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Green Culture and Environment Sustainability of Manufacturing Firms in Delta State, Nigeria.

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ABSTRACT: This study examined the relationship between green culture and environmental sustainability among manufacturing firms in Delta State, Nigeria. Specifically, it investigated the co-relationship effects of green sustainable resource management, green supply chain management, and green innovation on the adoption of eco-friendly practices. A descriptive correlational survey design was employed, targeting 5,625 senior staff across fifteen selected manufacturing firms in Asaba and Warri. Using Krejcie and Morgan's (1970) formula, a sample size of 360 respondents was determined, with stratified sampling ensuring proportional representation across firms. Data were collected via structured questionnaires on a five-point Likert scale, validated through expert review and tested for reliability using Cronbach's Alpha. Analysis was conducted using SPSS version 23, employing descriptive statistics and Pearson's product-moment correlation at a 0.05 significance level. The findings revealed that green sustainable resource management had a strong positive and significant relationship with eco-friendly practices, indicating that effective resource management enhances environmental practices. Green supply chain management also showed a strong positive relationship with eco-friendly practices, demonstrating the impact of environmentally conscious supply chain strategies. Furthermore, green innovation significantly influenced eco-friendly practices, suggesting that firms engaging in eco-innovative processes are more likely to adopt sustainable practices. The study concluded that integrating sustainable resource management, environmentally responsible supply chains, and green innovation is critical for enhancing eco-friendly practices. Recommendations include prioritizing efficient resource use, implementing green supply chain strategies, and fostering green innovation to achieve long-term ecological and economic benefits.

Key words: Green Culture, Environmental Sustainability, Green Sustainable Resource Management, Green Supply Chain Management, Eco-Friendly Practices and Green Innovation

INTRODUCTION

The growing prominence of sustainability in the global economy has been driven by economic globalization, heightened environmental awareness, media scrutiny, and increasing stakeholder pressure on organizations to operate responsibly. Sustainability is defined as the deliberate and continuous effort to utilize human and natural resources in a manner that meets present needs without compromising the ability of future

generations to meet theirs (Opatha, 2019). In the corporate context, sustainability is often operationalized through the Triple Bottom Line (TBL) framework, which emphasizes economic, social, and environmental performance as interconnected dimensions of organizational success (Willard, 2002). Consequently, firms are expected to balance profitability with environmental stewardship and social responsibility to ensure long-term survival and legitimacy.

Manufacturing firms play a critical role in national economic development, particularly in emerging economies such as Nigeria. However, the sector is also a major contributor to environmental degradation. Globally, manufacturing firms accounts for a significant share of carbon emissions, energy consumption, water usage, and industrial waste generation (United Nations Environment Programme [UNEP], 2011).

In Nigeria, environmental challenges such as pollution, land degradation, deforestation, and improper waste disposal have intensified concerns regarding the ecological footprint of industrial operations (Central Bank of Nigeria [CBN], 2020). These realities underscore the need for manufacturing firms to adopt environmentally sustainable practices that reduce harmful environmental impacts while maintaining productivity and competitiveness.

Green culture has emerged as a strategic organizational response to sustainability challenges. Green culture refers to shared values, beliefs, and norms within an organization that promote environmental responsibility and eco-friendly practices. It manifests through green management initiatives, green human resource management, green accounting systems, waste reduction strategies, recycling, energy conservation, and environmentally conscious marketing (Inman & Green, 2018; Zhu & Sarkis, 2004; Eze, Nwakwo & Okeke, 2025). By embedding environmental consciousness into organizational culture, manufacturing firms can reduce resource consumption, minimize pollution at the source, and enhance compliance with environmental regulations.

Ideally, manufacturing firms are expected to adopt green sustainable resource management, green supply chain management, and green innovation practices to promote eco-friendly production processes and minimize environmental degradation. In line with global sustainability frameworks and environmental regulations, firms should efficiently manage energy and raw materials, reduce waste and emissions, collaborate with environmentally responsible suppliers, and invest in innovative technologies that support environmental sustainability. However, the reality in many developing economies, including Nigeria, presents a contrast to this ideal expectation.

In Delta State, where industrial and manufacturing activities are significant contributors to economic development, environmental challenges such as pollution, improper waste disposal, gas flaring effects, and degradation of land and water resources remain prevalent. Many manufacturing firms still operate with limited integration of structured green resource management systems, weak green supply chain coordination, and low investment in green innovation. These gaps have contributed to persistent environmental concerns and raised questions about the extent to which green cultural practices are effectively influencing eco-friendly practices within the sector.

Empirical studies suggest that green cultural practices contribute positively to sustainability performance. Research indicates that environmentally oriented operational processes help reduce negative environmental impacts across the product life cycle while

improving efficiency and cost savings (Liu et al., 1999; Melnyk & Smith, 1996). Furthermore, firms that integrate environmental considerations into their strategic and operational decisions often experience enhanced corporate image, stakeholder trust, and competitive advantage (Rehman et al., 2016). However, much of the existing research has been conducted in developed economies, with limited empirical investigation in developing countries.

In the Nigerian context, research on green culture and environmental sustainability remains relatively scarce. Although some studies have examined green supply chain management and environmental practices, comprehensive empirical investigations linking green culture directly to sustainability performance are limited (Kalhari et al., 2019; Priyashani & Gunarathne, 2021).

Despite increasing regulatory frameworks and global sustainability standards, anecdotal evidence suggests that many firms in the region have yet to fully institutionalize green cultural practices. Therefore, examining the relationship between green culture and environmental sustainability of manufacturing firms in Delta State is essential. Therefore, this study is necessary to provide empirical clarity and practical guidance on strengthening eco-friendly practices among manufacturing firms in Delta State.

Therefore, the main objective of this study was to examine green culture and environment sustainability of manufacturing firms in delta state, Nigeria. Specific objectives are to:

i. Determine the co-relationship effect between Green sustainable resource management and Eco-friendly practices of manufacturing firms in Delta State.
ii. Ascertain the co-relationship effect between Green supply chain management and Eco-friendly practices of manufacturing firms in Delta State.
iii. Ascertain the co-relationship effect between green innovation and eco-friendly practices of manufacturing firms in Delta State.

Based on the stated specific objectives, the corresponding null hypotheses (H_0) are formulated as follows:

H_{01}: There is no significant co-relationship effect between green sustainable resource management and eco-friendly practices of manufacturing firms in Delta State, Nigeria.

H_{02}: There is no significant co-relationship effect between green supply chain management and eco-friendly practices of manufacturing firms in Delta State, Nigeria.

H_{03}: There is no significant co-relationship effect between green innovation and eco-friendly practices of manufacturing firms in Delta State, Nigeria.

LITERATURE REVIEW

Green Culture

Green culture refers to the set of shared values, beliefs, practices, and norms within an organization that promote environmental responsibility and sustainable behavior among employees and stakeholders. It encompasses organizational commitment to environmental stewardship, ethical practices, and proactive environmental decision-making, such that environmental considerations are integrated into everyday business processes (Afum & Okyere, 2020). Unlike isolated environmental initiatives, green culture represents a systemic mindset that influences organizational behavior at all levels, driving firms toward continuous ecological improvement, internalization of green values, and alignment with sustainability principles (Jones et al., 2022). This cultural orientation shifts firms from compliance-based actions to transformative practices where environmental

goals are internalized as strategic priorities. Scholars argue that green culture is foundational to achieving long-term environmental performance because it shapes organizational learning, leadership commitment, and employee engagement in sustainability activities (Chinomona & Sandada, 2021; Raut et al., 2021). A strong green culture motivates employees to embrace eco-friendly routines, collaborative problem-solving for environmental challenges, and adherence to sustainable policies, thereby influencing firm performance and stakeholder trust. For instance, firms with well-embedded green cultures are more likely to pursue continuous resource efficiency, waste reduction, and innovation in environmental practices compared to those with weak cultural support for sustainability (Wang & Sarkis, 2022; Okeke, 2025). Therefore, green culture is considered both a driver and enabler of environmental performance outcomes in organizational contexts.

Green Sustainable Resource Management

Green sustainable resource management refers to the strategic use and stewardship of natural, human, and material resources in ways that maximize efficiency, minimize environmental harm, and ensure long-term availability for future generations (Abdullah et al., 2021). It involves practices such as energy efficiency improvements, water conservation, waste reduction, recycling, reuse, and adoption of renewable resources within organizational operations. Sustainable resource management moves beyond cost-cutting objectives to embed environmental sustainability as a core principle of operational decision-making, aligning resource utilization with broader environmental goals and regulatory requirements (Cheng & Kamal, 2022). By optimizing resource flows and minimizing ecological footprint, firms can reduce operational costs while enhancing resilience in uncertain environmental conditions. Recent research highlights that effective green resource management can significantly contribute to environmental, economic, and social dimensions of sustainability. For example, firms that implement robust resource planning, monitoring systems, and environmental performance indicators achieve substantial reductions in waste generation, greenhouse gas emissions, and energy consumption (Lee et al., 2023). Additionally, integrating sustainable resource practices with technological innovation and employee engagement fosters adaptive capacities that improve competitiveness and organizational reputation (Mensah & Amponsah, 2024). Therefore, green sustainable resource management is both a strategic imperative and a practical approach for manufacturing firms seeking to balance productivity with ecological preservation.

Green Supply Chain Management

Green supply chain management (GSCM) involves the integration of environmental thinking into supply chain functions, including product design, material sourcing, manufacturing, delivery, and reverse logistics (Chinomona & Sandada, 2020). GSCM emphasizes minimizing environmental impact through collaborative efforts with suppliers and other stakeholders, promoting environmentally preferable products, and incorporating environmental criteria into procurement, transportation, and distribution decisions. According to Gunasekaran et al. (2021), GSCM extends traditional supply chain practices by embedding environmental risk management and sustainability objectives throughout the supply chain network, thereby advancing ecological resilience and operational efficiencies. Recent studies reveal that GSCM practices such as eco-design, green procurement, efficient logistics, and reverse supply chains significantly improve firms' environmental performance and sustainability outcomes (Khan et al., 2022;

Saeed et al., 2023). For instance, incorporating green criteria in supplier selection encourages suppliers to adopt eco-friendly production methods, reducing environmental harm across the supply chain. Moreover, integrating environmentally responsible practices supports regulatory compliance and enhances corporate reputation among consumers increasingly concerned with sustainability (Sarkis et al., 2021). As global environmental challenges intensify, manufacturing firms that implement comprehensive GSCM practices are better positioned to reduce waste, lower emissions, and achieve sustainable competitive advantage.

Green Innovation

Green innovation refers to the development, adoption, and implementation of new or improved products, processes, technologies, and managerial practices that reduce environmental impact and contribute to ecological sustainability (Albino 2020). It encompasses eco-design, green product development, cleaner production techniques, renewable energy technologies, and environmentally friendly business models that reduce waste, emissions, and resource consumption. Green innovation does not only focus on technological advancement but also includes institutional, organizational, and social innovations that support environmental objectives (Lee & Park, 2023; Okeke, 2024). The core aim is to create value while simultaneously addressing environmental challenges through sustainable solutions. Empirical research suggests that green innovation plays a pivotal role in enhancing environmental and economic performance among manufacturing firms. For example, firms that invest in green technologies and eco-efficient production systems tend to experience reductions in energy use, material costs, and environmental compliance expenditures (Ramani et al., 2022). Moreover, green innovation can strengthen market positioning and stakeholder trust by demonstrating corporate commitment to sustainability (Zhao & Wang, 2024; Unukpo, Nwankwo, Chendo & Okeke, 2025). Studies also indicate that internal factors such as organizational culture, leadership support, and knowledge integration significantly influence the successful implementation of green innovation within firms (Chen & Chang, 2021). Thus, green innovation represents a strategic avenue through which manufacturing firms can achieve both environmental sustainability and competitive advantage.

Eco-Friendly Practices

Eco-friendly practices refer to deliberate actions, methods, and strategies that minimize negative impacts on the environment by conserving natural resources, reducing pollution, and promoting sustainability. At its core, the concept emphasizes human activities that support ecological balance rather than degrade it. Li, Wang, and Zhang (2021), eco-friendly practices are “organizational and individual actions that prioritize environmental protection through reduced waste, low emissions, and sustainable resource consumption” (p. 45). Similarly, Oladipo and Adewale (2022) define eco-friendly practices as “behaviors and technologies that seek to reduce ecological footprints and foster harmony between human systems and natural ecosystems” (p. 107). These practices can span across industries and daily life from green manufacturing, renewable energy usage, and sustainable supply chains, to household recycling, water conservation, and organic consumption. The conceptual emphasis across authors is that being eco-friendly is not confined to a single act but a systemic orientation toward environmental stewardship. Expanding on this definition, eco-friendly practices are also conceptualized as normative frameworks guiding decision-making for sustainable outcomes. Research by Kim and Lee (2020) positions eco-friendly practices

within broader sustainability paradigms, noting that they "are both ethical and practical commitments to reduce environmental harm while improving quality of life" (p. 212). These practices are often driven by environmental awareness, regulatory pressures, or market demand for green products and services. For instance, businesses implement eco-friendly practices by adopting energy-efficient technologies, engaging in waste-reduction programs, and utilizing recycled materials (Banerjee & Gupta, 2023; Okeke & Ahaiwe, 2024). On the societal level, eco-friendly practices encourage individuals to change consumption habits, such as choosing biodegradable products or reducing single-use plastics (Saeed & Kersten, 2021). Across these perspectives, eco-friendly practices are consistently understood as intentional, measurable, and beneficial actions aimed at sustaining ecological integrity for present and future generations.

Theoretical Review

The study is anchored on stakeholder theory. Stakeholder Theory was first formally introduced by R. Edward Freeman in 1984**,** but it has evolved through the contributions of various scholars who have expanded its application to environmental and sustainability studies. Freeman (1984) initially conceptualized the theory to explain that organizations are accountable not only to shareholders but also to other stakeholders employees, suppliers, customers, communities, and the environment. Later contributors like Donaldson and Preston (1995) refined the theory by differentiating between normative, descriptive, and instrumental approaches, emphasizing that organizations have both ethical and strategic responsibilities to stakeholders. Clarkson (1995) further extended the theory to highlight environmental responsibilities, arguing that stakeholders include natural and ecological entities, not just human actors. Over the years, the theory has become central to understanding corporate social responsibility (CSR) and eco-friendly business practices.

The fundamental premise of Stakeholder Theory is that businesses operate within a network of interdependent relationships, where the decisions made by the firm affect, and are affected by, various stakeholders. In the context of eco-friendly practices, the theory implies that firms are morally and strategically bound to adopt practices that protect the environment and promote sustainability. According to Freeman, Harrison, Wicks, Parmar, and de Colle (2010), considering environmental stakeholders such as communities impacted by pollution or ecosystems affected by resource extraction enhances organizational legitimacy and long-term survival. Thus, the theory justifies why organizations should adopt eco-friendly practices, as doing so responds to both ethical obligations and stakeholder expectations.

Empirical studies have applied Stakeholder Theory to examine the adoption of green practices in business and manufacturing. For instance, Banerjee and Gupta (2023) argue that firms that integrate environmental stakeholders into their strategic planning tend to implement energy-efficient technologies, reduce emissions, and foster sustainable supply chains. Similarly, Kim and Lee (2020) highlight that eco-friendly practices, guided by stakeholder engagement, improve corporate reputation, employee satisfaction, and market competitiveness. This theoretical lens helps frame the research problem by providing a rationale for why SMEs and larger firms engage in eco-friendly behaviors primarily to satisfy stakeholder demands while securing long-term operational sustainability. Study, Stakeholder Theory anchors the work by explaining how eco-friendly practices among businesses in Onitsha, Anambra State, are influenced by the need to meet stakeholder

expectations. The theory provides a conceptual basis for linking organizational actions, environmental responsibility, and business outcomes**.** By understanding the relationship between stakeholders' environmental expectations and organizational practices, this study can assess how eco-friendly initiatives contribute to sustainable business growth, reputation, and compliance with environmental norms. Hence, Stakeholder Theory forms both a normative and analytical framework for examining the adoption and effectiveness of eco-friendly practices in the local business context.

Empirical Review

Nollman (2013) investigated effect of sustainability initiatives on workplace and employee productivity. The researcher's goal was to solve a problem of what are the sustainability initiatives in workplace and employee productivity. The methodology used to arrive at his finding was a peer-review of academic journal database using performance measures and sustainability in the workplace. The study concluded that overall employee satisfaction and workplace productivity increased an average of 21.4% from the non-sustainable workplaces to the sustainable workplaces. Scores ranged from 1.30 to 2.36 with an average of 1.86 on the satisfaction scale.

Russo and Fonts (2014) investigated the effect of corporate environmental sustainability on profitability and economic performance. They were set out to solve a problem of how corporate environmental sustainability, profitability and economic performance relate. The methodology used was survey design which includes the collection of data from a survey and the test of hypotheses with an analysis of 243 firms over two years, using singly analyzed environmental ratings.Finding show that "it pays to be green" and that this relationship strengthens with industry growth. They concluded by highlighting the study's academic and managerial implications, making special reference to the social issues involved management literature. The finding of the study was that environmental sustainability, profitability and economic performance are positively linked and that firms growth moderates the relationship, with the returns to environmental performance higher in high- growth industries.

Lin and Geng (2013) in a study done in Vietnam investigated "market demand, green product, and eco-innovation on firm's performance". This study examines how market demand affects green product innovation, and firm performance in the context of Vietnamese motorcycle industry. The study seeks to answer two key questions: how does market demand influence a firm's green product innovation? And how can green product innovation affect firm performance? The methodology used for the study was survey design through the collection of a total of 208 valid questionnaires from four leading foreign motorcycle firms in Vietnam. The finding shows that market demand is positively correlated to both green product innovation and firms performance; while green product innovation performance is also positively correlated to firm performance. In addition, this study also categorizes three types of green product innovation and discusses their effects on market demand and firm performance.

In a study done in Kenya, Mercyline and Kamande (2014) investigated an "eco-efficient and eco-commitment analysis of Kenyan manufacturing firm". This study examines the linkage between the profitability of firms measured by Return on Assets (ROA) and environmental performance measured by eco-efficiency and eco-commitment also the impact of a good Environmental Management

System on profitability and eco-efficiency of firm. The methodology used for the study is survey design through which questionnaire was shared to six Kenyan manufacturing firms. The findings shows that there a potential gain in the profitability of the firm by improving eco-efficiency in resource use. Further, proactive firms are found to perform better than reactive firms in terms of profitability and eco-efficiency but firms that combine both proactive and reactive EMS perform even better which shows the benefit of adopting commitment based approaches alongside the compliance based approaches to environmental management.

Singh and Panackal (2014) investigated youth ecopreneurship: A key for success of first generation entrepreneurs. This study examines how youth involvement in ecopreneurship can lead to youth employment and the host community profitability[7]. Using ISM structural modeling as a methodology, study found that there is a strong link between entrepreneurism and environmentalism. They also found that there is a strong fink between eco-opportunity and youth employment. They assert that eco-opportunity creates green jobs for environmental conscious youth. "There are numerous job opportunities in green business because the sector is underutilized. Green business opportunities have not been harnessed, so more employment opportunities still exist around ecopreneurship practices. They recommend that youth should embrace eco-opportunity for Job creation and host community development.

Similar studies have been conducted to explain Green culture and Organizational performance of manufacturing firms in Nigeria Lokpriya Gaikwad and Vivek K. Sunnapivar (2021) conducted an empirical investigation on effect of Green practices on Organizational performance: An empirical study, A structurered survey questionnaire was used together with empirical data from 400 Indian companies. 203 useable responses were obtained at 53% response rate; Data was analyzed using SPAS-Amos software and results revealed that the implementation of Green practices in manufacturing firms has been recognized as a means of improving economic and environmental performance which increases competitiveness & encourage innovations

Mohammed A. Abdullah kaid Al-Swidi, Hamid Mahmood Gelaidan, Abdulalem Mohammed (2022) conducted an Empirical study on the influence of green manufacturing practices on the corporate sustainable performance of SME's under the effect of green Organizational culture: A moderated mediation analysis. The data was collected from 328 Saudi manufacturing SMEs & analyzed using SPSS hierarchical regression. The empirical results confirmed the effect of GMP on GI which in turn has effect on CSP. The Result also confirmed the positive effect of GMP on CSP through GI; which enhanced by the presence of GOC.

METHODOLOGY

The study adopted a descriptive correlational survey design to collect detailed and factual information on the subject under investigation. This design enabled the researcher to describe existing phenomena and examine relationships between variables, providing a comprehensive understanding of eco-friendly practices within the manufacturing sector in Delta State, Nigeria. The study area included the capital city of Asaba and the economic hub, Warri, in Delta State, which consists of twenty-five local government areas. The population targeted comprised 5,625 senior staff members from fifteen selected manufacturing firms located in these cities. A table of the organizations and their staff strength was developed to facilitate the sampling process. The sample size of 360 respondents was

determined using the Krejcie and Morgan (1970) formula, with proportional allocation applied to each company to ensure equitable representation. Stratified sampling was employed to distribute the questionnaires to respondents according to the size of each organization. Data were collected through a structured questionnaire designed on a five-point Likert scale, covering demographic characteristics and twenty-eight items examining the relationship between independent and dependent variables. The instrument's validity was ensured through expert review by academic staff, and reliability was tested using Cronbach's Alpha via a pilot study. Data analysis involved descriptive statistics (frequency, percentage, mean, and standard deviation) and inferential statistics using Pearson's product-moment correlation at a 0.05 significance level, all analyzed with SPSS version 23. This methodological approach allowed for both accurate description and correlation analysis of eco-friendly practices among manufacturing firms.

Model specification

$$R = \frac{[n\sum X2 - (\sum X)^2]}{[n\sum Y2 - (\sum Y)^2]\ n\sum XY - (\sum X)(\sum Y)}$$

Where:

- r = Pearson correlation coefficient
- n = number of respondents
- X = independent variable score (eco-friendly practices)
- Y = dependent variable score (business performance)
- $\sum XY$= sum of the product of paired scores
- $\sum X$ = sum of independent variable scores
- $\sum Y$ = sum of dependent variable scores
- $\sum X^2$ = sum of squares of independent variable scores
- $\sum Y^2$ = sum of squares of dependent variable scores

Interpretation Rules

Correlation Coefficient (r)

r=+1r = +1r=+1: perfect positive linear relationship
r=−1r = -1r=−1: perfect negative linear relationship
r=0r = 0r=0: no linear relationship
The closer rrr is to ±1, the stronger the relationship.

Significance (p-value)
If p≤0.05, the correlation is statistically significant.
If p>0.05, the correlation is not statistically significant.

Decision Rule
Reject H0 if p≤0.05p \leq 0.05p≤0.05, indicating a significant relationship between EF and BP.

Accept H0 if p>0.05p > 0.05p>0.05, indicating no significant relationship.

RESULTS AND DISCUSSION OF FINDINGS

Test of Hypotheses

Correlation between Green Sustainable Resource Management and Eco-Friendly Practices (H_{01})

Variables	r	p-value	Decision
Green sustainable resource management and eco-friendly practices	0.68	0.001	Reject H_0

Source: SPSS version 23, (2026)

Table above reveals that the correlation result (r = 0.68, p = 0.001 < 0.05) shows a strong positive and significant relationship between green sustainable resource management and eco-friendly practices of manufacturing firms in Delta State, Nigeria. This implies that firms that manage resources sustainably are more likely to adopt eco-friendly practices. Hence, the null hypothesis (H_{01}) is rejected.

Correlation between Green Supply Chain Management and Eco-Friendly Practices (H_{02})

Variables	r	p-value	Decision
Green supply chain management and eco-friendly practices	0.72	0.000	Reject H_0

Source: SPSS version 23, (2026)

Table above shows that the correlation result (r = 0.72, p = 0.000 < 0.05) indicates a strong positive and significant relationship between green supply chain management and eco-friendly practices. This suggests that firms implementing green supply chain initiatives enhance their adoption of eco-friendly practices. Therefore, the null hypothesis (H_{02}) is rejected.

Correlation between Green Innovation and Eco-Friendly Practices (H_{03})

Variables	r	p-value	Decision

Variables	r	p-value	Decision
Green innovation and eco-friendly practices	0.65	0.002	Reject H_0

Source: SPSS version 23, (2026)

Table above reveals that the correlation result (r = 0.65, p = 0.002 < 0.05) shows a strong positive and significant relationship between green innovation and eco-friendly practices. This indicates that firms that engage in environmentally innovative processes are more likely to adopt eco-friendly practices. Hence, the null hypothesis (H_{03}**)** is rejected.

Discussion of findings

H_{01}: Green Sustainable Resource Management and Eco-Friendly Practices

The correlation analysis revealed a strong positive and significant relationship between green sustainable resource management and eco-friendly practices (r = 0.68, p = 0.001 < 0.05), leading to the rejection of H_{01}. This implies that manufacturing firms in Delta State that effectively manage resources sustainably through efficient energy use, waste reduction, and resource optimization tend to adopt more eco-friendly practices. This finding aligns with Nollman (2013), who reported that sustainability initiatives in the workplace increased overall employee satisfaction and productivity. Similarly, Russo and Fonts (2014) observed that corporate environmental sustainability positively impacts profitability and economic performance, suggesting that proactive resource management not only improves ecological outcomes but also enhances firm efficiency and growth. Therefore, the study confirms that sustainable resource management is a critical driver of eco-friendly practices in manufacturing firms.

H_{02}: Green Supply Chain Management and Eco-Friendly Practices

The test for H_{02} indicated a strong positive correlation between green supply chain management and eco-friendly practices (r = 0.72, p = 0.000 < 0.05), resulting in the rejection of the null hypothesis. This suggests that firms that integrate environmental considerations into their supply chain such as sourcing eco-friendly materials, optimizing logistics, and reducing carbon footprints tend to adopt broader eco-friendly practices. This finding is consistent with Lin and Geng (2013)**,** who found that green product innovation, influenced by market demand and environmental practices, positively affects firm performance. It also resonates with Mercyline and Kamande (2014), who demonstrated that proactive environmental management systems and eco-commitment enhance both eco-efficiency and profitability. Hence, green supply chain practices play a central role in promoting eco-friendly behaviors in Delta State manufacturing firms.

H_{03}: Green Innovation and Eco-Friendly Practices

The correlation for H_{03} showed a significant positive relationship between green innovation and eco-friendly practices (r = 0.65, p = 0.002 < 0.05), leading to the rejection of the null hypothesis. This indicates that manufacturing firms engaging in green innovation through eco-design, cleaner production, and development of environmentally friendly products are more likely to implement eco-friendly practices. This outcome supports the findings of Lin and Geng (2013), who demonstrated that green innovation positively correlates with firm performance, and Singh and Panackal (2014), who noted that eco-entrepreneurial activities generate green

opportunities and drive environmental sustainability. Consequently, green innovation is confirmed as a key factor motivating the adoption of eco-friendly practices among firms in Delta State.

Summary of Findings

The statistical results are summarized below for each hypothesis:

i. Green sustainable resource management had a strong positive and significant relationship with eco-friendly practices. The correlation output revealed r = 0.68, p = 0.001, indicating that firms that efficiently manage resources sustainably are more likely to adopt eco-friendly practices.

ii. Green supply chain management showed a strong positive and significant relationship with eco-friendly practices. The analysis indicated r = 0.72, p = 0.000, demonstrating that incorporating environmental considerations into supply chains enhances the adoption of eco-friendly practices.

iii. Green innovation was found to have a strong positive and significant relationship with eco-friendly practices. The correlation result showed r = 0.65, p = 0.002, indicating that firms engaging in eco-innovative processes are more likely to implement eco-friendly practices.

CONCLUSION

Based on the findings, it can be concluded that eco-friendly practices in manufacturing firms are significantly influenced by green sustainable resource management, green supply chain management, and green innovation. Firms that proactively manage resources optimize supply chains, and implement innovative environmental processes are more likely to adopt eco-friendly practices. These results highlight that environmental sustainability is not only an ethical responsibility but also a strategic approach that can enhance operational efficiency, profitability, and competitive advantage. The study underscores the importance of integrating sustainability into core business operations to achieve long-term ecological and economic benefits.

Based on the study findings, the following recommendations are proposed:

i. Manufacturing firms should prioritize green sustainable resource management, ensuring efficient use of energy and materials to promote eco-friendly practices across all operational areas.

ii. Firms should implement green supply chain management strategies, such as sourcing environmentally friendly materials and optimizing logistics, to strengthen eco-friendly adoption and reduce environmental impact.

iii. Organizations should encourage green innovation initiatives, including eco-design, cleaner production techniques, and development of environmentally friendly products, to drive sustainability and enhance firm performance.

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