

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

Ikenna Christopher Ugwu (Research Scholar)¹, Kelechi 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
²Email: kelechi.ugwu@futo.edu.ng

Article information

Received: 19 Jul 2026
Revised: 31 Jul 2026
Accepted: 02 Aug 2026
Published: 05 Aug 2026

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

Organizations across the world are increasingly integrating environmental sustainability into procurement and supply chain management in response to climate change, stricter environmental regulations, stakeholder expectations, and global supply chain uncertainties. Procurement is no longer evaluated solely on the basis of cost, quality, and delivery performance but also on suppliers' environmental responsibility, resource efficiency, waste reduction, and compliance with sustainability standards. Consequently, green supplier selection (GSS) has emerged as a strategic procurement practice that enables organizations to improve environmental performance while strengthening operational efficiency, resilience, and long-term competitiveness (Adamides & Mouzakitis, 2024; Saputro et al., 2024).

The urgency of adopting green supplier selection has become more pronounced as organizations continue to experience frequent supply chain disruptions arising from geopolitical

conflicts, exchange-rate volatility, inflation, transportation bottlenecks, import restrictions, and climate-related events. These challenges are particularly severe in developing economies such as Nigeria, where organizations depend heavily on imported equipment and specialized materials. Public universities, including the Nigerian Maritime University (NMU), rely extensively on suppliers for maritime equipment, engineering materials, laboratory facilities, marine technologies, and information and communication technology infrastructure. Consequently, procurement disruptions often result in increased procurement costs, extended lead times, interrupted academic and administrative operations, and reduced institutional performance (Dhillon et al., 2022).

To address these challenges, organizations are increasingly complementing green supplier selection with flexible sourcing strategies. Flexible sourcing enables organizations to diversify their supplier base, maintain relationships with multiple qualified suppliers, rapidly adjust procurement decisions, and minimize supply risks during periods of uncertainty. Sustainable suppliers are therefore expected not only to demonstrate environmental responsibility but also to possess operational flexibility, innovation capability, technological competence, delivery reliability, and responsiveness to changing organizational requirements. Integrating these capabilities enhances procurement continuity while supporting environmental sustainability and organizational resilience (Adamides & Mouzakitis, 2024; Sahoo & Goswami, 2024).

Green supplier selection forms an important component of Green Supply Chain Management (GSCM), which seeks to minimize environmental impacts throughout procurement, production, distribution, and disposal activities. Organizations implementing GSCM have reported improved environmental performance, lower operational risks, stronger supplier relationships, enhanced corporate reputation, and superior organizational performance. Green supplier selection specifically involves identifying and evaluating suppliers based on environmental criteria such as pollution prevention, waste management, energy efficiency, carbon emission reduction, environmental certifications, and compliance with environmental regulations, alongside traditional procurement criteria including cost, quality, and delivery performance (Baki, 2022; Govindan et al., 2022; Masudin et al., 2022).

Similarly, green innovation has become an essential organizational capability for achieving sustainable competitiveness. Green innovation refers to the development and implementation of environmentally friendly products, processes, technologies, and management practices that reduce environmental impacts while improving organizational efficiency and competitiveness. Through efficient resource utilization, reduced emissions, cleaner production, and circular economy practices, organizations can simultaneously achieve economic growth and environmental sustainability (Chen & Liu, 2023; Zhang et al., 2024).

Flexible sourcing likewise represents an organization's strategic capability to modify supplier portfolios, sourcing locations, procurement strategies, and contractual arrangements in response to changing environmental and market conditions. This capability enables organizations to maintain business continuity, improve supply chain responsiveness, and reduce procurement risks. At the supplier level, flexibility reflects the ability to accommodate changes in order quantities, product specifications, delivery schedules, and production requirements without compromising quality, delivery performance, or cost efficiency (Wieland & Durach, 2023; Ivanov & Dolgui, 2024; Yu et al., 2023; Shao et al., 2024).

The theoretical foundation of this study is anchored on Dynamic Capabilities Theory (DCT), originally proposed by Teece et al. (1997). The theory argues that organizations operating in dynamic environments must continuously develop, integrate, and reconfigure their internal and external resources to respond effectively to technological changes, market uncertainties, competitive pressures, and evolving stakeholder expectations. Dynamic capabilities enable organizations to sense emerging opportunities and threats, seize strategic opportunities, and transform organizational resources to sustain competitive advantage (Teece et al., 2016; Teece, 2018). Within the context of this study, Dynamic Capabilities Theory explains how the Nigerian

Maritime University can strengthen procurement performance by integrating green supplier selection, flexible sourcing, organizational flexibility, and green innovation into its procurement processes. These capabilities allow the University to respond effectively to environmental challenges while enhancing institutional sustainability and resilience.

Previous empirical studies have consistently demonstrated the importance of sustainable procurement and flexible sourcing in improving organizational performance. Soita and Osoro (2023) found that supplier sourcing significantly improved procurement performance among Total Energies Kenya Limited employees. Ngatia et al. (2024) established that supply chain flexibility significantly enhanced the performance of food and beverage manufacturing firms in Kenya. Similarly, Mary and Chege (2024) reported a strong positive relationship between green procurement practices and supply chain performance among food and beverage processing firms in Nairobi County, while Wachiuri (2023) concluded that supplier capacity positively influenced the performance of Kenyan state corporations.

Beyond these studies, recent literature indicates that supplier selection has evolved into a strategic process integrating environmental, economic, and social sustainability considerations. Organizations increasingly adopt sustainable supplier selection to improve supply chain resilience, environmental performance, operational efficiency, and long-term competitiveness (Rashidi et al., 2020; Konys, 2019). Researchers have further emphasized the integration of environmental management systems, waste reduction, carbon emission control, resource efficiency, and environmental compliance into supplier evaluation frameworks alongside traditional procurement criteria (Abuzaid et al., 2024; Nsikan et al., 2022).

Recent methodological advancements have also introduced sophisticated multi-criteria decision-making techniques—including fuzzy Best-Worst Method (BWM), TOPSIS, SWARA, COPRAS, WASPAS, and Fermatean fuzzy approaches—to improve the objectivity and accuracy of sustainable supplier evaluation under uncertainty (Hailiang et al., 2023; Asadabadi et al., 2022; Sithi et al., 2025; Pamucar et al., 2024; Saputro et al., 2024; Tavana et al., 2021; Masoomi et al., 2022). In addition, the emergence of Industry 4.0 technologies and circular economy principles has expanded sustainable supplier selection frameworks by incorporating digitalization, innovation capability, resource recovery, and lifecycle sustainability considerations (Xie et al., 2022). Other studies have highlighted the importance of green knowledge, green intellectual capital, green relational capital, and management commitment in facilitating effective green supplier selection and sustainable procurement implementation (Ograh et al., 2023; Ograh et al., 2024; Ograh et al., 2025). Evidence from public procurement and sector-specific studies further confirms that sustainable supplier selection contributes positively to organizational performance, supply chain competitiveness, and sustainable development across diverse industries (Isoghom & Worgu, 2025; Ghosh et al., 2021; Sithi et al., 2025; Masoomi et al., 2022).

Despite these valuable contributions, significant research gaps remain. Existing studies have largely concentrated on manufacturing, healthcare, energy, construction, textiles, and public sector organizations, with most empirical evidence originating from Kenya and other international contexts. Very limited empirical attention has been devoted to higher education institutions in Nigeria, particularly specialized federal universities such as the Nigerian Maritime University. Furthermore, previous studies have primarily examined green procurement, supplier capacity, sustainable supplier selection, or supply chain flexibility independently, while limited research has investigated the relationship between green supplier selection and flexible sourcing within Nigerian public universities.

Against this background, this study seeks to bridge these contextual and empirical gaps by examining the relationship between green supplier selection and flexible sourcing at the Nigerian Maritime University, Okerenkoko, Delta State. Specifically, the study aims to determine the relationship between green supplier selection and green innovation and between green supplier selection and organizational flexibility resilience. The findings are expected to contribute to the growing body of knowledge on sustainable procurement while providing practical

guidance for strengthening procurement resilience, environmental sustainability, and supply chain performance within Nigerian higher education institutions.

Despite the growing emphasis on sustainable procurement and green supply chain management, many organizations, particularly public higher education institutions in developing economies, continue to rely on traditional supplier selection practices that primarily emphasize cost, quality, and delivery while giving limited attention to environmental sustainability and supplier flexibility. At the Nigerian Maritime University, procurement activities involve specialized maritime equipment, engineering materials, laboratory facilities, marine technologies, and information and communication technology infrastructure, much of which is sourced from both domestic and international suppliers. These procurement activities are increasingly affected by exchange-rate volatility, import restrictions, transportation bottlenecks, inflationary pressures, supply chain disruptions, and regulatory uncertainties, resulting in increased procurement costs, delayed deliveries, operational interruptions, and reduced organizational resilience (Dhillon et al., 2022).

Although previous studies have established that green supplier selection improves environmental and organizational performance and that flexible sourcing enhances supply chain resilience, most empirical evidence has been generated from manufacturing, healthcare, construction, textile, energy, and public sector organizations outside Nigeria (Soita & Osoro, 2023; Ngatia et al., 2024; Mary & Chege, 2024; Wachiuri, 2023; Rashidi et al., 2020). Likewise, studies on sustainable supplier selection have largely focused on developing supplier evaluation models and multi-criteria decision-making techniques rather than examining how green supplier selection influences flexible sourcing capabilities within higher education institutions (Hailiang et al., 2023; Saputro et al., 2024; Xie et al., 2022). Consequently, there is limited empirical evidence regarding the relationship between green supplier selection and flexible sourcing in Nigerian universities, particularly specialized institutions such as the Nigerian Maritime University. This study therefore seeks to address this gap by investigating how green supplier selection relates to organizational flexibility resilience and green innovation within the University's procurement system.

The main objective of this study is to examine the relationship between green supplier selection and flexible sourcing at the Nigerian Maritime University, Okerenkoko, Delta State. The specific objectives are to: (1) examine and analyse the relationship between green supplier selection and green innovation at the Nigerian Maritime University. (2) Determine the relationship between green supplier selection and organizational flexibility resilience at the Nigerian Maritime University.

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 → 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);

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

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).

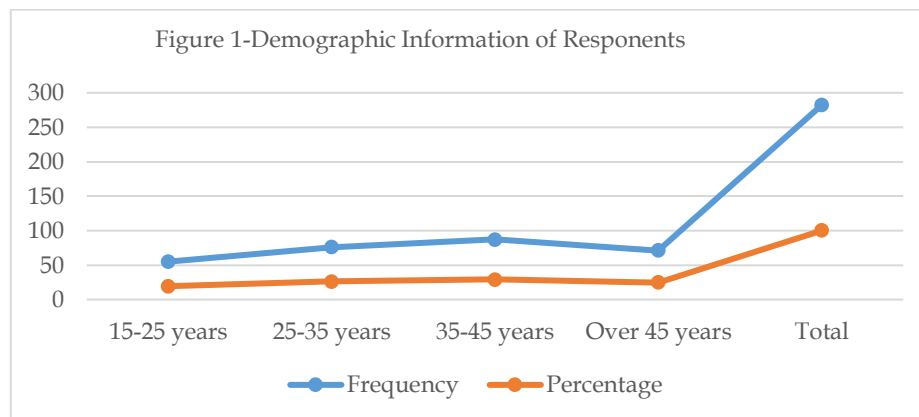


Figure 1 Demographic Information of respondents

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.

The primary objective of this study was to examine the relationship between green supplier selection (GSS) and flexible sourcing (FLS) at Nigeria Maritime University, South-South Nigeria. The research hypothesis was tested using the Pearson Product-Moment Correlation (PPMC) statistical technique based on responses obtained from 281 valid questionnaires returned by employees involved in procurement, logistics, auditing, administration, and departmental management. The findings revealed a very strong positive relationship between green supplier selection and flexible sourcing ($r = .998$, $N = 281$, $p = .000$). The correlation coefficient indicates that the two variables move in the same direction, implying that improvements in green supplier selection are associated with corresponding improvements in flexible sourcing practices within the university. Since the probability value ($p = .000$) is less than the conventional significance level of 0.05, the null hypothesis was rejected, confirming that a statistically significant relationship exists between green supplier selection and flexible sourcing.

The implication of this finding is that procurement units that place greater emphasis on selecting environmentally responsible suppliers are more likely to develop sourcing systems that are adaptable, resilient, and responsive to changing operational requirements. Green supplier selection extends beyond evaluating suppliers based solely on price and quality. It includes assessing suppliers' environmental management systems, waste reduction practices, compliance with environmental regulations, resource efficiency, sustainable production methods, and commitment to continuous environmental improvement. When institutions prioritize these sustainability criteria during supplier evaluation and selection, they are more likely to establish long-term relationships with suppliers capable of responding effectively to market uncertainties, technological changes, supply disruptions, and evolving institutional needs.

The exceptionally strong positive relationship observed in this study suggests that environmentally conscious procurement decisions contribute significantly to sourcing flexibility.

Flexible sourcing enables organizations to diversify supply sources, reduce dependence on a single supplier, adapt quickly to fluctuations in demand, and respond efficiently to unforeseen disruptions within the supply chain. For a tertiary institution such as Nigeria Maritime University, flexible sourcing is particularly important because universities procure a wide variety of goods and services ranging from laboratory equipment, office supplies, construction materials, ICT infrastructure, maintenance services, and teaching resources. The ability to obtain these resources from environmentally responsible suppliers while maintaining flexibility enhances operational continuity and institutional efficiency.

The findings further suggest that green supplier selection strengthens procurement decision-making by encouraging procurement officers to evaluate suppliers based on broader strategic considerations rather than relying exclusively on traditional cost-based procurement criteria. Conventional procurement approaches often prioritize the lowest acquisition cost without adequately considering long-term environmental, social, and operational consequences. Such approaches may expose institutions to supply disruptions, poor product quality, increased maintenance costs, environmental liabilities, and reputational risks. Conversely, green supplier selection promotes strategic partnerships with suppliers that possess strong environmental capabilities, technological innovation, and sustainable production practices, thereby improving procurement resilience and supply chain flexibility.

The findings are consistent with the Dynamic Capabilities Theory, which provides the theoretical foundation for this study. Dynamic Capabilities Theory argues that organizations achieve sustainable competitive advantage by continuously integrating, developing, and reconfiguring internal and external resources in response to rapidly changing environmental conditions. Within the context of procurement and supply chain management, green supplier selection represents an important organizational capability that enables institutions to identify suppliers capable of supporting innovation, sustainability, and operational adaptability. Flexible sourcing similarly reflects an organizational capability that allows institutions to adjust procurement strategies quickly in response to changing market conditions, environmental regulations, technological developments, and stakeholder expectations. The strong relationship between the two constructs observed in this study demonstrates that organizations possessing strong green procurement capabilities are better positioned to develop flexible sourcing systems capable of supporting long-term organizational sustainability.

The findings also provide practical evidence that environmental sustainability and operational flexibility should not be viewed as competing objectives. Traditionally, some organizations have perceived environmental procurement requirements as additional constraints that increase procurement costs and reduce supplier options. However, the results of this study indicate the opposite. Organizations that integrate environmental considerations into supplier selection processes can simultaneously improve procurement flexibility and organizational responsiveness. Suppliers committed to sustainable production often invest in cleaner technologies, efficient manufacturing processes, waste minimization, energy conservation, and continuous process improvement. These investments frequently enhance supplier reliability, product consistency, delivery performance, and production adaptability, all of which contribute directly to sourcing flexibility.

The findings support previous empirical studies that have examined the contribution of sustainable procurement practices to organizational performance. Specifically, the results are consistent with the study conducted by Soita and Osoro (2023), who found that supplier sourcing significantly and positively influences procurement performance. Their study emphasized that effective supplier sourcing strategies improve procurement efficiency by enhancing supplier relationships, minimizing procurement risks, reducing operational delays, and improving overall organizational performance. The present study extends these findings by demonstrating that supplier sourcing practices become even more valuable when environmental sustainability forms part of the supplier selection criteria. Rather than focusing solely on supplier availability or cost considerations, organizations benefit from evaluating suppliers based on environmental

performance, regulatory compliance, and sustainability capabilities. Such an approach contributes to more flexible procurement systems capable of adapting to changing institutional and environmental requirements.

Similarly, the present findings agree with the work of Ngatia, Osoro, and Nyang'au (2024), who reported that supply chain flexibility significantly improves organizational performance within the food industry. Their study demonstrated that organizations capable of responding rapidly to changing customer demands, market conditions, and supply disruptions achieve higher operational effectiveness and competitive advantage. Although the current study was conducted within the higher education sector rather than the food industry, the consistency of the findings suggests that the positive effects of supply chain flexibility extend across different sectors. Whether operating in manufacturing, food production, healthcare, or education, organizations require procurement systems capable of adapting to changing operational circumstances while maintaining sustainability objectives. This consistency strengthens the external validity of the present findings and supports the growing body of literature advocating the integration of sustainability into supply chain management.

The findings also contribute to the growing discourse on sustainable public procurement within developing countries, particularly Nigeria. Public institutions have traditionally relied on procurement systems that prioritize compliance with financial regulations while paying limited attention to environmental sustainability. However, increasing environmental challenges, climate change concerns, resource scarcity, and international sustainability commitments have prompted governments and public institutions to incorporate environmental criteria into procurement decisions. The present study provides empirical evidence that green supplier selection not only supports environmental sustainability but also enhances sourcing flexibility, thereby improving institutional effectiveness. Consequently, sustainable procurement should be regarded as a strategic management tool rather than merely an environmental compliance mechanism.

Within Nigeria Maritime University, the findings have several important managerial implications. Procurement managers should establish comprehensive supplier evaluation frameworks that incorporate environmental sustainability indicators alongside traditional procurement criteria such as cost, quality, delivery reliability, and technical competence. Environmental assessment criteria may include suppliers' environmental certifications, waste management practices, carbon reduction initiatives, recycling programs, energy efficiency measures, compliance with environmental regulations, and adoption of environmentally friendly production technologies. Incorporating these indicators into supplier evaluation processes will enable the institution to identify suppliers capable of supporting both sustainability objectives and operational flexibility.

Furthermore, university management should strengthen strategic partnerships with environmentally responsible suppliers through long-term contractual relationships. Long-term collaborations encourage information sharing, joint planning, technological innovation, supplier development, and continuous improvement. These collaborative relationships increase suppliers' understanding of institutional requirements while enhancing their ability to respond rapidly to changing procurement needs. Consequently, stronger supplier relationships contribute to improved sourcing flexibility and supply chain resilience.

Another important implication of the findings concerns local supplier development. The study recommends that university management prioritize local sourcing while encouraging investments in indigenous manufacturing firms capable of producing office equipment, educational materials, laboratory facilities, and other institutional requirements. Strengthening local suppliers reduces dependence on imported goods, shortens procurement lead times, minimizes transportation-related environmental impacts, and increases procurement flexibility during international supply chain disruptions. Local supplier development also contributes to national economic development by supporting domestic industries, creating employment opportunities, and promoting technological advancement within Nigeria.

The remarkably high correlation coefficient observed in this study also highlights the importance of institutional commitment to sustainability. Green procurement initiatives cannot succeed without strong support from senior management, adequate procurement policies, staff training, environmental awareness programs, and continuous monitoring of supplier performance. Procurement professionals should receive regular training on sustainable procurement principles, environmental assessment techniques, supplier sustainability evaluation, and life-cycle costing methods. Building employee capacity ensures that procurement decisions consistently reflect both operational objectives and environmental sustainability goals. The findings further indicate that integrating green supplier selection into institutional procurement policies may improve long-term operational effectiveness. Organizations increasingly face uncertainties arising from global supply chain disruptions, economic instability, technological change, environmental regulations, and climate-related risks. Procurement systems characterized by flexibility are better equipped to respond to these uncertainties through diversified supplier networks, adaptive sourcing strategies, and collaborative supplier relationships. Green supplier selection therefore becomes an important strategic mechanism for enhancing institutional resilience and ensuring uninterrupted service delivery.

The findings demonstrate that green supplier selection is not merely an environmental initiative but a strategic procurement practice that significantly strengthens flexible sourcing capabilities. The strong positive association observed confirms that environmentally responsible supplier selection contributes to improved procurement adaptability, organizational responsiveness, supply chain resilience, and long-term institutional sustainability. These findings reinforce the propositions of Dynamic Capabilities Theory by demonstrating that organizations capable of integrating sustainability into procurement decisions develop stronger adaptive capabilities necessary for operating in dynamic and uncertain environments.

The results of this study are consistent with existing empirical literature and theoretical expectations. The findings corroborate the conclusions of Soita and Osoro (2023), who established that supplier sourcing significantly enhances procurement performance, as well as Ngatia, Osoro, and Nyang'au (2024), who demonstrated that supply chain flexibility positively influences organizational performance. By extending these findings to the Nigerian tertiary education sector, this study contributes to the growing body of knowledge on sustainable procurement and provides empirical evidence that green supplier selection is a critical determinant of flexible sourcing. The researcher therefore concludes that institutions seeking to improve procurement efficiency, operational effectiveness, and long-term sustainability should integrate comprehensive green supplier selection practices into their procurement strategies while fostering collaborative relationships with environmentally responsible suppliers.

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. (a) 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. (b) 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.

References

- Abuzaid, A., Alateeq, M., Madadha, S., Sharari, F. E. A. A., & Alsbou, M. K. K. (2024). The Effect of Suppliers' Green and Traditional Selection Criteria in Supply Chain Management on Purchasing Firms' Performance. *Sustainability*. <https://doi.org/10.3390/su16156276>
- Adamides, E.D., & Mouzakitis, Y. (2024). *Green sourcing: Supplier assessment and selection practices across industries*. *Logistics*, 8(4), 105.

- Asadabadi, M. R., Ahmadi, H., Gupta, H., & Liou, J. (2022). Supplier selection to support environmental sustainability: the stratified BWM TOPSIS method. *Annals of Operations Research*, 322, 321 - 344. <https://doi.org/10.1007/s10479-022-04878-y>
- Baki, R. (2022). An integrated multi-criteria structural equation model for green supplier selection. *International Journal of Precision Engineering and Manufacturing-Green Technology*, 9(4), 1063-1076.
- Chen, Y., & Liu, H. (2023). Green innovation, environmental sustainability and firm performance: A systematic review. *Journal of Cleaner Production*, 402, 136872.
- Christopher, M., & Peck, H. (2004). Building the resilient supply chain. *International Journal of Logistics Management*, 15(2), 1-14.
- Dhillon, M.K., Rafi-Ul-Shan, P.M., Amar, H., & Sher, F. (2022). Flexible green supply chain management in emerging economies: A systematic literature review. *Global Journal of Flexible Systems Management*, 24(1), 1-28.
- Ghosh, S., Mandal, M., & Ray, A. (2021). Green supply chain management framework for supplier selection: an integrated multi-criteria decision-making approach. *International Journal of Management Science and Engineering Management*, 17, 205 - 219. <https://doi.org/10.1080/17509653.2021.1997661>
- Govindan, K., Rajeev, A., Padhi, S.S., & Pati, R.K. (2022). Supply chain sustainability and green supplier selection: A systematic review and future research agenda. *Journal of Cleaner Production*, 351, 131489.
- Hailiang, Z., Khokhar, M., Islam, T., & Sharma, A. (2023). A model for green-resilient supplier selection: fuzzy best-worst multi-criteria decision-making method and its applications. *Environmental Science and Pollution Research International*, 30, 54035 - 54058. <https://doi.org/10.1007/s11356-023-25749-4>
- Isoghom, H. W., & Worgu, P. O. (2025). Sustainable public procurement and supply chain competitiveness of Federal Universities in Nigeria. *International Journal of Economics and Business Management*. <https://doi.org/10.59568/ijebm-2025-1-2-35>
- Ivanov, D., & Dolgui, A. (2020). A digital supply chain twin for managing the disruption risks and resilience in the era of Industry 4.0. *Production Planning & Control*, 32(9), 775-788.
- Ivanov, D., & Dolgui, A. (2024). Supply chain resilience and adaptive sourcing strategies in the era of digital transformation. *International Journal of Production Research*, 62(3), 847-865.
- Konys, A. (2019). Green Supplier Selection Criteria: From a Literature Review to a Comprehensive Knowledge Base. *Sustainability*. <https://doi.org/10.3390/su11154208>
- Mary, W. S. & Chege, PhD, D.P. (2024). Green Procurement Practices and Supply Chain Performance of Food and Beverage Processing Firms in Nairobi City County, Kenya. *Journal of Procurement & Supply Chain*, 4(2), 16-27.
- Masoomi, B., Sahebi, I. G., Fathi, M., Yıldırım, F., & Ghorbani, S. (2022). Strategic supplier selection for renewable energy supply chain under green capabilities (fuzzy BWM-WASPAS-COPRAS approach). *Energy Strategy Reviews*. <https://doi.org/10.1016/j.esr.2022.100815>
- Masudin, I., Umamy, S.Z., Al-Imron, C. N., & Restuputri, D.P. (2022). Green procurement implementation through supplier selection: A bibliometric review. *Cogent Business & Management*, 9(1), 2119686.
- Ngatia, R. N., Osoro, D.A., & Nyang'au, D.S.P. (2024). Supply Chain Flexibility and Performance of Food and Beverages Manufacturing Firms in Kenya. *Journal of Procurement and Supply Chain*, 4(2), 1-15. Retrived from <https://doi.org/10.70619/vol4iss2pp1-15>.
- Nsikan, J., Affiah, E. A., Briggs, I., & Koko, N. (2022). Sustainable supplier selection factors and supply chain performance in the Nigerian healthcare industry. *Journal of Transport and Supply Chain Management*. <https://doi.org/10.4102/jtscm.v16i0.633>
- Ograh, T., Ayarkwa, J., & Acheampong, A. (2025). Management green commitment barriers to green supplier selection: the missing link towards a green intellectual capital. *The International Journal of Logistics Management*. <https://doi.org/10.1108/ijlm-01-2025-0013>
- Ograh, T., Ayarkwa, J., Acheampong, A., & Abu, I. (2024). Advancing collaboration toward green supplier selection: perspective of green relational capital. *Journal of Public Procurement*. <https://doi.org/10.1108/jopp-04-2024-0046>
- Ograh, T., Ayarkwa, J., Acheampong, A., & Osei-Asibey, D. (2023). Developing green knowledge toward supplier selection: a green intellectual capital perspective. *Journal of Public Procurement*. <https://doi.org/10.1108/jopp-04-2023-0020>
- Pamucar, D., Ulutaş, A., Topal, A., Karamaşa, Ç., & Ecer, F. (2024). Fermatean fuzzy framework based on preference selection index and combined compromise solution methods for green supplier selection in textile industry. *International Journal of Systems Science: Operations & Logistics*. <https://doi.org/10.1080/23302674.2024.2319786>

- Rashidi, K., Noorizadeh, A., Kannan, D., & Cullinane, K. (2020). Applying the triple bottom line in sustainable supplier selection: A meta-review of the state-of-the-art. *Journal of Cleaner Production*, 269, 122001. <https://doi.org/10.1016/j.jclepro.2020.122001>
- Sahoo, S.K., & Goswami, S.S. (2024). Green supplier selection using MCDM: A comprehensive review of recent studies. *Spectrum of Engineering and Management Sciences*, 2(1), 1–16.
- Saputro, T. E., Rosiani, T. Y., Mubin, A., Dewi, S., & Baroto, T. (2024). Green supplier selection under supply risks using novel integrated fuzzy multi-criteria decision making techniques. *Journal of Cleaner Production*. <https://doi.org/10.1016/j.jclepro.2024.141788>
- Shao, X., Zhang, M., & Dubey, R. (2024). Supplier flexibility and supply chain resilience: Evidence from manufacturing firms. *International Journal of Production Economics*, 267, 109061.
- Sithi, S. S., Ara, M. A., Dhrubo, A. T., Rony, A. H., & Shabur, M. A. (2025). Sustainable supplier selection in the textile industry using triple bottom line and SWARA-TOPSIS approaches. *Discover Sustainability*, 6. <https://doi.org/10.1007/s43621-025-01206-9>
- Soita, A.M., & Osoro, PhD, D.A. (2023). Supplier Sourcing and Performance of Total Energies Kenya Limited in Mombasa City County Kenya. *Journal of Procurement and Supply Chain*, 3(2), 1–8. <https://doi.org/10.70619/vol3iss2pp1-8>
- Tavana, M., Shaabani, A., Santos-Arteaga, F., & Valaei, N. (2021). An integrated fuzzy sustainable supplier evaluation and selection framework for green supply chains in reverse logistics. *Environmental Science and Pollution Research International*, 28, 53953 - 53982. <https://doi.org/10.1007/s11356-021-14302-w>
- Teece, D. J. (2018). Business models and dynamic capabilities. *Long Range Planning*, 51(1), 40–49. <https://doi.org/10.1016/j.lrp.2017.06.007>
- Teece, D. J., Peteraf, M., & Leih, S. (2016). Dynamic capabilities and organizational agility: Risk, uncertainty, and strategy in the innovation economy. *California Management Review*, 58(4), 13–35. <https://doi.org/10.1525/cmr.2016.58.4.13>
- Wachiuri, E. W. (2023). The influence of supplier capacity on the performance of state corporations in Kenya. *Journal of Procurement & Supply Chain*, 3 (1), 1-9.
- Wieland, A., & Durach, C.F. (2023). Two perspectives on supply chain resilience. *International Journal of Physical Distribution & Logistics Management*, 53(5/6), 429–446.
- Xie, Z., Tian, G., & Tao, Y. (2022). A Multi-Criteria Decision-Making Framework for Sustainable Supplier Selection in the Circular Economy and Industry 4.0 Era. *Sustainability*. <https://doi.org/10.3390/su142416809>
- Yu, W., Chavez, R., Jacobs, M.A., & Feng, M. (2023). The role of supplier flexibility in enhancing supply chain performance under uncertainty. *Supply Chain Management: An International Journal*, 28(4), 785–802.
- Zhang, Y., Wang, L., & Li, J. (2024). Green innovation capability and sustainable competitive advantage: Evidence from emerging economies. *Business Strategy and the Environment*, 33(2), 1185–1203.