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Green supplier selection and flexible sourcing: An empirical study of Nigeria tertiary institution

Ikenna Christopher Ugwu (Research Scholar)¹, ²Kelechi Enyinna Ugwu, PhD²

Centre of Excellence in Sustainable Procurement,
Environment and Social Standards (CE-sPESS), Federal
University of Technology Owerri NIGERIA¹

Department of Logistics and Supply Chain Management,
Federal University of Technology Owerri, NIGERIA²

Corresponding Author's Email: kelechi.ugwu@futo.edu.ng

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Abstract - Continued use of traditional procurement method hampers the adoption of innovative, and sustainable procurement practices capable of enhancing operational efficiency and long-term institutional performance. This research investigated the relationship between Green Supplier Selection (GSS) and flexible sourcing practices (FSP) in Nigeria Maritime University, South-South Region. The total population of the study comprised of 1,252 employees, using taro Yamane formula to determine a sample size of 303 employees. A descriptive survey research design was employed in the research, and a stratified random sampling technique was applied in the distribution of the survey to the participants including- procurement officers, internal auditors, logistics managers, administrative staff, and heads of departments. Copies of 303 questionnaires were distributed out of which 281 were returned, while the remaining 22 were not returned and utilized for the study. Both descriptive, inferential statistics, and Pearson correlation techniques were utilized in testing hypotheses to determine the relationships between the variables. The findings indicated a high association between green supplier selection (GSS) and flexible sourcing (FLS) based on responses from the participants. The study recommended university management to prioritize local sourcing and encourage investments in indigenous manufacturing firms to reduce dependence on foreign products such as office equipment and machines.

Keywords: green supplier selection, green innovation, flexible sourcing, dynamic capabilities theory

1. Introduction

In both public and commercial enterprises, the environmental sustainability movement has radically changed supply chain management and procurement procedures. The majority of organizations, particularly Nigerian Maritime University, have realized how critical it is to incorporate environmental factors into procurement decisions in order to reduce ecological degradation and increase organizational resilience and operational efficiency. As a result, green supplier selection has become a strategic procurement practice in which companies assess and choose suppliers based on environmental performance, resource efficiency, waste management, compliance with environmental regulations, and sustainability certifications in addition to more conventional criteria like cost, quality, and delivery. The shift from traditional procurement to sustainable supply chain management, where environmental stewardship is incorporated into organizational decision-making and supplier relationship management, is reflected in this paradigm (Adamides & Mouzakitis, 2024; Saputro et al., 2024).

Additionally, because procurement activities at the Nigerian Maritime University frequently face supply disruptions due to exchange-rate volatility, import restrictions, transportation bottlenecks, inflationary pressures, insecurity, and global supply chain disruptions, flexible sourcing is equally important. Keeping up connections with several eco-friendly suppliers improves procurement continuity, reduces operational disruptions, and fortifies institutional resilience. The University can strike a balance between environmental responsibility, operational dependability, and procurement efficiency by combining flexible sourcing with green supplier selection (Dhillon et al., 2022).

Because sustainable suppliers are required to exhibit operational flexibility and resilience in addition to meeting environmental criteria, the relationship between green supplier selection and flexible sourcing has grown in importance. Therefore, in addition to risk management skills, delivery dependability, technological proficiency, innovation potential, and adaptability, contemporary supplier evaluation frameworks also include environmental factors. Organisations can accomplish sustainable goals by integrating these characteristics without sacrificing procurement effectiveness or operational continuity (Adamides & Mouzakitis, 2024; Sahoo & Goswami, 2024).

In a similar vein, the Nigerian Maritime University's procurement operations include the purchase of specialised maritime equipment, engineering materials, laboratory facilities, marine technologies, information and communication technology infrastructure, and other operational resources, which are frequently obtained from both domestic and foreign vendors. Exchange currency instability, import restrictions, disruptions in the global supply chain, transportation bottlenecks, inflationary pressures, and delays in the delivery of specialised equipment are some of the issues that these procurement procedures are increasingly facing.

These difficulties lower supplier dependability, raise procurement prices, lengthen lead times, interfere with production schedules, and have a detrimental impact on an organization's capacity to compete. Macroeconomic volatility, poor transit infrastructure, reliance on imported commodities, and regulatory uncertainty all exacerbate these limitations in developing economies, especially Nigeria. As a result, businesses that rely significantly on imported goods and specialised machinery have less operational flexibility and are more vulnerable to supply chain threats.

Furthermore, companies that primarily rely on conventional supplier selection methods—which prioritise cost reduction and regulatory compliance at the expense of supplier flexibility and responsiveness—are likely to suffer from decreased operational flexibility and increased susceptibility to supply chain disruptions, according to Christopher and Peck (2004) and Ivanov and Dolgui (2020).

The study's main goal is to determine how flexible sourcing procedures at Nigeria Maritime University in the South-South Region relate to Green Supplier Selection (GSS). The study specifically aims to investigate the connection between organisational flexibility resilience and green innovation practices at the Nigerian Maritime University. The Nigerian Maritime University (NMU) in Okerenkoko, Delta State's procurement officers, administrative staff, heads of departments or units, senior management, and academic staff involved in sustainability-related research comprise the study's target audience.

Green Supply Chain Management (GSCM), which aims to lessen the environmental effects of procurement, production, distribution, and disposal activities along the supply chain, now heavily relies on green supplier selection. Organisations have been forced to implement procurement methods that support sustainability while preserving operational performance due to the growing frequency of climate-related disruptions, tighter environmental rules, and rising stakeholder expectations. According to recent research, companies that use green supplier selection report better environmental performance, lower operational risks, higher corporate reputation, and stronger long-term supplier relationships (Baki, 2022; Masudin et al., 2022).

However, Govindan et al. (2022) described green supplier selection as the process of finding and choosing suppliers who meet an organization's operational, financial, and quality needs while also exhibiting better environmental performance. In this procedure, suppliers are

assessed according to environmental standards, including pollution prevention, waste management, energy efficiency, carbon emissions, environmental certifications, and adherence to environmental laws.

The creation and application of novel or much enhanced goods, procedures, technologies, and managerial techniques that lessen their negative effects on the environment while improving organisational performance and sustainable competitiveness is also referred to as "green innovation." It places a strong emphasis on cutting greenhouse gas emissions, increasing resource efficiency, minimising pollution, and encouraging circular economy activities (Chen & Liu, 2023). According to Zhang et al. (2024), green innovation is the adoption of eco-friendly innovations in production, operations, and business processes that allow companies to achieve both economic growth and environmental sustainability through reduced ecological footprints and efficient resource utilisation.

Additionally, flexible sourcing refers to an organization's strategic ability to modify its supplier base, procurement techniques, supply arrangements, and sourcing strategies in response to shifting market conditions, disruptions, consumer demands, and technology breakthroughs. It helps businesses to improve operational resilience and responsiveness while preserving supply continuity (Wieland & Durach, 2023). Ivanov and Dolgui (2024) define flexible sourcing as an organization's capacity to quickly change suppliers, diversify procurement channels, alter sourcing locations, and modify purchasing decisions in order to reduce supply chain risks and improve business continuity in unpredictable circumstances.

According to Yu et al. (2023), supplier flexibility is the capacity of suppliers to adapt to the evolving needs of buyers in terms of product specifications, order quantities, delivery schedules, and production modifications without suffering appreciable declines in quality, cost effectiveness, or delivery performance. Similarly, the ability of suppliers to quickly adapt to changes in customer demand, production volumes, product customisation, and delivery requirements while preserving dependable supply chain performance and fostering organisational resilience is known as supplier flexibility (Shao et al., 2024).

Teece et al (1997) first presented Dynamic Capabilities Theory (DCT) in 1997. This explains why businesses work in settings that are marked by fast technology advancement, globalisation, changing consumer tastes, evolving regulations, and heightened competition. Teece (2018) asserts that dynamic capabilities allow businesses to recognise opportunities and threats, take advantage of new opportunities by making strategic choices, and modify organisational resources to sustain long-term competitiveness. According to Teece et al. (2016), if current resources and capabilities are not regularly refreshed, they may soon become outdated.

The theory has been widely used in a variety of industries, including education, manufacturing, logistics, healthcare, finance, construction, information technology, retail, energy, agriculture, and public-sector organisations. As a result, it is especially beneficial for businesses to adapt to changing circumstances and compete favourably. It is important to apply DCT to the study on flexible sourcing and green supplier selection in order to assist the Nigerian maritime sector in using its resources to develop the capacity to adapt to a changing environment. In order to achieve long-term sustainability and competitiveness in the industry, the theory emphasises the significance of green innovation, organisational flexibility, and flexible sourcing strategies as resource reconfiguration.

Soita and Osoro (2023) evaluated the impact of supplier sourcing on performance of Total Energies Kenya Limited's in Mombasa City County, Kenya. The research design used in this study was descriptive. The 700 full-time and part-time workers of Total Energies Kenya Limited made up the study population. Descriptive and inferential statistics were employed to analyse the data collected using questionnaires. According to the study, procurement performance was positively and significantly impacted by supplier sourcing.

Ngatia et al. (2024) investigated the performance of Kenyan food and beverage manufacturing companies and the flexibility of their supply chains. 246 people, including top procurement managers from Kenyan food and beverage companies, participated in the cross-

sectional survey. Using a basic random sampling technique, Krejcie and Morgan (1970) estimated a sample size of 150 respondents. The researcher used self-administered, semi-structured questionnaires. Only 119 of the 135 questionnaires that were sent to respondents were returned and used in the study. The data was analysed using descriptive statistics, such as mean, standard deviation, skewness, and kurtosis. Regression analysis and correlation were used to examine the data. The outcome showed that the food industry's performance is greatly enhanced by supply chain flexibility.

Mary and Chege (2024) studied green procurement practices and supply chain performance of food and beverage processing companies in Nairobi City County, Kenya. The study was conducted by cross-sectional descriptive research designs. The target population comprised of 217 food and beverage processing companies in Nairobi City County. A representative sample of 108 businesses was selected using stratified random selection. The primary data was gathered using a standardised questionnaire. The researcher employed a pilot study with 15 processing enterprises from neighbouring Kiambu County to assess the reliability and validity of the research instrument. For statistical testing and analysis, the data's mean, percentage, and standard deviations were shown. The results demonstrated a robust and favourable relationship between supply chain performance and green procurement practices.

Wachiuri (2023) evaluated the impact of supplier capacity on performance of Kenyan state enterprises. The study used both quantitative and qualitative methods in a cross-sectional survey methodology. 187 Kenyan state businesses were among the target population. A census approach was used in the investigation. Questionnaires were used to gather primary data. The percentages of respondents' responses were calculated using descriptive and inferential statistics. The results showed that the performance of Kenyan state enterprises was significantly and favourably impacted by supplier capacity.

Furthermore, earlier research by Soita and Osoro (2023) looked at Kenya's oil and energy industry; Ngatia et al. (2024) looked into Kenyan food and beverage manufacturing companies; Mary and Chege (2024) focused on manufacturing companies in Nairobi City County, Kenya; and Wachiuri (2023) studied Kenyan state corporations. None of the earlier studies looked at the education sector, despite the insightful information they offered. As a result, by filling in this contextual gap and expanding the empirical understanding of the phenomenon within educational institutions, our study adds to the body of knowledge already in existence.

2. Method

The research design used in this study is a descriptive survey. The study's population consists of Nigeria Maritime University employees, especially those who work in supply chain and procurement. This comprises department leaders, logistics managers, procurement officers, internal auditors, and administrative personnel. To choose participants or individuals with pertinent professional competence and experience in the procurement department, the study used a stratified sample technique. To guarantee that the sample fairly reflected all pertinent subgroups within the population, stratified random sampling was employed.

Taro Yamane's formula (1967) for finite population studies was used to calculate the total population of 1,252, with a 5% margin of error and a 95% confidence level.

The following is the formula:

$$n = \frac{N}{1 + Ne^2}$$

Where $n \rightarrow$ the required sample size

N = the Target Population

e = accuracy level required standard error = 5%

Where:

$N = 1,252$; $e = 0.05$ (margin of error);

$n = 1,252 / (1 + 1,252 (0.05)^2)$ $n = 303.147$

Thus, the sample size = 303 employees.

Additionally, two academic specialists in public procurement and supply chains evaluated the instrument. Each tool included both positive and negative statements about flexible sourcing and green supplier selection. The reliability of the instrument was pre-tested in a pilot study with ten respondents. To ascertain statistical significance, primary data were examined using Pearson correlation at a 5% level of significance ($p < 0.05$).

3. Results and Discussion

3.1 Results

The Statistical Package for Social Sciences (SPSS, Version 25) was used to collect, organise, and analyse primary data. 282 of the 303 surveys that were issued were properly filled out and returned, indicating a good response rate; the remaining 21 surveys were not included in the analysis. The respondents' demographic profile is listed below.

Table 1 Age Bracket of the Respondents

Age Group	Frequency	Percentage
15-25 years	55	19.41
25-35 years	76	26.30
35-45 years	87	29.30
Over 45 years	71	24.99
Total	282	100

Source: (Field Survey 2026)

The age group also reveals that, with 29.30% of the sample, the majority of respondents were in the 35–45 age range. The age distribution shows that the early, mid, and senior age groups are fairly evenly distributed, with the 35–45 age group somewhat predominating. Young adults (15–25 years old) made up the smallest group of participants, with the majority being middle-aged (35–45 years old).

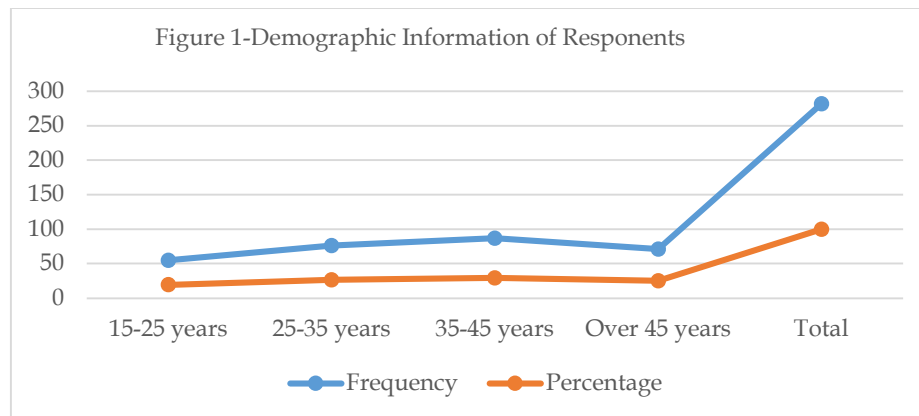


Figure 1 Demographic Information of respondents

3.1.1 Analysis of Research Question

What is the relationship between flexible sourcing and green supplier selection at Nigeria's Maritime University South-South Region?

Table 2: Investigative Questions on Green Supplier Selection and Flexible Sourcing

S/N	Questions	SA	AG	UN	DA	SD	Total
A. Green Supplier Selection (Independent Variable)							
1	My firm choose vendor to supply office equipment.	134	129	5	8	6	282

2	We select vendor who have ecofriendly certification.	135	132	8	1	6	282
3	Green supplier requirements limit the pool of available vendors, reducing sourcing flexibility.	130	137	4	3	8	282
4	Partnering with certified eco-suppliers enhances procurement adaptability.	137	133	2	6	4	282
5	Dependence on eco-certified suppliers exposes institutions to higher costs and sourcing constraints.	134	139	5	1	3	282
6	We minimize risk by adhering to environmental standards	142	133	4	2	1	282
7	Strict adherence to environmental standard can delay supplier selection and reduce responsiveness.	134	135	2	6	5	282
B. Flexible Sourcing (Dependent Variable)							
1	We prioritizes sustainable suppliers to enhance environmental sustainability.	136	132	3	6	5	282
2	Not being flexible during sourcing may my organizational bureaucracy and control during decision processes.	131	136	8	6	1	282
3	Firms that are flexible in their procurement practices are more innovative than others.	136	142	3	1	0	282
4	We adopt flexible sourcing strategies which help to improved supply continuity and reduced disruption.	132	133	9	6	2	282
5	Collaboration with certified eco-suppliers improves my institutions performance.	135	133	6	5	3	282
6	Excessive sourcing flexibility can lead to inconsistent supplier relationships and quality variations in my firm.	132	136	9	3	0	282
7	Integrating environmental criteria in supplier selection help my firm to build responsive sourcing networks.	140	134	1	4	3	282

Source: (Field Survey, 2026)

3.1.2 Decision Rule

When the p-value was less than 0.05, the null hypothesis was rejected; otherwise, the alternative hypothesis (HA) was accepted. According to the Pearson correlation result in table 4.4 below, the null hypothesis that there is no significant relationship between flexible sourcing and green supplier selection in the Nigerian maritime sector was rejected because the p-value (0.000) was below the critical threshold of 0.05. On the other hand, the alternative hypothesis, which claimed that flexible sourcing and the choice of green suppliers are significantly correlated in the Nigerian maritime industry, was approved. The test result shows that the independent and dependent variables are significantly correlated.

3.1.3 Test of Research Hypothesis

H₀₂: There is no significant relationship between green supplier selection and flexible sourcing in the South-South Region.

Table 3: Result of Bivariate Correlations

		GSS	FLS
GSS	Pearson Correlation	1	.998**
	Sig. (2-tailed)		.000
	N	281	281
FLS	Pearson Correlation	.998**	1
	Sig. (2-tailed)	.000	

N	281	281
**. Correlation is significant at the 0.01 level (2-tailed)		

Based on replies from 282 participants, the above result shows a strong correlation between flexible sourcing (FLS) and green supplier selection (GSS). According to the analysis, there is a strong correlation between GSS and FLS ($r = .998$, $N = 281$, $p = .000$), meaning that a commensurate increase in green supplier selection is linked to a +1 increase. A rise in flexible sourcing of 998 would improve operational effectiveness. Additionally, GSS and FLS are highly aligned, with the majority of their changes happening simultaneously, according to a correlation with a r value of 0.998. Consequently, the statistical significance of this link is confirmed by the significant p -value (.000).

3.2 Discussion

Research hypotheses were examined and tested using the Pearson Correlation method. Based on replies from 282 participants, the outcome shows a strong correlation between flexible sourcing (FLS) and green supplier selection (GSS). According to the analysis, there is a strong correlation between GSS and FLS ($r = .998$, $N = 281$, $p = .000$), meaning that a commensurate increase in green supplier selection is linked to a +1 increase. A rise in flexible sourcing of 998 would improve operational effectiveness. The results are consistent with previous research by Soita and Osoro (2023), which found that supplier sourcing greatly and favorably enhances procurement performance. The outcome is also consistent with a previous study by Ngatia, Osoro, and Nyang'au (2024), which showed that supply chain flexibility greatly enhances the food industry's performance. In light of the aforementioned, the researcher observed that the results of the study aligned with the literature.

4. Conclusion

Based on replies from 282 participants, the study's findings show a strong correlation between flexible sourcing (FLS) and green supplier selection (GSS). According to the analysis, there is a strong correlation between GSS and FLS ($r = .998$, $N = 281$, $p = .000$), meaning that a commensurate increase in green supplier selection is linked to a +1 increase. A rise in flexible sourcing of 998 would improve operational effectiveness. The practically perfect and statistically significant association between GSS and FLS is indicated by the Pearson correlation coefficient of $r = .998$ ($N = 281$, $p < .001$). In the real world, flexible sourcing strategies help businesses increase operational effectiveness by making it easier for them to react to changes in the market, legal requirements, and sustainability requirements. Additionally, eco-friendly suppliers maintain cutting-edge environmental management systems, creative capacities, and compliance-focused procedures that can improve supply responsiveness, diversity, and flexibility.

In order to minimize disruptions and guarantee sustainable organizational performance, the study also comes to the conclusion that creating resilient supply chains through strategic sourcing, supplier diversification, local content creation, digital supply chain technologies, proactive risk management, and cooperative supplier relationships is crucial. Businesses that effectively use these resilience tactics are better equipped to endure external shocks while preserving long-term competitiveness and operational continuity.

4.2 Recommendation

The study recommendations are stated as follows.

- University management should develop robust foreign exchange risk management strategies by utilizing hedging mechanisms, forward contracts, and maintaining foreign currency reserves to minimize the adverse effects of exchange rate volatility.
- Promoting local sourcing and local content development through investments in indigenous manufacturing capabilities, supplier development programmes, and strategic partnerships with local industries is vital to reduce excessive import dependence.

(c) Strengthening organizational risk management practices by conducting regular supply chain risk assessments, scenario planning, and business continuity planning is essential to improve preparedness for future disruptions.

(d) By implementing collaborative supplier relationship management through long-term contracts, information sharing, joint planning, and supplier performance evaluation helps to enhance supplier responsiveness and reliability.

4.3 Practical and Theoretical Implication of the Study

The existing literature emphasizes the impact of supplier sourcing on the success of businesses worldwide. However, little empirical research has been done in the South-South region of Nigeria to examine the relationship between flexible sourcing and green supplier selection procedures, especially at the Nigeria Maritime University (NMU).

By utilising dynamic capability theory to explain how firms employ their resources to respond to environmental changes, the study addresses these constraints and closes both conceptual and geographic research gaps. As a result, this work adds to the body of knowledge in both theoretical and practical ways. Public sector procurement agencies, legislators, academic institutions, environmental advocacy organisations, and academics are among the main recipients of this study's evidence-based research.

4.4 Contribution to Knowledge

This work expanded the views of Dynamic Capabilities Theory by connecting it to flexible sourcing and green supplier selection. By so doing, the study contributes to the body of knowledge.

This study focuses on the education sector, in contrast to earlier research that was carried out in various industrial situations. For example, Soita and Osoro (2023) studied Kenya's oil and energy industry; Ngatia et al. (2024) studied Kenyan food and beverage manufacturing companies; Mary and Chege (2024) studied Kenyan manufacturing companies in Nairobi City County; and Wachiuri (2023) studied Kenyan state corporations. None of these studies looked at the education sector, despite the insightful information they offered. As a result, by filling in this contextual gap and expanding the empirical understanding of the phenomenon within educational institutions, our study adds to the body of knowledge already in existence.

The results offer practical methods for improving organisational resilience through supplier diversification, digital transformation, local sourcing, proactive risk management, and strategic cooperation to managers, procurement specialists, legislators, and supply chain practitioners. These suggestions help enhance organisational readiness for upcoming shocks and encourage better-informed procurement decisions.

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