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Green Innovations and Performance of Small and Medium Enterprises in Nigeria

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Abstract

This study evaluates the relationship between green innovations and performance of Small and Medium Enterprises (SMEs). The objectives are to examine the connection between green knowledge, green products, green process, green management and performance of SMEs. The sample size for this study was (75) and questionnaires were employed as the source of data collection and administered to respondents. The hypotheses were tested using ordinary least square regression and the findings revealed that there is no significant relationship between green knowledge and performance. This is contrary to the fact that three of the independent variables namely; green product, green process and green management exhibit significant positive relationships with performance of SMEs in Nigeria. The study recommends that management should devote more effort to acquiring comprehensive knowledge of green innovation and invest more on research and development of green product as a means of sustaining businesses.

Key Words: *Green Innovations, Performance, Knowledge, Products.*

1. Introduction

Primarily, the value of an entity is typically measured by its level of performance, whether financial or operational (Fuad et al., 2022). Green innovations typically encompass a wide range of activities, from adopting energy-efficient technologies and reducing waste to developing eco-friendly products or utilizing renewable resources in manufacturing processes. Small and Medium-sized Enterprises (SMEs) that embrace such innovations contribute not only to the reduction of their environmental footprint but also position themselves as responsible business entities that can meet consumer demand for sustainability (Bocken et al., 2023). Research has shown that adopting green technologies can lead to better resource management, energy savings, and improved waste management (Bisultanova, 2024; Sahoo et al., 2024; Revell & Blackburn, 2022). In the case of SMEs, green innovations can be more cost-effective, as they often utilize existing technologies in novel ways to reduce energy consumption, lower production costs, and increase operational efficiency (Kammerer, 2022).

Green innovations are often driven by the need to reduce operational costs. By adopting energy-efficient processes, reducing waste, or optimizing resource use, SMEs can lower operational costs and improve profit margins. For instance, the introduction of energy-saving technologies or the shift to renewable energy sources can substantially reduce energy bills. This is particularly important for SMEs

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that operate on tight margins and need to control costs effectively. Green innovations that lead to resource optimization or waste minimization help SMEs achieve greater operational efficiency, which enhances their overall performance (Mokhber, 2023). Sustainability is becoming a central concern for consumers, who are increasingly preferring products and services from companies that are environmentally responsible. By integrating green innovations into their product lines, SMEs can tap into a growing market of eco-conscious consumers. The adoption of sustainable practices not only helps SMEs differentiate themselves in competitive markets but also attracts a loyal customer base that values environmental stewardship. Companies that invest in green innovations can position themselves as industry leaders, enhancing their brand image and reputation in the eyes of customers (García-Sánchez et al., 2022).

SMEs that adopt green innovations proactively can align themselves with these regulations, ensuring compliance and reducing the risk of non-compliance penalties. Furthermore, the adoption of green innovations can help SMEs future-proof their businesses by preparing them for evolving environmental policies (Jones & Green, 2021). By reducing their reliance on environmentally harmful processes, SMEs can mitigate potential legal and financial risks. While the benefits of green innovations are clear, one significant barrier is the perceived high initial costs of green technologies and innovations. Probably due to their size, SMEs often face financial constraints, and investing in green innovations may require substantial upfront costs that can be a deterrent. However, studies suggest that while initial investments can be high, the long-term benefits, such as cost savings and improved operational efficiency, can outweigh the costs (Teece, 2021).

1.2 Research Hypotheses

H_{01}: Green knowledge has no significant correlation with performance of Small and Medium-sized Enterprises in Nigeria.

H_{02}: There exist no significant association between green products and performance of Small and Medium-sized Enterprises in Nigeria.

H_{03}: The link between green process and performance of Small and Medium-sized Enterprises in Nigeria is not significant.

H_{04}: Green Management does not exhibit any significant link with performance of Small and Medium-sized Enterprises in Nigeria.

2. Literature Review

2.1 Business Performance

Performance, in an organizational context, refers to the ability of employees, teams, or the organization as a whole to achieve set objectives and goals effectively and efficiently. It encompasses various dimensions, such as individual performance, team performance, and organizational performance. Performance is often assessed based on factors like productivity, quality, innovation, and customer satisfaction, which directly influence the success and sustainability of an organization (Kaplan & Norton, 2023). High-performing employees contribute to improved organizational productivity and foster a positive work culture. In addition, organizational performance is often assessed through financial outcomes, customer satisfaction, and market share, which provide a broader perspective on how well an organization meets its strategic goals (Barney, 2021; Shields, 2022). Effective performance management systems are essential for enhancing both individual and organizational performance. These systems include goal setting, regular feedback, training, and development opportunities (Aguinis, 2024). By aligning individual goals with organizational objectives, companies can ensure that employees' contributions directly contribute to broader strategic outcomes.

2.2 Green Knowledge and Performance

Humans have the capacity to rationally comprehend the characteristics, sustainability, nature, and interrelationships of natural resources in order to maintain the equilibrium of the socio-ecological system. Green knowledge covers an extensive measure of topics, including how human beings should respond to the natural world and think about taking a more sustainable route for social, economic, and environmental growth. It is not just information about the state of the environment. Eco-innovation concerns become a national strategic goal and a crucial activity on the organization's value chain in the global knowledge economy. Incorporating knowledge as an instrument to promote the green economy is a pertinent subject matter for virtually every industry in these circumstances. Every organization today faces the requirement and task of becoming "greener." Organizations can grow to be economically viable, environmentally responsible, and more competitive, reduce risk, boost customer attention, and improve efficiency, while meeting society's environmental needs in an ethical and equitable way by incorporating the concept of "green" into their business plans. There is a body of research (Klassen & McLaughlin, 1996; Rao, 2014; Chen, 2008; Chien & Shih, 2007) that suggests a positive relationship between environmental practices and organizational

performance, also providing organizations with new opportunities and privileges to sustain their competitive advantage.

2.3 Green Products

Green product is a long-lasting item that is made with a commitment toward reducing its negative effects on the environment both throughout and following its useful life. Waste minimization and resource optimization are typically the two primary qualities or features of green products. Energy Star and the Forest Stewardship Council emblem are just two of the reputable organizations that have approved them. They are made using non-toxic chemicals and eco-friendly manufacturing processes. Features like being grown in a hygienic and toxic-free environment, being recyclable, reusable, and biodegradable in nature, having eco-friendly packaging, utilizing the fewest resources possible, being eco-efficient, having little to no carbon footprint, and having little to no plastic footprint are all considered characteristics of green products. Green product innovation aims to change or modify product designs by using nontoxic compounds or biodegradable materials during the production process in order to reduce the disposal impact on the environment and to improve energy efficiency (Lin, Tan & Geng, 2013). A new perspective on the product life cycle is necessary for green product innovation. Numerous positive results have been reported by studies such as those conducted by Albort-Morant, Leal-Millán, and Cepeda-Carrión (2016) in order to ascertain the performance impact or repercussions of green product and process innovation. Furthermore, green product innovation aids businesses in creating new markets and drawing in new clients (Roh, Noh, Oh & Park, 2022).

2.4 Green Process Innovation

Green process innovation is defined as the application or exploitation of production processes that are novel to firms and which results in the reduction of environmental pollution compared to relevant alternatives (Ma, Zhang & Yin, 2017). Green process innovation encompasses strategies designed to minimize waste generated throughout the entire manufacturing process (Mendes, 2012; Severo, Guimarães & Dorion, 2017). It also concerns the end-of-pipe technology using pollution-control equipment to ensure compliance with environmental regulations (Mantovani, Tarola & Vergari, 2017; Xie, Huo, Qi & Zhu, 2016). Using such technology and processes, a significant amount of waste is reduced or recycled (Chen, Chen, Wang & Chen, 2019), and energy is utilized more efficiently (Wahid and Lee, 2011). Thus, companies often implement green process

innovations to improve production efficiency, gain cost advantages, and help their organizations develop new market opportunities to promote their competitive advantage (Chiou, Chan, Lettice & Chung, 2011; Wahid & Lee, 2011). Overall, scholars investigating business and innovation frequently view green process innovation as an essential component for businesses, sectors, and both.

2.5 Green Management

Green management depicts an environmentally conscious business management that concentrates on the voluntary prevention or continuing decrease of pollution, waste, and emissions (Balcıoğlu & Akçin, 2023). Through the experimental examination of the literature handling historical, practical, and theoretical views, Pane Haden et al. (2009) defined green management as "the organization-wide process of applying innovation to achieve sustainability, waste reduction, social responsibility, and a competitive advantage via continuous learning and development and by embracing environmental goals and strategies that are fully integrated with the goals and strategies of the organization." Moreover, a firm that shows good environmental initiatives will most probably acquire a high ecological reputation (Miles & Covin, 2000). Consequently, conceptual methodologies and instruments like green production, green marketing, and green design, as well as integrating green considerations into the organization's long-term goals, are essential components of companies' green management, which transcend beyond legislative difficulties (Pane-Haden, Oyler & Humphreys, 2009).

2.3 Theoretical Review

2.3.1 The Corporate Sustainability Theory

In 1987, the book "Our Common Future," written by the World Commission for Environment and Development (WCED), was when the phrase originally appeared widely. The WCED defines environmental sustainability as improvement that meets contemporary necessities without endangering the ability of subsequent generations to meet their own. One approach to conceptualize corporate sustainability is as a novel and emerging paradigm for managing businesses. The word "paradigm" is used intentionally since business sustainability provides an alternative to the traditional advancement and profit-maximization strategy. While corporate sustainability recognizes the importance of growth and profitability, it likewise exerts pressure on the organization to commit to social goals, especially those related to economic development, environmental preservation, and social fairness and equity. Corporate sustainability is a company model attempting to achieve long-

term benefits for consumers, workers, shareholders, and society at large by pursuing ethical environmental, social, and economic (or governance) activities. The present research investigation evaluates the correlation between green innovation and business financial performance, based on the corporate sustainability hypothesis. The rationale for this is that in order for a business to continue operating and remaining in operation for the foreseeable future, it must also work to keep all of its resources, whether social, environmental, human, or financial, in excellent condition.

2.4 Review of Empirical Literature

Kasraoui, Ben-Ahmed, and Feid (2024) examined how green innovation affected the performance of oil and gas companies in the Middle East and North Africa (MENA) between 2010 and 2020. Businesses were evaluated financially using return on assets (ROA). The environmental pillar and the innovation scores, on the other hand, were used to measure green innovation. In order to investigate its impact on the company's profitability and the relationship between green innovation and oil prices, they also included an oil price-moderated variable. From the DataStream database, they gathered their data. In their empirical section, they performed the analysis using the generalized least squares method. The firm's performance in the MENA region was positively correlated with green innovation scores, according to the results. Furthermore, they discovered a linear relationship between green innovation and company performance. Ultimately, a negative, somewhat mitigated relationship between crude oil prices and green innovation and the company's financial performance has been discovered.

Khan, Johl, Kumar, and Luthra (2023) compared the influence of comprehensive green innovation (green product, process, service, and organization) on the financial performance of businesses in Malaysia and Indonesia. By creating the green innovation and corporate governance index, their study has closed the gap. They gathered panel data over a three-year period from the top 188 publicly traded companies and used the general least squares technique to analyze it. The results also indicate that the significance level is higher in Indonesia. The empirical data indicates that Malaysia has superior green innovation practices. Additionally, this study offers empirical support for the positive moderating link between board composition and firm success in Malaysia, but not in Indonesia. Policymakers and practitioners in both nations might gain fresh insights from this comparative study on how to oversee and monitor green innovation processes.

In order to assess organizational green innovation and green performance, Abbas, Shumaila, and Khan (2023) examined the relationship between green knowledge management and organizational green culture. The authors employed the non-probability convenience sampling technique to gather data, with a particular focus on the managerial and non-managerial personnel of manufacturing and service organizations. The data that were gathered were analyzed using structural equation modeling. It is discovered that green knowledge management improves an organization's capacity for green performance and green innovation and is a substantial positive predictor of these outcomes. Nonetheless, there is a partial mediating role of green innovation between corporate green performance and green knowledge management. It was also discovered that organizational green innovation and green knowledge management have a stronger association when green culture is present.

Vasileiou, Georgantzis, Attanasi, and Llerena (2022) looked at whether and when a company's environmental performance improves and whether it results in increased profits. The current research project investigates whether environmental innovation (EI) and other forms of innovation work well together by analyzing innovation data. In order to achieve this, the researcher takes into account the cost savings and competitive advantages resulting from various forms of environmental innovations (EI) that impact both the supply and demand sides of a firm's operations. They demonstrated synergistic relationships between EI and some, though not all, other forms of innovation utilizing the Italian CIS dataset (2006–2008).

Xie, Hoang, and Zhu (2022) conducted an analysis of data gathered through surveys from 221 Chinese manufacturing firms. In order to fill this research gap, they investigated the impact of varying degrees of green process innovation on the financial performance of firms. Specifically, they looked at the moderating roles of green social capital and users' implicit green needs. The financial performance of enterprises is found to be impacted by green process innovation in a U-shaped manner; that is, the impact is initially negative but progressively becomes more positive as the level of green process innovation rises. They also find that the tacitness of green needs and green social capital modify this U-shaped relationship, meaning that green social capital mitigates the detrimental impact of green process innovation on enterprises' financial performance, whereas green needs' tacitness strengthens the negative effect of green process innovation on firms' financial performance.

Their findings contribute to the literature on green innovation by highlighting the nonlinear relationship between green process innovation and firms' financial performance.

The Wang, Li, Li, and Wang (2021) investigation establishes an empirical analytical structure for economic performance transmission for green technology innovation and upgrading employing data from 642 Chinese industrial businesses. The research results demonstrate how green product and process innovation may significantly enhance an organization's financial success. Enterprise competitiveness and environmental performance assume a significant role as mediating variables in the pathways to improved economic performance. It can also be conceivable to upgrade technological innovation, and an organization's green process innovation can stimulate green product innovation.

Therefore, considering all the diverse views from extant literature on green innovations and its relationship with or effect on performance, this present study, to the best of the researcher's knowledge, is the first study to combine four determinants of green innovation - green knowledge, green product, green process and green management simultaneously and relate them with corporate performance of SMEs.

3. Research Methodology

The survey research design was adopted and of data for this research were sourced primarily from surveys and interviews. The population for this study was 522 employees of small and medium-sized enterprises who are directly involved in green practices or have expertise knowledge in sustainability activities. A purposive sampling technique was employed to select the sample size of one- hundred and seventy- five (175) respondents. Data was sourced using questionnaires to enable respondents express their voluntary views as it relates to the dependent and the independent variables. The Ordinary Least Square method was employed to assess the extent of adoption, and effectiveness of green practices and qualitative methods to explore challenges, barriers, and recommendations for improvement.

3.1 Model Specification

To determine the connection that exists between green innovations and corporate performances in Small and Medium-sized Enterprises, the following regression model was specified:

$y = \beta 0 + \beta 1x1 + \beta 2x2 + \beta 3x3 + \beta 4x4 \ldots + \beta nxn + eit$ ..... (i)

Where: y = dependent variable – corporate performance.

$\beta 0$ = the intercept,

$\beta 1$-3 the coefficients for the independent variables, and x1-3 represent the independent variables related to green innovation practices adopted while e is the error term. The equation is suitably represented by the researcher, thus:

CFPERF= $\beta 0 + \beta 1$GRKNOW + $\beta 2$GRPDTIN + $\beta 3$GRPROC + $\beta 4$GRMGTIN … + $\beta nxn + eit$ …(ii)

Where:

CFPERF = Corporate Performance

GRKNOW = Green Knowledge

GRPDTIN = Green Product

GRPROC = Green Process

GRMGTIN = Green Management

$\beta 0$ = the intercept,

e = error term

i = Firms

t = Time

4. Data Presentation, Analysis and Interpretation

4.1. Reliability test

The reliability test was conducted to ascertain the internal consistency of the questionnaires used. The study applied the use of Cronbach alpha test that has an acceptable bench mark of 0.7. The result of the test conducted is presented below:

Table 4.1 - Cronbach Alpha test

Test scale = mean (unstandardized items)

Average interitem covariance: .1995315

Number of items in the scale: 5

Scale reliability coefficient: 0.7646

Source: Stata 14 ouput

The table above shows that the Cronbach alpha coefficient is 0.76, the figure is more than the acceptable bench mark of 0.7. The indices indicate that the data has internal consistency and reliability.

Table 4.2 Correlation Matrix Analyses

. spearman GRKNOW GRPDTIN GRPROC GRMGTIN CFPERF

(obs=75)

| GRKNOW GRPDTIN GRPROC GRMGTIN CFPERF

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GRKNOW | 1.0000

GRPDTIN | 0.1350 1.0000

GRPROC | 0.3775 0.2086 1.0000

GRMGTIN | 0.2322 0.1895 0.2899 1.0000

CFPERF | 0.0548 -0.1023 0.1099 0.1355 1.0000

Source: stata 14 output

The relationship among the independent variables disclose that green knowledge has positive and very low relation with green product innovation (GRKNOW/GRPDTIN= 0.135); green knowledge has positive and low relation with green process (GRKNOW/GRPROC= 0.377); green knowledge has positive and low relation with green management innovation (GRKNOW/GRMGTIN= 0.2322). Green product innovation on the other hand has positive and low correlation with green process

(GRPDTIN/GRPROC= 0.1895). Finally, green management innovation has positive and low correlation with green process (GRMGTIN/GRPROC= 0.289). However, the study considered it worthwhile to conduct multicollinearity test using variance inflation factor to ascertain if there is strong correlation amongst the independent variables of our study.

4.2 Multicollinearity Test

This test was conducted to check if the independent variables of the study are highly correlated among themselves. However, the test will be conducted using variance inflation factor analysis.

Table 4.3 – Variance Inflation Factor (VIF)

Variable	VIF	1/VIF
GRPROC	1.41	0.706745
GRKNOW	1.34	0.747686
GRMGTIN	1.12	0.889236
GRPDTIN	1.08	0.928484
Mean VIF	1.24	

Source: stata 14 output

From the table 4.3 above, it is shown that the mean VIF is 1.24. It is however, the rule of VIF to place a benchmark mean of 10 for acceptance level. Hence it is assumed that any result that produces mean VIF above 10 has a case of high correlation of the independent variables. Since our result is 1.24, which is far lesser than acceptable level of 10, we conclude that there is no presence of multicollinearity among the independent variables.

4.3 Ordinary Least Square Regression

From the table 4.7 below, it was seen that the F-statistics and its corresponding P-value were 130.00(0.0000) respectively. This shows that our model remains valid for drawing inference since it is statistically significant at 5% level. The R-squares (coefficient of determinations) of the results were shown as 95% while adjusted R-square was 94%. These values indicate that 95% or 94% for R-square or adjusted R-square respectively of the firm's corporate performance could be changed or determined by the combination of the green innovations variables which are contained in the model.

Table 4.4 Ordinary Least Square Regression

ANOVA: CFPERF: GRKNOW GRPDTIN GRPROC GRMGTIN

Number of obs = 75 R-squared = 0.9572
Root MSE = .964215 Adj R-squared = 0.9498

Source	Partial SS	df	MS	F	Prob>F
Model	1329.4985	11	120.8635	130.00	0.0000
GRKNOW	6.0340312	3	2.0113437	2.16	0.1010
GRPDTIN	22.825913	3	7.6086376	8.18	0.0001
GRPROC	7.6004591	3	2.5334864	2.73	0.0514
GRMGTIN	27.455806	2	13.727903	14.77	0.0000
Residual	59.501516	64	.92971118		
Total	1389	75	18.52		

Source: stata 14 output

Hypothesis One

Green knowledge has no significant effect on performance of Small and Medium-sized Enterprises

The ANOVA result shows green knowledge has a regression coefficient 6.03. This figure indicates that green knowledge has positive effect on the corporate performance of SMEs in Nigeria. The P value of 0.1010 is an indication that green knowledge is not a significant determinant of corporate performance of SMEs.

Hypothesis Two

There is no significant association between green products innovation and performance of Small and Medium-sized Enterprises

From the table above, it was seen that the regression coefficient of green product is 22.82, which implies that green product innovation has positive association with corporate performance. Pertinently, green product innovation has P-statistics of (Prob>F = 0.001) lesser than 5% critical

value. Which means that green product innovation is statistically associating with corporate performance of SMEs

Hypothesis Three

The association between green process and performance of Small and Medium-sized Enterprises

The result of the analysis on the other hand provided that green process scored a regression coefficient of 7.68, which indicates that green process has positive association with performance of SMEs. The result in table 4.7 above further shows that the p-statistics (P>/t/= 0.0514) is lower than 5% critical level. The statistics implies that green process is another major determinant of corporate performance of the sampled firms.

Hypothesis Four

Green Management does not exhibit any significant association with performance in Small and Medium-sized Enterprises

Lastly, the ANOVA table shows that coefficient of determination of green management innovative was 27.45, which is confirming that, green management innovation has positive association with corporate performance. The implication is that, 27 unit changes in green management innovates would attract a unit change in corporate performance on SMEs, if other variables are held constant. The probability value of prob>F = 0.0000 is less than 5% critical level which indicates that green management innovation is a strong determinant of corporate performance of the sampled Small and Medium-sized Enterprises.

5. Conclusion and Recommendations

5.1 Conclusion

The study investigated the association between green innovation and corporate performance of the Small and Medium-sized Enterprises (SMEs). The newness of the title warranted the application of questionnaire for extraction of data from the correspondents. The study engaged ANOVA inferential statistics for better understanding of the relationship between the dependent and independent variables. The result generated from the study made a robust empirical submission which draw the conclusion that green product innovation, green process and green management all have positive and statistically strong determinants of corporate performance that ensures sustainability of Small and Medium-sized Enterprises**.**

5.2 Recommendation

The study made the following recommendation which were drawn from the findings as thus;

(a) The firm's management are encouraged to devote more effort to acquiring more comprehensive knowledge of green innovation as a way to sustaining the company's earnings.

(b) CEOs of SMEs should invest adequate fund in research and development of green product for acquisition of larger market share and improved performance of the firms that can guarantee its sustainability.

(c) CEOs of should invest fund in the green process to ensure that harmful manufacturing process that reduce waste and support production efficiency is embraced.

(d) The authorities of green product manufacturers should ensure that their firms adopt acceptable management strategy that encourages green process for green product innovations, so as to increase the profitability and sustainability of the corporate entity.

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