

Green Operation Practice and Organizational Performance in Selected Manufacturing Firms in Akwa Ibom State, Nigeria

Uforo Akpan Ekanem,

Doctoral Student, Department of Business Management,
Faculty of Management Sciences, University of Uyo, Nigeria.

Bassey, Bassey Akpan

Doctoral Student, Department of Business Management,
Faculty of Management Sciences, University of Uyo, Nigeria.

Glory Uforo Ekanem,

M.Sc, Student, Department of Business Administration,
Faculty of Management Sciences, Akwa Ibom State University, Nigeria.

Ededem Asuakak Edem

Doctoral Student, Department of Business Management,
Faculty of Management Sciences, University of Uyo, Nigeria.

Citation: Ekanem U.A., Akpan B.B., Ekanem G.U., and Edem E.A. (2023) Green Operation Practice and Organizational Performance in Selected Manufacturing Firms in Akwa Ibom State, Nigeria, *European Journal of Business and Innovation Research*, Vol.11, No.4, pp.,59-73

ABSTRACT: *The goal of this study was to determine how green operation affected organizational performance in a selected Nigerian manufacturing companies in Akwa Ibom State. The study used a descriptive survey approach, and 179 sample were drawn from a total of 295 populations. With the research goal in mind, two hypotheses were developed. A structured questionnaire that was given to the respondent utilizing random sampling procedures served as the primary tool for data collection. Regression analysis was used for the data analysis. The findings indicate that green manufacturing and design have a significant impact on organizational performance in specific Akwa Ibom State manufacturing enterprises. Based on the analysis's findings, it is concluded that green manufacturing and green design are relational variables that can affect organizational performance at Nigerian manufacturing companies. As a result, it is suggested that industrial companies in Akwa Ibom State, Nigeria, incorporate these green design concepts. Designers may develop strategies that reduce negative environmental effects, conserve resources, advance human health and wellbeing, and help build a more resilient and sustainable future. Additionally, green manufacturing lowered resource use, reduced waste, and increased operational efficiency, all of which resulted in cost savings.*

KEYWORDS: Green Operation, Green Design, Green Manufacturing and Organizational Performance.

INTRODUCTION

Green business practises are one of the elements that either directly or indirectly increase a company's value. Development occurs when current requirements are satisfied while maintaining the ability to meet those of future generations. The ability of a corporation to more fully comprehend the responsibilities played by its host communities, customers, employees, and stakeholders and to provide solutions to suit their unique needs in order to ensure better cooperation with the firm is referred to as "green operation." The manufacturing business, as defined by the APICS, 2005 dictionary, is " a collection of interconnected tasks and activities that involve the planning, manufacture, quality control, management, and marketing of discrete consumer and durable goods. In addition, manufacturers have to cope with a variety of requirements from investors, governments, customers, and other stakeholders. In the end, it is evident that the manufacturing company's operations actively aided in the harm and disturbance of the ecosystem, as well as the air and water pollution. The value of a company's products can currently be increased, environmental costs can be decreased, and improved firm performance can ultimately result from green operations (Handayani, Wahyudi, and Suharnomo, 2017).

The issue of efficient waste management grows more challenging as Nigeria's population and businesses continue to expand. For instance, solid waste is typically burned or buried in landfills, both of which are very damaging to the environment. Garbage that is decomposing could attract parasites, emit a terrible smell, or contaminate groundwater. Air pollution is a result of waste burning, which emits smoke. The demand for better waste management is amplified by some production byproducts. Sometimes the pursuit of efficiency comes at the expense of environmental sustainability. Manufacturers may use techniques that initially appear to be economical but are ultimately resource-intensive in order to create as much as possible in the most cost-effective way (Onwudiwe, Agwamba, and Ugwuegbu, 2019).

Statement of the Problem

In recent trends, the perspectives on the operations of manufacturing enterprises have broadened beyond economic to environmental and social factors. As manufacturing companies work to be competitive in terms of economic, environmental, and social issues as well as improving operations in terms of flexibility, delivery, quality, and cost, understanding green operation practices is crucial and should be given priority in the decision-making processes by company management. The direct impact of investments in environmental management practices, such as green design and green manufacturing, on organizational performance in terms of productivity, cost containment, and pollution reduction is still up for debate. Thus, a number of research have confirmed the idea that green operations and organizational performance are positively correlated. It has been demonstrated that many industrial companies improperly disposed of waste goods without taking into account how they might improve the efficiency of the company. In order to make recommendations on how effective green operation practices would either lead

to organizational performance in manufacturing firms, this study will examine the relationship between the dimensions and measures of green operation adopted in this work and organizational performance manufacturing firms in Nigeria.

Objective of the Study

The general objective of the study is to examine the effect of green operations on organizational performance in selected manufacturing firms in South South Nigeria. The specific objectives include;

- i. To examine the effect of green design on organizational performance in selected manufacturing firms in South Southern Nigeria
- ii. To ascertain the effect of green manufacturing on organizational performance in selected manufacturing firms in South Southern Nigeria

Statement of Hypothesis

Ho₁: There is no significant effect of green design on organizational performance in selected manufacturing firms in South Southern Nigeria

Ho₂: There is no significant effect of green manufacturing on organizational performance in selected manufacturing firms in South Southern Nigeria.

REVIEW OF RELATED LITERATURE

The conceptual framework under which we shall work at the notion of green operation and the concept of organizational performance were divided into the following sub-topics for the literature review. To provide a solid foundation for this work from these three horizons, we will also examine the theoretical framework and empirical review of study.

Conceptual Review

Concept of Green Operation (GO)

In order for all business decisions to be made from a green perspective, green operations management begins with planning and continues through the production process and waste management (Srivastava, 2007). Almost all operations management activities involve the production of goods and services (Slack and Lewis, 2017), and supply chain management operations involve the distribution of production goods and services to customers (Darojat and Yunitasari, 2017). Supply chain management that incorporates environmental considerations also has an impact on green business, green marketing, and green operations management. Given the large number of Indonesian businesses that have not fully embraced green principles in operations management, this study is crucial (Rohdayatin, 2018). The selection of raw material suppliers, production procedures, consumer delivery of the finished product, and management of products after their lives are all included in marketing. Since reducing waste and the environmental impact of supply chain activities is a long-term, non-financial factor crucial to the

environment in maintaining good relations for the sustainability of supply chain activities, environmental governance is based on this environmental perspective. Environmentally friendly management, environmentally friendly design, environmentally friendly architects, environmentally friendly culture, environmentally friendly productivity, and so forth as a green business (Hasan, 2016), where the green supply chain management is focused on long-term survival but also has an impact on long-term profitability, competitiveness, and other factors.

GO has garnered a lot of interest recently due to a growing need to solve environmental challenges (Cherrafi et al., 2018). According to Liu et al. (2017), GO is the process of integrating and aligning environmental management strategies with production and operations in order to improve environmental performance. Green design (GD), green purchasing (GP), and green manufacturing (GM) are the three main components of GO (Cherrafi et al., 2018). According to Liu et al. (2017), GD is the systematic evaluation of design performance with regard to environmental improvement throughout the entire product life cycle. Examples include product design that minimizes energy usage, uses recycled materials, and conserves resources. In order to increase environmental performance, GP takes this into account while making purchases (Seles et al., 2016). Environmental supplier certification and supplier auditing are examples of best practices. GM aims to minimize negative environmental effects throughout the production stage, such as factory pollution prevention and control, reduced energy use and emissions, and improved operational efficiency (Liu et al., 2017).

Adopting GO techniques has numerous advantages for the focus firm's supply chain partners as well (Handfield et al., 2005). For instance, a business can use a green design approach to set itself apart from competitors by providing eco-friendly goods and services. Customers might be prepared to pay higher prices for these goods, which would be clearly advantageous for both the focus company and its suppliers that produce goods using less hazardous raw materials or in a more environmentally friendly way (Marchi et al., 2013). As a result of widely dispersed production networks and growing globalization, businesses must coordinate GO issues across increasingly large distances and disparate business cultures and environmental laws. The complexity of a company's supply chain influences how it must design its green initiatives to address environmental issues (Marchi et al., 2013). As a result, making strategic decisions in GO is crucial and difficult, particularly when firms are bound by their limited resources and competencies (Wu and Pagell, 2011).

Dimensions of Green Operation

Green Design:

The goal of green design is to create ecologically friendly goods and procedures. The implementation of green design calls for the use of a specific framework for thinking about environmental challenges, the use of pertinent analytical and synthesis techniques, and a

challenge to conventional design and production processes. Product factors including cost, performance, manufacture ability, safety, and customer appeal are all taken into account throughout the synthesis process that goes into product design. Today's products are typically created without consideration for their total environmental impact. The environmental characteristics of products are still influenced by numerous health and environmental laws imposed by Congress. Some do so subtly by increasing industry's expenses associated with discharging trash into the air, water, and land. The Resource Conservation and Recovery Act, the Clean Air Act, and the Clean Water Act serve as examples. Others, including the Federal Insecticide, Fungicide, and Rodenticide Act and the Toxic Substances Control Act, actively restrict the use of hazardous chemicals and pesticides (Johns and Blair 2015). One of the most crucial non-price elements that affects a product's success is product design. Throughout a product's life cycle, the function of product design evolves. Design's primary responsibility throughout the early stages of product development is to transform an idea into a salable good. The product may fill a gap where there wasn't one before (like when the Sony Walkman was debuted), or it may be in direct competition with another product in the same market (like when trams, autos, and buses compete for urban transportation). The primary function of design is to differentiate products through quality, appearance, performance, ease of use, reliability, reparability, and other factors as the product life cycle matures and more competitors enter the market (Tonny-Murray, 2017).

Green Manufacturing

A strategic approach to sustainable development is green manufacturing. (2012) Tan, et al. Due to escalating demand and constrained availability, the cost of commodities and energy is always growing. Companies strive to successfully produce within broad price ranges of energy and resource costs because price changes are difficult to predict. Passing on markups to the client is one method for adjusting for price changes. However, a price markup might necessitate product enhancements. Instead, increasing production efficiency—which is possible by lowering resource consumption and streamlining the industrial system—might help keep costs stable. Nancy, et.al.(2013). The primary goal of this essay is to grab the reader's attention.

As green manufacturing methods grew quickly, several authors focused on the topic and conducted a lot of research with expansions. (Richards 2015) examined the life cycle approach and development feedback. According to Handfield et al. (2015), who surveyed five environmental protection professionals, both suppliers and customers are more impacted by green supply chain strategies than manufacturing processes alone (Stephan 2007). Environmentally friendly manufacturing techniques are currently being used by the manufacturing sector. Small and medium-sized businesses are having a variety of difficulties implementing sustainable manufacturing processes and are still unable to spot any obstacles or stumbling blocks in supply chain problems as well as manufacturing-related operations. According to Ki-Hoon Lee (2009), Korean small and medium-sized firms disregard the

importance of comprehension in favor of the more useful environmental law. According to Handfield et al. (2015), green manufacturing businesses have been addressing energy-efficient technology in China with more financial support and are helping SMEs to promote better development activities there. However, through boosting customer happiness and creating a stronger brand identity for shareholders, workers' ethics are strengthened, along with productivity and competitiveness (Richards 2015).

The entire product life cycle, including the use of manufacturing resources, environmental effect, and the green attributes of an organic whole, is referred to as the "green manufacturing system." Resources (materials, energy, equipment, etc.), capital, human resources, and the associated green manufacturing theory, green manufacturing technology, and manufacturing information are among the components of manufacturing resources. The term "environmental impact factors" refers to a number of broad environmental impact variables as well as ecological effect, resource usage, occupational health, and safety. The term "green characteristic" refers to the maximum rate of resource utilization and the least amount of environmental harm over the course of a product's life cycle. The following are the primary meanings of the term "green manufacturing system" according to the definition:

- i. The green manufacturing system encompasses the entire life cycle of a product. Taking into account the environmental impact and resource consumption of modern manufacturing systems, the goal is to minimize environmental impact while maximizing resource utilization of the products throughout their entire life cycle, from design through production, packaging, transportation, use, and disposal.
- ii. The pursuit of green manufacturing systems places greater focus on sustainable development and environmental benefits than it does on achieving the system's economic benefits. The operation and advancement of the green manufacturing system must adhere to the "three measurements" of sustainable development, i.e., the degree of development, the degree of harmony, and the degree of sustainability.
- iii. The green manufacturing system is a closed-loop composite system that includes recycling, scrap-multiple remanufacturing, industrial production, and product use. It is currently concentrating on the entire life cycle of the product and will continue to advance to the circulation usage of the extension of the life cycle for many years to come.
- iv. A highly integrated production system is the green manufacturing system. It covers issues with social integration, information integration, and other forms of integration. The green manufacturing system encompasses the natural ecological environment, natural resources, the consumer service system, and many other problems in the field of systems, all of which are advanced manufacturing problems. It also involves the protection of the environment and the efficient use of resources in complex manufacturing systems.
- v. There are more components in the green manufacturing system. The green manufacturing system includes, in addition to the traditional manufacturing system components, the full product

life cycle process of the natural ecological environment system and the influential aspects like the natural resources system. The whole life cycle of the product's resource use and environmental impact factors as a result are now essential elements of the green manufacturing system.

Organizational Performance

Organizational performance, according to Cascio (2014), is the extent to which the work mission is attained as determined by the work outcome, intangible assets, customer connection, and quality services. Organizational performance, according to Kaplan and Norton (2001), is the ability of the organization to use its human and material resources in an effective and efficient manner to achieve its goals. This definition gives corporations the basis to base employee performance evaluations on objective performance standards. This is beneficial for formulating strategic plans for the companies' future performance as well as for assessing the accomplishment of organizational goals (Ittner and Larcker, 2012). The literature implies that financial profitability and expansion are the most typical metrics of organizational performance, despite the fact that numerous studies have indicated that various organizations in different nations tend to emphasis on different objectives. There are countless definitions that may be applied to the idea of performance, many of which are related to particular situations or functional viewpoints. Anthony (1965) provided a comprehensive definition of performance that was well-crafted and shared the idea of two main components: efficacy and efficiency. Efficiency is performance measured in terms of inputs and outputs; hence, a higher volume produced for a given input volume indicates greater efficiency. Effectiveness is measured by how well intended goals are accomplished. For instance, the goal of preventing supply interruptions throughout time might be viewed as an efficient outcome.

Theoretical Review

According to (Washington, 2013), ecocentrism encompasses the general notion that all lifeforms are valuable in and of themselves. It stands in contrast to anthropocentrism, which views the value of other lifeforms solely in terms of how they affect human interests. According to Kirloskar-Steinbach and Diaconu (2020), Keller describes ecocentrism as an axiology that accords moral care to biotic communities and assigns moral judgement based on the health and flourishing of ecological wholes. (Callicott, 1999) says that "ecocentrism sprung from Aldo Leopold's Land Ethic" as a method of environmental philosophy. In his Sand County Almanac and Land Ethic, Aldo Leopold sought to advance an alternative to anthropocentrism that places more emphasis on the entirety of ecological (or biotic) systems than on the individual members of those communities. As a result, it explains why the ecological level is morally more important than the individual organism. According to Rowe (1994), ecocentrism emphasises a shift in axiology away from homo sapiens and towards the ecosphere, a change in values that is justified by the scientific axiom that "Earth is the whole of which we are subservient parts." Ezedike (2020) argues that "ecocentrism puts all beings in the ecosystem in one moral universe" and that

this implies that "quite apart from its assumed instrumental value in supporting the existence of human species, nature is deemed valuable in and of itself." This is the best way to put it into words. Therefore, all members of the natural community should be respected and treated with moral decency by humans.

Empirical Review

Anitha and Feng (2021) The relationship between green operation and sustainable quality performance: The mediation role of environmental technology. By using environmental technology as a mediator, this study explores the connection between sustainable quality performance and green operations. Partially least squares structural equation modeling, which enables consistent analysis, is used to assess a specified set of hypotheses using a sample of 124 enterprises in Malaysia's industrial products and service companies. The findings demonstrate how green business practices benefit environmental technology. Additionally, there is a strong connection between each of these characteristics and sustained quality performance. Additionally, environmental technology plays a constructive role in mediating the interaction between sustainable business practices and high-quality performance.

Onwudiwe, Agwamba and Ugwuegbu, (2019) studied on Green Management and Organizational Effectiveness and the results showed waste recycling has a positive and significant effect on cost reduction and pollution reduction. According to Hofer, Cantor, and Dai (2012), environmental management methods can stimulate innovation. In turn, innovation can assist businesses in growing their market share and lowering their expenses, both of which lead to bigger financial rewards. The idea that improved economic, environmental, and social practices can help businesses achieve a competitive edge and consequently enhance their performance was further substantiated by Zhu, Sarkis, and Lai's (2012) research. According to Anosike (2016), in order to maintain competitiveness in the era of sustainability pressure, organizational effectiveness must take into account economic, social, and environmental performance. Additionally, a study by Ukpabi, Ikaba, Enyindah, Orji, and Idatoru (2014) found a strong link between organizational effectiveness and corporate social responsibility. The findings also suggest that a company's active participation in CSR significantly affects both its productivity and stability.

METHODOLOGY

The survey research design approach was used by the researchers. The layout was selected to help the researchers obtain data directly from a sample of a bigger population. 295 management personnel from the chosen industrial companies in Akwa Ibom State made up the study's population at the time. As a result, the Taro Yamane Formula was used to establish the sample size for this study. The research instrument for this study was administered using a straightforward random sample technique. Each person in the population would have an equal probability of getting chosen using this strategy. The demographic information of the

respondents as well as the frequency replies of staff opinion on the study variables were recorded using percentages and a frequency distribution table. It employed a linear regression approach.

$$Y = F (X_1, X_2,)$$

Equation 3.2

Recoded to represent the variables it is presented;

$$GO= F (G_d, G_m)$$

Equation 3.2

The simple linear regression model representing the influence of each of the independent variables ($X_1, X_2,$) on the dependent variable (Y) is expressed in this form;

$$Y = a_0 + \beta_1 X_1 + \dots e \text{ Equation 3.3}$$

$$Y = a_0 + \beta_2 X_2 + \dots e \text{ Equation 3.4}$$

Data Analysis and Discussion of Findings

The analyses in this section are done as per the research questions and hypotheses formulated for this study. They analysis is to ascertain the highest positive response rate to the questions on the questionnaire.

Table 4.1.9 Percentage Analysis of Green Design

Green Design	Extent of Agreement				
	SA	A	D	SD	Total
Green design aims to minimize energy consumption by using energy-efficient technologies and strategies.	57 (36%)	76 (48%)	15 (9%)	11 (7%)	159 (100%)
Green design promotes the use of sustainable and non-toxic materials.	76 (48%)	66 (42%)	10 (6%)	7 (4%)	159 (100%)
Designing with water efficiency in mind is crucial.	93 (58%)	60 (38%)	1 (0.63%)	5 (3.3%)	159 (100%)
Green design seeks to minimize waste generation by designing for durability, repairability, and recyclability.	54 (34%)	74 (47%)	20 (13%)	11 (6%)	159 (100%)
Total	366	312	68	49	795
Proportion of N	73.2	62.4	13.6	9.8	159
Percentage of Proportion	(46%)	(39%)	(9%)	(8%)	(100%)

Source: Field survey 2023

Table 4.1.9 showed the frequency of responses and their percentages on the green design dimension. Of a proportion of 159 respondents, 73.2 (46%) strongly agreed to questions, 62.4

(39%) agreed, 13.6 (9%) disagreed and 9.8 (8%) strongly disagreed, thus concludes that green design contributes to organizational performance.

Table 4.1.10: Percentage Analysis of Responses on green manufacturing

Green Manufacturing	Extent of Agreement				
	SA	A	D	SD	Total
Green manufacturing emphasizes the efficient use of resources such as energy, water, and raw materials.	86 (54%)	36 (23 %)	22 (14%)	15 (9%)	159 (100%)
Green manufacturing aims to minimize the release of toxic substances into the environment.	54 (34%)	74 (47%)	20 (13%)	11 (6%)	159 (100%)
Green manufacturing also considers the social and economic aspects of sustainability	61 (38%)	65 (41%)	25 (15%)	8 (6.0%)	159 (100%)
Green manufacturing aim is to create safe and healthy working conditions for employees and contribute to local economies.	53 (33%)	65 (41%)	33 (21%)	8 (7%)	159 (100%)
Total	340	276	122	57	795
Proportion of N	68	55.2	24.4	11.4	159
Percentage of Proportion	(32.7%)	(37.4%)	(16.3%)	(7.9%)	(100%)

Source: Field survey 2023

Table 4.1.10 showed the frequency of responses and their percentages on the green manufacturing. Of a proportion of 159 respondents, 68 (32.7%) strongly agreed to question, 55.2 (37.4%) agreed, 24.4 (16.3%) disagreed; 11.4 (7.9%) strongly disagreed.

Testing of Hypotheses

H₀₁: There is no significant effect of green design on organizational performance in selected manufacturing firms in South Southern Nigeria.

Table 1 Regression analysis on green design on organizational performance**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.799 ^a	.639	.637	.30171

a. Predictors: (Constant), green design

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	28.659	1	28.659	314.834	.000 ^b
	Residual	16.203	158	.091		
	Total	44.862	159			

a. Dependent Variable: organizational performance

b. Predictors: (Constant), green design

Coefficients^a

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	.466	.153		3.055	.003
	green design	.884	.050	.799	17.744	.000

a. Dependent Variable: organizational performance

From the table 1, the model summary displays an R- value of 0.799. This implies that green design has a favorable impact on organizational performance in particular South Southern Nigerian manufacturing enterprises. The R square-value of 0.639 demonstrates that changes in organizational performance accounted for 63.9% of the variation in green design. Given the F-value of 314.834 and its accompanying P- value of 0.00, the regression model significantly predicts the dependents variable, according to the ANOVA table. This suggests that green design has a major impact on organizational performance. The B-coefficient of 0.466 further suggests that the model predicts an increase in green design of 0.884 units given an increase in organizational effectiveness.

Hypothesis Two: There is no significant effect of green manufacturing on organizational performance in selected manufacturing firms in South Southern Nigeria.

**Table 2 Regression analysis on green manufacturing on organizational performance
Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.825 ^a	.681	.679	.28363

a. Predictors: (Constant), green manufacturing

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	30.542	1	30.542	379.666	.000 ^b
	Residual	14.319	158	.080		
	Total	44.862	159			

a. Dependent Variable: organizational performance

b. Predictors: (Constant), green manufacturing

Coefficients^a

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	.210	.152		1.382	.169
	green manufacturing	.962	.049	.825	19.485	.000

a. Dependent Variable: organizational performance

Table 2's model summary displays an R value of 0.825. This implies that green manufacturing has a favorable impact on organizational performance, particularly in South-South Nigerian manufacturing enterprises. The R square-value of 0.6881 demonstrates that changes in organizational performance were responsible for 68.1% of the variation in green manufacturing. Given the F-value of 379.666 and its related P-value of 0.00, the ANOVA table shows that the regression model significantly predicts the dependent variable. This suggests that green manufacturing has a considerable impact on organizational performance. Additionally, the B-coefficient of 0.210 indicates that the model predicts a 0.962 unit increase in green manufacturing given a unit improvement in organizational performance, leaving all other factors constant.

DISCUSSION OF FINDING

Table 1's model summary displays an R value of 0.799. This implies that green design has a favorable impact on organizational performance, in particular in Southern Nigerian manufacturing enterprises. The R square-value of 0.639 demonstrates that changes in organizational performance accounted for 63.9% of the variation in green design. Given the F-value of 314.834 and its accompanying P-value of 0.00, the regression model significantly predicts the dependent variable, according to the ANOVA table. This suggests that green design has a major impact on organizational performance. The B-coefficient of 0.466 further suggests that the model predicts an increase in green design of 0.884 units given an increase in organizational effectiveness.

The R-value for the model summary in Table 2 is 0.825. This implies that green manufacturing has a favorable impact on organizational performance, particularly in southern Nigerian manufacturing enterprises. Variations in organizational performance accounted for 68.1% of the variation in green manufacturing, according to the R squared value of 0.6881. With an F-value of 379.666 and a matching P-value of 0.00, the regression model's ability to substantially predict the dependent variable is shown in the ANOVA table. This suggests that green manufacturing has a considerable impact on organizational performance. Additionally, the model predicts a 0.962 unit increase in green manufacturing given a unit increase in organizational performance, according to the B-coefficient of 0.210, assuming that nothing else changes.

CONCLUSION

It is clear from the study that environmentally friendly manufacturing and green design are related dimensions that can affect organizational performance at manufacturing companies in Nigeria's Akwa Ibom State. The empirical findings of the study unequivocally demonstrate that environmentally friendly manufacturing and design are important factors in determining organizational effectiveness. Businesses that think about how to implement green operating dimensions are likely to be more ecologically friendly, save money, use less, and implement green design from the very beginning. Reducing resource use, energy use, waste production, and emissions of pollutants and greenhouse gases is the main objective of green manufacturing. It tries to minimize the emission of dangerous substances by emphasizing the effective use of resources such as energy, water, and raw materials.

Recommendation

It is recommended that manufacturing companies in Nigeria's specially Akwa Ibom State should use these green design concepts. Designers may develop strategies that reduce negative environmental effects, conserve resources, advance human health and wellbeing, and help build a more resilient and sustainable future. Additionally, green manufacturing lowered resource use,

reduced waste, and increased operational efficiency, all of which resulted in cost savings. Additionally, it can help a business comply with environmental requirements, attract environmentally concerned clients, and improve its reputation.

REFERENCES

- Anitha Moosa and Feng He (2022) The relationship between green operation and sustainable quality performance: the mediation role of environmental technology, *Journal of Environmental Planning and Management*, 65:8,
- Amosike, A. (2016) *The relationship between lean and environmental performance: Practices and measures*
- Azari, S. Baihaqi, I. and Bramanti, G. W. (2018). Identifikasi Risiko Green Supply Chain Management di PT Petrokimia Gresik. *Jurnal Sains dan Senu Pomits*. Vol. 7, No. 1, pp. 2337-3520.
- Darojat and Yunitasari. 2017. Pengukuran Performansi Perusahaan dengan Menggunakan Metode Supply Chain Operation Reference (SCOR). *Seminar dan Konferensi Nasional IDEC*.
- Golicic, S. L., Boerstler, C. N. and Ellram, L. M. (2010). Greening' Transportation in the Supply Chain. *Sloan Management Review*, Vol. 51 No. 2, pp. 47-55.
- Handayani, Rini, Sugeng Wahyudi, and Suharnomo Suharnomo. (2017). The effects of corporate social responsibility on manufacturing industry performance: The mediating role of social collaboration and green innovation. *Business: Theory and Practice* 18: 152–59. [CrossRef]
- Handfield, R.B., Walton, S.V., Seegers, L.K., Melnyk, S.A., (2005). 'Green' value chain practices in the furniture industry. *Journal of Operations Management* 15 (3), 293–315.
- Hasan, A. 2016. Green Management System. *Jurnal Media Wisata*, Vol. 16, No.1, pp. 317 332.
- Ittner, W .F. and Larcker, J. (2012). *Management International Edition*. Heinemann Professional Publishing.
- Kaplan, D. and Norton, P. (2015). *Business research methods* (8th ed.). New Delhi: Tata McGraw Hill.
- Liu Xiaomin, et al. "Innovative design of self-cleaning glass integrating bionics and extenics." *Chinese Journal of Engineering Machinery*.2019.17(04):323-328+334. DOI:10.15999/j.cnki.311926.2019.04.007.
- Nancy Diaz-Elsayed, Annabel Jondral, Sebastian Greinacher, David Dornfeld, Gisela Lanza, (2013) Assessment of lean and green strategies by simulation of manufacturing systems in discrete production environments, *CIRP Annals – Manufacturing Technology* 62 (2013) 475-478.
- Onwudiwe Uju Jovita(2019): Green Management and Organizational Effectiveness, *Strategic Journal of Business and Social Science (SJBS)* Volume 2. Issue

- Rohdayatin, A. Sugito P. Handayani. K. (2018). Green Supply Chain: Studi Keterkaitannya dengan Kinerja Lingkungan dan Kinerja Finansia. *Jurnal Manajemen & Kewirausahaan*. Vol. 6, No. 2, pp. 103-114.
- Slack, Nigel. and Lewis, Mike. (2017). *Operations Strategy*. Pearson.
- Shrivastava, Paul. (2007). “Environmental Technologies and Competitive Advantage.” *Strategic Management Journal* 16 (S1): 183–200. doi:10.1002/smj.4250160923.
- Tamulis, V., Guzavičius, A., & Žalgirytė, L. (2012). Factors influencing the use of green logistics: theoretical implications. *Economics and Management*, 17(2), 706-711.