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Green manufacturing practices and customer efficiency of consumer goods manufacturing companies listed in Nigeria.

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ABSTRACT :Purpose - The present paper investigates the impact of Green Manufacturing Practices (GMP) and Customer Efficiency (CEF) of consumer goods manufacturing companies listed in Nigeria. The study utilized Green Product Design (GPD), Green Supply Chain Management (GSM), Green Efficient Processes (GEP), Green Renewable Energy (GRE), and End-of-life Product Management (EPM) as constructs for green manufacturing practices on customer efficiency of consumer goods manufacturing companies listed in Nigeria.
Design/methodology/approach – A survey research design was adopted for the study. The study population comprises 526 staff members at the managerial level of the consumer goods manufacturing firms listed in Nigeria. The sample size 228 was determined using Taro Yamane's formula and randomly selected. A 5-point Likert Scale questionnaire was employed for data collection from the sampled 228 managerial staff members of the listed firms. The validity of the instrument of data collected was premised on the vast experience of the managers and the reliability of the data was done using the Cronbach Alpha Coefficient Technique which produced between 0.767 to 0.966 results. Statistical Package for Social Sciences (SPSS) version 22.0 was used to analyze and test the multiple regression. Descriptive and inferential (multiple regression) statistics were used to analyze the data at a 5% level of significance.
Findings – The findings indicate that green manufacturing practices variables (GPD, GSM, GEP, GRE, and EPM) had a positive significant effect on customer efficiency ($Adj.R^2 = 0.385$, $F(5,211) = 28.055$, $p < 0.05$) indicating that a unit increase in GMPs will enhance theCEF of consumer goods manufacturing companies listed in Nigeria.
Practical implications – These findings should be of major interest to the Management of the listed consumer goods on the need to make informed strategic decisions about green initiatives and prioritize investments thereon while the Government policymakers are to develop or refine regulatory frameworks that encourage green manufacturing practices in the manufacturing industry.
Originality/value – This investigation provides original empirical evidence on the effect of green manufacturing practices on customer efficiency of consumer goods manufacturing companies listed in Nigeria.

KEYWORDS– *Customer Efficiency (CEF), End-of-life Product Management (EPM), Green Efficient Processes (GEP), Green Product Design (GPD), Green Renewable Energy (GRE), Green Supply Chain Management (GSM).*

I. INTRODUCTION

Customer efficiency embodies customers' perception regarding the ease and seamlessness of their interactions with enterprises, emphasizing the elimination of friction and complexity throughout their journey.Satisfying the customer's needs has always been the utmost desire of every firm, especially profit-oriented ones. Still, customer satisfaction is often a coin with two sides as it aims at getting the best quality product or service at the lowest price possible. Bakator et al., (2018) noted that every business entity is out to satisfy at least a need of an existing or potential customer(s) through offering unique products or services. High customer expectations and growing competitors strain customer capabilities and efficiency (Okunuga et al., 2022). This appears to be the reason why industries are striving to enhance competitiveness within the manufacturing sector by meeting the needs of their customers in a cost-effective manner (Rundh, 2013). With the changing behaviors of customers leading to them attempting to integrate environmental considerations into their lifestyles, purchasing decisions are made based on how well these products satisfy their needs and the effect they have on the natural environment, firms in the manufacturing sector are therefore being made to see the need to adopt practices that will suit these changes. GMP, being an evolving technology, supports customer efficiency by helping to reduce

their environmental footprint which aids firms to be more profitable in a sustainable way (Ismail et al., 2018; Washika&Kuya, 2023).

The main objective of this study was to determine the effect of green manufacturing practices on the customer efficiency of consumer goods manufacturing companies listed in Nigeria while the research question was "How do green manufacturing practices affect the customer efficiency of consumer goods manufacturing companies listed in Nigeria?". The study enriches the existing literature on consumer efficiency of listed consumer goods manufacturing companies within Nigeria's context by providing empirical evidence relating to the discourse of green manufacturing practices in Nigeria.

The study employed a survey research design. The sample size of 228 was determined using Taro Yamane's formula from a population of 526 staff members at the managerial level of the consumer goods manufacturing firms listed in Nigeria randomly selected. A 5-point Likert Scale questionnaire was employed for data collection from the sampled 228 managerial staff members of the listed firms. The validity of the instrument of data collected was premised on the vast experience of the managers and the reliability of the data was done using the Cronbach Alpha Coefficient Technique which produced between 0.767 to 0.966 results. Statistical Package for Social Sciences (SPSS) version 22.0 was used to analyze and test the multiple regression. Descriptive and inferential (multiple regression) statistics were used to analyze the data at a 5% level of significance.

The main finding of the study suggests that green manufacturing practices are important factors to be considered in achieving and sustaining customer efficiency of consumer goods manufacturing companies listed in Nigeria. This is evidenced by the result of the test, CEF($Adj.R^2$ = 0.385, F (5, 21) = 28.055, p >0.05). The study concluded that green manufacturing practices have a positive effect on the customer efficiency of consumer goods manufacturing companies listed in Nigeria. The study recommended thatmanagement should consider the integration of green manufacturing practices into their operations to enhance customer efficiency and overall firm sustainability. Investors should consider the long-term financial implications of green manufacturing practices in investment decisions, recognizing its potential to enhance customer efficiency and build wealth for high returns.

The paper reviewed related literature in three folds, conceptual review, theoretical review, and empirical review. The primary data collected through the administration of a structured questionnaire were analyzed through descriptive analysis, and inferential analysis and interpretations given. Test of the formulated hypothesis was carried out using the collected data based on the specified multiple regression models. The main findings on the effect of green manufacturing practices on the customer efficiency of consumer goods manufacturing companies listed in Nigeria were also explained.

II. RELATED LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Customer efficiency reflects the ease and effectiveness with which customers can achieve the desired outcomes when relating to a business or using its services or products. It connotes the process of minimizing the efforts required by customers, maximizing the value they get, and ensuring a positive and focused experience throughout their course. It also connotes regularly optimizing relationships between a brand and its customers for timely resolutions that benefit both parties. Customer efficiency from the perspective of firms is viewed from the ability of that firm to satisfy a customer and retain such customer's loyalty thus retaining such customer with the attendant repeat orders (Asgarpour et al., 2015). Customer efficiency embodies the perception that customers have regarding the ease and seamlessness of their interactions with enterprises, emphasizing the elimination of friction and complexity throughout their journey. Firms are forced to invent new ways of achieving competitive advantage which relies on efficiency and productivity that cut across all the functional areas of the company to be more responsive to consumer needs and market demands through the production of high-quality goods with the attendant fast delivery strategy (Putri et al., 2023).

Verhoef et al., (2021) emphasized that increasing customer efficiency is all about minimizing the amount of work that consumers put forth, making it so that customers may accomplish their objectives with as little effort as possible. This entails the streamlining of procedures and the provision of frictionless experiences, which allow customers to travel through their interactions efficiently without experiencing any unneeded impediments. Homburg et al., (2017) propose the concept of customer efficiency as an essential performance metric, highlighting the need for prompt response times, efficient problem resolution, and user-friendly interfaces to simplify and expedite interactions with customers. They contend that effective interactions result in increased levels of consumer satisfaction as well as loyalty.

Lemon and Verhoef (2016) noted that there is a correlation between the effectiveness of the customer and the conversion rate. Higher conversion rates are indicative of a more effective customer journey. This occurs when a greater proportion of users can complete their desired actions, such as making a purchase, indicating that the

process has been well-optimized. Nambisan (2017) opined that consumer efficiency can be understood via the lens of accessibility and convenience. It is the process of making it easy and hassle-free for customers to communicate with a company, typically using well-designed websites, mobile applications that are friendly to their users, and self-service choices. Grewal et al., (2021) present the concept of personalization as an essential part of effective customer service. Companies can improve their efficiency by lowering the amount of time customers spend searching for appropriate items or services by adapting interactions to the interests of individual customers. This results in experiences that are both more effective and efficient.

The concept of customer efficiency is not new; nonetheless, it has gained a substantial amount of relevance in recent years. Pappas (2016) stated that the rise of e-commerce and the digital revolution have brought about a significant shift in how customers evaluate and prioritize efficiency in their interactions with various types of enterprises. Customers today expect frictionless experiences that save them time and effort, and businesses need to evolve to reach this new standard of service. Reimers et al., (2021) observed that businesses that prioritize the efficiency of their interactions with customers have a greater propensity to experience increasing levels of customer loyalty and advocacy. This underscores the notion that customer efficiency is not just about convenience but also about developing relationships with customers that are strong and long-lasting.Nambisan (2017), accomplishing convenience requires developing websites and mobile applications of high-quality design and user-friendliness, as well as highly effective customer care channels. Time sensitivity is another pivotal element, with speed and timeliness being paramount. Customers prioritize swift access to what they need, and organizations that excel in this regard tend to foster greater customer satisfaction (Lemon & Verhoef, 2016). Delays or inefficiencies can lead to frustration and a decline in customer loyalty.

Streamlining and simplifying purchasing processes can significantly elevate the overall customer experience (Lee & Kwon, 2019). By offering personalized recommendations and tailored offers, organizations can save customers time and effort, as they don't have to search extensively for what they need (Grewal et al., 2021). This personalization not only enhances efficiency but also strengthens the bond between customers and businesses.Homburg et al., (2017) and Lemon and Verhoef (2016), opined that analysts evaluate effectiveness by making use of a wide variety of Key Performance Indicators (KPIs) such as rapid responses and resolution times. Customer Effort Score (CES) is an important metric that evaluates the difficulty or ease customers experience while dealing with a particular business. A low CES indicates a more efficient experience, displaying the company's expertise in streamlining customer interactions and increasing overall efficiency.

Verhoef et al., (2021) and Zhang et al., (2018) AI-driven chatbots and customized algorithms can effectively manage a wide variety of consumer requests, thereby enabling human agents to concentrate on more complex jobs and helping customers to save time thereby increasing the possibility of making a purchase. Customers are given the ability to independently access information, troubleshoot problems, or make purchases with self-service portals, which several businesses have implemented. Van-Doorn et al., (2017) noted that using these platforms greatly reduces the requirement for direct connection with customers. As a result, customers, and businesses alike experience time savings as a direct result of the use of these platforms.The integration of GMPs into manufacturing operations enhances customer loyalty, thus, marketing strategies should emphasize the environmental responsibility of the company (Bag & Pretorius, 2022).

Green Manufacturing

Green manufacturing is a modern manufacturing practice, that attempts to comprehensively consider the environmental impact and efficient use of resources to render the life cycle of products, from design to disposal, energy efficient and with minimum discharge of pollutants (Al-Hakimi et al., 2022). Green manufacturing as an evolving manufacturing practice One of the new terms in the manufacturing world that efficiently uses resources and ensures a friendly environment during the product life cycle is called green Manufacturing practices (Haleem et al., 2023).green manufacturing is an important tool needed to achieve superior and competitive performance relating to the environment (Baah et al., 2021). GMP are manufacturing practices that are cost-efficient and unified methods of manufacturing thatare utilized to reduce or eradicate all possible waste streams from product design to disposal (Andaregie&Astatkie, 2022).

Green Product Design

Businesses globally are currently facing a lot of pressure to go green in a way that positively affects the environment by reviewing their production processes to ensure that they conform to this demand (Sezen & Çankaya, 2013). Green product design helps reduce the harmful impact on the environment by reducing waste and mitigating air, land, and water pollution which in turn reduces health risks to humans and other species (Buzuku&Kässi, 2019; Skare & Riberio-Soriano, 2021). Green products are those that are naturally recyclable, reusable, and biodegradable. It is made with safe chemicals, repurposed materials, and natural substances

(Moshood et al., 2022). Green products are produced and initially grown using permitted chemicals. They don't damage the environment or cause pollution. They are deemed to be environmentally benign as a result (Zhang et al., 2022). According to Raišiene et al., (2021), green product design uses innovative design that addresses environmental challenges and improves the environment.Globalization and its processes to introduce innovation that expedites technology transmission and globalization-induced innovation appear to be more product-oriented than process-oriented (Skare & Riberio-Soriano, 2021).

Green Supply Chain Management (GSCM)

Green Supply Chain Management (GSCM) as a concept is made up of three components which are green design, clean production, and recycling technology designed in such a way as to reduce resource and energy consumption as well as reduce the impact on the environment. GSCM was introduced first by Michigan University around 1996 to achieve a manufacturing supply chain theory (Tippayawong et al., 2016). GSCM across the globe compete in a sophisticated and fast-changing environment deciding to select sustainable suppliers a very crucial one in enhancing the firm's operational performance, competitiveness, and profitability (Orji & Wei, 2015; Tseng et al., 2019). A suitable GSCM strategy can avail the needed ingredients that will lead to the success of any firm operating in a very competitive environment as it should ensure quick changeovers, faster launch of products, flexible capabilities to accommodate customer and their expectations, as well as rapid adaptation to new and changing market conditions (Garcia-Buendia et al., 2023; Owida et al., 2022). GSCM is also known as sustainable, or Eco SCM and it tends towards efficiency and care for natural resources and focused solutions to meet the needs of current and future generations leading to the achievement of a sustainable performance (Permana&Soediantono, 2022; Zimon et al., 2020).

Green Efficient Processes (GEP)

Green Efficient processes (GEP) not only meet but also surpass quality compliance norms. For manufactured goods to provide value and increase competitive advantage, efficient procedures need to be employed to maximize available resources (Eltyateb, 2011). Considering how fast issues about environmental sustainability have emerged in recent years, product development and manufacturing decisions that led to the offering of innovative and environmentally friendly products are being offered to consumers using digital manufacturing technologies and precision equipment that helps to eliminate waste generation as much as possible (Guo et al., 2022; Kumar et al., 2015; Sezen & Çankaya, 2013).

Green Renewable Energy (GRE)

One of the main matters affecting modern-day industrialization is the issue of energy utilization and recovery and the associated environmental pollution. Energy is seen as the main factor contributing to more than 80% of total emissions globally (Saxena & Srivastava, 2022). Energy costs are on the rise because of the frequent crises occurring in the energy sector globally (Li & Zhang, 2018), which has led to the need to ensure the use of renewable energy. The level of pollution is on the rise yearly because of the rise in industrialization leading to climate change and global warming which negatively impacts the quality of life. This, therefore, leads to the need for manufacturing firms to engage in GM by engaging in practices that use fewer natural resources and more renewable resources with little or no pollution (Zhang, 2018). Renewable energy is generated from such sources as wind power, solar energy, and water power and is consumed within the manufacturing sector to reduce environmental and health hazards and efficiency (Petronijevic et al., 2020, Rastogi et al., 2020).

End-of-life Product Management (EPM)

Green manufacturing methods use raw materials with less harmful alternatives that can also be recycled and repurposed thus making more efficient use of resources while reducing to a minimum (Kehinde et al., 2020). Environmental contamination due to solid waste mismanagement is a global issue and developing countries such as Nigeria have little financial resources, waste management, and sustainable initiatives leading to open dumping and burning which are the main waste treatment implementation and final disposal systems (Ferronato& Torretta, 2019). The practice of recycling by waste sorting and collection seems to be a regular thing to do by the millennials in developed countries while on the other side in emerging countries, it is a privilege to have it (Freitas-Netto et al., 2020). The cost of a product's life cycle could considerably contribute to reducing the effects of environmental management practices and the environmental consequences captured through the life of the product (Ogunmola &Orajekwe, 2021). To achieve customer efficiency, manufacturing firms in Nigeria employ various strategies needed to handle these challenges. The study, therefore, aims to examine the effect of GMP on manufacturing firms' customer efficiency.

The Ecological Modernization Theory (EMT) was first introduced by Janicke and Huber in 1980.EMT underscores the significance of consideringintegrating the needed environmental concerns throughout the manufacturing processes to ensure the protection of the environment. EMT attempts to explain how external

institutions' pressures exerted on manufacturing firms force them into adopting GMP noting that the theory positions manufacturers to improve their customer efficiency through innovations that enhance their competitive advantage (Adua et al., 2022, Musau & Rucha, 2021). This study has been anchored by this theory. Also, the stakeholder theory aimed at handling the issues that affect the various stakeholders of an entity in such a way as to ensure that all are properly sorted out and in a very satisfactory way. This makes the theory relevant to this study(Eze, 2021). This is because GMP as a manufacturing practice is expected to affect the interest of stakeholders other than the shareholders in its resource utilization.

The hypothesis tested in line with the objective of this study is:
H_{01}: Green manufacturing practices have no significant impact on the customer efficiency of consumer goods manufacturing companies listed in Nigeria.

III. METHODOLOGY

The methodology employed in this study involved the utilization of the survey design. The primary data was collected usinga structured questionnaire. The population of this study was all 526 managerial staff members of the consumer goods manufacturing firms listed on the Nigeria Exchange Group (NGX) as of 31st January 2024. The choice of consumer goods stemmed from their kind of products, production capacity, and their link to other companies. The copies of the questionnaire were distributed based on the sample size of 228 which was determined using the Taro Yamane sample size determination formula:

$n = \left(\frac{N}{1+N\ (e)^2}\right)$

n = the sample size; N = the population size; e = marginal error at 0.05

$n = \frac{526}{1+526(0.05)^2}$

$n = \frac{526}{2.315}$

$n = 227.214 \approx 228$

Therefore, the total copies of questionnaire distributed are two hundred and twenty-eight (228).
The model that was used in testing the hypotheses of the study is presented below:
To evaluate Y = f (X)
Y = Dependent Variable (Customer Efficiency)
X = Independent Variable (Green Manufacturing Practices)
X and Y are broken down as follows
$Y = (y_1)$
$X = (x_1, x_2, x_3, x_4, x_5)$
Where; y_1 = Customer Efficiency (CEF)
x_1 = Green Product Design (GPD)
x_2 = Green Supply Chain Management (GSM)
x_3 = Green Efficient Processes (GEP)
x_4 = Green Renewable Energy (GRE)
x_5 = End-of-Life Product Management (EPM)
These will result to an expanded functional model of:
CEF = f (GPD, GSM, GEP, GRE, EPM) …….... Equation 1

The regression model is given thus as:
$CEF_i = \beta_0 + \beta_1 GPD_i + \beta_2 GSM_i + \beta_3 GEP_i + \beta_4 GRE_i + \beta_5 EPM_i + \mu$
Where: β_0 is the intercepts and $\beta_1 – \beta_v$ represents the estimated parameters for tax administration.
β_1= estimated parameter of Green Product Design and Development
β_2= estimated parameter of Green Supply Chain Management
β_3= estimated parameter of Green Efficient Processes
β_4= estimated parameter of Green Renewable Energy
β_5 = estimated parameter of End-of-Life Product Management
μ = error term or stochastic variable

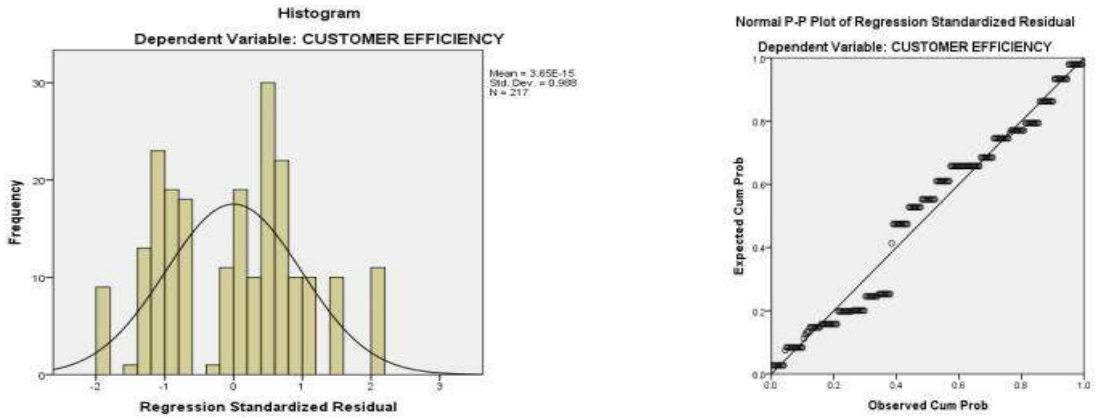
IV. DESCRIPTIVE AND EMPIRICAL RESULTS

a. Data Treatment Results

This section showed the treatment results performed on the data gathered before the inferential analyses to ensure that the regression assumptions of normality, multicollinearity, linearity, and homogeneity of variance were met.

4.1a Results of Normality Test

Figure 4.1: **Results of Normality Test for Customer Efficiency**



Source: Researcher's Computation, 2024

In figure 4.1, the histogram plot showed the normality test, which indicated that the residuals were normally distributed and had a goodness of fit as indicated by the bell-shaped diagram while the P-P plot also indicated that the points were arranged along the diagonal line both having few outliers that will not affect negative impact on the overall. The Normal P-P plots showed the linearity, which implied that the predictor variable which is the Green Manufacturing Practices (Green Product Design, Green Supply Chain Management, Green Efficient Processes, Green Renewable Energy and End-of-Life Product Management) had a straight-line relationship with Customer Efficiency.

4.3 Multicollinearity Test

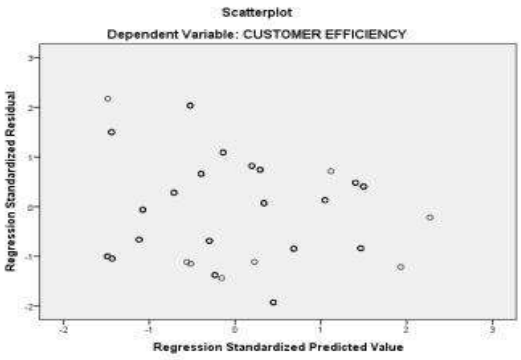
Table 4.2 Result of Multicollinearity Test

	Collinearity Statistics	
	Tolerance	VIF
Green Product Design	0.555	1.800
Green Supply Chain Management	0.648	1.544
Green Efficient Processes	0.559	1.790
Green Renewable Energy	0.527	1.898
End-Of-Life Product Management	0.421	2.375
Average	0.527	1.935
Dependent Variable: Customer Efficiency.		

Table 4.2 presented the results of the multicollinearity test, which revealed that the VIF values of all the independent sub-variables (Green Product Design, Green Supply Chain Management, Green Efficient Processes, Green Renewable Energy, and End-of-Life Product Management) were all between 1.544 to 2.375 producing an average of 1.935 which is less than 10 (VIF < 10) while the Tolerance values ranged from 0.421 to 0.648 with an average of 0.527 which are higher than 0.1 (Tolerance > 0.1), suggesting that there was no case of severe multicollinearity problem in the variables of study which is in accordance to the threshold of (Gujarati et al., 2004; Shrestha, 2020).

4.4 Result of Homoscedasticity Test

Figure 4.2: Scatter plot for Homoscedasticity tests for Customer Efficiency



Source: Researcher's Computation, 2024

The scatterplot in Figure 4.2, customer efficiency revealed no exact or systematic pattern, thereby signifying the normality of the residuals and the constant variance. This confirmed that the model was homoscedastic thus ensuring the reliability, validity, and robustness of regression analysis.

4.4 Test of Hypothesis Regression Analysis

$H_0$1: Green manufacturing practices have no significant effect on customer efficiency of consumer goods manufacturing companies listed in Nigeria.

Table 4.2b: Summary of multiple regression between green manufacturing practices and customer efficiency (Model 2)

N	Model	β	SE	t-stat	Sig.	ANOVA (Sig.)	R	Adjusted R^2	F (5,211)
217	(Constant)	2.678	0.163	16.395	0.000*	0.000b	0.632	0.385	28.055
	GPD	0.483	0.066	7.260	0.000*				
	GSM	-0.275	0.070	-3.933	0.000*				
	GEP	0.059	0.068	0.869	0.000*				
	GRE	0.118	0.053	2.234	0.027*				
	EPM	0.054	0.067	0.801	0.424				
		Predictors: (Constant), GPD, GSM, GEP, GRE, EPM							
		Dependent Variable: CEF							

Source: Researcher's computation, 2024 underlying data from Field Survey at 5% level of significance.

Interpretation

Table 4.2b shows the multiple regression analysis results for the components of green manufacturing practices and financial efficiency of consumer goods manufacturing companies listed in Nigeria. The results show that Green Product Design (GPD) (β = 0.483, t = 16.395, p< 0.05), Green Efficient Processes (GEP) (β = 0.059, t = 0.869, p< 0.05), and Green Renewable Energy (GRE) (β = 0.118, t = 2.234, p< 0.05) had a positive and significant effect on customer efficiency. Also, Green Supply Chain Management (GSM)(β = -0.275, t = -3.933, p< 0.05) had a negative but significant effect while End-of-Life Product Management (EPM) (β = 0.054, t = 0.801, p> 0.05) exert a positive but insignificant effect on customer efficiency of consumer goods manufacturing companies listed in Nigeria. This implied that Green Product Design (GPD), Green Efficient Processes (GEP), and Green Renewable Energy (GRE) were important factors in enhancing customer efficiency of consumer goods manufacturing companies listed in Nigeria.

The *R-value* of 63.2% supported this result and it indicated that green manufacturing practices had a strong positive relationship with customer efficiency of consumer goods manufacturing companies listed in Nigeria. The coefficient of multiple determination $Adj.R^2$ = 0.385 indicated that only 38.5% of the variation that occurred in the customer efficiency of consumer goods manufacturing companies listed in Nigeria could be accounted for by the components of green manufacturing practiceswhile the remaining 61.5% changes that occurred were accounted for by other variables not captured in the model. The predictive and prescriptive multiple regression models were thus expressed:

CEF = 2.678 + 0.483GPD - 0.275GSM + 0.059GEP + 0.118 GRE + 0.054 EPM--------Eqn(i) (Predictive Model)

CEF = 2.678 + 0.483GPD - 0.275GSM + 0.059GEP + 0.118 GRE--------Eqn(i) (Prescriptive Model)

Where:

CEF = Customer Efficiency

GPD = Green Product Design

GSM = Green Supply Chain Management

GEP = Green Efficient Processes

GRE = Green Renewable Energy
EPM = End-of-Life Product Management

The regression model showed that when holding green manufacturing practices components constant at zero, customer efficiency was positive at 2.678. In the predictive model, End-of-Life Product Management (EPM) was not significant, implying that management could downplay the variable. That is why it was not included in the prescriptive model. Green Supply Chain Management (GSM) on the other hand, was negative and significant. This indicates that management should pay detailed attention to it. The results of the multiple regression analysis in the prescriptive model indicated that if Green Product Design (GPD), Green Efficient Processes (GEP), and Green Renewable Energy (GRE) are improved by one percentage, there will bean improvement in the customer efficiency while improvement in Green Supply Chain Management (GSM) may bring about a reduction in the customer efficiency of consumer goods manufacturing companies listed in Nigeria.

Also, the F-statistics (df = 5, 211) = 28.055 at p = 0.000 ($p< 0.05$) indicated that the overall model was significant in predicting the effect of green manufacturing practices and customer efficiency. This further suggests that the Green Manufacturing practices component (Green Product Design (GPD), Green Efficient Processes (GEP), and Green Renewable Energy (GRE) are important determinants of customer efficiency. The result suggests that consumer goods manufacturing companies listed in Nigeria should pay more attention to developing Green Product Design (GPD), Green Efficient Processes (GEP), and Green Renewable Energy (GRE) components to maximize customer efficiency. The findings of this study align with the work of other scholars who found that GMPs positively and significantly affect operational efficiency. Permana&Soediantono, (2022); and Weerakkody et al., (2022) found that customer efficiency is directly affected by GMP.

Decision – $H_0$1 (Model 1)
At a level of significance 0.05 and degree of freedom 5,211, the F-statistics is 28.055 while the p-value of the F-statistics is 0.000 which is less than the 0.05 level of significance adopted for this study. Therefore, the study rejected the null hypothesis which implied that green manufacturing practices have significant effect on customer efficiency of consumer goods manufacturing companies listed in Nigeria.

Practical Implications
The management of consumer goods manufacturing companies listed in Nigeria may need to prioritize investments and initiatives related to green product design (GPD), efficient processes (GEP), and renewable energy adoption (GRE) to enhance customer efficiency. Green manufacturing practices that enhance customer efficiency could create long-term value for investors by improving the company's reputation, customer loyalty, and overall financial performance. Manufacturing companies with strong green product design (GPD) and efficient processes (GEP) may be viewed more favorably due to their positive impact on customer efficiency. Green manufacturing practices that enhance customer efficiency could create long-term value for investors by improving the company's reputation, customer loyalty, and overall financial performance.

V. Conclusion, Recommendations, and Suggestions for further studies

The regression estimates for the test of hypothesis revealed that green manufacturing practices (Green Product Design, Green Efficient Processes, and Green Renewable Energy) had a strong positive relationship with customer efficiency of consumer goods manufacturing companies listed in Nigeria. Thus, answering research question two, green manufacturing practices has a significant effect on the customer efficiency of consumer goods manufacturing companies listed in Nigeria. This implied that green manufacturing practices are important factors to be considered in achieving and sustaining customer efficiency in consumer goods manufacturing companies listed in Nigeria.

To achieve and sustain customer efficiency, the management of the consumer goods manufacturing companies listed in Nigeria should incorporate green product design, green efficient processes, and green renewable energy as part of their green manufacturing practices. Proper consideration should be given to end-of-life product management to maximize customer efficiency while a green supply chain as a green manufacturing practice should be re-evaluated before adopting it for use. Investors should consider the long-term financial implications of green manufacturing practices in investment decisions, recognizing its potential to enhance customer efficiency as a happy customer leads to a loyal customer.
It is suggested that future studies should extend the scope of the study and explore other strategies and sectors in Nigeria and beyond in other to be able to generalize the conclusions therefrom.

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