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A Comprehensive Review of Engineering, Procurement, and Construction in Nigeria

[1]Samson Imoni, [2]Orseer Ama, [3]Ebenezer Ogırıma Akande, [4]Victoria Hassana Jiya, [4]Collins Onuzulike, [4]Terlumun Sesugh, [5]Tiza Michael*
Corresponding Author: *tizamichael@gmail.com
[1] Department of Monitoring and Evaluation, Tertiary Education Trust Fund, Nigeria
[2] Procurement Officer, Federal Polytechnic Wannune, Nigeria
[3] Bells University, Ota, Nigeria
[4] Air Force Institute of Technology, Kaduna, Nigeria
[5] University of Nigeria, Nsukka, Nigeria

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ABSTRACT

This study focuses on the challenges and prospects of engineering procurement in Nigeria. The research examines the existing literature on engineering procurement practices, identifies gaps in knowledge, and explores potential areas for improvement. Through a comprehensive review, key findings emerge, highlighting limited research specific to engineering procurement in Nigeria and a lack of empirical studies on project performance and outcomes. Moreover, the literature review reveals a need for more research on engineering procurement projects' socio-economic and environmental impacts. The implications of these findings underscore the need for targeted research, enhanced data collection, and monitoring mechanisms to evaluate project performance accurately. Additionally, the study emphasises the importance of considering the broader socio-economic and environmental implications for sustainable development. Overall, this study serves as a foundation for advancing the understanding of engineering procurement in Nigeria and offers insights for policy-makers, researchers, and practitioners in the field.

Keywords
Engineering Procurement
Environmental Impacts
Project Performance
Socio-Economic Impacts
Sustainable Development

Introduction

The literature review is essential in researching Engineering, Procurement, and Construction in Nigeria as it provides a deep understanding of challenges and possibilities. It identifies gaps, informs the study's direction, and shapes research goals. By analysing relevant literature, researchers gain insights into complexities, trends, and influences on procurement. This informs methodologies, objectives, and recommendations. The review also examines the history, regulations, and stakeholders' perspectives, building on existing research to avoid redundancy. It uncovers best practices from other regions, enabling context-specific strategies to improve Nigeria's procurement. Addressing potential barriers creates a conducive environment for successful procurement. Research objectives and questions guide the review's scope and depth, ensuring alignment with the study's aim of comprehending Nigeria's Engineering, Procurement, and Construction challenges and prospects.

Engineering, Procurement, and Construction in Nigeria refers to acquiring materials, equipment, and services necessary for engineering projects [1]. It involves identifying, selecting, sourcing, negotiating, and developing resources needed to support engineering activities, such as construction, infrastructure development, oil and gas projects, power generation, telecommunications, and other related industries [2]. In the Nigerian context, Engineering, Procurement, and Construction encompass various activities, including procuring engineering designs [3], construction materials, machinery, equipment, specialised services, and skilled labour [4].

The research objectives and research questions guiding the literature review serve as guiding principles for the scope and depth of the review. They provide a clear focus and direction to ensure the assessment addresses the study’s objectives. The research objectives were aligned with the overall aim of understanding the challenges and prospects of engineering procurement in Nigeria.

Methodology

The methodology employed in this literature review centres on examining challenges and prospects within Nigeria's Engineering, Procurement, and Construction (EPC). The research involves a comprehensive analysis of existing literature, aiming to identify gaps in knowledge and potential areas for enhancement. Through an in-depth review process, notable findings emerge, highlighting the scarcity of research specific to EPC practices in Nigeria, particularly about empirical studies on project performance and outcomes. Moreover, the review must include more research concerning EPC projects' socio-economic and environmental impacts.

These findings underscore the significance of undertaking focused research efforts, improving data collection mechanisms, and establishing effective monitoring protocols for precise project performance assessment. Furthermore, the study emphasises the importance of encompassing broader socio-economic and environmental considerations for sustainable development.

The research objectives and questions closely align with the literature review, effectively setting the stage for future inquiries addressing the identified gaps and challenges. By addressing these knowledge gaps, conducting empirical studies, nurturing collaborations, and executing recommended strategies, Nigeria can elevate its EPC practices, encourage sustainable development, and foster the success of infrastructure projects across the nation. In its entirety, this study establishes a solid groundwork for advancing the comprehension of EPC in Nigeria. It extends invaluable insights to policy-makers, researchers, and practitioners within the domain, contributing to informed decision-making and enhanced practices that can ultimately drive the progression of EPC endeavours in the country.

The Engineering, Procurement, and Construction (EPC) process involves several key components and steps, as explained in Table 1.

Table 1. Engineering, Procurement, and Construction (EPC) Process Steps

Step	Description	Key Activities	Ref.
1.	Needs Assessment	Feasibility studies, project scoping, defining requirements, specifying technical details, resource quantity, quality needs, and timing.	[5]
2.	Planning and Budgeting	Accurate cost estimates, funding source identification, financial planning, risk assessment, procurement strategy development, and setting project timelines.	[6]
3.	Tendering and Bidding	Preparing bid documents and evaluation criteria and assessing bids based on technical competence, pricing, and past performance.	[7]
4.	Contracting and Negotiation	Contract negotiations, discussing terms, conditions, pricing for mutually beneficial agreements, and adhering to laws like the Public Procurement Act.	[8]
5.	Supplier/Contractor Selection	We choose suppliers/contractors based on project requirements, technical expertise, financial stability, track record, and transparent and fair selection processes.	[9]
6.	Procurement Execution	We are placing orders, contract management, tracking deliveries, coordinating logistics, monitoring, and quality control.	[9]
7.	Supplier/Contractor Performance Evaluation	Continuous assessment using predefined key performance indicators, contract milestones, enabling improvement, accountability, and guiding future decisions.	[10]

Practical Engineering, Procurement, and Construction (EPC) practices are crucial for successful project execution and desired outcomes in Nigeria, contributing significantly in various ways, as explained in Table 2.

Table 2. Significance of Effective Procurement in Engineering Projects

Significance	Description	Ref.
Cost Control and Budget Efficiency	Proper procurement practices help manage project costs, optimise budget allocation, and prevent cost overruns. By ensuring competitive pricing, value for money, and efficient resource allocation, effective procurement leads to cost-effective project delivery.	[11]
Timely Project Completion	Efficient procurement processes ensure the timely acquisition of materials, equipment, and services, leading to projects being completed within specified timelines. Delays in procurement can result in setbacks, increased costs, and missed deadlines.	[12]
Quality Assurance	Effective procurement ensures the availability of quality materials and the involvement of reputable suppliers and contractors. This contributes to delivering projects that meet or exceed standards, enhancing infrastructure quality and durability in Nigeria.	[12] [13]
Local Content Development	Effective procurement practices encourage local participation by involving suppliers, contractors, and labour. This builds local capacity, creates jobs, and fosters economic growth and sustainability.	[13]
Transparency and Accountability	Transparent and accountable procurement processes mitigate corruption risks, ensure fair competition, and enhance public trust. They create an equitable platform for suppliers, contractors and efficient use of public funds.	[13] [14]
Stakeholder Engagement	Effective procurement practices facilitate stakeholder collaboration, including government, project owners, contractors, suppliers, and communities. Involving stakeholders aligns expectations, addresses concerns, and ensures project success.	[14]
Sustainable Development	EPC practices prioritising sustainability, such as considering environmental impact, social responsibility, and ethical sourcing, contribute to sustainable development in Nigeria. This involves promoting eco-friendly materials, supporting local communities, and complying with regulations.	[14]

Results

A. Historical Development and Evolution of Engineering, Procurement, and Construction

The historical development of Engineering, Procurement, and Construction in Nigeria can be traced back to the colonial era when foreign companies primarily executed infrastructure projects. During this period, procurement processes were often biased towards the interests of colonial powers, and local participation was limited [14][15]. Following Nigeria's independence in 1960, the government recognised the need for infrastructure development and established various institutions and agencies to oversee procurement activities. The evolution of Engineering, Procurement, and Construction in Nigeria has been influenced by economic, political, and social factors [15].

In the early years, procurement practices in Nigeria were characterised by centralised decision-making, bureaucratic procedures, and limited transparency [15]. However, with the introduction of democratic governance and the establishment of regulatory bodies, such as the Bureau of Public Procurement (BPP), in 2007 [15], efforts have been made to reform and

improve procurement processes [16]. Over time, Nigeria has witnessed the adoption of international best practices in Engineering, Procurement, and Construction, such as competitive bidding, value-for-money principles, and standard contract templates [16]. The country has also embraced technological advancements, including implementing e-procurement systems, to enhance efficiency, transparency, and accountability in procurement processes [16].

B. Regulatory and Legal Frameworks Governing Engineering, Procurement, and Construction

The regulatory and legal frameworks governing Engineering, Procurement, and Construction in Nigeria provide the foundation for transparent, efficient, and accountable procurement practices. Key legislation and regulations include:

- Public Procurement Act (PPA) 2007 establishes Nigeria's legal framework for public procurement. It provides procurement processes, contract awards, transparency, and dispute resolution guidelines. The PPA aims to promote competition, value for money, and the participation of Nigerian companies in procurement activities
- State Laws and Regulations: In addition to federal legislation, individual states in Nigeria have their procurement laws and regulations. These laws may provide specific guidelines and procedures for Engineering, Procurement, and Construction activities within their respective jurisdictions.

It is important to note that compliance with these legal and regulatory frameworks is crucial to ensure fairness, transparency, and accountability in Engineering, Procurement, and Construction processes in Nigeria.

C. Key Stakeholders Involved in the Procurement Process

The procurement process in Nigeria involves multiple stakeholders, each with specific roles and responsibilities. These stakeholders may include:

- Government Agencies: Various government agencies are crucial in Engineering, Procurement, and Construction. This includes the Federal Ministry of Works and Housing, the Federal Ministry of Power, Works, and Housing, state ministries, and parastatal organisations responsible for project implementation and procurement oversight [17].
- Bureau of Public Procurement (BPP): The BPP is Nigeria's apex regulatory body for public procurement. It is responsible for formulating policies, guidelines, and regulations and providing oversight, capacity building, and support to procuring entities. The BPP ensures compliance with procurement laws and regulations and promotes transparency and efficiency in the procurement process (17).

- Procuring Entities: These government agencies or departments are responsible for initiating and implementing engineering projects. They identify project needs, prepare bidding documents, evaluate bids, and award contracts. Procuring entities must adhere to procurement regulations and ensure fairness, transparency, and value for money in the procurement process [18].
- Contractors and Suppliers: Contractors and suppliers are critical stakeholders in Engineering, Procurement, and Construction. They participate in the procurement process by submitting bids or proposals for the supply of goods, provision of services, or execution of construction works. These stakeholders play a critical role in project execution and delivery, and their expertise, capabilities, and track record are essential considerations in the selection process [18].
- Professional Bodies and Associations: Professional bodies and associations, such as the Nigerian Society of Engineers (NSE), the Council for the Regulation of Engineering in Nigeria (COREN), and industry-specific associations, represent the interests of engineers, architects, and other professionals involved in Engineering, Procurement, and Construction. These bodies provide guidance, promote professional standards, and advocate for the development and advancement of the engineering profession in Nigeria.
- Civil Society Organizations (CSOs) and Non-Governmental Organizations (NGOs): CSOs and NGOs play a vital role in promoting transparency, accountability, and good governance in Engineering, Procurement, and Construction. They monitor procurement processes, advocate for transparency and fair competition, and raise awareness about the importance of efficient and ethical procurement practices.
- Financial Institutions: Financial institutions like banks and development finance institutions provide financing options for engineering projects. They may be involved in assessing the financial viability of projects, offering project financing solutions, and ensuring compliance with financial regulations.
- Local Communities and Beneficiaries: Local communities and beneficiaries of engineering projects are important stakeholders in procurement processes. Their input and engagement are essential to ensure that projects meet the needs of the local population, address social and environmental concerns, and contribute to community development [19].

Effective collaboration and coordination among these stakeholders are essential for successful Engineering, Procurement, and Construction in Nigeria [19]. It requires clear communication, transparency, and mutual trust to ensure that projects are delivered on time,

within budget, and to the desired quality standards. Engaging stakeholders at various stages of the procurement process can help identify potential challenges, address concerns, and foster a sense of ownership and accountability for project outcomes [20].

In conclusion, understanding the historical development, regulatory frameworks, and key stakeholders involved in Engineering, Procurement, and Construction in Nigeria is crucial for promoting transparency, accountability, and efficiency in the procurement process. By recognising the roles and responsibilities of each stakeholder, policymakers, practitioners, and researchers can work together to address challenges, strengthen procurement practices, and maximise the benefits of engineering projects for Nigeria's development. See Table 3 for the critical stakeholders in the procurement process for engineering projects in Nigeria.

Table 3. Key Stakeholders in the Procurement Process for Engineering Projects

Stakeholder	Role and Responsibilities	Ref.
Government Agencies	• Responsible for project implementation and procurement oversight. • Formulate policies, guidelines, and regulations. • Ensure compliance with procurement laws and regulations. • Promote transparency and efficiency.	[17]
Bureau of Public Procurement (BPP)	• Apex regulatory body for public procurement. • Formulate policies, guidelines, and regulations. • Provide oversight, capacity building, and support. • Ensure compliance with procurement laws. • Promote transparency.	[17]
Procuring Entities	• Initiate and implement engineering projects. • Prepare bidding documents. • Evaluate bids and award contracts. • Adhere to procurement regulations. • Ensure fairness, transparency, and value for money.	[18]
Contractors and Suppliers	• Participate in the procurement process by submitting bids or proposals. • Supply goods, provide services, or execute construction works. • Contribute to project execution and delivery. • Expertise and capabilities.	[18]
Professional Bodies and Associations	• Represent the interests of engineers, architects, and professionals. • Provide guidance and promote professional standards. • Advocate for the development and advancement of the engineering profession.	
CSOs and NGOs	• Promote transparency, accountability, and good governance. • Monitor procurement processes. • Advocate for transparency and fair competition. • Raise awareness about efficient and ethical procurement practices.	
Financial Institutions	• Provide financing options for engineering projects. • Assess the financial viability of projects. • Offer project financing solutions. • Ensure compliance with financial regulations.	
Local Communities and Beneficiaries	• Essential stakeholders to ensure projects meet local needs. • Provide input and engagement. • Address social and environmental concerns. • Contribute to community development.	[19]

D. Challenges in Engineering, Procurement, and Construction

1. Infrastructure Deficiencies and Their Impact on Procurement Processes

Infrastructure deficiencies significantly challenge Nigeria's Engineering, Procurement, and Construction. Inadequate transportation networks, unreliable power supply, and limited access to basic amenities can hinder procurement activities' efficient and timely delivery [21]. The lack of well-maintained infrastructure makes transporting materials and equipment to project sites difficult, resulting in delays and increased costs. It also limits the availability of local suppliers and contractors, leading to a reliance on imported goods and services, which further escalates project costs [21]. Additionally, more infrastructure is needed to maintain the overall productivity and competitiveness of the Nigerian economy. It hampers local industries' development and domestic suppliers' growth, increasing dependency on foreign suppliers [22]. The limited availability of skilled labour and specialised technical expertise further exacerbates Engineering, Procurement, and Construction challenges. Addressing infrastructure deficiencies and investing in the development of robust transportation networks, reliable power systems, and other essential infrastructure is crucial to overcoming these challenges and improving procurement processes in Nigeria.

2. Inadequate Legal and Regulatory Frameworks and Their Implications

The legal and regulatory frameworks governing Engineering, Procurement, and Construction in Nigeria face several challenges that impact the effectiveness and efficiency of procurement processes. Inconsistencies, gaps, and outdated legislation can create ambiguity and hinder the implementation of transparent and standardised procurement practices [22]. Furthermore, the interpretation and enforcement of procurement laws and regulations may vary across different government agencies and levels, leading to inconsistencies and potential opportunities for corruption. The lack of coordination and harmonisation among relevant authorities can result in inefficiencies, delays, and increased costs [23]. Inadequate legal and regulatory frameworks also contribute to the challenges of bid-rigging, contract inflation, and non-compliance with procurement procedures. These issues undermine fair competition, transparency, and accountability in Nigeria's Engineering, Procurement, and Construction. To address these challenges, it is essential to review and update existing legislation, establish clear guidelines and procedures, enhance enforcement mechanisms, and promote harmonisation and coordination among procurement authorities [23].

3. Corruption and Lack of Transparency in Procurement Practices

Corruption and lack of transparency pose significant challenges to Nigeria's Engineering, Procurement, and Construction. They undermine the integrity of the procurement process, distort competition, and lead to the misallocation of resources. Corruption can occur at various stages, including bid preparation, evaluation, contract award, and project implementation [24]. Procurement-related corruption in Nigeria often involves bribery, kickbacks, nepotism, and favouritism. These practices compromise the quality of infrastructure projects, inflate costs, and undermine public trust. They also discourage competent and reputable contractors and suppliers from participating in procurement processes, limiting the pool of qualified bidders [24]. To address these challenges, anti-corruption measures must be strengthened. This includes establishing robust monitoring and oversight mechanisms, increased procurement process transparency, and strict penalties for corrupt practices. Embracing technology, such as e-procurement systems, can help improve transparency and reduce opportunities for corruption in Engineering, Procurement, and Construction in Nigeria.

4. Limited Local Capacity and Capability in Engineering, Procurement, and Construction

Limited local capacity and capability challenges Nigeria's Engineering, Procurement, and Construction. The country often relies on foreign contractors, suppliers, and consultants to execute engineering projects, resulting in capital flight and limited local economic benefits [25]. The country's lack of skilled labour, technical expertise, and specialised equipment leads to a dependence on foreign expertise, which increases project costs and limits the transfer of knowledge and skills to local professionals [25]. This dependence also hampers the development of local industries and the growth of domestic suppliers. To overcome these challenges, efforts should focus on building and strengthening local capacity and capability in Engineering, Procurement, and Construction. This includes investing in technical education and vocational training programs, promoting collaboration between academic institutions and industry, and supporting initiatives that enhance the skills of local professionals. Encouraging the participation of local contractors and suppliers in procurement processes and providing them with opportunities to gain experience and build their capacity is also crucial [26].

5. Funding and Financial Constraints Faced in Procurement

Funding and financial constraints are significant challenges in Nigeria's Engineering, Procurement, and Construction. There need to be more budget allocations, delays in fund disbursement, and limited access to affordable financing options can impede the implementation of procurement activities and hinder project execution [26][27]. Inadequate funding leads to project delays, cost overruns, and compromises on project

quality. It also affects the ability to attract qualified contractors and suppliers, who may hesitate to participate in projects with certainty or insufficient funding. Moreover, limited access to affordable financing options, especially for small and medium-sized enterprises (SMEs), further exacerbates the challenges. SMEs, vital in promoting local content and economic development, often need help accessing capital and securing financing for project implementation [27]. Addressing funding and financial constraints requires increased investment in infrastructure development, improved budget planning and execution, and exploring innovative financing mechanisms. Public-private partnerships (PPPs), development finance institutions, and initiatives that facilitate access to affordable financing for SMEs can help address these challenges and support the successful implementation of Engineering, Procurement, and Construction projects.

6. Political and Bureaucratic Challenges Influencing Procurement Outcomes

Political and bureaucratic challenges significantly impact procurement outcomes in Nigeria. These challenges include political interference, undue influence, bureaucratic red tape, and inefficiencies in decision-making processes [27]; political interference in procurement processes can lead to biased decision-making, favouritism, and the awarding of contracts based on political considerations rather than merit. This undermines fair competition, transparency, and accountability and results in selecting contractors and suppliers who may need the qualifications or experience [28]. Bureaucratic challenges, such as complex and lengthy approval processes, excessive paperwork, and cumbersome procedures, contribute to delays and inefficiencies in procurement activities. These challenges increase project costs, deter potential bidders, and hinder the timely execution of projects [29]. Addressing political and bureaucratic challenges requires political will, institutional reforms, and establishing clear lines of authority and accountability. Strengthening governance structures, streamlining approval processes, and promoting transparency and merit-based decision-making is crucial to improving procurement outcomes in Nigeria [29].

In conclusion, Nigeria's Engineering, Procurement, and Construction challenges are multifaceted and require comprehensive and strategic interventions. Overcoming these challenges necessitates addressing infrastructure deficiencies, enhancing legal and regulatory frameworks, combating corruption, building local capacity, addressing funding constraints, and tackling political and bureaucratic obstacles. By addressing these challenges, Nigeria can foster an environment conducive to efficient, transparent, and accountable procurement practices, ultimately leading to the successful execution of engineering projects and promoting

sustainable development. See Table 4 for a summary of Nigeria's engineering, procurement, and construction challenges.

Table 4. Challenges in Engineering, Procurement, and Construction

Challenge	Description and Implications	Ref.
Infrastructure Deficiencies	• Inadequate transportation, power supply, and basic amenities. - Delays, increased costs, and reliance on imported goods and services. • Limits local suppliers and contractors. – Hamper's economic growth.	[21][22]
Inadequate Legal and Regulatory Frameworks	• Inconsistencies, gaps, and outdated legislation. • Ambiguity and non-standardized practices. • Variability in interpretation and enforcement. • Inefficiencies and potential corruption opportunities.	[22][23]
Corruption and Lack of Transparency	• Undermines integrity of the procurement process. • Distorts competition and misallocates resources. • Compromises project quality and inflates costs. • Undermines public trust. • Discourages reputable bidders.	[24]
Limited Local Capacity and Capability	• Reliance on foreign expertise and limited local economic benefits. • Capital flight and skills gap. • Dependence on foreign contractors and suppliers. • Hinders local industry growth and skills transfer.	[25][26]
Funding and Financial Constraints	• Insufficient budget allocations and delays in fund disbursement. • Cost overruns, project delays, and compromised quality. • Limited access to affordable financing options. • Challenges for SMEs.	[26][27]
Political and Bureaucratic Challenges	• Political interference, biased decision-making, and favouritism. • Bureaucratic red tape and inefficiencies. • Delays and increased costs. • Hinders transparent and merit-based procurement practices.	[27][28][29]

E. Analysis of Challenges in Engineering, Procurement, and Construction

Infrastructure deficiencies significantly affect Nigeria's Engineering, Procurement, and Construction. Inadequate infrastructure, such as poor road networks, insufficient power supply, and limited access to water, significantly impacts procurement processes and hinders project execution [30]. For instance, transporting materials and equipment to project sites can be difficult and expensive due to poor road networks. This can result in delays in project execution and increased costs. Additionally, limited access to reliable power can affect equipment operation, decreasing productivity and increasing maintenance costs [30][31]. Furthermore, the limited availability of water can impact project execution, particularly in construction projects that require large quantities of water. Inadequate water supply can also affect equipment functioning, resulting in downtime and increased costs [31]. Addressing infrastructure deficiencies requires significant investment in the development of infrastructure. This includes constructing and rehabilitating roads, bridges, and other transportation networks, providing reliable power, and improving water supply systems.

Infrastructure development will facilitate the transportation of materials and equipment, reduce project costs, and improve project execution.

The legal and regulatory frameworks governing Engineering, Procurement, and Construction in Nigeria are essential to ensure fair competition, transparency, and accountability. However, these frameworks have been plagued by challenges such as inadequate enforcement and compliance, ambiguous provisions, and overlapping responsibilities [32]. For instance, the Public Procurement Act (PPA) was introduced to provide a legal framework for procurement activities in Nigeria. However, the implementation of the Act has been hindered by inadequate funding, poor enforcement, and the absence of an effective monitoring and evaluation mechanism. Similarly, the Bureau of Public Procurement (BPP), responsible for overseeing procurement activities in Nigeria, has been criticised for its need for more transparency, efficient decision-making processes, and limited capacity. Addressing these challenges requires a review of the legal and regulatory frameworks to ensure they are clear, comprehensive, and effective. Additionally, there is a need for increased funding, improved enforcement mechanisms, and enhanced monitoring and evaluation mechanisms.

The assessment of corruption and transparency issues in procurement practices in Nigeria is of significant importance due to the potential impact on public funds, effective service delivery, and sustainable development. Nigeria, like many other countries, faces challenges related to corruption and transparency in its procurement processes [32]. The assessment in Nigeria would involve a thorough evaluation and analysis of the existing procurement system, identifying potential corruption risks, and examining transparency measures. It would aim to understand the extent of corrupt practices and determine the level of transparency achieved in procurement activities [32]. One key assessment aspect would be identifying and analysing corruption risks in Nigeria's procurement processes. This includes examining bid rigging, bribery, kickbacks, and favouritism. It would involve a review of procurement laws, regulations, and practices to assess their susceptibility to corruption and identify areas where improvements are needed [32][33]. Transparency measures would also be a crucial focus of the assessment. This includes evaluating the transparency mechanisms, such as open and competitive bidding processes, disclosure of procurement information, and fairness in selecting contractors. The review would examine the effectiveness and implementation of these measures to identify any gaps or challenges that hinder transparency in procurement practices. To conduct a comprehensive evaluation, engagement with key stakeholders is essential. This includes government agencies responsible for procurement, civil society organisations, the private sector, and the general public. By incorporating diverse perspectives,

experiences, and feedback from these stakeholders, the assessment can provide a more accurate and holistic understanding of corruption and transparency issues in procurement practices [34]. The assessment findings would serve as a basis for developing targeted recommendations and strategies to address corruption and enhance transparency in Nigeria's procurement practices. These may include strengthening anti-corruption frameworks, implementing robust monitoring and enforcement mechanisms, improving transparency and accountability measures, strengthening the capacity of procurement officials, and promoting ethical practices across all stages of the procurement process [34]. Ultimately, assessing corruption and transparency issues in procurement practices in Nigeria aims to foster a culture of integrity, accountability, and transparency, leading to efficient and effective procurement processes that promote public trust and contribute to sustainable development in the country.

Examining local capacity and capability gaps in Engineering, Procurement, and Construction focuses on evaluating the readiness and capabilities of local entities involved in procuring engineering services and projects. This examination aims to identify areas where deficiencies or limitations in skills, resources, and infrastructure could impact the successful implementation of Engineering, Procurement, and Construction processes [34][35]. One aspect of this examination involves assessing the availability and expertise of local Engineering, Procurement, and Construction professionals. This includes evaluating the qualifications, technical skills, and experience of engineers, procurement officers, and other relevant personnel. The examination seeks to identify gaps in knowledge or expertise that may hinder the effective management and execution of Engineering, Procurement, and Construction projects [35]. Another important consideration is the availability of resources required for Engineering, Procurement, and Construction. This includes evaluating the adequacy and quality of infrastructure, equipment, and technology necessary for successful project implementation. The examination aims to identify resource gaps or limitations that impede the smooth execution of Engineering, Procurement, and Construction processes [35]. Additionally, the study assesses the capacity of local entities to manage and oversee Engineering, Procurement, and Construction projects. This involves evaluating the coordination, communication, and project management skills among local stakeholders, including government agencies, contractors, and consultants. The examination aims to identify any capability gaps that may affect the efficient and timely delivery of Engineering, Procurement, and Construction projects [36]. Engaging with stakeholders is crucial for conducting this examination effectively. Collaborating with local government agencies, professional associations, industry experts, and other relevant stakeholders provides a comprehensive understanding of the local capacity and capability gaps. It facilitates gathering insights, perspectives, and experiences to accurately assess the situation and identify improvement

areas [36]. Based on the examination's findings, recommendations can be developed to address the identified gaps and enhance local capacity and capability in Engineering, Procurement, and Construction. These recommendations may include targeted capacity-building initiatives, training programs, knowledge-sharing platforms, infrastructure investments, and policy interventions. By addressing the identified gaps, local entities can enhance their ability to successfully undertake and manage Engineering, Procurement, and Construction projects, ultimately contributing to improved project outcomes and overall regional development.

The analysis of funding and financial constraints faced in procurement involves examining the financial aspects and challenges associated with the procurement process. This analysis aims to identify and understand the funding constraints that procurement entities and stakeholders may face and how these constraints impact the procurement process and outcomes [37]. One aspect of the analysis focuses on assessing the availability and adequacy of funding for procurement activities. This includes evaluating the budget allocated for procurement purposes and determining if it is sufficient to meet the demands and requirements of the procurement projects. The analysis also considers the stability and predictability of funding sources and any existing limitations or restrictions [37]. Another important consideration is the impact of financial constraints on the procurement timeline. The analysis examines whether funding constraints lead to delays or disruptions in the procurement process, potentially affecting project implementation. It also explores the potential consequences of inadequate funding on the quality and scope of the procured goods or services [38]. The analysis further assesses the financial sustainability of procurement entities. This involves evaluating their ability to manage financial resources effectively and efficiently, ensuring transparency and accountability in financial management. It may also include examining procurement entities' financial risks and vulnerabilities, such as budgetary constraints, debt obligations, or reliance on external funding sources [38]. Engaging with stakeholders is crucial for conducting a comprehensive analysis of funding and financial constraints in procurement. This includes collaborating with procurement officials, finance departments, project managers, and other relevant stakeholders. By gathering insights and perspectives from these stakeholders, the analysis can provide a more accurate understanding of the funding challenges and financial constraints faced in procurement [39]. Based on the analysis findings, recommendations can be developed to address funding and economic constraints in procurement. These may include advocating for increased funding, exploring alternative financing mechanisms, improving financial planning and management practices, enhancing transparency and accountability in economic processes, and seeking partnerships or collaborations to leverage additional resources [39]. Ultimately, analysing funding and

economic constraints in procurement aims to ensure adequate financial resources are available to support the procurement process effectively. By addressing these constraints, procurement entities can enhance their ability to deliver quality goods and services on time and within budget, contributing to the overall success of procurement projects and achieving value for money.

Understanding the influence of political and bureaucratic challenges is crucial in analysing the complexities and dynamics that can impact procurement processes. Political and bureaucratic difficulties refer to the various obstacles and influences stemming from political systems and bureaucratic structures that can affect procurement decisions, practices, and outcomes [40]. Political challenges in procurement involve the influence of political interests, pressures, and considerations on the procurement process. This can include political interference, favouritism, or nepotism in selecting suppliers or contractors. Political challenges may also arise from changes in government administrations, policy shifts, or the alignment of procurement decisions with political agendas. Understanding these challenges helps identify potential risks to the procurement process's integrity, transparency, and fairness [40]. Bureaucratic challenges pertain to the structures, regulations, and procedures governing procurement activities. These challenges include lengthy and complex procurement processes, bureaucratic red tape, lack of coordination between government departments, and inefficient decision-making. Bureaucratic challenges can lead to delays, increased costs, and limited flexibility in procurement operations. Analysing these challenges helps identify areas for streamlining processes, improving efficiency, and enhancing the overall effectiveness of procurement activities [41]. To understand the influence of political and bureaucratic challenges, engaging with relevant stakeholders, including government officials, procurement practitioners, and civil society organisations [42]. This engagement allows for gathering insights into the specific political and bureaucratic dynamics that impact procurement and identifying potential areas of concern. Understanding the influence of political and bureaucratic challenges makes it possible to develop strategies to mitigate their adverse effects. This may involve advocating for transparent and accountable procurement practices, strengthening procurement regulations and guidelines, enhancing inter-departmental coordination, and promoting technology and digital platforms to streamline processes. It may also involve capacity-building initiatives to improve the skills and knowledge of procurement officials in navigating political and bureaucratic challenges effectively [42]. A comprehensive understanding of the influence of political and bureaucratic difficulties in procurement ultimately helps design and implement strategies that promote fairness, transparency, and efficiency. By addressing these challenges, procurement processes can better serve public

interests, enhance accountability, and contribute to successfully implementing projects and programs.

F. Prospects for Engineering, Procurement, and Construction

1. Government initiatives and reforms aimed at improving procurement processes

In recent years, the Nigerian government has recognised the importance of improving procurement processes to enhance efficiency, transparency, and value for money in public projects. To achieve these goals, several government initiatives and reforms have been implemented to transform the landscape of Engineering, Procurement, and Construction in Nigeria [43]. One significant initiative is the establishment of the Bureau of Public Procurement (BPP) in 2007. The BPP serves as the apex regulatory body responsible for formulating policies, guidelines, and procedures for public procurement in Nigeria. It has played a crucial role in promoting transparency, fairness, and competitiveness in procurement by enforcing standard practices and conducting pre- and post-procurement audits.

Furthermore, the Nigerian government has embraced electronic procurement (e-procurement) to enhance efficiency and transparency [44]. The introduction of the Government Electronic Procurement System (GePS) has automated the procurement process, making it more streamlined and accessible [44]. E-procurement has reduced human intervention, minimised corruption risks, and improved the speed and accuracy of procurement activities [44][45].

In addition to these initiatives, the government has focused on capacity-building and training programs for procurement professionals [46]. This includes establishing the National Institute for Procurement Management (NIPM) to provide specialised training, certification, and professional development opportunities. These capacity-building efforts have aimed to enhance the skills, knowledge, and professionalism of procurement practitioners in Nigeria [46].

2. Strengthening of legal and regulatory frameworks to enhance procurement practices

Nigeria has significantly strengthened its procurement laws and regulations, recognising the importance of a robust legal and regulatory framework [47]. These initiatives have promoted transparency, accountability, and fair competition in Engineering, Procurement, and Construction. One crucial development is enacting the Public Procurement Act 2007 [47]. The Act provides a comprehensive legal framework for public procurement in Nigeria, covering all stages of the procurement process. It sets out the principles of transparency, competition, and value for money and establishes the roles and responsibilities of various stakeholders involved in the procurement process [47].

The government has also established the Public Procurement Regulatory Authority (PPRA) to ensure the effective implementation of the Public Procurement Act. The PPRA regulates and monitors procurement activities and provides guidance and support to procuring entities [48]. Furthermore, efforts have been made to align Nigeria's procurement practices with international best practices[8]. This includes adherence to the World Trade Organization's Agreement on Government Procurement (WTO-AGP) principles and the African Union's African Public Procurement Reform Program (APPRP). By aligning with these standards, Nigeria aims to enhance transparency, promote fair competition, and attract international investments.

Recently, there has been an increased emphasis on using alternative dispute resolution mechanisms in procurement disputes [49]. This approach aims to expedite the resolution of conflicts and reduce the burden on the judiciary. Arbitration, mediation, and other non-litigious methods provide more efficient and cost-effective means of resolving procurement-related disputes [49]. In conclusion, the prospects for Engineering, Procurement, and Construction in Nigeria are promising due to the government's initiatives and reforms. Through the establishment of regulatory bodies, implementation of e-procurement systems, capacity-building programs, and strengthening of legal and regulatory frameworks, Nigeria is working towards creating a transparent, efficient, and competitive procurement environment. These efforts are expected to attract more investment, improve project delivery, and contribute to the country’s overall development. However, these initiatives continuous monitoring, evaluation, and improvement are essential to ensure sustained progress in Nigeria's Engineering, Procurement, and Construction practices [50].

3. Measures to promote transparency and accountability in procurement

Promoting transparency and accountability in procurement is crucial to ensuring fairness, preventing corruption, and achieving optimal value for money. Several measures have been implemented in Nigeria to promote transparency and accountability in procurement practices [51]. One important measure is the use of electronic procurement systems and online platforms. The adoption of e-procurement allows for greater transparency by providing easy access to procurement information, including bid documents, evaluation criteria, and award notices. This reduces the opportunity for manual manipulation of procurement processes and enhances fairness and competition [51].

Another measure is the implementation of open and competitive bidding processes. Competitive bidding ensures that all qualified suppliers have an equal opportunity to participate in procurement processes. This includes advertising procurement

opportunities, establishing clear evaluation criteria, and conducting transparent bid evaluations. These measures help prevent favouritism and promote fair competition. In addition, selecting procurement audit units and anti-corruption agencies is crucial in promoting transparency and accountability. These units and agencies are responsible for conducting audits, investigations, and sanctions in cases of procurement fraud or misconduct. Their presence is a deterrent and helps build a culture of accountability in procurement practices [52].

4. Strategies for enhancing local content and capacity development

Enhancing local content and capacity development is vital for sustainable economic growth and reducing dependence on foreign expertise and resources. In the context of Engineering, Procurement, and Construction, several strategies can be employed to promote the participation of local companies and develop their capabilities. One strategy is the implementation of local content requirements in procurement processes. This can involve setting minimum percentages of local participation in contracts or mandating the use of locally manufactured or sourced materials. Such conditions help stimulate local industries, create employment opportunities, and foster technology transfer [53].

Additionally, capacity development programs can be established to enhance the skills and capabilities of local companies. These programs can include training, mentorship, and knowledge-sharing initiatives. By improving technical and managerial skills, local companies can compete more effectively in procurement processes and deliver high-quality projects [53]. Collaboration between government agencies, industry associations, and educational institutions is crucial for successful capacity development. Partnerships can be formed to establish training centres, promote research and innovation, and provide continuous professional development opportunities. These collaborations foster a supportive ecosystem for local companies to thrive and contribute to the growth of the Engineering, Procurement, and Construction sector [54].

5. Access to finance and funding mechanisms for procurement projects

Access to finance is essential for the successful execution of procurement projects. Various funding mechanisms and initiatives have been introduced in Nigeria to ensure adequate financial resources are available for procurement activities. One key mechanism is the establishment of specialised funds dedicated to infrastructure development. These funds, such as the Infrastructure Bank of Nigeria and the Nigeria Sovereign Investment Authority, provide financial support for procurement projects through loans, guarantees, and equity investments. They help bridge the funding gap and attract private sector participation in infrastructure development [54].

Furthermore, public-private partnerships (PPPs) have become a financing model for procurement projects. PPPs involve collaboration between the public and private sectors, where the private sector brings in investment and expertise while the public sector provides the necessary infrastructure and regulatory framework. PPPs enable leveraging of private sector capital and resources, reducing the burden on public finances [55].

To enhance access to finance, efforts have been made to improve the investment climate in Nigeria. This includes implementing financial sector reforms, simplifying regulatory processes, and improving business credit access. A favourable investment climate encourages both domestic and foreign investors to participate in procurement projects, facilitating the availability of funding [55].

6. Opportunities for international collaborations and partnerships

International collaborations and partnerships present significant opportunities for Nigeria's Engineering, Procurement, and Construction sector. These collaborations facilitate knowledge exchange, technology transfer, and access to global best practices [56]. One avenue for international collaboration is technical cooperation agreements with foreign governments and organisations. These agreements involve sharing expertise, conducting joint research, and implementing development projects. Through these collaborations, Nigeria can benefit from other countries experiences and technical know-how, which can enhance the efficiency and effectiveness of Engineering, Procurement, and Construction practices [57].

Participating in international organisations and forums related to Engineering, Procurement, and Construction is another way to foster collaborations. Nigeria can engage with regional and global bodies focusing on procurement standards, practices, and capacity building. This allows networking opportunities, knowledge sharing, and staying updated on the latest trends and innovations in the field.

Furthermore, forming partnerships with international companies and contractors can bring valuable expertise and resources to procurement projects in Nigeria. Multinational firms can contribute advanced technologies, specialised skills, and access to global supply chains, resulting in improved project outcomes and delivery[58]. These partnerships can also create opportunities for local companies to learn and develop through joint ventures or subcontracting arrangements [58]. International collaborations can also facilitate access to funding sources and investment opportunities. Foreign investors and development finance institutions may be more inclined to support procurement projects in Nigeria when there is evidence of strong international partnerships and collaborations. This can help attract additional financial resources and increase the scale and impact of the country's Engineering, Procurement, and Construction initiatives [59].

Embracing international collaborations and partnerships in Engineering, Procurement, and Construction can provide Nigeria numerous benefits. It enables knowledge transfer, technology adoption, funding access, and global best practices exposure. By leveraging these opportunities, Nigeria can strengthen its Engineering, Procurement, and Construction sector, improve project delivery, and contribute to sustainable economic development [60]. See Table 5 for a summary of Nigeria's engineering, procurement, and construction prospects.

Table 5. Prospects for Engineering, Procurement, and Construction

Prospect	Description and Implications	Ref.
Government Initiatives and Reforms	• Establish the Bureau of Public Procurement (BPP) for regulatory oversight. • Adoption of electronic procurement (e-procurement) systems. • Capacity building for procurement professionals.	[43][44][45] [46]
Strengthening of Legal and Regulatory Frameworks	• Enactment of the Public Procurement Act in 2007. • Establishment of Public Procurement Regulatory Authority (PPRA). • Alignment with international best practices. • Emphasis on alternative dispute resolution.	[47][48][49]
Transparency and Accountability Measures	• Adoption of e-procurement systems for easy access to procurement information. • Implementation of open and competitive bidding processes. • Establishment of procurement audit units and anti-corruption agencies.	[51][52]
Enhancing Local Content and Capacity Development	• Implementation of local content requirements in procurement. • Capacity development programs and partnerships. • Training, mentorship, and skills enhancement. • Collaboration between government, academia, and industry.	[53][54]
Access to Finance and Funding Mechanisms	• Establishment of specialised funds for infrastructure development. • Promotion of public-private partnerships (PPPs) for financing. • Improving the investment climate and credit access for businesses.	[54][55]
International Collaborations and Partnerships	• Technical cooperation agreements with foreign governments and organisations. • Participation in international organisations and forums. • Partnerships with international companies and contractors.	[56][57][58] [59][60]

Conclusion

The literature review has provided a solid foundation for the research objectives and questions. It has identified the gaps in knowledge, highlighted the challenges faced in engineering procurement in Nigeria, and pointed out the areas for further research and exploration. By addressing these gaps, conducting empirical studies, and fostering collaborations, the analysis can contribute to filling the knowledge gaps, improving procurement practices, and enhancing the prospects of engineering procurement in Nigeria. In

conclusion, the literature review has shed light on Nigeria's challenges and opportunities in engineering procurement. By addressing the identified gaps, conducting further research, and implementing the suggested recommendations, Nigeria can strengthen its engineering procurement practices, promote sustainable development, and contribute to the overall growth and success of infrastructure projects in the country.

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Authors

Engr. Samson Imoni is a distinguished figure with an extensive background spanning more than 25 years across academia, industry, and the public sector. His impressive educational journey includes a range of degrees, notably a Second Class Honours (Upper Division) degree from the University of Agriculture, Makurdi, in 1996, an M.Sc. in Civil Engineering from Ahmadu Bello University (A.B.U.) Zaria, in 2012, an MBA from the University of Mkar, an M.Sc. in Public Administration from NOUN, and Postgraduate Diplomas (PGD) in Education, Management, and Public Administration. He currently pursues a Doctorate Programme in Public Governance and Leadership at the University of Abuja, alongside a PhD (Civil) at A.B.U. Zaria. (email: imonisam@gmail.com).

Engr. Ama Moses Orseer is a highly accomplished Agricultural and Environmental Engineering, Public Procurement, Entrepreneurship, and Administration professional. His expertise in procurement is evident through his position as the Pioneer Procurement Officer at the Federal Polytechnic Wannune. He is actively engaged in professional development and community service, exemplified by his memberships in esteemed institutions and involvement in strategic committees. (email: amaorseer@gmail.com).

Engr. Ebenezer Ogirima Akande is a senior Engineer at FEGEC Worldwide Ltd, No. 3, Peace Street, Ijeododo Lagos State, Nigeria. He is a civil engineer specialising in building construction. He is currently lecturing in the civil engineering department at Bells University. He is a COREN registered engineer. (email: besteben2000@gmail.com).

Victoria Hassana Jiya is a lecturer with the Civil and Environmental Engineering Department, Air Force Institute of Technology, Kaduna. She is a Member of the Nigerian Institute of Quantity Surveyors (NIQS) and a Registered Quantity Surveyor (RQS) with the QuantitySurveyors Registration Board of Nigeria (QSRBN). (email: hassvics@gmail.com).

Engr. Collins Onuzulike is a lecturer in the Department of Civil and Environmental Engineering at the Airforce Institute of Technology in Kaduna, Nigeria. He received his higher education at the University of Port Harcourt, obtaining his Bachelor's and master's degrees. He is currently working on his PhD research thesis at the same university. He is a fellow of the prestigious Institute of Disaster Management and Safety Science and the Association of Climate Change Practitioners. He is also an Ambassador for ClimateChange in the Federal Republic of Nigeria and has published several articles in national and international journals. (email: collinsonuzulike@gmail.com).

Engr. Michael Toryila Tiza is an experienced civil engineer with degrees in Civil Engineering, Transportation Engineering, and Construction Management. He is pursuing a PhD in Civil Engineering and holds memberships in professional organisations such as Fellow-ISDS, registered with COREN, and NSE. He has authored books, published academic articles, received awards, and attended various academic and professional conferences. (email: tizamichael@gmail.com).