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Sustainable supplier selection factors and supply chain performance in the Nigerian healthcare industry

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Background: There has been considerable effort amongst commercially-oriented services firms towards achieving sustainable supplier selection. However, little is known about the specific sustainability factors employed by healthcare supply chain managers when selecting medical materials vendors in developing economies, and the impact that such selection approaches has on the buying firm's performance.

Objective: This study examines the sustainability factors mostly considered by Nigerian healthcare supply chain managers in their supplier selection processes. It further assesses the supply chain performance impact of the identified sustainable supplier selection factors.

Methodology: The study adopted a quantitative survey approach to randomly collect and analyse primary data from a large sample of 116 logistics and supply chain executives in 58 healthcare organisations in Nigeria. The descriptive scores (mean and standard deviation) were summarised and used to estimate the relationship among variables.

Results: Overall, the results suggest that economic sustainability towers above other sustainability factors for the selection of healthcare suppliers in the context of this study. In addition, economically sustainable supplier selection correlates strongly and positively with supply chain performance, while social sustainability supplier selection had moderate correlation with performance.

Conclusion: Based on these findings, it is our conclusion that most healthcare supply chain managers in Nigeria attaches importance to economic sustainability factors in their supplier selection process than environmental and social sustainability factors.

Keywords: sustainability; supplier selection; procurement; triple-bottom-line; sustainable supply chain management.

Introduction

Organisations are constantly required by the relevant stakeholders to implement sustainability initiatives in their supply chain management processes including supplier selection. Sustainable supplier selection entails the integration of both socio-economic and environmental factors into the processes of selecting a supplier (David, Alexander & Chee 2017). It may also be viewed as the practice by which suppliers are purposefully selected on the basis of their social, economic and environmental background to function as part of the firm's supply chain (Sarkis & Dhavale 2015). The idea of selecting suppliers on their social, economic and environmental antecedents arise from the need to achieve sustainable development, which is defined by the Brundtland Commission as meeting today's developmental needs in a way that do not impede the achievement of future generation needs (Mensah & Casadevall 2019). In addition, as firms aim towards leanness and competitive advantage, their supply chains become more and more vulnerable to disruption that sometime exposes the last-mile customer to adverse social, economic and environmental hazards (González, Quesada & Mora-Monge 2004; NZBCSD 2003).

To guard against the customer vulnerability, firms are expected to plan and organise their internal resources and processes in such a manner that integrate sustainability requirements into their supply chain management functions including supplier selection. Granted that suppliers are not integral members of a firm's internal supply chain system, their activities are, however, capable of enhancing an organisation's cost saving, and the realization of social and environmental goals. Moreover, as firms deepen their supplier selection processes, they gain meaningfully beyond economic incentives (Stefan & Martin 2008). Consequently, it is vital that managers begin to

develop capabilities to successfully select suppliers who would enhance the achievement of as much economic, social and environmental advantages as possible (Muhammad, Saeed & Wolfgang 2019).

In manufacturing and many retail sectors of advanced economies, evidence abound where suppliers are selected by sustainability standards (Ghadimi & Heavey 2014; Mani, Agrawal & Sharma 2015; Maria, Hana & Helena 2019; Ogunlela & Lekhanya 2016), and how their supply chains performance are impacted in the process (Ghadimi & Heavey's 2014; Sarkis & Dhavale 2015). However, little is known about the specific sustainability factors considered by healthcare organisations in developing nations when selecting suppliers of health commodities (materials, equipment and products). Quantitative studies of the specific factors and supply chain performance (SCP) outcomes of selecting a sustainable healthcare supplier in less industrialised economies are still rare.

The objective of this study was to address the above gap in two main ways. Firstly, by identifying the specific factors which are considered as important by healthcare supply chain managers in Nigeria when selecting a sustainable supplier. Secondly, by examining the specific SCP outcomes of implementing the sustainable supplier selection. Achieving these objectives empirically would add significantly to the supply chain sustainability body of knowledge in terms of developing context-specific factors of sustainable supplier selection. Besides, the findings would assist to shape policy direction for the efficient and responsive management of healthcare supply chains.

Literature review and hypothesis

Sustainable supply chain management has become a contemporary issue and a significant aspect of management research. The literature on sustainable supplier selection often considered as an important element of supply chain management is also widespread (Duque-Uribe, Sarache & Gutiérrez 2019). For instance, a study conducted by Bjørn and Hauschild (2013) suggested some broad sustainable supplier selection issues or criteria used among public sector health institutions including delivery quality, ease of congestions, truck-loading capacity, total distance travelled by oldest truck in the suppliers' fleet, traffic safety procedures, eco-driving capabilities, dependable delivery, and credible financial strength and liquid position.

Similarly, Maria et al. (2019) conducted 10 semi-structured interviews on Swedish third-party logisticians and transporters with the view to ascertain sustainability issues associated with hospital supplier selection. Their findings include amount of energy consumption from renewable sources, fuel economy, percentage of suppliers using environmental criteria for collaborating with buyers, type of delivery truck and number of aged vehicles in delivery fleet, average fleet CO_2 emission and number of trucks with pollution-abatement technology.

The works of Kannan, Govindan and Rajendran (2015), and Hutchins and Sutherland (2008) explored the social sustainability issues in supplier selection. Their studies suggest that some social sustainability issues confronting buyers and service providers when selecting suppliers/ Third Party Logistics (3PL) include the extent and perception of staff training by the company, respect to employee rights, priority accorded to worker's safety, health and welfare, respect to stakeholder rights, respect to local community, laws and policies, investment in community welfare, and the willingness to share and disclose information.

In another study involving 245 general hospitals and primary health centres in Italy, González et al. (2004) found that 85% of the surveyed hospitals and health centres attaches more significance to the consistency of service delivery in the form of quality and on-time delivery compared to those who select suppliers on the basis of social factors. Similarly, Duque-Uribe et al. (2019) systematically reviewed the sustainable supply chain management literature and developed a framework for identifying the sustainable supplier selection practices capable of enhancing sustainable performance in hospitals. The proposed framework was composed of nine sustainability practices including strategic supplier management, ethical purchasing, warehousing costs, inventory quality, transportation and distribution environmental hazards, information and technology security, energy saving, water pollution, and hospital waste disposal.

Lambbert, Adams and Margaret (2006) employed mail survey to examine the specific criteria employed by 299 American hospitals purchasing managers in selecting coagulation reagent suppliers. They reported that product quality metrics (reliability and stability), customer support services, technical service responsiveness, employee safety, salesforce honesty, environmental consciousness in packaging, and reagent waste disposal were the key components of hospital supplier selection.

Ghadimi and Heavey (2014) utilised the efficient Fuzzy Inference System (FIS) to evaluate the sustainability of suppliers specifically operating in medical device industry. Their study concluded that medical device manufacturer can move towards sustainable manufacturing by incorporating certain sustainability criteria into procurement and supplies activities. Amongst the sustainability criteria for medical device supplier selection included economic sustainability criteria- (quality, service delivery, costs minimisation and technical capability); social sustainability included health and safety, and supplier's employment practices, while environmental sustainability included green image, pollution control, and green competences in packaging.

The concept of SCP is widespread in the literature. It implies the outcome of adopting or implementing supply chain management practices and procedures in the business processes. The outcome may be a financial indicator such as cost reduction, profitability or non-financial (operational)

indicators such as process speed, product quality, dependability, flexibility, extent of learning. However, following Balance Scorecard Model and the Supply Chain Operations Reference (SCOR) model, there is increasing propensity for the adoption of a combination of both performance measurement metrics in supply chain management operations (Bigliardi & Bottani 2014; Gunasekaran, Patel & Tirtioglu 2001).

Measuring the performance impact of supply chain processes such as supplier selection has been a key factor in many sustainable supply chain management studies, nevertheless with mixed findings. For instance, Horváthová (2010) reported some inconsistencies in the relationship between environmental practices and financial performance of healthcare supply chain. Similarly, Fujii, Iwata and Kaneko (2013) observed that improved environmental practices are positively related to enhanced financial performance. Golicic and Smith (2013) carried out a review of sustainable supply chain management and found that 24 out of 45 empirical studies reported positive relationship between the environmentally sustainable supply chain practices and a firm's performance, while the remaining 21 studies showed a negative relationship.

Conversely, some researchers found a positive impact of sustainable supply chain practice on performance. For instance, Ehrgott et al. (2011) reported a positive effect of sustainable supplier selection on the performance of emerging economies' supply chain in terms of improving the buying organisation' staff health and safety, less safety incidences and enhancing the level of learning and innovation. Carter and Easton (2011) found a positive influence on SCP in terms of less material wastes, less transport costs, and high recycling rates. Wu, Chuang and Hsu (2014) reported that improved learning capacity, enhanced information sharing, increased level of supply chain innovation, and successful collaboration and partnership are linked to the sustainable selection of suppliers.

Despite the conflicting outcomes, and the dearth of healthcare specific investigation of performance effect of sustainable supplier selection, performance measurement of sustainable supplier should be particularly important in the context of healthcare where sustainability is considered a key success factor. This study therefore contributes to knowledge by linking supplier sustainability to the performance of healthcare supply chain in terms of improved corporate reputation and enhanced capacity to learn and innovate. Consequently, the impact of specific sustainable supplier selection practice on SCP in healthcare service is measured in this study.

In line with the specific goals of this study, the following hypotheses were tested in this research:

H1: Environmental sustainability is an important factor in healthcare supplier selection process

H2: Social sustainability is an important factor in healthcare supplier selection process

H3: Economic sustainability is an important factor in healthcare supplier selection process

H4: A combination of environment, social and economic sustainable supplier selection factors are positively related to healthcare SCP.

Methodology

Sample selection and data collection

A random sample of 420 top and middle level supply chain managers in 58 healthcare-related organisations in Nigeria made up this study. They were drawn from registered public and private healthcare sector organisations. The database of Corporate Affairs Commission and the Federal Ministry of Health provided the framework in which samples were drawn. For the purpose of inclusion, the targeted organisations had to have an established purchasing or procurement unit/department, substantially purchase from local contractors, employ at least 10 purchasing personnel, and the Head of procurement/purchasing unit must be a certified supply chain management or procurement/purchasing professional. Professional certification for the unit head was included as a measure of ensuring that someone knowledgeable in sustainable supply chain management is responsible for the administration of the research instrument.

A survey approach was employed in this study, and copies of close–ended items questionnaire were personally addressed to the heads of the companies' procurement department/units. Although the respondents were mainly from the purchasing department of selected companies, some were also drawn from the production planning and quality control units of pharmaceutical production firms in particular. This path was taken because the sets of respondents, by their nature of job responsibilities, were acquainted with sustainability requirements and strategies.

Data were collected through mailed questionnaires. The personal administration of questionnaires on respondents was not possible because of the restriction posed by the COVID-19 pandemic. Consent for participation in the survey was sought from the respondents before mailing the questionnaire. Phone call reminders were made to the heads of the units every 2 weeks after mailing the questionnaire. This procedure was in line with the suggestions from Dilman (2000) in designing and administering survey instruments. Data collection which started by March was then completed by July 2020. A total of 116 copies of usable questionnaires were received from the sample representing an effective response rate of 28%. Following the suggestion of Hair et al. (2006) of a minimum sample size of 100–150 respondents, and a minimum 20% response rate for supply chain management study Pagell et al. (2004), it can be concluded that the respondent sample

TABLE 1: Summary of responses.

Organisation type	Sample size	Number of respondents	Rate of response (%)
Medical centres	154	43	27.9
Teaching hospitals	33	9	27.3
Pharmaceuticals	120	32	26.7
Humanitarian organisations	48	10	20.8
Healthcare regulators	12	3	25.0
Medical diagnostics	53	19	35.8
Total	**420**	**116**	**28.0 (Average)**

size is adequate for this study. Table 1 summarises the response characteristics.

Non-response bias was verified through comparison of the early retrieved questionnaire and those returned at a later date. Ten items each were randomly selected from the two sets of surveys and a sample *t*-test was conducted. The results revealed no significant differences existing among the 10 items subjected to test (p = 0.321). This suggests that the problem of non-response bias does not influence the robustness of the findings.

Variables and measurement

The questionnaire was designed to capture the constructs and measure the variables of this study. It measured what healthcare supply chain managers considered as sustainable when selecting suppliers, and how these sustainability factors enhances their performance outcomes. Following the triple bottom line sustainable supply chain literature (Okwu & Tartibu 2020; Sarkis, Zhu & Lai 2011), a three-dimensional construct was used to measure sustainable supplier selection, namely economic sustainability, social sustainability, and environmental sustainability factors. A total of 14 items for these three dimensions were taken from extant literature with already established validity and reliability (Maria et al. 2019; Sarkis et al. 2011; Xiongyong & Zhiduan 2018). Following Matthias et al. (2011), and Xiongyong and Zhiduan (2018), SCP was measured by two indicators — learning innovation and corporate reputation.

The age and size of the firms was used as moderators of the relationship between supplier selection factors and SCP. Firm size and age has been used substantially to estimate the effect of moderators on statistical relationships in supply chain management and sustainability studies (Su-Yol 2008; Zhu, Sarkis & Geng 2005). To measure firm size, the total number of employees was used as the proxy, while the number of years in healthcare business operation was used as proxy for age. The instrument (Appendix 1) consisted of 23 closed-ended items measured along the 5-point Likert scale where strongly agree = 5 and strongly disagree = 1.

Instrument validation

Content validity for the questionnaire items was supported through the selection of items from extensive literature review. The pre-study discussion with contact persons (Heads of purchasing units) also helped in validating the design content of the instrument. Reliability of the survey instrument was estimated using Cronbach's alpha coefficient. The results are shown in Table 2. As can be observed, all the reliability coefficients exceeded the acceptable 0.70 benchmark (Nunnally 1978), thereby suggesting that the items capture the essence of the study.

TABLE 2: Reasons for selecting sustainable healthcare supplier (N = 116).

Sustainable supplier attributes	Cronbach coefficient	%	Mean	SD	Rank
Environmental sustainability	0.79				
Pollution control	-	43.8	2.82	0.74	11
Waste and hazardous materials management	-	51.3	2.90	0.76	10
Competencies for green packaging	-	71.0	3.85	0.73	5
ISO 14001 certification	-	68.0	3.59	0.78	8
Public disclosure of environmental records	-	42.5	2.75	0.76	12
Social sustainability	0.82				
Workers health & safety	-	51.2	3.93	0.85	4
Work and business ethics	-	50.8	3.84	0.87	6
Human right	-	45.5	3.14	1.34	9
Employee education	-	40.1	2.70	1.24	13
Social responsibility	-	37.3	1.28	2.62	14
Economic sustainability	0.74				
On time service delivery	-	73.3	4.45	1.43	2
Health product quality	-	84.2	4.32	1.31	3
Flexibility	-	77.8	3.76	0.66	7
Contract cost	-	72.1	4.92	1.26	1

Note: Rank the following sustainability attributes to reflect your reasons for choosing a health commodity supplier.

Results and discussion

Sustainable supplier selection factors

Descriptive results in Table 2 summarise the findings regarding the factors considered by healthcare supply chain executives when selecting a sustainable material supplier. The respondents were asked to rate each item under a 5-point Liker-type scale to indicate their agreement on how important each sustainability sub-component is to their supplier selection decision. The mean score of $\geq$ 3.00, derived by dividing the sum of the scale by 5, was used as an index for describing the responses and making decision. Thus, a sustainability construct with a mean score less than 3.0 is taken as disagreement, while a score from 3.0 and above signifies agreement. Data analysis was carried out through the Statistical Package for the Social Sciences (SPSS) technology, Version 22.

Nine supplier sustainability attributes were highly rated (positive agreement) by the respondents. In the order of ratings, Results in Table 2 depicts the following: Contract cost (Mean = 4.92, SD = 1.26), on-time service delivery (Mean = 4.45, SD = 1.43), consistent product quality (Mean = 4.32, SD = 1.31), health and safety of employees (Mean = 3.93, SD = 0.85), competencies for green packaging (Mean = 3.85, SD = 0.73), work and business ethics (Mean = 3.84, SD = 0.87), and flexible delivery system (Mean = 3.76, SD = 0.66), ISO 14001

certification (Mean = 3.59, SD = 0.78), and human right emphasis (Mean = 3.14, SD = 1.34).

As revealed, economically sustainable factors were the dominant reasons for considering a supplier. In fact, three of the four dimensions of economic sustainability, namely contract (purchase) cost, delivery timeliness, and quality of product delivered occupied the top three ranking of healthcare supplier selection criteria. This may suggest that healthcare supply chain managers in the studied area attached more importance to these sustainability attributes than others for the purpose of selecting a supplier. In terms of social sustainability factors for selecting suppliers, two factors, namely 'health and safety of workers' and 'work and business ethics' were the major considerations. Similarly, in terms of environmental sustainability factors, 'ISO 14001 certification' and 'Competencies for green packaging' were the highly-rated supplier attributes.

It appears that many of the environmental sustainability factors were not given much attention by healthcare supply chain managers in this context. For instance, three of the five environmental sustainability factors (pollution control, waste and hazardous materials management, public disclosure of environmental records) occupied the bottom echelon of the ranking. However, the need to develop competencies for green packaging and obtaining ISO 14001 certification was a major consideration for selecting a medical product supplier.

Relationship between sustainable supplier selection and supply chain performance

The results of bivariate correlation analysis is presented in Table 3. It shows the relationship among study variables. Specifically, a statistically significant but moderate correlation exists between socially sustainable supplier selection ($r = 0.46$, $p < 0.01$), and SCP. In the same vein, economically sustainable supplier selection correlates strongly and positively with SCP ($r = 0.66$, $p < 0.01$). This may suggest that an increase in economic and socially related sustainability supplier selection variables would yield similar increase in SCP measures in terms of organisational learning and innovation, and corporate reputation. Firm size also shows significant but moderate association with SCP ($r = 0.15$, $p < 0.01$). However, an insignificant and negligible relationship was found between environmentally sustainable supplier selection and SCP ($r = –0.08$, $p > 0.01$).

Discussion and implications

Considerations for the selection of sustainable healthcare material supplier in a Nigerian context have been studied. The findings reveal that the economic sustainability consideration ranks the highest among the factors. In terms of environmental sustainability, the factors most considered by healthcare supply chain professionals included the need to develop competencies for green packaging and obtaining ISO 14001 certification was a major consideration. Public disclosure of environmental records, waste and hazardous materials management, and pollution control requirement were ranked the bottom lowest for selecting suppliers. Contrary to the expectation and findings from previous studies (Bjorn & Hauschild 2013; Maria et al. 2019), healthcare respondents seem to be saying that environmental issues like pollution control, waste and hazardous materials management, and public disclosure of environmentally friendly records were not important factors for selecting the suppliers. However, the suppliers' competence in environmentally friendly packaging, and showing evidence of ISO 14001 environmental management certification were important factors. Therefore, it means that healthcare firms who are not incorporating environmental sustainability factors into their choice of medical material supplier may be violating legal and regulatory compliance and therefore exposing their companies to sanctions, litigations as well as compromising their corporate reputation. Again, the findings here refute previous research carried out by González et al. (2004), Bjorn and Hauschild (2013) which relate sustainable supplier selection to eco-efficiency factors such as pollution control, waste management, and environmental record disclosure.

It was also proposed in the course of this study that socially sustainable supplier selection is positively related to healthcare SCP. The results revealed a positive but moderately significant association amongst social sustainability factors and healthcare SCP. This implies that health care organisations with highly rated supply chains view social sustainability as an important factor that merits consideration for the selection of suppliers of medical materials and consumables. Another important implication of this finding is that by paying attention to social factors in the selection of healthcare suppliers, the performance of healthcare supply chain could be boosted. For instance, the buying healthcare firms make significant gains in understanding the ethical standards to uphold, determining the safety and welfare requirements to incorporate into the sourcing process, and become aware of the required humanitarian elements for success in healthcare supply chain management.

TABLE 3: Pearson correlation matrix ($N = 116$).

	Sustainable supplier selection construct	Mean	SD	1	2	3	4	5	6
1	Environmental sustainability	2.67	0.75	1.00					
2	Social sustainability	4.26	1.37	0.33***	1.00				
3	Economic sustainability	4.47	1.41	0.25**	0.32**	1.00			
4	Supply chain performance	4.61	1.32	-0.08	0.46***	0.66***	1.00		
5	Company size†	4.14	1.26	0.16**	-0.07	0.04	0.15**	1.00	
6	Age of company	19.08	10.43	0.21**	0.26***	0.06	-0.14	0.08	1.00

†, Natural logarithm of number of workers employed by sample firms. ***$p < 0.01$, **$p < 0.05$.

Moreover, by attaching importance and addressing social issues in supplier selection, upstream healthcare managers tend to record operational efficiency in their performance; a notion proposed by Bai and Sarkis (2010) and Mani, Agrawal and Sharma (2014). Accordingly, in the course of selecting suppliers on the basis of social sustainability, healthcare firms gain more insights on how to successfully conduct business with indigenous suppliers, and also learn to innovate their business strategies. In addition, the focal firm develops expertise on supplier management, and enhance their customer reputation level which is consistent with previous studies that reported positive relationship between social sustainability supplier selection and corporate performance (Ghadimi & Heavey 2014; Mani et al. 2015; Matthias et al. 2011). These findings present important insights to healthcare supply chain managers in other developing nations who may be interested in using the socially sustainable approach for supplier selection. Managers in other nations may develop sustainable supply chain policies for the selection of material suppliers by making use of the social dimensions analysed in this study.

A relatively high correlation between economically sustainable supplier selection and SCP has been established in this study. The important implication of this finding in practice is that economic factors such as delivery timeliness, history of past supplies, financial strength and competitive quotation are mostly considered by healthcare supply chain professionals. Again, this finding is in line with the outcome of Muhammad et al. (2019) which in their study found socio-economic factors as drivers of sustainability supply chain implementation, and the work of Su-Yol (2008) which reported economic factors as one of the drivers for the participation of small- and medium-sized suppliers in green supply chain initiatives. The importance placed on economic sustainability considerations for the selection of healthcare suppliers in the study area calls for better insight and additional research to unravel the reasons that might account for this preference amongst healthcare supply chain professionals. Further findings confirm previous study (Su-Yol 2008; Zhu et al. 2005) that firm size can strengthen, diminish, or otherwise alter the sustainably supplier selection factors considered by healthcare supply chain organisations. Thus, performance factors in terms of corporate reputation and learning innovation can be altered by the size of the firm and how it affects the company's view as highly reputable among industry players, and its view in the market as championing innovation.

Conclusion and recommendations

This research sought to understand what Nigerian healthcare supply chain managers considered as important sustainability factors when selecting suppliers. It was also part of the objective to find out how the identified sustainability factors enhance their SCP in terms of learning and innovation and corporate reputation. This study makes contributions to the sustainable supply chain body of knowledge in at least four main ways. Firstly, healthcare supply chain managers in Nigeria seems not to accord much significance to environmental sustainability in their supplier selection decision. Secondly, economic sustainability is the paramount consideration amongst healthcare supply chain professionals for the selection of medical material suppliers. Thirdly, both the social and economic sustainability supplier selection factors were positively and significantly related to SCP in terms of strengthening the buying firm's learning and innovation capability, and enhancing their reputation amongst suppliers. Lastly, while firm size regulates the relationship between sustainable supplier selection and healthcare SCP outcomes, the age of the focal firm- the buyer has no significant moderating effect on the model.

Going by these findings, it is important that healthcare managers begin to actively consider suppliers that are environmentally sustainable in their activities. This is particularly important now because the former perception of sustainability as a matter of goodwill with no direct impact on an organisation's bottom line has changed over the years. Now, organisations need to actively incorporate sustainability principles into their core business strategies. It is therefore important to comply with not just the social requirements but the entirety of the triple bottom line of sustainability – people, planet and profit. This is important to maintain compliance and reduce regulatory pressure and sanctions, and enhance reputation and brand management.

Limitations and areas of further research

Sustainability considerations have been at the front burner of research in recent years. This research has identified the specific factors which are considered as important by healthcare supply chain managers in Nigeria when selecting a sustainable supplier. However, our study was limited by the fact that the sample considered the healthcare industry alone. Future studies can focus on other industries to further validate the findings. Furthermore, future studies can be carried out using sample from other developing countries apart from just one as was the case in this study. In addition, future study could examine why healthcare supply chain managers in Nigeria seems to place less importance on environmental sustainability in their supplier selection process. Finally, our model and measurements could be further refined through interviewing supply chain practitioners rather than relying on questionnaire survey alone as the major data collection instrument.

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Competing interests

The authors have no competing interest in the study.

Authors' contributions

J.N. provided the concept, analysis, and draft copy. E.A.A. designed the methods, validated instrument and conducted the investigation. I.B. provided the software, resources, and administered the research project, while N.K. carried out data curation, review and editing of the article.

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Data availability

All relevant data supporting the findings of this study are available within the article.

Disclaimer

The views and opinions expressed in this article are those of the authors and do not necessarily reflect the official policy or position of any affiliated agency of the authors.

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Appendix 1

Sustainable supplier selection questionnaire scale items

The respondents were told: 'This survey is targeted at registered healthcare organisations/institutions that purchase medical supplies (equipment, drugs, consumables, etc.) from indigenous contractors. You should complete this questionnaire if you buy directly from indigenous suppliers'.

Please rank the following sustainability attributes to reflect your reasons for choosing a health commodity supplier. Use the scale: Strongly agree = 5, slightly agree = 4, Neutral = 3, Disagree = 2, strongly Disagree = 1

A. Environmental Sustainable Supplier Selection

In selecting new indigenous contractors for medical supplies, our company ensures that the supplier:

1. Has a well-established pollution control procedure and policy
2. Demonstrates knowledge of proper waste and hazardous materials management
3. Has capacity and human competencies to invest in environmentally friendly packaging system
4. Presents evidence of ISO 14001 Environmental Management Certification or registration with Federal Environmental Protection Agency (FEPA)
5. Discloses relevant environmental compliant records

B. Socially Sustainable Supplier Selection

When selecting new indigenous contractors for medical supplies, our company ensures that the supplier:

1. Demonstrates evidence of seriousness with health, welfare and safety of its employees
2. Maintains high ethical standard in their own sourcing processes
3. Has no discriminatory practices existing in the supplier organisation and that employees' rights are not impinged on
4. Demonstrates evidence of training and developing its employees on sustainability requirements
5. Has considerable involvement in humanitarian and community services (CSR)

C. Economic Sustainability

When selecting new indigenous contractors for medical supplies, our company ensures that the supplier:

1. Shows evidence of consistent on time service delivery
2. Is known for delivering good quality healthcare product
3. Has high capacity to adjust to changing demands within limited time frame (flexibility)
4. Has good financial strength
5. Presents economically competitive quotation/contract cost

D. Corporate Reputation (CR)

1. Our company is highly reputable amongst industry players
2. Our company is well known in the market for championing innovative ideas
3. Our customers know us to be highly dependable

E. Learning and Innovation (LI) in management of supply chain relations

Implementing high sustainability standards in supplier selection enables us to:

1. Learn more about doing business with indigenous suppliers
2. Innovate strategies and develop expertise to managing our suppliers
3. Gain more insights that also enhances the growth of the entire company