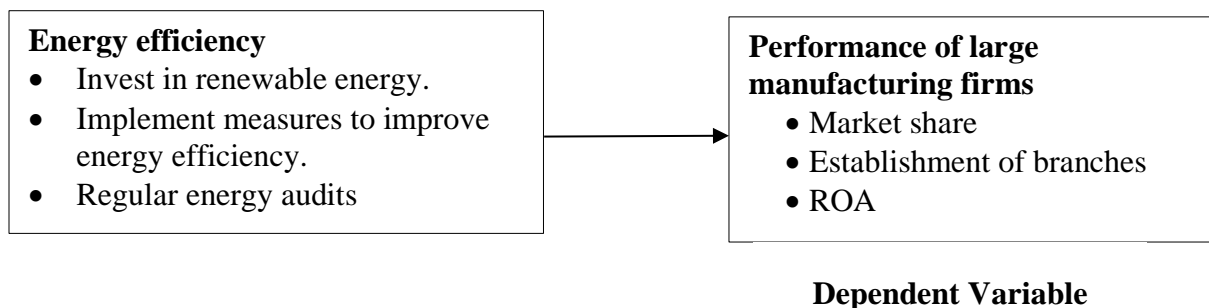


Figure 1: Conceptual Framework

EMPIRICAL LITERATURE REVIEW

The study by Jiang, Zhou, and He (2021) established there is a positive correlation between energy efficiency and output efficiency, suggesting that these firms could successfully manage a balance between conserving energy and maintaining high output. This implies that improvements in energy efficiency do not necessarily come at the cost of reduced output performance in the textile sector. The study also noted that factors like increased taxes and operating expenses could negatively impact both output and energy efficiency in textile firms, while larger firms often benefitted from economies of scale, enhancing both efficiencies. The study by Macharia, Gathiaka, and Ngui (2022) revealed a considerable potential for enhancing energy efficiency across these sub-sectors. It identifies key factors that positively impact energy efficiency, such as exporting status, research and development, managerial experience, and female ownership, although these effects vary by sub-sector and energy type. Conversely, labor productivity is found to negatively influence energy efficiency, while the effects of firm age and size remain ambiguous.

The study by Berner, Lange, and Silbersdorff (2022) investigates the intriguing case of Germany's manufacturing sector, where increased energy efficiency has not led to a significant decrease in overall energy use, suggesting the presence of growth-induced rebound effects. Analyzing data from over 16,000 firms, the research employs dynamic analysis and quantile regression to explore these effects, finding that while firms achieving reductions in energy use do see a decrease in subsequent energy consumption, 4.5 to 5.3% of these savings are offset by increased production. The study reveals that the magnitude of this rebound effect varies depending on firm-specific characteristics and investment decisions, indicating that the impact of energy efficiency measures is not uniform across the sector. This nuanced understanding of the rebound effect is vital for developing more effective energy policies and strategies tailored to different types of firms within the manufacturing industry.

Osazefua (2019) revealed that energy efficiency has a significant impact on the financial sustainability. By implementing energy-efficient practices and technologies, businesses and organizations can reduce their energy consumption and related costs. This not only leads to immediate cost savings but also contributes to long-term financial stability. Additionally,

improved energy efficiency often aligns with environmental goals, which can further enhance a company's reputation and appeal to eco-conscious consumers. In summary, the link between energy efficiency and financial sustainability is evident, as it not only reduces operational expenses but also positions entities favorably in an increasingly sustainability-focused market. The study by Herce et al. (2021) reveal that companies equipped with an EnMS and a monitoring system tend to have higher “energy savings/company” and “EPIA/site” ratios. This indicates that the presence of these systems is associated with more effective and extensive implementation of energy-saving measures.

The study by Moon and Min (2020) examined the effect of energy efficiency on the financial performance of energy-intensive firms in Korea, in response to government-enforced energy regulations. Through an advanced two-stage network DEA model, the research explored changes in both pure-energy and economic efficiencies over time, considering various factors influencing energy efficiency. The findings revealed that energy efficiency had a significant relationship with financial performance, but interestingly, firms with higher pure-energy efficiency did not consistently achieve better financial results. This study sheds light on the intricate interplay between energy efficiency and financial performance in the context of stringent energy regulations, offering valuable insights for businesses facing the challenge of balancing environmental compliance and financial stability.

RESEARCH METHODOLOGY

The study employed descriptive and explanatory research designs to describe relationships and explain causal connections between variables. A positivistic philosophy was adopted, guiding the formulation and testing of hypotheses through quantitative methods. The target population for the study was 499 and the sample size was 336 respondents selected through stratified and simple random sampling techniques. Data collection utilized a questionnaire to gather primary data, complemented by secondary data from industry reports and firm annual reports. Descriptive statistics like mean and frequencies was used to perform data analysis. Statistical Package for Social Scientists (SPSS) was used to produce frequencies, descriptive and inferential statistics was used to derive conclusions and recommendations regarding the study findings. The analysis of

variance (ANOVA) was checked to reveal the overall model significance. The regression coefficient was checked to establish whether the energy efficiency affects the performance of large manufacturing companies in Kenya. A critical p value of 0.05 was used to determine whether the variable is significant or not.

RESEARCH FINDINGS AND DISCUSSION

RESPONSE RATE

The study results on response rate are presented in Table 1

Table 1: Response Rate

Item	Frequency	Percent
Returned questionnaires	315	93.8
Unreturned questionnaires	21	6.2
Total	336	100.0

The study targeted a sample of 336 respondents. Out of the 336 questionnaires given out during data collection, 315 filled ones were received back, with twenty-one (21) not returned. This translated to 93.8% response rate which was good for analysis. According to Kothari (2004), a response rate of above 50% is adequate for a descriptive study. Babbie (2004) also asserted that return rates of above 50% are acceptable to analyze and publish, 60% is good and 70% is very good and 80% is excellent. Based on these assertions from renowned scholars, the researcher used the returned questionnaires to analyze, and non-response questionnaires were not considered.

DESCRIPTIVE ANALYSIS

ENERGY EFFICIENCY

To obtain information about the energy efficiency, several statements were asked and the respondents required to provide feedback on a likert scale of one (1) to five (5), for 1 being strongly disagree, 2 being disagree, 3 being neither agree nor disagree, 4 being agree and 5 being strongly agree to the statements as shown in table 2.

Table 2: Energy Efficiency

Environmental awareness	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	Mean	Std. Dev.
Investing in renewable energy reduces energy costs and enhances performance	-	-	14.9	69.8	15.2	4.00	0.550
Implementing energy-efficient measures lowers operational expenses and boosts organizational performance	-	-	5.1	74.3	20.6	4.16	0.483
Regular energy audits identify areas for improvement, optimizing performance.	-	5.4	5.1	62.9	26.7	4.11	0.723
Energy-efficient practices reduce environmental impact, enhancing the organization’s image and market competitiveness.	-	5.4	25.4	45.4	23.8	3.88	0.834
Lower energy consumption improves cost-effectiveness and overall financial performance.	-	5.4	18.4	34.9	41.3	4.12	0.895
Energy-efficient processes lead to reduced downtime and increased productivity, positively impacting performance.	-	-	-	32.4	67.6	4.68	0.469
Utilizing renewable energy sources aligns with sustainability goals and attracts eco-conscious customers, benefiting performance.	-	-	-	53.7	46.3	4.46	0.499
Efficient energy use minimizes resource waste, contributing to improved resource management and performance	-	5.4	-	65.1	29.5	4.19	0.691
Lower energy bills free up capital for investments that can further enhance performance	-	-	44.8	32.7	22.5	3.78	0.791
Energy-efficient technologies enhance reliability and resilience, minimizing disruptions and maintaining performance..	-	5.4	36.2	39.4	19.0	3.72	0.832
Energy savings contribute to increased profitability, positively influencing organizational performance.	-	5.4	25.4	48.3	21.0	3.85	0.811
A commitment to energy efficiency fosters a culture of sustainability, attracting talent and partners, ultimately enhancing overall performance.	-	26.7	9.8	36.2	27.3	3.64	1.146
Average						4.05	0.727

The study results in Table 2 shows that on the statement “Investing in renewable energy reduces energy costs and enhances performance” 14.9% of the respondents neither agreed nor disagreed to the statement, 69.8% of the respondents agreed to the statement whereas 15.2% of the respondents strongly agreed to the statement, with a mean of 4.00 and standard deviation 0.550. On the statement “Implementing energy-efficient measures lowers operational expenses and

boosts organizational performance” 5.1% of the respondents neither agreed nor disagreed to the statement, 74.3% of the respondents agreed to the statement whereas 20.6% of the respondents strongly agreed to the statement, with a mean of 4.16 and standard deviation 0.483. Concerning the statement “Regular energy audits identify areas for improvement, optimizing performance” 5.4% disagreed to the statement, 5.1% of the respondents neither agreed nor disagreed to the statement, 62.9% of the respondents agreed to the statement whereas 26.7% of the respondents strongly agreed to the statement, with a mean of 4.11 and standard deviation 0.723.

About the statement “Energy-efficient practices reduce environmental impact, enhancing the organization’s image and market competitiveness” 5.4% disagreed to the statement, 25.4% of the respondents neither agreed nor disagreed to the statement, 45.4% of the respondents agreed to the statement whereas 23.8% of the respondents strongly agreed to the statement, with a mean of 3.88 and standard deviation 0.834.. On the statement “Lower energy consumption improves cost-effectiveness and overall financial performance” 5.4% disagreed to the statement, 18.4% of the respondents neither agreed nor disagreed to the statement, 34.9% of the respondents agreed to the statement whereas 41.3% of the respondents strongly agreed to the statement, with a mean of 4.12 and standard deviation 0.895.

Concerning the statement “Energy-efficient processes lead to reduced downtime and increased productivity, positively impacting performance” 32.4% of the respondents agreed to the statement whereas 67.6% of the respondents strongly agreed to the statement, with a mean of 4.68 and standard deviation 0.469. About the statement “Utilizing renewable energy sources aligns with sustainability goals and attracts eco-conscious customers, benefiting performance” 53.7% of the respondents agreed to the statement whereas 46.3% of the respondents strongly agreed to the statement, with a mean of 4.46 and standard deviation 0.499.

On the statement “Efficient energy use minimizes resource waste, contributing to improved resource management and performance” 5.4% disagreed to the statement, 65.1% of the respondents agreed to the statement whereas 29.5% of the respondents strongly agreed to the statement, with a mean of 4.19 and standard deviation 0.691.. Concerning the statement “The organization has audit procedures covering conducting audits and reporting results” 44.8% of the

respondents neither agreed nor disagreed to the statement, 32.7% of the respondents agreed to the statement whereas 22.5% of the respondents strongly agreed to the statement, with a mean of 3.78 and standard deviation 0.791. About the statement “Energy-efficient technologies enhance reliability and resilience, minimizing disruptions and maintaining performance.” 5.4% disagreed to the statement, 36.2% of the respondents neither agreed nor disagreed to the statement, 39.4% of the respondents agreed to the statement whereas 19.0% of the respondents strongly agreed to the statement, with a mean of 3.72 and standard deviation 0.832.

On the statement “Energy savings contribute to increased profitability, positively influencing organizational performance” 5.4% disagreed to the statement, 25.4% of the respondents neither agreed nor disagreed to the statement, 48.3% of the respondents agreed to the statement whereas 21.0% of the respondents strongly agreed to the statement, with a mean of 3.85 and standard deviation 0.811. Concerning the statement “A commitment to energy efficiency fosters a culture of sustainability, attracting talent and partners, ultimately enhancing overall performance” 26.7% disagreed to the statement, 9.8% of the respondents neither agreed nor disagreed to the statement, 36.2% of the respondents agreed to the statement whereas 27.3% of the respondents strongly agreed to the statement, with a mean of 3.64 and standard deviation 1.146. The average mean score was 3.53, with a standard deviation of 1.005. This implied that most of the respondents agreed with the survey statement under environmental regulations compliance. The average mean score was 4.05, with a standard deviation of 0.727.

In addition, from the open-ended questions, it was found that energy efficiency is viewed as a critical factor that can positively impact both the operational and strategic aspects of these organizations. Energy efficiency directly contributes to improved operational performance. Respondents emphasized that manufacturing firms that invest in energy-efficient technologies and practices experience reduced energy consumption, which leads to lower operational costs. This cost-saving aspect is especially vital for businesses in a competitive market, where every reduction in overhead expenses contributes to increased profitability. Moreover, improved energy efficiency often translates into higher production output for the same energy input, leading to increased productivity and reduced downtime. In essence, energy-efficient processes contribute to smoother operations, decreased resource waste, and enhanced overall performance.

In addition, energy efficiency has strategic implications that extend beyond day-to-day operations. Manufacturing firms that prioritize energy efficiency are better positioned to navigate the challenges of an increasingly environmentally conscious market. They not only reduce their carbon footprint but also bolster their reputation as responsible and sustainable entities. This reputation, in turn, attracts environmentally conscious customers and investors, broadening the customer base and increasing access to capital. Furthermore, by implementing renewable energy sources and efficient technologies, these firms are often more resilient to energy price fluctuations, supply chain disruptions, and regulatory changes. This strategic foresight ensures long-term stability and competitive advantage, ultimately impacting the performance of manufacturing organizations positively.

PERFORMANCE OF LARGE MANUFACTURING FIRMS

Table 3 presents the study results on performance of large manufacturing firms.

Table 3: Performance of Large Manufacturing Firms

Performance of Large Manufacturing Firms	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	Mean	Std. Dev.
The assets of the organization have been increasing	-	25.4	4.1	36.8	33.7	3.79	1.163
The organization equity has been growing over the years	-	25.4	4.1	51.7	18.7	3.64	1.057
The organization market share has been on the rise in the last five years	-	25.4	21.6	39.7	13.3	3.41	1.010
The organization has established/opened new branches in the last five years	-	9.5	28.3	48.9	13.3	3.66	0.827
The customer retention in the organization has been high over the years	-	21.3	9.2	50.8	18.7	3.67	1.012
The organization has been achieving its target goals in the last five years	-	25.4	5.1	50.8	18.7	3.63	1.058
The market share of our company has increased consistently over the past 5 years	-	30.8	14.3	30.5	24.4	3.49	1.166
Average						3.61	1.042

The study results in Table 3 shows that on the statement “The assets of the organization have been increasing” 25.4% disagreed to the statement, 4.1% of the respondents neither agreed nor disagreed to the statement, 36.8% of the respondents agreed to the statement whereas 33.7% of the respondents strongly agreed to the statement, with a mean of 3.79 and standard deviation 1.163.. About the statement “The organization equity has been growing over the years” 25.4% disagreed to the statement, 4.1% of the respondents neither agreed nor disagreed to the statement, 51.7% of the respondents agreed to the statement whereas 18.7% of the respondents strongly agreed to the statement, with a mean of 3.64 and standard deviation 1.057.

Concerning the statement “The organization market share has been on the rise in the last five years” 25.4% disagreed to the statement, 21.6% of the respondents neither agreed nor disagreed to the statement, 39.7% of the respondents agreed to the statement whereas 13.3% of the respondents strongly agreed to the statement, with a mean of 3.41 and standard deviation 1.010. Regarding the statement “The organization has established/opened new branches in the last five years” 9.5% disagreed to the statement, 28.3% of the respondents neither agreed nor disagreed to the statement, 48.9% of the respondents agreed to the statement whereas 13.3% of the respondents strongly agreed to the statement, with a mean of 3.66 and standard deviation 0.827. On the statement “The customer retention in the organization has been high over the years” 21.3% disagreed to the statement, 9.2% of the respondents neither agreed nor disagreed to the statement, 50.8% of the respondents agreed to the statement whereas 18.7% of the respondents strongly agreed to the statement, with a mean of 3.67 and standard deviation 1.012.

About the statement “The organization has been achieving its target goals in the last five years” 25.4% disagreed to the statement, 5.1% of the respondents neither agreed nor disagreed to the statement, 50.8% of the respondents agreed to the statement whereas 18.7% of the respondents strongly agreed to the statement, with a mean of 3.63 and standard deviation 1.058. Concerning the statement “The market share of our company has increased consistently over the past 5 years” 30.8% disagreed to the statement, 14.3% of the respondents neither agreed nor disagreed to the statement, 30.5% of the respondents agreed to the statement whereas 24.4% of the respondents strongly agreed to the statement, with a mean of 3.49 and standard deviation 1.166. This signified

that majority of the respondents agreed that the market share of the company has increased consistently over the past 5 years. The average mean score was 3.61, with a standard deviation of 1.042. Trend analysis was performed to examine the trend of the return of the assets among the large manufacturing firms and the results are presented in Figure 2

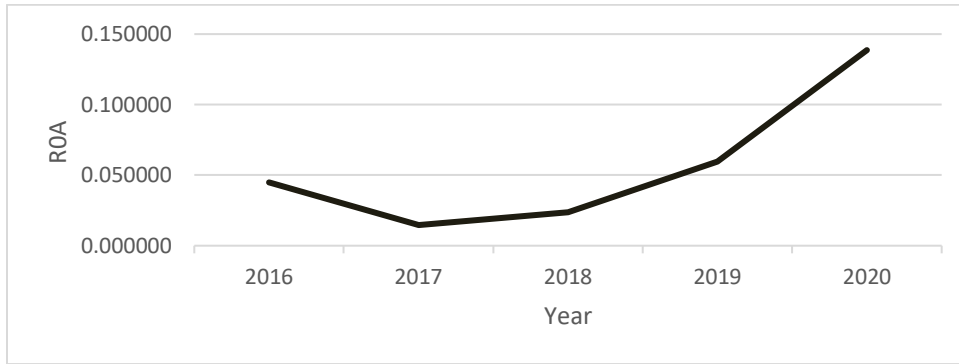


Figure 2: Trend Analysis of ROA

Based on the results presented in Figure 2, the ROA of the large manufacturing firms has been fluctuating. The trend illustrates that ROA has been decreasing from 2021 up to 2021. This could be attributed to the fact that Kenya was approaching the general election and thus, investors were not willing to inject their resources into the firms due to the fear of losing. However, from 2018 onward, the ROA has been increasing. This could have been attributed to the peace stability that the country is encountering.

CORRELATION ANALYSIS

Table 4 gives the correlation results between energy efficiency and performance.

Table 4: Correlation Analysis for Energy Efficiency

		Performance	Energy Efficiency
Performance	Pearson Correlation	1.000	
Energy Efficiency		.499**	1.000
	Sig. (2-tailed)	.001	

The correlation analysis presented in Table 4 reveals a notable and statistically significant positive relationship between energy efficiency and performance among large manufacturing firms in Kenya. The Pearson correlation coefficient of 0.499 suggests a moderate to strong positive

correlation between the two variables. This indicates that as energy efficiency increases, performance also tends to improve. The significance value of 0.001 further confirms the reliability of this relationship, highlighting that the observed correlation is unlikely to have occurred by random chance. These findings underscore the importance of energy efficiency initiatives within manufacturing firms, as they not only contribute to environmental sustainability but also have tangible benefits for overall performance and productivity.

REGRESSION ANALYSIS

The study results on the model summary are presented in Table 5.

Table 5: Model Summary

Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.499a	.249	.247	.83669	.249	103.802	1	313	.001

a. Predictors: (Constant), Energy efficiency

The study found that energy efficiency has a substantial impact on the performance of large manufacturing firms in Kenya. This is evident from the regression analysis summarized in Table 5. The R Square value of .249 indicates that approximately 24.9% of the variation in these firms' performance can be explained by their energy efficiency. This significant proportion suggests that energy efficiency is a major factor influencing firm performance. Additionally, the F-value of 103.802 is notably high, which further strengthens the case for a strong relationship between energy efficiency and firm performance. The significance (Sig. F Change) value of .001, which is much lower than the standard 0.05 threshold for statistical significance, indicates a very low probability that this relationship could be due to chance.

Table 6: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	72.667	1	72.667	103.802	.001b
	Residual	219.117	313	.700		
	Total	291.784	314			

a. Dependent Variable: Performance of large manufacturing firm

The study found that energy efficiency significantly impacts the performance of large manufacturing firms in Kenya, as shown by the ANOVA results. The F-value is very high at 103.802. This is further reinforced by the very low significance (Sig.) value of .001, far below the standard threshold of 0.05. Thus, energy efficiency is not just a matter of environmental stewardship but is also critically linked to the operational success of large manufacturing firms in Kenya.

Table 7: Regression Coefficients (Energy efficiency)

Model		Unstandardized Coefficients		Standardized	t	Sig.
		B	Std. Error	Coefficients		
1	(Constant)	-1.001E-005	.047		.001	1.001
	Energy efficiency	.994	.098	.499	10.188	.001

a. Dependent Variable: Performance of large manufacturing firms

The beta coefficient value for energy efficiency (0.994) meant that for every one (1) unit increase in the dimension of energy efficiency in large manufacturing firms, it leads to 0.994 increase in performance of large manufacturing firms. Agreeing to this research findings are Chen and Weng (2020); Sheikh (2020) who found out that Environmental Awareness has positive influence on performance of institutions. Similarly, Nderitu and Ngugi (2020) found out that green procurement influenced firm performance positively. From hypothesis of the study, **H₀**: Energy efficiency does not have significant influence on performance of large manufacturing firms in Kenya, and based on the findings, the study revealed that there was positive significant relationship between Environmental Awareness and performance of large manufacturing firms in Kenya.

The results were fitted in the Model $Y = \beta_0 + \beta X + e$

The study therefore rejected the null hypothesis (**H₀**: Energy efficiency does not have significant influence on performance of large manufacturing firms in Kenya) and concluded that indeed energy efficiency (X₄) significantly influenced performance of large manufacturing firms (Y).

The Model equation therefore became $Y = -1.001E-005 + 0.994X$; Where, Y is performance of large manufacturing firms; X₄ is energy efficiency.

CONCLUSION

The study concludes that energy efficiency positively influences the performance of large manufacturing firms in Kenya. This means that if a large manufacturing firm put in place energy efficiency for managing the environment, then it is likely to realize better results in terms of firm performance. The positive influence observed suggests that companies that prioritize energy efficiency measures, such as investing in renewable energy sources, implementing strategies to improve energy efficiency, and conducting regular energy audits, are more likely to achieve better

overall performance outcomes. By adopting these practices, firms not only contribute to environmental sustainability by reducing their carbon footprint and energy consumption but also reap tangible benefits in terms of enhanced productivity, cost savings, and competitiveness. These findings underscore the importance of integrating energy efficiency considerations into corporate strategies and operations, highlighting it as a key driver for sustainable business growth and success in the manufacturing sector.

RECOMMENDATIONS

The study recommends that large manufacturing firms in Kenya prioritize investments in energy efficiency initiatives as a strategic imperative for enhancing their performance. By focusing on energy efficiency measures such as investing in renewable energy sources, implementing energy-saving strategies, and conducting regular energy audits, these firms can significantly reduce their environmental impact while simultaneously improving their competitiveness, profitability, and long-term sustainability. It is crucial for policymakers and industry stakeholders to support and incentivize the adoption of energy-efficient practices through targeted policies, financial incentives, and capacity-building initiatives to promote a more sustainable and resilient manufacturing sector in Kenya. Additionally, firms should integrate environmental considerations into their strategic planning processes and corporate governance structures to ensure that energy efficiency remains a central focus area for continuous improvement and innovation. By embracing energy efficiency initiatives, large manufacturing firms can not only contribute to environmental conservation but also strengthen their market positioning and contribute to the overall socio-economic development of Kenya.

REFERENCES

- Aldieri, L., Kotsemir, M., & Vinci, C. P. (2020). The role of environmental awareness through the technological proximity in the implementation of the sustainable development. *Business strategy and the environment*, 29(2), 493-502.
- Aslam, S., Rehman, R. U., & Asad, M. (2020). Linking environmental management practices to environmental performance: The interactive role of environmental audit. *Pakistan Journal of Commerce and Social Sciences (PJCSS)*, 14(1), 99-119.

- Babiak, K., & Trendafilova, S. (2020). Corporate Social Responsibility and environmental responsibility: motives and pressures to adopt green management practices. *Corporate social responsibility and environmental management*, 18(1), 11-24.
- Baraza, D. N., & Arasa, R. (2021). Effects of Firm characteristics on Performance of Manufacturing firms in Kenya. *International Journal of Economics, Commerce and Management*, 5(9) 311-328.
- Chen, S. Y., & Chen, D. K. (2018). Air pollution, government regulations and high-quality economic development. *Econ. Res. J*, 53, 20-34.
- Gualandris, J., & Kalchschmidt, M. (2021). Developing environmental and social performance: the role of suppliers' sustainability and buyer-supplier trust. *International Journal of Production Research*, 54(8), 2470-2486.
- Herce, C., Biele, E., Martini, C., Salvio, M., & Toro, C. (2021). Impact of energy monitoring and management systems on the implementation and planning of energy performance improved actions: An empirical analysis based on energy audits in Italy. *Energies*, 14(16), 47-52.
- Hindle, T. (2019). "Triple Bottom Line: It Consists of Three Ps: Profit, People and Planet. *Economist*.
- Jackson, M. C. (2007). *Systems approaches to management*. Springer Science & Business Media.
- Jamali, D. (2019). A stakeholder approach to corporate social responsibility: A fresh perspective into theory and practice. *Journal of business ethics*, 82(1), 213-231.
- Jiang, L., Zhou, H., & He, S. (2021). Does energy efficiency increase at the expense of output performance: Evidence from manufacturing firms in Jiangsu province, China. *Energy*, 2(20), 119-131
- Kalantzis, F., & Revoltella, D. (2019). Do energy audits help SMEs to realize energy-efficiency opportunities?. *Energy Economics*, 83(12), 229-239.
- Kasych, A., Suler, P., & Rowland, Z. (2020). Corporate environmental responsibility through the prism of strategic management. *Sustainability*, 12(22), 95-109.
- Kenya Association of Manufacturing (K.A.M) (2020). The Kenya Association of Manufacturing Industrial Business Agenda, *Priority actions to build competitive local industry to expand employment in Kenya*
- Khan, S. A. R., Yu, Z., & Umar, M. (2021). How environmental awareness and corporate social responsibility practices benefit the enterprise? An empirical study in the context of emerging economy. *Management of Environmental Quality: An International Journal*, 32(5), 863-885.
- Kibogy, J. C. (2021). *The Effect of Corporate environmental responsibility on Organizational Performance: A Case of Bamburi Cement Limited* (Doctoral dissertation, Daystar University, School of Business and Economics).

- Knight, F. H. (2020). *Risk, uncertainty and profit*. Courier Corporation.
- Kogan, L., & Tian, M. H. (2020). Firm characteristics and empirical factor models: a data-mining experiment. *FRB International Finance discussion paper*, (1070).
- Lavrakas, P. J. (2019). *Encyclopedia of survey research methods*. Sage Publications.
- Lee, K. H., Park, B. J., Song, H., & Yook, K. H. (2021). The value relevance of Environmental Impact Assessment s: evidence from Japan. *Business Strategy and the Environment*, 26(5), 609-625.
- Macharia, K. K., Gathiaka, J. K., & Ngui, D. (2022). Energy efficiency in the Kenyan manufacturing sector. *Energy Policy*, 16(1), 112-117
- Makori, D. M., & Jagongo, A. O. (2020). Environmental accounting and firm profitability: An empirical analysis of selected firms listed in Bombay stock exchange, India.
- Menike, L. M. C. S. (2020). Impact of Environmental Disclosure on Firm Performance: An Empirical Analysis of Food, Beverage and Tobacco Sector Companies Listed in Colombo Stock Exchange, Sri Lanka. *International Journal of Academic Research in Business and Social Sciences*. 10(10), 518-536.
- Moon, H., & Min, D. (2020). A DEA approach for evaluating the relationship between energy efficiency and financial performance for energy-intensive firms in Korea. *Journal of Cleaner Production*, 25(5), 120-128.
- Muloli, M. M. (2020). Effects of Corporate Social Responsibility on Firm Performance: Implication for Banking Sector in Tanzania.
- Mwangi, M., & Mwit, J. K. (2020). The effect of voluntary disclosure on stock market returns of companies listed at the Nairobi securities exchange. *Journal of Finance*, 2(16),42-57
- Nderitu, K. M., & Ngugi, K. (2020). Effects of green procurement practices on an organization performance in manufacturing industry: case study of East African Breweries Limited. *European Journal of Business Management*, 2(1), 341-352.
- Nederhand, J., & Klijn, E. H. (2019). Environmental regulations compliance in public-private partnerships: Its influence on the innovative character of projects and on project performance. *Administration & Society*, 51(8), 1200-1226.
- Ntiamoah, E. B., Egyiri, P. O., & Kwamega, M. (2020). Corporate social responsibility awareness, firm commitment and organizational performance. *Journal of Human Resource and Sustainability Studies*, 2020.
- Osazefua, I. J. (2019). Operational efficiency and financial sustainability of listed manufacturing companies in Nigeria. *Journal of Accounting and Taxation*, 11(1), 17-31.
- Schalk, J. (2021). Linking environmental regulations compliance to policy performance: Nonlinear effects in Dutch local government policy making. *The American Review of Public Administration*, 47(4), 479-495.

- Somjai, S., Fongtanakit, R., & Laosillapacharoen, K. (2020). Impact of management responsibility, environmental management accounting and green innovation on firm performance: An empirical investigation. *International Journal of Energy Economics and Policy*, 10(3), 204.
- Tasneem, F., Muhammad, S., & Basit, A. (2021). The Impact of Environmental Reporting on Firms' Performance. *International Journal of Accounting and Business Management*, 4(2), 275-300.
- TATA CHEMICALS MAGADI LIMITED (2021). Annual Report And Financial Statements For The Year Ended 31 March 2021. Retrieved from https://www.tatachemicals.com/upload/content_pdf/18-tata-chemicals-magadi-limited-march-2021.pdf
- World Bank Group (2019). Kenya Economic Update. Reviving Private Sector Credit Growth and Boosting Revenue Mobilization to Support Fiscal Consolidation.
- Yang, Z., Liu, W., Sun, J., & Zhang, Y. (2021). Corporate environmental responsibility and environmental non-governmental organizations in China. *Sustainability*, 9(10), 1756.