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Green Innovation Strategy as Antecedent of Performance Sustainability among ISO 14001-Certified Manufacturing Firms in Kenya: Does Regulatory Framework Play a Moderating Role?

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Abstract:
Performance sustainability has been a major concern in the manufacturing sector in Kenya. Most firms have recorded a dwindling performance: a decline in profits, an increase in environmental crisis and unmanaged waste. Firms in the manufacturing sector have been on the move to get ISO 14001 certification, which is perceived as critical as firms go green. It is, however, noted that despite the regulatory framework and increased ISO 14001 certification, sustainability challenges are still high. This study aimed to establish whether the regulatory framework had a moderating effect on the relationship between green innovation strategy and performance sustainability of ISO 14001-certified manufacturing firms in Kenya. The scholar operationalized a green innovation strategy using green products, green processes, green marketing and green organizational innovation strategy. The regulatory framework was operationalized using environmental regulations, clean technologies regulations and NEMA regulations, while performance sustainability was operationalized using financial, social and environmental performance. The study was anchored on triple bottom line theory, green business model innovation, and institutional and stakeholders' theory. The study adopted a positivism philosophy where descriptive and explanatory research design was adopted. A Census of all 60 ISO 14001-certified manufacturing firms in Kenya was conducted involving 218 respondents. Primary data was collected using semi-structured self-administered questionnaires and analysed using a multiple regression model. The study findings indicated that regulatory framework had a significant negative moderating effect on the relationship between green innovation strategy and performance sustainability of ISO 14001-certified manufacturing firms. The study recommended that the government should come up with a flexible regulatory framework that will encourage firms to adopt green innovation. It was further recommended that management should come up with an internal policy and train its staff so that it may improve their compliance, leading to the performance sustainability of the firms.

Keywords: *Green innovation strategy, performance sustainability, regulatory framework, ISO 14001-certified manufacturing firms*

1. Introduction

Manufacturing is a principal engine for global economic growth (United Nations, 2017). Manufacturing sector has recorded growth for the last 2 decades, with Manufacturing Value Added increasing to 22.6 percent from 2005 to 2016. However, it has lagged behind in Least Developed Countries compared to developed countries (World Bank, 2018). It is, however, noted that the growth in Sub-Saharan Africa (SSA) has been inconsistent and has dwindled for the last decade. For instance, the growth dropped from 3.3 percent in 2018 to 3.1 percent in 2019 (Kenya National Bureau of Statistics, 2020). This is accrued to inadequate finance, increased geopolitical tension and protectionism (KNBS, 2020). Despite Kenya being one of the most industrialized countries in Eastern and Central Africa, it has been inconsistent for the last decade and lagged behind other sectors in its contribution to the GDP (KNBS, 2020). It is worth noting that the government of Kenya had prioritized one sector as a key economic pillar in 'The Vision 2030' and 'The Big 4 Agenda' where it targeted to increase its contribution to GDP to 15% by 2022 (Kenya Association of Manufacturer, 2019) which it has fallen short of achieving. Actually, the sector recorded a decline in growth rate from 3.3 percent in 2018 to 3.1 in 2019 (KNBS, 2019).

Kenya is in pursuit of sustainable manufacturing, which is linked to sustainable development, whose roots are traced to Stockholm conference by UN relating to the human environment in 1972 (WCED, 1987; Gholami, Rezaei, Saman, Sharif & Zakuan, 2016). The zeal intensified after the 1992 'Rio de Janeiro Earth Summit' held in Brazil (UN, 1993). This

has been the genesis of the switch from 'traditional manufacturing' to sustainable manufacturing, which is considered an environmental concern and was popularized as 3Rs - reduce, reuse and recycle. Gholami et al. (2016) noted that sustainable manufacturing has been expanded to cover 6Rs whose scope is re-manufacture, recover, reduce, recycle, redesign and reuse, which has formed the basis for green innovation and green circular economy. The trigger to sustainable manufacturing is pushed by climatic changes and increased environmental degradation (Borowski, 2020). It is projected that if the world does not adopt sustainable manufacturing, material consumption will double, and annual waste generation will increase by 70% by 2050 (Kaza, Yao, Bhada-Tata, & Van Woerden, 2018). This call for the adoption of sustainable manufacturing in line with Sustainable Development Goals (SDGs) Agenda 2030 goal number nine (UN, 2017). Sustainable manufacturing, which is synonymous with green innovation strategy, will help achieve climatic neutrality and demystify the link between economic growth and escalated resource utilization (De Giovanni & Zaccour, 2019).

There is a succinct link between green innovation strategy and performance sustainability. Amini and Bienstock (2014) view performance sustainability as how a firm's strategy, innovation and level of compliance with the regulatory framework are interconnected and their importance in balancing the performance of firms economically, socially and environmentally. Firms qualify to perform sustainably if they mitigate the negative effects of business operations while maximizing the positive effect of business practices on the environment, community and economy (ITC, 2019; Kenton, 2020). Triple Bottom Line (TBL) reporting of sustainability advocates for advancing reporting beyond just firm economic gain to non-financial aspects of a firm that is the three bottom lines that use 3Ps that is Profit (Financial), Planet (Environmental) and People (Social) (Elkington, 1994; Kraaijenbrink, 2019; Kenton, 2020). Green innovation as a concept of sustainability focuses on coming up with processes and products involving technology that saves energy, recycles and minimizes waste, mitigates pollution, comes up with green product designs and promotes environmental management, which augments efforts to solve escalating environmental challenges and operate sustainably (Chen, Lai & Wen, 2006; Calza, Parmentola & Tutore, 2017; Tariq, Badir, Tariq and Bhutta, 2017 & Hernandez-Vivanco, Bernardo & Cruz-Cázares, 2018). OECD (2009) views green innovation strategy through the lenses of green product, process, marketing and organizational innovation strategy perspectives, which are linked to the sustainable performance of firms.

The Kenyan government, in its push for greenness, has come up with a regulatory framework in consultation with key players in the manufacturing sector. In line with Porter and Van der Linde (1995) on what was referred to as Porter's hypothesis – 'The win-win scenario' regulatory framework advocates for green innovation where win-win solutions are increasing economic, social and environmental gains (Doran & Ryan, 2012; Amores-Salvadó et al., 2015). It recommends that firms should not be reactive or just comply with the regulatory framework but should be proactive by managing environmental risk (IISD, 2019). Adopting sustainable practices will help avoid regulatory sanctions and address social challenges relating to the safety of products, product quality, pollution of the environment and social inequities (Cheruiyot & Tarus, 2015; ITC, 2019). Kenya, through the Ministry of Environment, has instituted various regulatory frameworks relating to the environmental sustainability of firms. These include Environment Management Coordination Act (EMCA) (1999), environment regulation (2003) relating to impact assessment and audit of the environment, waste management regulations (2006), conservation of biological diversity regulations (2006), controlled substances (ozone-depleting substances) regulations (2007); Noise and Excessive Vibrations Regulations (2009) and Air Quality Regulations (2014).

National Environment Management Authority (NEMA) has taken center stage in regulating firms to operate in an environmentally friendly manner where it formulates environmental regulations to manage waste and mitigate environmental pollution (NEMA, 2012). It works with Kenya National Cleaner Production Centre (KNCPC), which helps NEMA encourage cleaner production technologies in line with the push for sustainable manufacturing (NEMA, 2012). In transiting to green manufacturing, Kenya banned plastic carrier bags through gazette notice No. 2356, which accounted for 9% of the total waste in pursuit of clean production (NEMA, 2018). KAM has established Centre for Green Growth and Climate Change (CGGCC) to promote a green economy, import-substitution, and climate change actions and emphasize sustainable manufacturing. The Kenyan government, through the Ministry of Environment, has come up with National Climate Change Action Plan (NCCAP), which will be operational between 2018 and 2022 and which advocates for sustainable manufacturing (KAM, 2019). The major focus is placed on energy efficiency, circular economy, resource efficiency, water efficiency, innovations, financing for green growth and climate change programs, enhancing human capacity in climate change and green growth and compliance with NEMA regulations (KAM, 2019). Chuang and Yang (2014) advocate for each country to have its own regulations relating to pollution tax, pollution control standards, abatement subsidy, green public purchase law and flexible environmental policy to enhance the sustainability of firms.

There has been a rush worldwide for firms to achieve ISO certification. ISO 14001 deals with Environment Management System (EMS), which outlines the process for the control and the continuous improvement of an organization's environmental sustainability through reducing wastage and utilizing resources efficiently (ISO, 2015). ISO 14001 adheres to the 'Plan-Do-Check-Act' (PDCA) cycle, which involves coming up with a policy, action plan, monitoring, corrective actions, review and continuous improvement specifying the process, roles of each team player and time of implementation (Colceag, Dascălu, Lungu & Caraiani, 2015). Globally, it is only 8 percent of firms that were ISO 14001 certified (EMS) by 2015, which was relatively lower in Africa (KEBS, 2018). Firms in Kenya are certified by Bureau Veritas, SGS and KEBS. Firms are pursuing the adoption of ISO certification in a quest for better performance (Evangelos & Psomas, 2013). Many firms in Kenya are rushing to attain ISO 14001 certification, yet their performance is questionable (Zaramdini, 2007; Emeka et al., 2008; Anyango et al. (2012). ISO 14001 enables organizations to reduce the burdens of institutions' activities on the environment (Orzes, Touboulic, Culot, & Nassimbeni, 2019). There is a notable increase in environmental crises despite clear regulatory frameworks, the adoption of EMS and the greening of firm activities (Ololade & Rametse, 2018). There is a paradox in whether the existing regulatory framework in Kenya, whether stringent or

flexible, has an effect on performance sustainability and is influenced by green innovation strategy. Thus, the objective of this paper was to explore where the regulatory framework has a moderating effect on the relationship between green innovation strategy and performance sustainability of ISO 14001-certified manufacturing firms in Kenya.

1.1. Statement of the Problem

Manufacturing is a key beacon of economic growth and development in Kenya (KAM, 2019). It is, however, noted that the performance sustainability of firms in the sector has been inconsistent and dwindling for the last 10 years (KNBS, 2019). Most manufacturing firms have failed to achieve their profitability targets and lost their market share abroad for the last 5 years (Wangui, 2019). Only 46% of firms operate optimally due to costly energy, lack of finance and poor automation, with only 11% of firms being fully automated. Although employment opportunities rose by 11% in 2019, employee turnover has increased, with only 10% having social and health insurance systems (KNBS, 2019; Danish Trade Union Development Agency, 2020). In terms of environmental performance, most firms (67%) did not recycle waste water and less than half of firms recycled solid waste. Only 38% of firms had a sustainability department by 2019 in Kenya (KAM, 2019). This demonstrates there are performance sustainability challenges among manufacturing firms in Kenya despite increased adoption of EMS and ISO 14001 certification of firms and clear regulatory framework governing manufacturing.

The existing studies noted conceptual gaps, with varied studies conceptualizing green innovation strategy differently. Alsughayir (2017) operationalized green innovation strategy using green product innovation, while Buswari, Setiawan, Sumiati and Khusniyah (2021) viewed green innovation strategy using green product and marketing innovation strategies. The existing empirical studies have indicated an inconclusive result on green innovation strategy related to the performance sustainability of firms when moderated by a regulatory framework. For instance, a study by Feng and Chen (2018) indicated there was a moderating effect of environmental regulation on the relationship between green innovation and industrial green development performance of firms, while a study by Ramanathan, He, Black, Ghobadian and Gallear (2017) who noted that inflexible environmental regulations did not moderate the relationship between green innovation and performance of firms. Hitherto studies further noted methodological gaps; for instance, a study by Cao, Deng, Song and Zhong (2019) used convenient sampling, which is not suitable for hypotheses testing, while Ramanathan et al. (2017) used a case study and small sample size which was qualitative in nature which did not support statistical inferences and limited generalization of findings. Thus, this paper tried to bridge the existing gaps while responding to the suggestions made in the previous research on how green innovation strategy was linked to performance sustainability while examining how regulatory framework played a moderating role among the ISO 14001-certified manufacturing firms in Kenya.

1.2. Research Objective

The study sought to investigate the moderating role of regulatory framework on the effect of green innovation strategy on performance sustainability among ISO 14001-certified manufacturing firms in Kenya.

1.3. Research Hypothesis

- Ho: Regulatory framework does not moderate the effect of green innovation strategy on performance sustainability among ISO 14001 certified manufacturing firms in Kenya.
- Ha: Regulatory framework moderates the effect of green innovation strategy on performance sustainability among ISO 14001 certified manufacturing firms in Kenya.

2. Theoretical Review

2.1. Triple Bottom Line Theory

This theory was coined by Elkington (1994). The theory posits that the key purpose of any organization should not be getting financial gains only. However, it should improve the lives of people who interact with the firm and the environment around the firm. The theory came up with three bottom lines that each firm should strive to attain, which are summarized as 3Ps standing for Profit, People and Planet. The first P for profit represents the financial performance of a firm. The second P stands for people, representing social performance, while the third P stands for planet, representing environmental performance. TBL theory proposes that the measurement of the sustainability of a firm should combine both financial and non-financial measures of performance in order to account for the total cost of doing business (Kraaijenbrink, 2019). The sustainability of firms is noted to be attained when environmental, economic and social perspectives of performance are connected.

2.2. Green Business Model Innovation

The model was proposed by Bisgaard, Henriksen and Bjerre (2012). It is based on the key tenets that when a new model of performance sustainability is brought forth, it needs to recognize innovation as a key ingredient for a firm to be competitive as it develops new products (green tech and clean tech) or alters business model (Bisgaard et al., 2012). Innovation results in firms switching to greener inputs and reusing recycling resources to make greener products and processes. The alteration done by firms revolves around modification, redesigning alternatives and creating value as the firms adopt green business models (Osterwalder & Pigneur, 2010). The model is credited for coming up with processes and products that are ecologically friendly and efficient in the use of raw materials, energy and water while reducing waste and GHG emissions (Bisgaard et al., 2012). The model advocates for policy guidelines and regulations where all stakeholders and regulators are involved in dialogue so that they may map out challenges and come up with sustainable

standards and solutions. It advocated for flexible regulations and guidelines guiding firms to go green and adopt sustainable manufacturing.

2.3. Institutional Theory

This theory was coined by Scott (1995) and later improved in 2008. The theory is anchored on the deeper and more resilient aspect of social structure. The theory considers the process by which structures like cognitive models, rules, culture and practices become established guiding principles of people's social behaviours. The theory accentuates that firms replicate the behavioural norms of other actors in the organization's field of operation to survive in the business. Kraft's Public Policy (2007) connects the theory with policy-making, which guides lawful and prescribed aspects of authority. According to Scott (2008), the key tenets of institutional theory are based on coherent myths and legitimacy, where emphasis is placed on the connection between an organization and the contextual settings they are operating.

2.4. Stakeholders' Theory

The theory was first devised by Ansoff (1965) and later improved by Freeman (1984). The key tenets of this theory are that the interests and welfare of stakeholders and stockholders in an organization are most pivotal for a firm to realize its superior performance. Freeman (1984) observed that stakeholders are individuals acting individually or collectively as a group whose actions can affect or influence a firm's objectives. Stakeholders of any organization are noted to include: stockholders (investors), employees, creditors, suppliers, local community, public interest groups, customers and even government agencies. Freeman recognizes the government as a key stakeholder who takes a vital role in influencing the performance of a firm through the regulatory framework they institute (Freeman, 1984). The value system of stockholders needs to be considered to ensure they do not conflict with the practices of stakeholders (Sisodia et al., 2007; Nesvadbora, 2010). Regulatory framework and stakeholders are viewed as external push and imposed drivers of green innovation, which impact indistinctly firm performance on companies subjected to certain norms or stakeholder pressure.

3. Empirical Review

Eneizan, Matar, Al-Zawahreh, Alkhawaldeh and Eneizan (2019) evaluated the effects of green marketing strategy on firm financial performance when moderated by government policy among 386 car dealers in Jordan. Green marketing strategy was viewed in a green marketing mix, while performance was measured using both financial and non-financial metrics. The government policy was operationalized using government regulations and tax incentives. The study was anchored on stakeholder and resource-based view theories. Analysis was done using structural equation modelling (SEM). The study findings indicated that green marketing strategy had significant effects on the firm performance while government policy moderated the relationship. The study findings were limited as they could not be generalized to the manufacturing sector where this study was carried out.

Cao, Deng, Song and Zhong (2019) conducted a longitudinal study on how industrial enterprise technological innovation was affected by environmental regulation intensity among 30 Chinese municipalities with an annual turnover of 20 million Yuan. Panel data was collected from 2008 to 2016 and analyzed using panel regression. Environmental and government regulation had both direct and moderating effects on the relationship between technological innovation and firm performance. The study was limited because the research utilized convenience sampling, which may not be appropriate while testing the hypothesis and it was done in Chinese provinces for firms with a turnover of 20 million Yuan, limiting generalization of findings.

Saengchai, Rodboonsong and Jermsittiparsert (2019) conducted a survey of the sports industry in Thailand, linking performance with green product innovation and environmental regulation while examining the role of environmental dynamics. Environmental regulation was operationalized in terms of environmental policies. The study was anchored on the contingency theory. SEM was used in analyzing data. Both green product innovation and environmental regulations had an effect on the performance of the sports industry in Thailand, while environmental dynamism moderated the relationship. It was noted that there were contextual gaps where the study was done in Thailand's sports industry, whose regulatory framework is different from the manufacturing context in Kenya, limiting the generalization of findings.

Feng and Chen (2018) did a longitudinal study linking how industrial green development is affected by green innovation with environmental regulation as a moderator using the Spatial Durbin model among firms in 30 provinces in China. It involved panel data from 2007 to 2015. The results indicated that environmental regulation had both a direct and moderating effect on the relationship between green product innovation and industrial green development performance. The study is not to be limited to using a small sample size, which was not adequately representative of the entire population.

Ramanathan, He, Black, Ghobadian, & Gallear (2017) conducted qualitative research using a case of firms in both the UK and China on how environmental regulations moderated the relationship between innovation and the performance of firms by re-examining the Porter hypothesis. The study involved 6 firms in the UK and 8 firms in China. The paper operationalized environmental regulation as an environmental regulation design (flexible and inflexible government regulations). The results indicated that depending on firms' resources and capabilities, the adoption of more environmental regulations innovatively leads to firm performance. Inflexible regulations negatively moderated the relationship, while flexible regulations played a moderating role in how innovation was related to the performance of firms. The study had methodological gaps where the sample size was small and it used a case study, which limits the use of

a large sample, limiting generalization of the findings. The study was also qualitative, which did not support statistical inferences.

Kousar, Sabri, Zafar and Akhtar (2017) conducted a survey on how the adoption of green innovation and technological factors were related and whether government intervention moderated the relationship among 280 SMEs in Pakistan. Government interventions were measured in terms of policy and regulations. The study found that technological factors had effects on the adoption of green innovation while government intervention moderated the relationship. The study was limited in that it had contextual gaps where it was done in SMEs and in Pakistan, unlike ISO 14001-certified manufacturing firms in this study, thus limiting the generalization of the findings.

Based on the reviewed literature, there exist differences in the operationalization of the variables under investigation. The study noted various contextual and methodological limitations in the existing studies. Various studies had contradictory results on whether regulatory framework moderated the relationship between GIS and the performance sustainability of firms, prompting the need for this study.

4. Conceptual Framework

Based on the reviewed literature, the study developed the conceptual framework that outlined the relationship between green innovation strategy (Independent variable) and performance sustainability (Dependent variable) of ISO 14001-certified manufacturing firms. It went ahead and connected the regulatory framework (moderating variable), showing how it affects (moderates) the relation between green innovation strategy and the performance sustainability of firms.

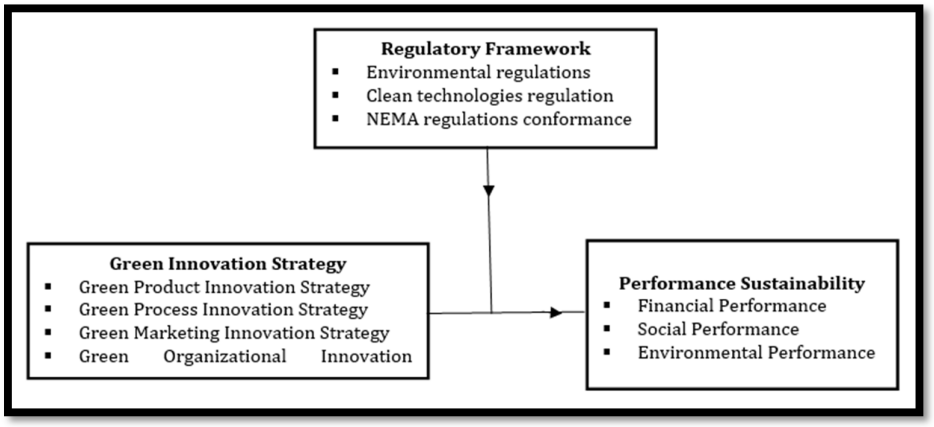

Figure 1: Conceptual Framework
Source: Author (2022)

5. Research Methodology

The study adopted positivism philosophy, which holds the view that research is external to the researcher and results are objective and not influenced by the researcher (Saunders, Lewis & Thornhill, 2019). The study utilized both descriptive and explanatory research designs, as recommended by Sekaran and Bougie (2016), who recommend that an ideal study should incorporate more than one design to enhance the study and deliver optimal results. The research design chosen has enjoyed wide application in management-related research (Kinyua, Muathe & Kilika, 2015; Mirugi & Kinyua, 2018; Odhiambo & Kinyua, 2022; Motum & Kinyua, 2022). The target population was ISO 14001-certified manufacturing firms where a census was done for all 60 ISO 14001- certified manufacturing firms that were certified by Bureau Veritas (K) Ltd, KEBS and Société Générale de Surveillance (SGS) - Kenya Ltd and which got certification before December 2019. The unit of observation was 300 respondents who were obtained from the heads of finance, human resource, marketing, ICT and operations departments of each firm.

This research gathered primary data using semi-structured questionnaires, which were administered through mail surveys and drop-and-pick methods. The questionnaire allowed respondents to be free to give their opinions independently and since it was anonymous, it helped produce more candid answers. A pilot was done among 3 ISO-certified manufacturing firms involving 15 respondents who were not part of the final respondents as recommended by Field (2009). Face, content and construct validity were used to analyze the validity of the tools, while reliability was analyzed using Cronbach's Alpha coefficient, whose threshold was a coefficient above 0.7, as proposed by Tavakol and Dennick (2011). The results of the reliability test are shown in table 1.

Variable	Cronbach's Alpha	No. of Items	Comment
Green innovation strategy	0.818	52	Reliable
Regulatory framework	0.819	13	Reliable
Performance sustainability	0.821	28	Reliable
Overall Reliability Coefficient	*0.819*	*93*	*Reliable*

Table 1: Cronbach's Alpha Values
Source: Pilot Data (2020)

The results indicated that all variables had Cronbach's Alpha Coefficient greater than 0.7, with the aggregate coefficient being 0.819. Thus, a conclusion was made that they were reliable. Quantitative data was analyzed to produce descriptive and inferential statistics. Descriptive statistics was summarized in the form of mean and standard deviation while inferential statistics was used to test the hypothesis where regression analysis model was used, which was reported using an adjusted coefficient of determination (R^2), F statistics (ANOVA), unstandardized coefficients (beta values) and p values at 0.05 level of significance.

6. Findings and Discussions

During the study, 218 questionnaires out of 300 were filled and returned. This represented a response rate of seventy-six percent. This was sufficient for making inferences and drawing conclusions, as recommended by Mugenda and Mugenda (2003), who proposed that a response rate of 50% was adequate.

6.1. Descriptive Statistics

The study utilized mean and standard deviation to offer insights into responses made by respondents on various attributes of the variables under investigation. The researcher performed analysis on the responses of each of the 218 respondents to the 52 items adopted for measuring green innovation strategy, which had four dimensions. The results of the descriptive analysis are presented in table 2.

Variable	Mean	Standard Deviation
Green product innovation strategy	4.04	0.552
Green process innovation strategy	4.01	0.549
Green marketing innovation strategy	3.94	0.644
Green organizational innovation strategy	3.98	0.613
Aggregate mean for green innovation strategy	3.99	0.590

Table 2: Descriptive Statistics of Green Innovation Strategy
Source: Survey Data (2022)

The findings in table 2 indicated that the combined mean for green innovation strategy was 3.99 while the standard deviation was 0.552. This mean was close to 4.0 (Agree) in a 5-point Likert scale, which implied that all aspects of green innovation strategy had been adopted among the ISO 14001-certified firms. This was confirmed by low standard deviation, which indicated low variability among the responses given by respondents on whether green innovation strategies had been adopted by the firms. The study further analyzed the responses of respondents relating to the regulatory framework, which was the moderating variable in this study. The statistics of the regulatory framework are presented in table 3.

Variable (Regulatory Framework)	Mean	Standard Deviation
Environmental regulations	3.93	0.799
Clean technological regulations	3.95	0.796
NEMA regulations	3.94	0.802
Aggregate mean for regulatory framework	3.94	0.799

Table 3: Descriptive Statistics of Regulatory Framework
Source: Survey Data (2022)

Results in table 3 indicated that the aggregate mean for the regulatory framework was 3.94 with a standard deviation of 0.799. The aggregate mean tended towards 4 (agree) in a 5-point Likert scale, implying there were regulatory frameworks regulating ISO 14001-certified manufacturing firms. This was confirmed by the low variability of responses as realized through standard deviation. The finding further highlighted that there were environmental regulations, clean technological regulations and NEMA regulations governing operations of the firms. The analysis extended to responses relating to performance sustainability, which was the dependent variable in this study. The statistics on performance sustainability are presented in table 4.

Variable	Mean	Standard Deviation
Financial performance	3.94	0.870
Social performance	3.94	0.821
Environmental performance	3.91	0.833
Aggregate mean for performance sustainability	3.93	0.841

Table 4: Descriptive Statistics of Performance Sustainability
Source: Survey Data (2022)

Results in table 4 indicated that the aggregate mean for performance sustainability was 3.93 while the corresponding standard deviation was 0.799. The aggregate mean was close to 4 (agree) in a 5-point Likert scale, while the standard deviation indicated low variability of responses, implying that most ISO 14001-certified manufacturing firms were performing sustainably.

6.2. Inferential Statistics

The researcher used regression analysis to determine whether the regulatory framework moderated the relationship between green innovation strategy and performance sustainability of ISO 14001- certified manufacturing firms in Kenya. The analysis relied on the adjusted coefficient of determination (R^2), F-statistics (ANOVA), unstandardized coefficients (beta values) and p-values at 0.05 level of significance.

7. Hypothesis Testing

The hypothesis was tested using two-step regression models. The hypothesis was "*Regulatory framework has no significant moderating effect on the relationship between green innovation strategy and the performance sustainability of ISO 14001-certified manufacturing firms in Kenya*." The first step involved regressing green innovation strategy and regulatory framework on performance sustainability. The results are summarized in table 5.

Model Summary					
Model	**R**	**R Square**	**Adjusted R^2**	**Standard Error of Estimate**	
1	.486[a]	.236	.229	.22604	
ANOVA					
Model	**Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.**
Regression	2.269	2	1.135	27.024	0.000b
Residual	9.496	225	.042		
Total	11.765	227			
a. Predictors: (Constant), GIS, RF					
b. Dependent Variable: Performance Sustainability					
Model	**Unstandardized Coefficients**		**Standardized Coefficient (Beta)**	**T**	**Sig.**
	Beta	**Std Error**			
Constant	2.537	.615		4.125	0.007
GIS	.281	.143	.130	1.969	0.050
RF	.069	.059	.077	1.174	0.042
Dependent Variable: Performance Sustainability (PS)					

Table 5: Regression Results for GIS, RF and Performance Sustainability
Source: Survey Data (2022)

The results in table 5 indicated that the adjusted R squared was 0.229, implying that both GIS and regulatory framework explain 22.9% of the variation of performance sustainability at 95% level of significance. The model was statistically significant at F (2, 225) = 27.024 and the calculated probability was 0.000. The summary for model 1 was:

PS = 2.537 + 0.281GIS + 0.069RF……Model 1

The model indicates that GIS and regulatory framework were statistically significant at β=0.281; t = 1.969; p = 0.050 and β=0.069; t = 1.174; p = 0.042 respectively. This suggested that there was a significant relationship to be moderated by the regulatory framework. The second step involved regressing green innovation strategy and regulatory framework and interaction term (GIS*RF) on performance sustainability. The results are summarized in table 6.

Model Summary					
Model	**R**	**R Square**	**Adjusted R^2**	**Standard Error of Estimate**	
1	.456[a]	.208	.204	.22647	
ANOVA					
Model	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Regression	3.277	3	1.092	28.737	0.000b
Residual	8.488	224	0.038		
Total	11.765	227			
*a. Predictors: (Constant), GIS, RF, Moderator (GIS*RF)*					
b. Dependent Variable: Performance Sustainability					

Model	**Unstandardized Coefficients**		**Standardized Coefficient (Beta)**	**t**	**Sig.**
	Beta	**Std error**			
Constant	2.525	.617		4.092	0.000
GIS	.283	.143	.131	1.979	0.049
RF	.071	.059	.080	1.200	0.031
Moderator	-.083	.216	-.026	-.386	0.010
Dependent Variable: Performance Sustainability (PS)					

Table 6: Regression Results for Moderation
Source: Survey Data (2022)

Table 6 shows that the adjusted R squared was 0.204, implying that both GIS, regulatory framework and moderator explained 20.4% of the variation of performance sustainability at 95% level of significance. The model was statistically significant at F (3, 224) = 28.737 and the calculated probability is 0.000. It was concluded that the regulatory framework had a negative moderating effect on the relationship between GIS and performance sustainability in ISO 14001-certified manufacturing firms. It was realized that performance sustainability had reduced from 22.9% to 20.4% after introducing a moderator (Interaction between GIS and RF) in the model. The summary for model 2 was:

*PS = 2.525 + 0.283GIS + 0.071RF + -0.083GIS*RF…… Model 2*

The model indicated that GIS, regulatory framework and moderator (GIS*RF) were statistically significant at β=0.283; t = 1.979; p = 0.049, β=0.071; t = 1.200; p = 0.031 and β= -0.083; t = -0.386; p = 0.010 respectively because the p-values were less than 0.05. The analysis confirmed that the regulatory framework had a significant negative moderating effect on the relationship between GIS and the performance sustainability of ISO 14001-certified manufacturing, implying that when you decrease the regulatory framework by one unit, the performance sustainability would increase by 0.083. These findings resonated well with a study by Ramanathan et al. (2017), who indicated that inflexible and rigid environmental regulations had negative moderating effects on the relationship between green innovation strategy and the performance of the firms. This was, however, contrasted by studies by Eneizan et al. (2019), Cao et al. (2019), Saengchai et al. (2019) and Feng and Chen (2018), who indicated regulatory framework had a positive moderating effect on the relationship between GIS and performance sustainability of firms. The Green Business Model Innovation (GBMI) by Bisgaard, Henriksen and Bjerre (2012) appreciates the role of policy guidelines and regulations in promoting green growth. However, flexibility and certainty of regulations are key. Scott (1995), in the institutional theory, advocates that organizations, while connecting themselves to the contextual setting they are operating in, should be conscious of market demands, institutional pressure and regulations.

8. Conclusion

This study sought to establish the moderating effect of regulatory framework on the relationship between GIS and performance sustainability. It was found that regulatory framework negatively moderated the relationship between GIS and the performance sustainability of ISO 14001-certified manufacturing firms in Kenya. This calls for coming up with a flexible regulatory framework that is favorable to laws and policies to ensure improved sustainable performance of firms.

9. Policy and Practical Recommendation

The study recommends that the management of manufacturing firms should come up with proactive internal policies and programs. These policies would enable firms to fit in well in the existing regulatory framework to promote high compliance levels and thus improve the performance sustainability of the firms. Management of the firms should organize training of staff on the regulatory framework and how compliance may be achieved to ensure the sustainability performance of firms. The study recommends that the government should collaborate with stakeholders and partners like NEMA, KNCPC and KAM in coming up with flexible and favorable laws and policies that would boost the performance of firms. The government ought to keep upgrading guidelines and regularly to meet the changing needs of the manufacturing sector. The government, together with the other stakeholders, should come up with awards for firms that green their processes by adopting designs that promote efficient utilization of energy and raw materials and reduce waste and emissions by firms.

10. Limitations and Suggestions for Future Research

The study focused on ISO 14001-certified manufacturing firms, thus limiting the scope. Future studies need to be included in other sectors like hospitality, finance and agriculture to validate the results. The study was cross-sectional in nature, which did not capture gains after firms became ISO-certified and it involved regression analysis. Future studies should consider conducting longitudinal research and using Structural Equation Modelling (SEM), Tobit Spatial Lag Model and Tobit Spatial Error Models while analyzing the data that ought to be panel or time series as the legal environment keeps on changing.

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