Factors Influencing Sustainable Procurement Practices in The Cross River State: An Interpretive Structural Modelling (ISM) Approach

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Abstract- ***The successful implementation of construction projects is usually predicated on the procurement systems adopted. This study aims to assess Sustainable Procurement Practices in the Cross River State using an Interpretive Structural Modelling (ISM) Approach. 100 copies of Questionnaires surveys were carried out using a close-ended questionnaire. The questionnaires were administered to experts and professionals in the engineering management field who were carefully selected. A study shows a response rate of 50.1%. A survey design approach was used in this study. A purposive sampling technique was adopted to select one hundred construction professionals. Data collected were analyzed using descriptive statistics and the Interpretive Structural Modelling (ISM) and MICMAC approaches were also adopted for the analysis. The study to assessed the practices of sustainable construction procurement in the study area, evaluated the key factors influencing the practices, and explore strategies for improvement. In the ISM approach, Reduction in the disruption of civic activities, Security and the promotion of ethical practices, and pollution hampers the success of sustainable procurement were found to be leading factors influencing sustainable procurement practices in the Cross River State. The result shows that factors such as Reduction in the disruption of civic activities will provide an allowance for the seamless transportation of construction materials to site, thereby promoting timely construction activities, security and the promotion of ethical practices, and pollution hampers the success of sustainable procurement, as it poses obstructions to transportation, communication and health. These factors ranked higher compared to other factors, hence having a greater influence in sustainable procumbent practices. Hence, to Foster collaboration and innovation: Collaboration and innovation are key to driving sustainable procurement practices. Organizations should foster collaboration with suppliers, customers, and other stakeholders to identify new and innovative solutions to sustainability challenges.***

Index Terms : Procurement, Nigerian Construction Industry, Circular economy, Sustainable Procurement Practices, MICMAC, ISM

I. INTRODUCTION

The complexities of procurement have become a crucial aspect in determining the success of construction projects, regardless of size (Kolosky, 2024). Purchasing materials, supplies, and other resources for building projects is a complex and difficult procedure. In the context of construction, according to Kolosky (2024), procurement is the process of obtaining all the products, services, and resources needed to complete a construction project. The scope of work involved is extensive and includes everything from procuring raw materials, employing contractors, and acquiring specialized equipment to acquiring licenses, permits, and even skilled labour. Implementing sustainable procurement is a business strategy supported by the circular economy (CE) business model (Nsiah-Sarfo, Ofori & Agyapong, 2023). By reducing waste and pollution, slowing, or stopping resource loops, and recycling, the circular economy departs from traditional linear production systems (Bocken et al., 2016). An important

component of sustainability is CE (Ntsonde and Aggeri, 2021). Sustainable purchasing means considering a product or service's complete lifecycle, from the extraction of raw materials to their eventual disposal. Sustainable purchase decisions are influenced by various factors, including ease of repair and refurbishment, recyclability, and reusability. This guarantees that the goods purchased follow the circular economy's tenets (Liao, 2022). Sustainability of products and services, no doubt, is the bedrock of every business engagement in the twenty-first century with construction industry not being left out.

The Nigerian construction industry plays a vital role in the nation's development, contributing significantly to employment, domestic capital formation and the Gross Domestic Product (GDP), infrastructure, housing, and economic growth (Saka & Adegbembo, 2022). The importance of the construction industry in Nigeria's development cannot be over emphasised. Infrastructure development of every nation is brought to be by the activities of construction industry it engages in building roads, bridges, power plants, and other infrastructure that underpins economic activity and social well-being. It plays a critical role in meeting the growing demand for housing provisions, improving living standards, and fostering a stable society. Construction activities stimulate various sectors like manufacturing, transportation, and finance, contributing significantly to Nigeria's GDP and job creation thereby promoting economic growth. However, project success in this sector is heavily reliant on efficient procurement practices (Oladigbolu et al., 2022).

Effective procurement plays a pivotal role in determining the success of construction projects, whether they are large-scale developments or smaller endeavours. Procurement decisions directly impact the budget by determining material costs, labour expenses, and service fees. The materials sourced and contractors secured through procurement significantly affect the project's outcome and durability. Delays in procurement can lead to setbacks and disruptions in the project schedule (Dunama et al., 2021). The legal and regulatory considerations of construction procurement are not to be downplayed. Procurement involves navigating complex legal and regulatory requirements. Compliance with building codes, zoning regulations, environmental standards, and safety protocols are essential. Failure to adhere to these intricacies can result in costly fines, project delays, and reputational damage. Strategic aspects of procurement should be of critical concerns while planning construction project. Smart procurement decisions foster collaboration and synergy among project stakeholders (Kolosky, 2024). Poor decisions can lead to disputes and conflicts. Hence, a systematic process that requires careful planning, precise execution, with a deep understanding of the construction industry's unique challenges and opportunities should be given adequate attention at the procurement stage. Assembling the right project team is critical. Architects, engineers, contractors, subcontractors, suppliers, and specialists should collectively shape the project (Nsiah-Sarfo, Ofori and Agyapong, 2023). Clear communication and coordination, and goal alignment during team procurement underscore the establishment of a shared understanding of project objectives, timelines, and budget constraints. Effective procurement is not merely transactional; it forms the foundation for successful construction projects, impacting cost, quality, and timely delivery (Kolosky, 2024, Ohamma, Anyanwu and Ejekwu, 2021).

There are a lot of potential areas for improvement in Nigerian construction procurement practices. The enhancements are crucial for achieving sustainable and successful construction projects. There is the lack of strong government commitment to sustainable procurement practices. Nigerian authorities need to actively promote and enforce sustainable procurement policies. This involves revising existing procurement acts to explicitly embrace sustainability principles (Oyewobi, Ija & Jimoh, 2017). The inadequate competence among procurement professionals which serves as a barrier to the realisation of construction project success need to be addressed. Strategy such as ensuring competent individuals handling responsibility for integrating and implementing sustainability aspects needs be encouraged. Proper training and certification programmes can enhance their skills and understanding of sustainable practices.

One of the setbacks of the current procurement practices is that it prioritizes economic aspects over environmental and social factors (Okeke & Nnaemeka-Okeke, 2021), whereas a holistic Triple Bottom Line (TBL) strategy should be encouraged to balance economic, environmental, and social considerations. Procurement decisions should align with sustainable development goals. Promoting research and development of cost-effective, eco-friendly materials and technologies need encouragement to offer sustainable alternatives at competitive prices. Lack of compelling legislation and awareness supporting sustainable procurement are prevailing. Advocacy for legal frameworks that incentivise sustainable practices is an essential requirement towards promoting sustainable procurement practices. Raising awareness among stakeholders about the benefits of sustainable procurement and its positive impact on the environment and society should not be wanting (Oyewobi & Jimoh, 2022). Inefficiencies of construction resources management resulting to high resource consumption and waste generation in construction should disappear. Rather, it should be replaced with resource-efficient practices, such as recycling, waste reduction, and responsible sourcing cum encouragement of circular economy principles. Fragmented communication and collaboration that ensure alignment with sustainability goals among project stakeholders should be fostered.

Limited consideration of the entire life cycle of materials and products need be replaced with integration of life cycle assessment (LCA) into procurement decisions. Evaluation of environmental impacts from extraction to disposal, including energy use, emissions, and recyclability cannot be overlooked. Labour conditions and community impact as social components of sustainable procurement cannot be neglected. Incorporation of social criteria into procurement processes to support local communities, promote fair wages, and consider social well-being are essentials. Insufficiencies of capacity for sustainable procurement implementation must be tackled headlong. The introduction of investment strategy in training programmes, workshops, and knowledge-sharing platforms will empower procurement professionals to drive positive change. Summarily, a concerted effort by stakeholders, including government bodies, industry professionals, and suppliers, is essential to enhancing Nigerian construction procurement practices and achieving sustainable development goals (Oyewobi, Ija & Jimoh, 2017; Oyewobi & Jimoh, 2022). Moreso, Agbesi, Kissi and Adjei-Kumi (2020) indicated that the simultaneous application of the economic, social, and environmental aspects of sustainable procurement in construction are limited. To the best of the author's knowledge, no or only few studies had focused on investigating the factors influencing sustainable construction procurement within the Cross River State construction sector. Therefore, to achieve the aforesaid prospects of sustainable construction procurement, this study intends to assess the practices of sustainable construction procurement in the study area, evaluate the key factors influencing the practices, and explore strategies for improvement.

II. REVIEW OF RELEVANT LITERATURE

To contextualise this study and summarise existing knowledge related to the subject matter of this study, efforts were made to capture relevant literature as foundations to this research. The following stanzas delved into the past body of knowledge on construction procurement.

Concept Of Procurement

There are many definitions of procurement, but generally it is considered as means of obtaining goods and services at the best possible operating costs, in the right quality and quantity, in the right place, at the right time and for the right period. All public procurement of goods and services in Nigeria is expressly governed by the Public Procurement Act 2007 (as amended). In the same vein, the law also established the Office for Public Procurement. In the construction industry, purchasing refers to the processes used to maintain a construction product. It includes all phases of the work and the associated costs (Maduekeh et al., 2022). It can also be viewed as a sequence of actions that are logically connected and also carried out using specific techniques, with the end goal of achieving the main result or a breakthrough. Therefore, there is no doubt that the concept of public procurement is an extremely

important issue in the real estate sector of the economy due to the nature of the sector and its product. The importance of public procurement in any system cannot be overstated. Oladigbolu et al. (2022) and Adewuyi and Ujene (2019) showed that project success depends on a good procurement process. This further highlights the importance of ensuring that the choice of procurement method and advice provided to the client is fully tailored to the needs of the project and its success.

Construction Projects Procurement Methods Adopted In Nigerian Construction Industry

The Nigerian construction industry utilizes a variety of procurement methods, with the choice often influenced by several factors like project complexity, budget, and risk profile. There are variants of the traditional method which includes traditional contract. The traditional contract method is the most prevalent method, involving a fixed-price contract between the client and the contractor (Adewuyi & Ujene, 2019). The contractor bears the risk for cost overruns, while the client has limited control over the construction process. The unit rate contract method sets a price per unit of work completed (for instance, per cubic meter of concrete). The final cost is determined by the actual quantity of work performed, offering some flexibility for the client but requiring clear and accurate measurement protocols. The non-traditional methods include design and build, management contracting, and the public-private partnerships (PPP). In the design and build method, the client appoints a single entity responsible for both the design and construction of the project. This method offers greater cost certainty and control for the client but requires careful selection of a qualified and experienced contractor (Oladigbolu et al., 2022). The client appoints a project manager who oversees the construction process in management contracting. The client's appointed project manager does not directly employ the workforce. This method allows for specialized expertise and flexibility in contractor selection. The public-private partnerships (PPP) involve private entities collaborate with the government to finance, design, construct, and operate infrastructure projects. PPP offers potential benefits in terms of funding, innovation, and efficiency but require complex contractual arrangements and careful risk allocation (Manal et al., 2021).

There are emerging methods of procurement in the country. These include integrated project delivery (IPD), turnkey contracting, direct labour, and force account. Integrated Project Delivery (IPD) uses collaborative approach which focuses on early involvement of key stakeholders throughout the project lifecycle, aiming to optimize design, construction, and operation phases for improved efficiency and reduced risk. On the other hand, the turnkey contracting entrusts the contractor with full responsibility for the entire project, from design and procurement to construction and handover. This method offers a single point of contact for the client but requires careful contract drafting and risk mitigation strategies.

Direct labour in some cases, clients may opt to employ their own workforce for specific tasks, particularly for smaller projects or where specialized skills are required (Alejo, 2015; Hackman et al., 2021). Force account method involves the client directly procuring materials and equipment and managing the workforce, usually for maintenance or repair projects (Stephen, 2021). Force account procurement method is mostly used for special circumstances.

Sustainableconstructionprocuremet

The application and dedicated practice of sustainable procurement is significantly challenging to many firms throughout the world over (Etse, McMurray and Muenjohn, 2023). Messah, Wirahadikusumah and Abduh (2023) asserted that the successful implementation of sustainable procurement of construction works is influenced by the fundamentals of sustainable procurement, sustainable procurement policies and strategies, procurement organization, and sustainable procurement processes. Jimoh et al. (2021) showed that the use of the sustainable practice is influenced by prior knowledge and education of the said practices. Okoye et al. (2021) discussed the factors influencing professionals and contractors' resistance behaviours towards sustainable construction practices in Nigeria. The authors highlighted industry, policy, human, and environment

factors, as well as specific sub-factors with significant influences. Adjarko, Agyekum and Offei (2016) revolved around understanding the benefits of applying project portfolio management for achieving sustainable development in construction contracting organizations and provided insight into key sustainability practices. The study pinpointed eleven potential sustainability practices to consider sustainability as an important factor in the selection and execution of projects regarding contractors' capabilities and resource capacities. Dalibi et al. (2017) perceived about ten hindrances to green building developments in Nigeria, with the perception of green building as an expensive concept being the major hindrance. Other obstacles explained include unavailability of local green building materials, high cost of imported materials, and divergent interests among stakeholders. There is the need to shape industrial attitudes and behaviours towards sustainability in developing construction industries (Maqbool et al., 2022). The study revealed the significant impact of project management practices and integrated approaches on sustainable construction, as well as the moderating role of industrial attitudes and behaviours. The authors showed the importance of strengthening stakeholder and quality management practices using the Ghanaian construction sector as a study sample. Perceptions of compatibility had a significant positive effect on the practice of sustainable procurement, and perceptions of complexity had a significant negative effect on sustainable procurement.

There are many factors that can influence construction project procurement with many variants vis-a-vis project characteristics (size, complexity, risk), procurement methods (traditional, design and build, and so on), client capabilities (experience, expertise), contractor competence (technical skills, financial resources), contractual arrangements (risk allocation, dispute resolution), legal and regulatory environment, technological advancements (e-procurement). Okeke and Nnaemeka-Okeke (2021) examined the state of social procurement practices within the Nigerian construction industry and its alignment with sustainability initiatives. The authors argued that traditional procurement practices need to change to encompass social value requirements, but this is challenging for the supply chain and often carries negative stereotypes towards disadvantaged groups employed by social enterprises. The study canvassed for social procurement in the construction sector which aims at enabling more socially service-oriented sustainable practices. However, significant implementation challenges were noted such as focus on compliance, engagement with existing industry incumbents who lack understanding of social value delivery, and micro-organizations that understand but lack scale. Akindele et al. (2023) asserted that education and training, stakeholder regulation, incentive support, and government and legislative support are key strategies influencing sustainable procurement practices in the Nigerian construction industry. Additionally, factors such as workforce satisfaction, value for money, and creating a healthy environment with high indoor air quality are crucial for achieving sustainable procurement in construction projects in Nigeria (Okeke et al., 2023).

Meanwhile Oyewobi and Jimoh (2022) opined that the lack of sustainable procurement regulatory frameworks, poor economic conditions, and insufficient knowledge act as barriers to implementing sustainable procurement practices in the Nigerian construction sector. Furthermore, the awareness level and prior knowledge significantly influence the extent of usage of sustainable construction practices in Abuja, Nigeria (Jimoh et al., 2022). These findings highlight the importance of education, stakeholder engagement, regulatory frameworks, and awareness in promoting sustainable procurement practices in the Nigerian construction industry. The need for professional bodies and government agencies to educate on sustainable development, and mentorship from international experts in sustainable construction have been suggested. Ultimately, the authors surmise that social procurement could be a strategic tool to create employment for disadvantaged groups and contribute positively to the social sustainability of the Nigerian construction industry (Okeke & Nnaemeka-Okeke, 2021).

Akindele et al. (2023) investigated the significant obstacles to the adoption of sustainable construction practices in Nigeria, alongside strategies to improve them. The study proposed four groups of strategies to

overcome the revealed barriers such as education and training; stakeholder regulation; incentive support; and government and legislative support, with education and training being marked as the most dominant and effective strategy. The research underscores the need for coordinated efforts in knowledge transfer and policy reforms to enhance sustainable construction practices and ultimately aims to assist policymakers, educators, and professional bodies in promoting sustainability in Nigeria's construction industry.

Peprah, Brako and Akosah (2018) emphasized the significance of green procurement in addressing environmental challenges, creating business opportunities, and promoting sustainable development, The study equally highlighted the lack of awareness and understanding of green procurement in district assemblies in Ghana. It called for targeted awareness campaigns and policy reforms to integrate green procurement practices. Nsiah-Sarfo, Ofori and Agyapong (2023) discussed the attention sustainable procurement has received and the challenges faced by developing nations in implementing sustainable procurement strategies. The findings of the study underscore the impact of isomorphic pressures and sustainable leadership on sustainable procurement implementation. It canvassed for coercive actions by development partners. Oke et al. (2023) identified five major clusters of drivers for the adoption of environmental economic practices vis-a-vis operational drivers, stakeholder drivers, market and financial drivers, regulatory and policy drivers, and technological drivers. The influence of stakeholders and government policies, the importance of sustainability for risk management and long-term value, and the role of digitalization in accelerating the adoption of sustainable practices were pinpointed by the study.

The importance of incorporating environmental and social issues in the strategy plans of public organizations, including the challenges in implementing sustainability measures in procurement cycles, and the significance of procurement sustainability in both public and private sectors have been enunciated (Billa, Gyamfi & Adamu, 2021).
According to Aliu et al. (2022), design-and-build and collaborative procurement for successful projects is important. The study identified the various procurement methods in Nigeria, the significant impact of drivers of procurement selection and selection criteria on project delivery. It demonstrated the significance of improvement of the public procurement process. Toriola-Coker et al. (2021) discussed the barriers to sustainable construction practice in Nigeria, highlighting issues such as poor sustainability education in academic institutions, lack of incentives for sustainable design, ignorance of lifecycle cost benefits, resistance to cultural change, and the need for government policies to support sustainable practices. The paper emphasized the importance of education, government intervention, and professional development to overcome these barriers and promote sustainable construction in the country. Agbesi, Kissi and Adjei-Kumi (2020) noted that sustainable procurement practices in public sector construction organizations in Ghana are moderately implemented, with specific practices such as maximum use of limited resources, environmental management system, and providing employment to the community being more prevalent. The economic aspect of sustainable procurement was relatively lacking. However, the study did not delve into the specific challenges faced by public sector organizations in fully implementing sustainable procurement practices. Concomitantly, the study did not explore the long-term effects or outcomes of the sustainable procurement practices implemented by the public sector organizations. Moreso, the study did not address the potential barriers or limitations in the implementation of sustainable procurement practices beyond what was reported by the respondents.

Moses, Lawani and Hare (2023) discussed the importance of sustainable practices in government construction projects in Ghana to meet United Nations Sustainable Development Goals (UNSDGs), the efforts made by the government to utilize a database system for tracking achievements, the need for a comprehensive sustainable development policy framework, and the primary responsibilities of member nations in using the database system to monitor progress on UNSDG goals and targets. According to Ogunsanya et al. (2022), the commonly cited hindrances to sustainable procurement are perceptions that it increases cost, lack of awareness of the need for sustainable procurement and the

processes entailed, lack of knowledge required, risk averseness on the part of clients, legal constraints, leadership challenges and inertia.

III. RESEARCH METHODOLOGY

At the onset of this study, an exploratory survey and literature search were conducted to identify the major factors that could influence sustainable construction procurement. A total of about forty variables were identified from literatures and pilot studies and were distributed into the two groups based on the type of influence each of the variable exerts on the subject matter of the study (positive or negative). The variables exerting positive influence on sustainable procurement are regarded as the promoters and were accordingly grouped together with the appellation of being drivers of sustainable construction procurement. The variables hindering the successful implementation of sustainable procurement are equally grouped and referred to as the barriers to sustainable construction procurement. The study adopted a survey research design involving the administration of structured questionnaire on professionally stratified selected population. The study sample consists of two key stakeholders in the construction industry namely consultants and contractors. Cross river state was used as the study area due to convenient and closeness to researcher.

Since the study was based on survey of respondents' opinions of factors that are usually measured on an ordinal scale, the survey was conducted with the assistance of a structured questionnaire. A closed-ended structured questionnaire is simple to complete and may be analysed quickly as claimed by Kothari (2004). There were two sections to the questionnaire (A and B). To ensure the dependability of the obtained data, Section A asked questions concerning the respondent's profile, including their professional affiliations and educational background. Data about the specific goal of the study were sourced for Section B. The respondent's judgments of the variables were given five-point Likert scale ratings, ranging from 1 to 5, where 1 represented the lowest point and 5 the highest point, respectively. The five-point Likert scale rated 1-5 vis-à-vis: Strongly agree (5); Agree (4); Partially agree (3); Disagree (2); and Strongly disagree (1).

A total of one hundred (100) respondents were involved in the study. fifty (50) questionnaires from 28 consultants and 22 contractors were returned: representing an average return rate of 50%. The moderate response rate enhanced the dependability of the results derived from the study and it is traceable to self-administration of the questionnaire and the use of trained research assistants rather than postal method which might lead to haphazard completion at the convenience of the respondents.

The data was collected through a conducted survey and were analysed using Interpretive Structural Modelling (ISM) and another method called MICMAC, which means a cross-impact matrix multiplication. They were applied for data integrity and accurate interpretation's purpose. Interpretive Structural Modelling (ISM) is a modelling technique that allows the specific relationship between related elements to be structured and represented in diagram form. ISM has been used as a modelling method to analyse green value chains, total quality management and reverse logistics (Mangla et al., 2018). The application of the method is useful when there are factors of uncertain relationship that affect an issue by transforming them into an understandable and structured form (Raut et al., 2019). The use of ISM is intended when it is desirable to use systematic and logical thinking to tackle a complex issue (Ravi et al., 2005). Matrice d'Impacts croises-multiplication appliqúe an classment (abbreviated as MICMAC) is to analyse the driving force and dependency of factors. The MICMAC is a principle that is based on multiplication properties of matrices (Attri et al., 2013). It was conducted to identify the key factors driving the system in distinct categories. Based on their driving force and dependent power, the factors were classified into four categories, namely autonomous factors, linking factors, dependent and independent factors. Autonomous factors have weak driving force and weak dependent force. They are relatively disconnected from the system with which they have few connections, which can be very strong. The linking factors, on the other hand, have both a strong driving force and a strong dependent force. These factors are unstable in that any action on these factors will influence on others and will also have a feedback effect on itself. Dependent factors have a

weak driving force but a strong dependent force while the independent factors have a strong driving force but a weak dependent force. Zhou, Si and Tiwari (2023) asserted that the business strategy, governmental regulations, and customer awareness capitulate to green purchasing behaviour, while the corporate culture, production system, and suppliers have little impact. Osuizugbo and Adenuga (2022) showed that satisfaction, which translates to workforce satisfaction and user satisfaction, value for money, and creating a healthy, nontoxic environment, including high indoor air quality were decisive factors for achieving sustainable procurement in construction projects in Nigeria.

IV. RESULTS AND DISCUSSION

4.1 Characteristics of the Respondents

From Table 1 depicting the analysis of the respondents' characteristics. The result shows that 70.5% of the construction practitioners who partook in the study are male, whereas, 29.5% are female. This implies that the majority of the professionals in the study are male. This also reveals the construction industry is dominated by male gender. Table 1 also reveals that the 71.7% respondents are within the grade of 18 to 60years, while 18.9% of the participants are above 60years. This shows that majority of the participants in this study are full of life and productive working years. Table 1 reveals that 15.7%, 15.7%, 24.5%, 39.6% and 1.9% of the participants in the study hold OND, WAEC/SSCE/NECO/NABTEB, HND, BSC and MSC respectively. The equally shows that all the respondents in this study are educated and experienced enough to provide knowledgeable and dependable information. Additionally, the result reveals that the respondents have a good work experience and have worked for a number of years in the construction industry. Hence, the information gotten from all of them are sufficient and reliable for the study.

Table 1. Respondents' Characteristics

Respondents' Characteristics	Sub- characteristics	Frequency	Percentage (%)
Gender	Male	36	70.5
	Female	15	29.5
	Total	51	96.2
Age	Below 18 years	3	87.9
	18 to 60 years	38	71.7
	Above 60years	10	18.9
	Total	51	100.0
Educational Qualification	OND	8	15.7
	WAEC/SSCE/NECO/NABTEB	8	15.7
	HND	13	24.5
	BSC	21	39.6
	MSC and ABOVE	1	1.9
	Total	51	96.2
Position	Project Manager	23	43.4
	Site Manager	6	11.3
	Supervisor	3	5.7
	Resident Consultant	8	15.1
	Contractors Employee	11	21.6
	Total	51	100
Membership Status	Student Member	1	2.0
	Technician Member	5	11.8
	Licentiate Member	9	29.4
	Associate member	15	58.8
	Graduate Member	14	86.3
	Corporate Member	7	13.7
	Total	51	

Years of Experience	From 6 to 10years	11	21.6
	From 11 to 15 years	10	41.2
	From 16 to 20 years	23	286.3
	Above 20 years	7	100.0
	Total	51	

4.2 Questionnaire Distribution and Response Rate

Table 2 reveals the result of questionnaire distribution and return rate. One hundred (100) construction practitioners, were purposively selected., and copies of the questionnaire were distributed by the researcher to construction practitioners. A total of 51 copies were returned, arriving a response rate of 50%. This shows that the response rate is good and sufficient. The result is in line with Ijosiga and Odubuker (2016), who revealed that a response rate of at least 50% is judged good for analysis and presentation, a response of 60% is good, and a response rate of 70% is measured to be very good.

Table 2. Questionnaire Distribution and Response Rate

Respondents	**Questionnaire Distributed**		**Frequency Returned**	**Response Rate (%)**
Professional Affiliation	20	NIA	9	17.0
	25	NIOB	11	20.8
	11	COREN	5	9.4
	10	NSE	10	8.9
	12	NIStrutE	9	17.0
	15	NIQS	6	11.3
	7	NIEVS	1	1.9
	100	Total	51	100
Professional Status		Consultant	29	56.9
		Contractor	22	43.1
		Total	51	100.0

4.3 Assessing the Practices of Sustainable Construction Procurement (Social Practices)

The result in table reveals the practices of sustainable construction procurement among construction professionals in Cross River State Nigeria. In accordance with the decision rule in this study, which states that any practices of sustainable construction procurement with an overall mean score (MS) of 1.0-1049. 1.5-2.49, 2.5-3.49, 3.5-4.49, and 4.5-5.0 is regarded to have a very low level of practices (VLLPR); low level of practices (LLPR); moderate level of practices (MLPR); high level of practices (HLPR); and very high level of practices (VHLPR) respectively. The result reveals that there is very high level of practices to Provide employment to the community (MS=4.84), Preventing nuisance from construction operations (MS= 4.76), Minimizing disruption to traffic of local community (MS= 3.60), Community security/wellbeing (MS= 3.96) among construction practitioners in Cross River State. Similarly, construction practitioners are highly aware of Improving working environment and conditions (MS= 3.45), Promoting ethical practices (MS= 3.45) on sustainable procurement practices in the Nigeria construction industry.

Table 3: Assessing the practices of sustainable construction procurement (social practices)

S/N	Social Practices on Sustainable Construction Procurement Practices	Sum	Mean	Rank	Remark
1	Health and	181.	3.54	5	HLP

	safety for workforce and local community/residents	00	90		R
2	Preventing nuisance from construction operations	243.00	4.7647	2	VHLPR
3	Minimizing disruption to traffic of local community	184.00	3.6078	4	VHLPR
4	Community security/wellbeing	202.00	3.9608	3	VHLPR
	Provide employment to the community	247.00	4.8431	1	VHLPR
5	Improving working environment and conditions	176.00	3.4510	6	HLPR
6	Promoting ethical practices	176.00	3.4510	6	HLPR

4.4 Assessing The Practices of Sustainable Construction Procurement (Environmental Practices)

The result in Table 4 shows that there is a high level of practices to Use of recycled and sustainable materials (MS=3.529). Also, there is a moderate level of practices to provide Reusing existing built assets (MS= 3.471), Conserving and improving biodiversity (MS= 3.471), Environmental management system (MS= 3.431), Reducing water, land and air pollution (MS= 3.373), Decreasing energy usage (MS=3.294) and Decreasing water usage (MS= 3.019) on sustainable procurement practices for environmental practice in the Nigeria construction industry.

Table 4: Assessing The Practices of Sustainable Construction Procurement

S/N	Environmental Practices	Mean	Std. Deviation	Rank	Remark
1	Decreasing energy usage	3.294	.70126	6	MLPR
2	Decreasing water usage	3.0196	.67794	7	MLPR
3	Use of recycled and sustainable materials	3.5294	.61165	1	HLPR
4	Reusing existing built assets	3.4706	.67388	2	MLPR
5	Reducing water, land and air pollution	3.3725	.77358	5	MLPR
6	Conserving and improving biodiversity	3.4706	.61165	3	MLPR
7	Environmental management system	3.4314	.70014	4	MLPR

4.5 Assessing the Practices of Sustainable Construction Procurement (Economic Practices)

The result in Table 5 shows that there is a high level of practices to Improving the efficiency of the supply side (MS= 4.412), Maximum use of limited resources (MS= 4.216), Local/area economic growth (MS= 4.177), Use of local material (MS= 4.019), Value for money (MS= 3.863) and Clearly establish needs and evaluate other options (MS= 3.588) on sustainable procurement practices for economic practice in the Nigeria construction industry.

Table 5: Assessing the Practices of Sustainable Construction Procurement

S/N	Economic Practices	Sum	Mean	Std. Deviation	Rank	Remark
1	Clearly establish needs and evaluate	183.00	3.5882	.75303	7	HLPR

	other options					
2	Consideration of whole life costing	197.00	3.8627	.56638	6	HLPR
3	Value for money	197.00	3.8627	.63308	5	HLPR
4	Use of local material	205.00	4.0196	.67794	4	HLPR
5	Local/area economic growth	213.00	4.1765	.62309	3	HLPR
6	Maximum use of limited resources	215.00	4.2157	.54088	2	HLPR
7	Improving the efficiency of the supply side	225.00	4.4118	.63801	1	HLPR

4.6 Interpretive Structural Modeling (ISM) For Factors and Drivers of Sustainable Procurement Practices

Structural Self Interactive Model (SSIM) I

This is the first stage of the ISM process as shown in table 6. With data from the Majority responses, the VAXO functions are established for the respective conditions established and explained in the methodology; V for i reaching j only, A for j reaching i only, X for i reaching j and j reaching i as well, and O for neither i nor j reaching each other. These functions form part of the basis for the ISM process.

Table 6: Structural Self Interactive Model (SSIM) I

Factors (Drivers)	F7	F6	F5	F4	F3	F2	F1
F1 Gaining Competitive Advantage	A	A	V	X	A	A	X
F2 Investor Pressure	O	X	A	X	A	X	
F3 Society Pressure	A	V	V	O	X		
F4 legislative and legal compliance	V	X	O	X			
F5 Develop Good Image	X	X	X				
F6 Desire To Improve Quality On Performance	A	X					
F7 Reduced Risk of Consumer Criticism	X						

In Table 6, we observe that only one part of the diagonal divide is populated, this is to show only the forward reachability of the Procurement Practices (Factors) to each other.

Initial Reachability Matrix (IRM)

In this stage Table 7 shows the IRM factors, the VAXO functions are transformed into ones and zeros based on the reachability conditions for i and j (explicitly explained in the methodology). The reachability of each function has two paths, one for i reaching j, and the other or j reaching i.

Table 7: Initial Reachability Matrix (IRM)

Factors	F7	F6	F5	F4	F3	F2	F1
F1	0	0	1	1	0	0	1
F2	0	1	0	1	0	1	0
F3	0	1	1	0	1	0	0
F4	1	1	0	1	0	1	1
F5	1	1	1	0	1	0	1
F6	0	1	1	1	1	1	0
F7	1	0	1	1	0	0	0

In Table 7, cell F1, F5 contains 1 for V, while cell F8, F1 being the mirror cell of the former contains 0 for A; cell F3, F7 contain 1 for A, while cell F7, F3 being the mirror cell of the former contains 0 for V; cell F5, F6 contains 1 for X, as well as cell F6, F5 being the mirror cell of the former contains 1 for X; lastly, cell F2, F7 contains 0 for O, as well as cell F7, F2 being the mirror cell of the former contains 0 for O, all predicated on the two-way reachability conditions for the VAXO functions.

Final Reachability Matrix (FRM)

In this stage, all cells containing 0, representing factors that have no reachability are checked for

indirect (transitive) reachability (links). The cells with transitive links below are indicated with asterisks (*) and an Orange colouration.

Table 8: Final Reachability Matrix (FRM)

Factors	F7	F6	F5	F4	F3	F2	F1
F1	1*	1*	1	1	1*	1*	1
F2	1*	1	1*	1	1*	1	1*
F3	1*	1	1	1*	1	1*	1*
F4	1	1	1*	1	1*	1	1
F5	1	1	1	1*	1	1*	1
F6	1*	1	1	1	1	1	1*
F7	1	1*	1	1	1*	1*	1*

An example of a transitive link in the table above is the cell F1, F6. For transition into conditional reachability to hold true, the factors must have another factor they are both reachable to. To this end, F1 reaches F4 and F4 reaches F6, therefore F1 reaches F6. The remaining cells with transitive links include: (F1, F6), (F1, F7), (F2, F7), (F2, F5), (F2, F3), (F2, F1), (F3, F4), (F3, F7), (F3, F2), (F3, F1), (F4, F5), (F4, F3), (F5, F4), (F5, F2), (F6, F7), (F6, F1), (F7, F2), (F7, F3), (F7, F6), and (F7, F1), and are illustrated in the table. The transitive links listed are mirrored on the other side of the divide.

Driving and Dependence Power

In this stage shown in Table 8, the cells are summed up to in rows and in columns to give Driving Power and Dependence Power respectively.

Table 8: Driving and Dependence Power

Factors	F7	F6	F5	F4	F3	F2	F1	Driving Power
F1	1*	1*	1	1	1*	1*	1	7
F2	1*	1	1*	1	1*	1	1*	7
F3	1*	1	1	1*	1	1*	1*	7
F4	1	1	1*	1	1*	1	1	7
F5	1	1	1	1	1	1	1	7
F6	1*	1	1	1	1	1	1*	7
F7	1	1*	1	1	1*	1*	1*	7
Dependence Power	7	7	7	7	7	7	7	

As seen in the Table 8, the sum for Driving Power are to the far right end of the table 8, while those for the Dependence Power are to the bottom of the table. Conspicuously, less zeros in the cells results to fewer levels in the iterative (Level Partitioning) process.

Level Partitioning (LP)

This step works in the similitude of Set Theory in mathematics. It is predicated on the establishment of the Final Reachability Matrix shown in Table 9. Upon completion of the FRM is the emergence of the Reachability, the Antecedent and the Intersection Set. The Reachability Set (RS) is a domain for all variables (sectors) that i influences (all the variables that reaches i), the Antecedent Set (AS) is a domain for all the variables that influences i (all the variables that i reaches and the Intersection Set is a domain containing variables that are both in RS and AS.

Table 9: Level Partitioning (LP)

Factors	Reachability Set	Antecedent Set	Intersection Set	Level
F1	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	1
F2	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	1
F3	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	1
F4	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	1
F5	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	1
F6	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	1
F7	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	1

The iteration is carried out for the establishment of the levels, a factor attains a level if and only if it's RS and IS are the same As observed the table above, all

the factors are in level I as they have satisfied the condition. Therefore, there is only one level in this iterative process. This implies that most of the practices, from the respondents' view, are dependent or influence themselves, either forward, backward or both.

Level Partitioning Summary (LPS)

The factors in the their various levels are shown in the table above, factors F1,F2,F3,F4,F5,F6,F7,F8,&F9 in level one. The levels are further shown graphically in the structural model of figure 4.1.

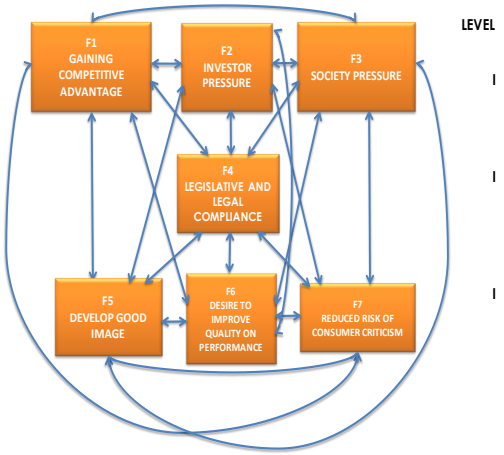
Table 10: Level Partitioning Summary (LPS)

Factors	Reachability Set	Antecedent Set	Intersection Set	Level
F1	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	I
F2	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	I
F3	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	I
F4	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	I
F5	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	I
F6	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	I
F7	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	I

Structural Model for Factors of Sustainable Procurement Practices

The model in figure 4.1 arrays the factors in full with their names and separates them into their respective cadres (levels). All the factors may be in the same level, which implies that they have strong reachability, however, factors F3 and F5, each having a reachability of 6, a point less than the others, are not as strong as factors F1, F2, F4, F6, and F7.

Figure 4.1: Structural Model(Factors)



MICMAC Analysis

MICMAC method, which was developed by Duperrin and Godet in the year 1973, is a structural analysis tool that gives a description of a system using a matrix that connects its constituent components. Figure 4.2 shows two hierarchies that were developed, one based on driver power and the second based on dependence power to study the dispersion of impacts. The MICMAC (Matrice d'Impacts croises multiplication appliqúe an classment (cross-impact matrix multiplication applied to classification) analysis is performed in order to analyze the driving and dependence power of the variables.

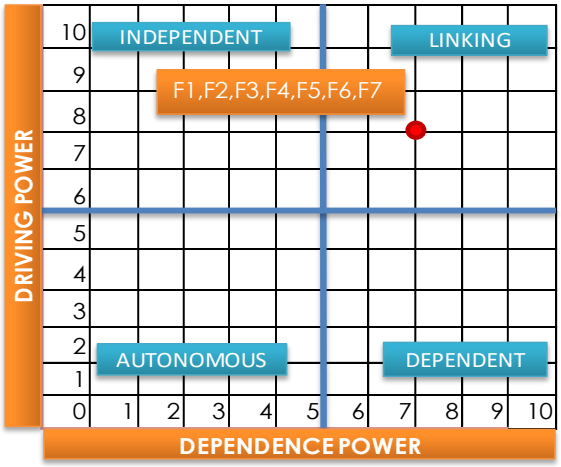


Figure 4.2: MICMAC Analysis

This analysis is carried out to place the variables into four categories as follows:

1. The Autonomous quadrant has weak driving and dependence power. It has no factors in it.
2. Linkage Variables: This category houses factors which have strong driving and dependence power. All the factors fell into this category.
3. Dependent Variables: These variables have weak driving power but strong dependence power. It houses no factor.
4. Independent Variables: These are factors that have strong driving power but weak dependence power. Generally, it is observed that the term 'key variable' is used to refer to variables with a very strong drive, and falls into the category of independent or linkage. No factors were classed here.

Interpretive Structural Modeling (ISM) For Barriers of Sustainable Procurement Practices

Structural Self Interactive Model (SSIM) I: The barriers of sustainable procurement practices are grouped in table 11 according to the Structural Self Interactive Model (SSIM) I and in Table 12 the initial reachability matrix (IRM) outline showing the barriers F1 to F7, also, Table 13 Final Reachability Matrix (FRM) derived from IRM, Table 14 shows the driving and dependence power F1 to F7, Table 15 arrays Level Partitioning (LP) and Level Partitioning Summary (LPS) on the barriers of sustainable procurement practices.

Factors (Barriers)	F7	F6	F5	F4	F3	F2	F1
F1 lack of capacity in required human resource	V	X	O	O	V	O	X
F2 Perceived High Cost of Adopting Sustainable solutions	X	O	A	A	O	X	
F3 Failure To Match Project Needs To Procurement Options	V	X	O	O	X		
F4 Political Interference	V	X	V	X			
F5 Unavailability of Sustainable Materials	O	A	X				
F6 Failure to adhere to quality management processes	V	X					
F7 Delay in payment of contractors	X						

Table 12: Initial Reachability Matrix (IRM)

Factors	F7	F6	F5	F4	F3	F2	F1
F1	1	1	0	0	1	0	1
F2	1	0	0	0	0	1	0
F3	1	1	0	0	1	0	1
F4	1	1	1	1	0	0	0
F5	0	0	1	1	0	0	0
F6	1	1	0	1	1	0	1
F7	1	1	0	1	1	1	1

Table 13: Final Reachability Matrix (FRM)

Factors	F7	F6	F5	F4	F3	F2	F1
F1	1	1	1*	1*	1	1*	1
F2	1	1*	1*	1*	1*	1	1*
F3	1	1	0	1*	1	1*	1
F4	1	1	1	1	1*	1*	1*
F5	1*	1*	1	1	0	1*	1*
F6	1	1	1*	1	1	1*	1
F7	1	1	1*	1	1	1	1

Table 14: Driving and Dependence Power

Factors	F7	F6	F5	F4	F3	F2	F1	Driving Power
F1	1	1	1*	1*	1	1*	1	7
F2	1	1*	1*	1*	1*	1	1*	7
F3	1	1	0	1*	1	1*	1	6
F4	1	1	1	1	1*	1*	1*	7
F5	1*	1*	1	1	0	1*	1*	6

F6	1	1	1 *	1	1	1 *	1	7
F7	1	1	1 *	1	1	1	1	7
Dependence Power	7	7	6	7	6	7	7	

Table 15: Level Partitioning (LP)

Factors	Reachability Set	Antecedent Set	Intersection Set	Level
F1	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	1
F2	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	1
F3	F1,F2,F3,F4,F6,F7	F1,F2,F3,F4,F6,F7	F1,F2,F3,F4,F6,F7	1
F4	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	1
F5	F1,F2,F4,F5,F6,F7	F1,F2,F4,F5,F6,F7	F1,F2,F4,F5,F6,F7	1
F6	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	1
F7	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	1

Table 16: Level Partitioning Summary (LPS)

Factors	Reachability Set	Antecedent Set	Intersection Set	Level
F1	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	I
F2	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	I
F3	F1,F2,F3,F4,F6,F7	F1,F2,F3,F4,F6,F7	F1,F2,F3,F4,F6,F7	I
F4	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	I
F5	F1,F2,F4,F5,F6,F7	F1,F2,F4,F5,F6,F7	F1,F2,F4,F5,F6,F7	I
F6	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	I
F7	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	F1,F2,F3,F4,F5,F6,F7	I

Structural Model On Barriers on Sustainable Procurement Practices

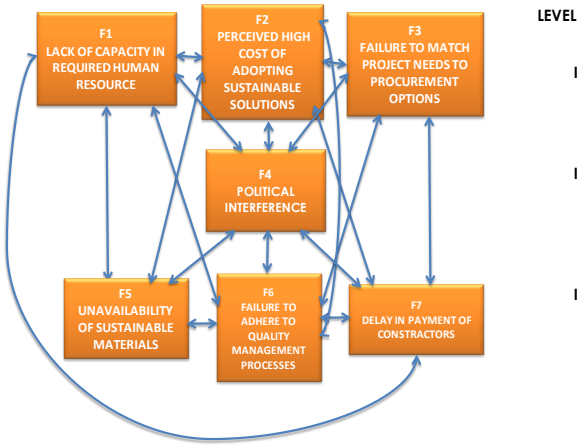


Figure 4.3: Structural Model (Barriers)

MICMAC Analysis

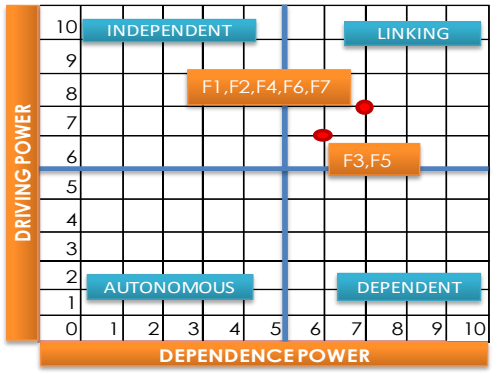


Figure 4.4 MIC MAC Analysis (Barriers)

4.7 Strategy for Implementing Sustainable Construction Procurement

Table 16 shows a very high strategy for implementing sustainable construction procurement on Emphasizing the importance of sustainability in tender evaluation and selection procedures (MS=4.89), Integrating sustainability requirements into contract specifications and conditions (MS= 4.79), Ensuring that payment mechanisms take account of whether sustainability requirements are delivered (MS= 4.59), Evaluating alternative procurement methods/routes in terms of their potential to deliver sustainability objectives (MS= 4.48), Ensuring transparency in procurement

decision-making (MS= 4.58), Ensuring that sustainability requirements can be clearly assessed and measured (MS= 4.47), Adopting a balanced approach that ensures the explicit consideration of all sustainability dimensions (MS= 4.35), Encouraging the supply side to improve communicational and knowledge sharing with all stakeholders throughout the project life cycle (MS= 4.17), Encouraging integrated supply chains (MS=4.21), Encouraging the incorporation of sustainability issues into risk management (MS= 3.74), Provision of incentives and rewards based on sustainability performance throughout the project life cycle. (MS= 3.68) on , whereas, Utilization/enhancement of existing assessment and measurements techniques and tools to considers sustainability (MS=3.28), Ensuring the competency of the people responsible for implementing and assessing sustainability issues (MS= 3.08), Encouraging long term contractual arrangements through strategic partnering (MS= 2.98), and Requiring the employment of a property trained workforce within the supply side (MS= 2.79) reveal a moderate strategy for implementing sustainable construction procurement in the Cross River State construction industry.

Table 16: Strategies for Implementing Sustainable Construction Procurement

	Strategy for Implementing Sustainable Construction Procurement	Construction practitioners Mean Score	Overall MS	Rank	Remark
1	Integrating sustainability requirements into contract specifications and conditions (including specifying any project specific sustainability requirements).	4.67	4.79	2	VHSIS
2	Adopting a balanced approach that ensures the explicit consideration of all sustainability dimensions.	4.14	4.35	7	VHSIS
3	Ensuring that sustainability requirements can be clearly assessed and measured.	4.25	4.47	6	VHSIS
4	Ensuring transparency in procurement decision-making.	4.55	4.58	5	VHSIS
5	Emphasizing the importance of sustainability in tender evaluation and selection procedures.	4.89	4.89	1	VHSIS
6	Ensuring the competency of the people responsible for implementing and assessing sustainability issues (in both the client organisational and the supply side).	3.16	3.08	13	MLSIS
7	Requiring the employment of a property trained workforce within the supply side.	2.89	2.79	15	MLSIS
8	Ensuring that payment mechanisms take account of whether	4.57	4.59	3	VHSIS

	sustainability requirements are delivered.				
9	Evaluating alternative procurement methods/routes in terms of their potential to deliver sustainability objectives.	4.35	4.48	4	VHS IS
10	Encouraging long term contractual arrangements through strategic partnering (covering a series of projects).	3.33	2.98	14	MLS IS
11	Encouraging integrated supply chains.	4.21	3.99	9	VHS IS
12	Encouraging the incorporation of sustainability issues into risk management.	3.55	3.74	10	VHS IS
13	Provision of incentives and rewards based on sustainability performance throughout the project life cycle.	3.74	3.68	11	VHS IS
14	Utilization/enhancement of existing assessment and measurements techniques and tools to considers sustainability.	3.25	3.28	12	MLS IS
15	Encouraging the supply side to improve communicational and knowledge sharing with all stakeholders throughout the project life cycle.	4. 25	4.17	8	VHS IS

CONCLUSION AND RECOMMENDATION

For the drivers of sustainable procurement practices in the ISM analysis, all the factors were ranked on the same level (illustrated in Figures 4.1 and Figure 4.2 for Structural Model and MICMAC respectively), however, Factor 4 (Legislative and Legal Compliance), Factor 5 (Develop Good Image), and Factor 6 (Desire to Improve Quality on Performance) are the most critical in term of reachability/impact for the reasons that they have the most driving power and reachability without transitive links (in essence, other factors depend more on them), and they have they least number of transitive links (2), whereas, the remaining factors in the matrix have 4 each. As facilitators of the sustainable procurement engine, policy makers and experts should pay keen attention to compliance of procurement to the legislature and legalities, the drive for establishment to develop reputation and the desire for improvement on quality and performance, as they are the key drivers in this analysis.

Meanwhile, in the ISM analysis for the Barriers of sustainable procurement practices, all the factors were ranked on the same level (illustrated in Figures 4.1 and Figure 4.2 for Structural Model and MICMAC respectively), however, Factor 3 (Failure to match Project Needs to Procurement Options) and Factor 5 (Unavailability of Sustainability Materials) which have 6 out of 7 reachability have the least impact on other barriers in the matrix. More so, Factor 7 (Delay in Payment of Contractors) and Factor 6 (Failure to Adhere to Quality Management Processes) are the more critical barriers in the system, for the reasons that they have less than 2 transitive

links, the most reachability and no zero reachability, whereas the rest have at least 3 transitive links. This implies that these barriers must be closely monitored and strategies (which are been discussed in this research) to curb them must be developed and implemented as soon as possible.

The study also evaluated strategies for sustainable procurement practices and ranked these strategies as critical to construction sustainable procurements. The critical strategies are Emphasizing the importance of sustainability in tender evaluation and selection procedures, Integrating sustainability requirements into contract specifications and conditions, Ensuring that payment mechanisms take account of whether sustainability requirements are delivered, Evaluating alternative procurement methods/routes in terms of their potential to deliver sustainability objectives, Ensuring transparency in procurement decision-making, Ensuring that sustainability requirements can be clearly assessed and measured, Adopting a balanced approach that ensures the explicit consideration of all sustainability dimensions, Encouraging the supply side to improve communicational and knowledge sharing with all stakeholders throughout the project life cycle, Encouraging integrated supply chains.

Conclusively, to implement sustainable procurement practices, organizations must understand sustainability, engage stakeholders, prioritize sustainability criteria, conduct sustainability assessments, foster collaboration, and monitor progress. They should identify sustainability issues, set goals, and develop a strategy aligned with their mission and values. Stakeholders should be engaged throughout the procurement process to understand their expectations and concerns. Prioritizing sustainability factors, conducting sustainability assessments, and fostering collaboration are essential for successful procurement. Monitoring progress and reporting on progress is crucial for continuous improvement.

REFERENCES

[1] Adewuyi, T. O. and Ujene, A. O. (2019). Impact of Procurement Methods on Material Waste in Low-Rise Building Projects in Nigeria. International Journal of Architecture, Engineering and Construction, 8(2), 44-53. http://dx.doi.org/10.7492/IJAEC.2019.010

[2] Adjarko., H., Agyekum., K. and Offei. I. (2016). Incorporating Environmental Sustainability into Construction Procurement at the District Assembly Level in Ghana. International Journal of Construction Engineering and Management, 5(2),3141.http://dx.doi.org/10.5923/j.ijcem.20160502.01

[3] Agbesi, K, Kissi, E and Adjei-Kumi, T. (2020). Implementation of Sustainable Procurement Practices in Public Sector Construction Organisation in Ghana In: Scott, L and Neilson, C J (Eds) Proceedings of the 36th Annual ARCOM Conference, 7-8 September 2020, UK, Association of Researchers in Construction Management, 526-53.

[4] Akindele, O. E., Ajayi, S., Toriola-Coker, L. Oyegoke, A. S., Alaka, H. and Zulu, S. L. (2023). Sustainable Construction Practice in Nigeria: Barriers and Strategies for Improvement. Built Environment Project and Asset Management, https://doi.org/10.1108/BEPAM-06-2022-0085

[5] Alejo, A.O. (2015). Evaluation of Building Project Procurement Strategies (A case study of Ondo State, Nigeria). International Research Journal of Engineering and Technology, 2(5), 616–623.

[6] Aliu, N. O., Oyewobi, L. O., Anifowose, M. O., and Ganiyu, B. O. (2022). Structural Equation Modelling of Public Construction Procurement Systems Implementation in Nigeria. Environmental Technology and Science Journal, https://doi.org/10.4314/etsj.v13i2.1

[7] Attri, R., Dev, N., and Sharma, V. (2013). Interpretive Structural Modelling (ISM): An Overview. Research Journal of Management Sciences, 2(2), 3-8.

[8] Billa, G., Gyamfi, K. and Adamu, M. (2021). Procurement Sustainability in Public Institutions in Ghana - Case Study on Selected Second Cycle Institution in Bono and Bono East Region of Ghana. World Journal of Advanced Research and Reviews, 12(02), 492–499. https://doi.org/10.30574/wjarr.2021.12.2.0562

[9] Bocken, N., Miller, K. and Evans, S. (2016). Assessing the Environmental Impact of New Circular Business Models. Proceedings of the "New Business Models"—Exploring a Changing View on Organizing Value Creation, Toulouse, France, 1, 16-17.

[10] Dalibi, S. G., Feng, J. C., Shuangqin, L., Sadiq, A., Bello, B. S. and Danja, I. I. (2017). Hindrances to Green Building Developments in Nigeria's Built Environment: "The Project Professionals' Perspectives". Proceedings of International Conference on Environmental and Energy Engineering (IC3E). IOP Conference Series: Earth and Environmental Science, 63, 012033, 1 -8. https://doi.org/10.1088/1755-1315/63/1/012033

[11] Daniel, E. I., Oshineye, O. and Oshodi, O. (2018). Barriers to Sustainable Construction Practice in Nigeria In: Gorse, C. and Neilson, C. J. (Eds) Proceedings of the 34th Annual ARCOM Conference, 3-5 September, Belfast, UK, Association of Researchers in Construction Management, 149-158.

[12] Dunama, M., Ali, Z. A. and Usman M. L. (2021). Causes and Effects of Delays and Disruptions in the Nigerian Construction Industry. International Journal of Innovative Research in Education, Technology & Social Strategies, 8(1), 66 – 75. https://doi.org/10.48028/iiprds/ijiretss.v8.i1.07

[13] Etse, D., McMurray, A. and Muenjohn, N. (2023). Sustainable Procurement Practice: The Effect of Procurement Officers' Perceptions. Journal of Business Ethics, 184, 525–548. https://doi.org/10.1007/s10551-022-05150-w

[14] Hackman, J. K., Ayarkwa, J., Osei-Asibey, D., Adjei-Kumi, T., Acheampong, A., and Nkrumah, P. A. (2021). Direct Labour as A Procurement Route for Infrastructure Delivery within Metropolitan, Municipal and District Assemblies (MMDAs) in Ghana. Advances in Social Sciences Research Journal, 8(5). 293-312. http://dx.doi.org/10.14738/assrj.85.10201

[15] Jimoh, R. A., Oyewobi, L. O., Ogunbode, E. B., Isa, R., Bilau, A., and Yusuf, A. I. (2021). Influence of Sustainable Construction Practices Awareness Level on Extent of Usage in Abuja-Nigeria. Journal of Infrastructure and Facility Asset Management, 3(3), 137 - 146. https://doi.org/10.12962/jifam.v3i3.14129

[16] Kolosky, C. (2024). Procurement in Construction: Strategies, Models, and Best Practices. https://www.knack.com/blog/blog-procurement-in-construction/ Accessed May 02, 2024.

[17] Kothari, C. R. (2004). Research Methodology: Methods and Techniques. New Age International (P) Ltd., Publishers, New Delhi.

[18] Liao, Y., (2022). Sustainable Leadership: A literature Review and Prospects for Future Research. Frontier in Psychology, 13 (November), 1–11. https://doi.org/10.3389/fpsyg.2022.1045570

[19] Maduekeh, C. O., Obi, G. N. and Nancy, O. I. (2022). An Assessment of the Impact of Professional Ethics on the Procurement of Construction Projects in Nigeria. Economic Growth and Environment Sustainability, 1(2), 5357.http://doi.org/10.26480/egnes.02.2022.53.57

[20] Manal, F., Chishiro, M., Rui, S. M., Isabel, R. and Ozlem, A. S. (2021). Mastering the Risky Business of Public-Private Partnerships in Infrastructure. International Monetary Fund. Fiscal Affairs Department (Series). International Monetary Fund Publisher, Washington, DC.

[21] Mangla, S. K., Luthra, S., Rich, N., Kumar, D., Rana, N. P. and Dwivedi, Y. K. (2018). Enablers to Implement Sustainable Initiatives in Agri-food Supply Chains. International Journal of Production Economics, 203, 379–393. https://doi.org/10.1016/j.ijpe.2018.07.012

[22] Maqbool, R., Saiba, M. R., Altuwaim, A. A., Rashid, Y. and Ashfaq, S. (2022). The Influence of Industrial Attitudes and Behaviours in Adopting Sustainable Construction Practices. Sustainable Development, https://doi.org/10.1002/sd.2428

[23] Messah, Y., Wirahadikusumah, R. and M. Abduh (2023). Structural Equation Model (SEM) of the Factors Affecting Sustainable Procurement for Construction Work. International Journal of Construction

Management, 23(13), 2221-2229. https://doi.org/10.1080/15623599.2022.2049488

[24] Moses, E. K., Lawani, K. and Hare, B. (2023). A Framework to Improve Sustainable Practices in Government Construction Projects in Ghana: An Exploratory Study Interviewing Industry Experts. Journal of the Ghana Institution of Engineering, 23(2), 51 – 63. https://doi.org/10.56049/jghie.v23i2.90

[25] Nsiah-Sarfo, D. J., Ofori, D. and Agyapong, D. (2023). Sustainable Procurement Implementation Among Public Sector Organisations in Ghana: The Role of Institutional Isomorphism and Sustainable Leadership. Cleaner Logistics and Supply Chain, https://doi.org/10.1016/j.clscn.2023.100118

[26] Ntsondé, J., and Aggeri, F. (2021). Stimulating Innovation and Creating New Markets – The Potential of Circular Public Procurement. Journal of Cleaner Production, 308, 127303. https://doi.org/10.1016/j.jclepro.2021.127303

[27] Ohamma, V. O., Anyanwu, O. A., and Ejekwu, T. B. (2021). Effective Project Management: A Veritable Tool for Successful Construction Project Procurements in Nigeria; PM World Journal, X(V), 1 -23.

[28] Oke, A. E., Aliu, J., Odia, O. A., Aigbavboa, C. O., Singh, P. S. J., Awuzie, B. O. and Samsurijan, M. S. (2023). A Quantitative Assessment of Key Drivers for Environmental Economic Practices Adoption for Sustainable Development. Sustainable Development, 31, 3579 – 3594. https://doi.org/10.1002/sd.2612

[29] Okeke, F. O., Nnaemeka-Okeke, R. C., and Awe, F. C. (2023). The Imperative of Social Sustainability and Procurement in the Nigerian Construction Industry. E3S Web of Conferences, 377, 02001.https://doi.org/10.1051/e3sconf/202337702001

[30] Okeke, F. O, and Nnaemeka-Okeke, R. C. (2021). Social Procurement and Sustainability in the Nigerian Construction Industry In: Laryea, S. and Essah, E. (Eds), Proceedings of West Africa Built Environment Research (WABER) Conference, 9-11 August, Accra, Ghana, 843-855.

[31] Okoye, P. U., Okolie, K. C. and Odesola, I. A. (2022). Risks of Implementing Sustainable Construction Practices in the Nigerian Building Industry. Construction Economics and Building, https://doi.org/10.5130/ajceb.v22i1.7420

[32] Okoye, P. U., Odesola, I. A., Ogbuagu, O. G. and Ngwu, C. (2021). Factors Influencing Professionals and Contractors' Resistance Behaviours Towards Sustainable Construction Practices in Nigeria https://doi.org/10.21601/EJOSDR/10825

[33] Oladigbolu, E. A., Okwori, J. O., Tafa, A. O., Adeniye, O. O., Awata, D. O., Gbadegesin, Y. A., Adeniran, D. G., and Elegbede, A. O. (2022). Assessment of Factors Affecting the Tendering Process in Construction Management: A Case Study of Lagos State, Nigeria. International Journal of Scientific & Engineering Research, 13(8), 289 – 307. http://www.ijser.org

[34] Osuizugbo, I. C. and Adenuga, O., A. (2022). Decisive Factors for Decision-Making to Achieving Sustainable Procurement in Construction Projects. International Journal of Building Pathology and Adaptation, https://doi.org/10.1108/ijbpa-04-2022-0065

[35] Oyewobi, L. O., and Jimoh, R. A. (2022). Barriers to Adoption of Sustainable Procurement in the Nigerian Public Construction Sector. Sustainability, 14(14832), 1-14. https://doi.org/10.3390/su142214832

[36] Oyewobi, L. O., Ija, M. I., and Jimoh, R. A. (2017). Achieving Sustainable Procurement Practices in the Nigerian Construction Industry: Examining Potential Barriers and Strategies. ATBU Journal of Environmental Technology, 10(2), 63 – 84.

[37] Peprah, J. A., Brako, S. and Akosah, N. B. (2018). The Awareness Level of Green Procurement at the District Assemblies in Western Region in Ghana. Journal of Management and Sustainability, 8(1), 46 - 58. https://doi.org/10.5539/jms.v8n1p46

[38] Raut, R., Gardas, B. B. and Narkhede, B. (2019). Ranking the Barriers of Sustainable

Textile and Apparel Supply Chains: An Interpretive Structural Modelling Methodology. Benchmark: International Journal, 26(2), 371–394. https://doi.org/10.1108/bij-12-2017-0340.

[39] Ravi, V., Shankar, R. and Tiwari, M.K. (2005). Productivity Improvement of a Computer Hardware Supply Chain. International Journal of Productivity and Performance Management, 54(4), 239 -255. https://doi.org/10.1108/17410400510593802

[40] Saka, N. and Adegbembo T. F. (2022). An Assessment of the Impact of the Construction Sector on the Gross Domestic Product (GDP) of Nigeria. Journal of Surveying, Construction and Property (JSCP), 13(1), 42 – 65.

[41] Stephen, K. (2021). Use of Force Account Procurement Method for Development of Small and Medium Contracting Firms in Mbeya, Tanzania. International Journal of Finance Research. 2(2), 94-110. https://doi.org/10.47747/ijfr.v2i2.311

[42] Toriola-Coker., L.O., Alaka, H., Bello, W. A., Ajayi, S. O., Adeniyi, A. and Olopade, S. O. (2021). Sustainability Barriers in Nigeria Construction Practice. IOP Conference Series: Materials Science and Engineering, 1036 012023.https://doi.org/10.1088/1757899X/1036/1/012023

[43] Zhou, F., Si, D. and Tiwari, S. (2023). Understanding the Green Procurement Behaviour of Household Appliance Manufacturing Industry: An Empirical Study of the Enablers. Journal of Environmental and Public Health, 2023, 1-17. https://doi.org/10.1155/2023/9719019