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Nigerian Construction Industry Reforms and Private Sector Involvement: X-raying Cost Engineering Roles in Sustainable Infrastructure Procurement

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ABSTRACT

This study examines the essential financial oversight cost engineering functions performed in the procurement of sustainable infrastructure. This is against the backdrop of the Nigerian construction industry, which has undergone significant transformation through targeted government policies and reforms, aimed at addressing procurement gaps and enhancing infrastructure development. As a result, innovative procurement methods have been adopted to ensure sustainability in public infrastructure projects. Cost engineering and financial management functions are necessary to ensure fiscal accountability in public project procurement. A systematic review of the extant literature is carried out to x-ray cost engineering roles in sustainable infrastructure procurement. Findings indicate a shift from a predominantly public sector-led approach to one driven by private investment, presenting new opportunities for cost engineering roles. Cost engineering expertise is needed in contract administration, risk mitigation, and financial planning and is instrumental in optimizing Public-Private Partnership (PPP) agreements and ensuring long-term project viability. The study underscores the need for Quantity Surveyors, who are professionally skilled in carrying out cost engineering functions, to strategically position themselves within the evolving procurement landscape to leverage emerging opportunities. This study therefore underscores the importance of diversification, and adaptability in navigating industry shifts in the cost management of public infrastructure projects. By embracing these principles, cost engineering roles will maintain relevance in sustainable infrastructure development. There is thus a need to strengthen the connection between government policies, innovative procurement methods, with a view to catalyse cost engineering functions, and their impact in sustainable infrastructure development.

Keywords: *Cost Engineering, Private Sector initiatives, Procurement, , Sustainable Infrastructure*

1. INTRODUCTION

There has been an ever-increasing global demand for basic infrastructure services over the years, this has quickly outstripped the supply capacity of existing assets. Many years of poor maintenance and underinvestment have left Nigeria with a substantial infrastructural deficit which is thus holding back the country‘s development and economic growth [1]. Today, Nigeria needs to make substantial investments to close its wide infrastructural gap. The Federal Government believes that the private sector can play an important role in providing some of this new investment through sustainable infrastructures. However, a typical private company would not invest without profiting from the infrastructure, which will normally require a significant upfront capital outlay to be recouped over a long-term term. With this in mind, the investors will need design and execute the project to reduce future maintenance costs since the investor is also expected to carry out planned maintenance on this project because its rate of return on investment will be affected if the project defect is high thereby requiring high cost of maintenance [2]. Best practice thus espouses that quantity surveying firms should not be limited to providing estimates of capital costs of infrastructure projects but also their life-cycle costs. Such forecasts will require knowledge of some of the reasons for past failures, the cost of repairs and remedying

of defects [3]. Life cycle costing know-how is a grey area in Nigeria, because of poor record-keeping cultures. As such, quantity surveyors despite their training have not fully been involved in exercising their full functionality in construction project procurement [4].

Given that Private Finance Initiative (PFI) projects call for a wide appreciation of commercial and business issues, and therefore it is advantageous for cost and project management organizations to identify individual personnel with a complementary skill set, and experience of the creation of complex project agreements related to construction. Advisors who can call upon this expertise are therefore well placed to work with public sector clients and their consultants to achieve the objectives of sustainable infrastructure projects [4]. This is given that construction development encompasses a wide range of participants within a 'product system'. This broad view incorporates the participants which include the government, consultants (Quantity Surveyors; Architect; Structural, electrical and mechanical engineers), general contractors, specialist contractors, the labour workforce, owners, professional associations, private capital producers and users of public infrastructure, vendors and distributors, testing services companies, educational institutions, certification bodies etc. There is therefore need for active engagement of professional consultants such as the Quantity Surveyor. This research paper highlights the relevance and level of involvement of the Quantity of Surveyors in sustainable infrastructure delivery in this emerging procurement system [5].

The global demand for basic infrastructure services has been steadily increasing over the years, rapidly surpassing the capacity of existing assets to supply these services. In Nigeria, years of poor maintenance and underinvestment have resulted in a significant infrastructural deficit, hindering the country's development and economic growth. To close this widening gap, Nigeria needs to make substantial investments in its infrastructure. The Federal Government recognizes the crucial role that the private sector can play in providing some of this investment through sustainable infrastructure.

However, typical private companies are unlikely to invest unless they can profit from the infrastructure [6]. This often requires significant upfront capital outlay, which will need to be recouped over the long term. Given this, investors must design and execute projects in ways that reduce future maintenance costs, as they will also be responsible for the planned maintenance of these projects. The investor's return on investment will be impacted if the project suffers from defects, leading to high maintenance costs.

Best practices now advocate for Quantity Surveying firms to go beyond merely estimating capital costs for infrastructure projects. They should also provide life-cycle cost estimates, which involve understanding the long-term costs of maintaining the infrastructure [7]. This includes knowledge of past failures, the cost of repairs, and defect remediation. However, life-cycle costing is an underdeveloped area in Nigeria, largely due to poor record-keeping practices. Consequently, despite their training, Quantity Surveyors have not fully utilized their expertise in the procurement of construction projects.

Private Finance Initiative (PFI) projects, which require a comprehensive understanding of commercial and business issues, benefit from identifying individuals with complementary skill sets and experience in creating complex project agreements related to construction. As noted, advisors with this expertise are well-positioned to collaborate with public sector clients and their consultants to achieve the objectives of sustainable infrastructure projects [8]. Construction development involves a wide range of participants, all working within a 'product system.' These participants include the government, consultants (such as Quantity Surveyors, architects, structural, electrical, and mechanical engineers), general contractors, specialist contractors, the labor workforce, owners, professional associations, private capital producers, infrastructure users, vendors, distributors, testing service companies, educational institutions, and certification bodies infrastructure [9]. Therefore, the active engagement of professional consultants, including Quantity Surveyors, is essential. This paper highlights the relevance and level of involvement of Quantity Surveyors in carrying out cost engineering roles in the delivery of sustainable infrastructure within this emerging procurement system.

2. RESEARCH SIGNIFICANCE

The need for the study is anchored on the nomenclature of the Nigerian Construction industry, as defined by its embedded inherent characteristics and the role that professional financial management and cost engineering will serve in fostering sustainable infrastructure development. The Nigerian construction industry is enormous and contributes fundamentally to the economic growth of the nation but the elements, especially materials and technology that make up the construction process are unfortunately not proudly Nigerian. There is a high rate of importation of construction materials and equipment which are most times borrowed technologies thus revealing that innovation in these aspects is low levelled. Historically, organized construction contracting in Nigeria began in the 1940s with few foreign companies coming into operation [9, 10]. It was opinioned that Nigeria's Independence in 1960 bolstered by the "oil boom" of the 1970s brought an upward trend in construction activities and up to the end of the second Republic in 1983 [11]. the construction industry in Nigeria witnessed an overwhelming upsurge in construction contracting dominated by expatriate companies with few indigenous companies. It was pointed out that unfortunately the period also exposed the country's indigenous companies low level of human resources development required for; planning, designing, constructing and maintaining the magnitude (in size and number) of projects conceived by the government [12].

However, with an improvement in training institutions, an engagement of expatriates, collaborations between indigenous and foreign entrepreneurs, political stability,

and an improvement in government policies, the apparent resources gap needed for the successful completion of complex projects between indigenous companies and their foreign counterparts are now closer compared to the pre-independence [13]. The Nigerian construction industry was considered to be one of the slowest to integrate technological advancement. It was opinioned that the issue of technology in the building industry is comparatively limited when compared to other sectors [14]. It was however acknowledged that technological implementation across all sectors of the building industry may be more difficult than in other industries and as such she advocated the need for innovation and process improvement to remain competitive in today's digital economy {15]. However, one cannot deny that the industry is also filled with inherent potentials, such as autonomy in cement production that can stabilize the materials sector and the huge deficit in physical infrastructure (road, rail, airport and seaport) that will be key to creating opportunities for sustainable development [16].

The construction industry in Nigeria comprises a group of varied and fragmented firms and, within firms, there is often a great diversity of activities. Normally, a large construction company may be engaged in activities ranging from general building and civil engineering to material manufacturing, property development, and trade specialization. Peripheral services such as material supply, plant hire, and the newly emerging project management firms contribute to a complex industrial structure [17]. Further research conducted, highlighted important characteristics of the construction industry that distinguish it from other industries. The industry is project-based where Firms undertake a range of discrete projects characterized by relatively long duration and difficult ground conditions. Construction works are carried out in the open and subject to interference from the weather thus, the plan of work on each construction site varies and changes from day to day. The labour force in the industry is considered nomadic. This is because operatives who are predominantly young males and employed on a casual basis do not only move from site to site but from one employer to the other. Construction could also involve a high level of specialist workers and as such, several professionals could be involved in a single construction project.

The separation of design functions from production. Traditionally, design is carried out by the design team-architects, structural engineers, and services engineers-while the production is carried out by a separate team, the building team comprising the builders/construction manager and the quantity surveyors who carry out the cost management. Ease of entry to the industry. While professional design and production management professionals have an effective form of registration and control over members, there are few constraints to setting up a building contracting business. The system of paying mobilization fees, and interim payments during the construction phase, coupled with extensive credit concessions for material purchasing and plant hiring has encouraged an influx of entrepreneurs. Sadly, this has resulted in many unethical practices leading to shoddy jobs, structural failures, and project abandonment among others. The Nigerian construction industry shares similar characteristics with construction industry all over the world. Hence, this study will be relevant to professionals in other countries and foreign professionals who will be doing business in Nigeria in the future.

The need for development in the construction industry cannot be underestimated. Development needs to be at the heart of the construction industry's efforts to improve productivity and develop new capabilities, businesses and markets, and also contribute to enhancing the standard of living as well as creating new opportunities. Changes in global markets, increased customer expectations and government pressure have all led to innovation becoming a key focus for the construction industry. It was warned that should the industry fail to be innovative, there is a risk that it either will lag in the international perspective or that the whole industry will disappear from the country. The higher the levels of innovations in the construction industry the greater the likelihood that it will increase its contribution to economic growth. It was further, stated that in most countries, there is a perception that the industry is not generally innovative and that there is much room for improvement.

The nature of the industry in its construction process and its actors pose a strong setback to supporting development and innovative conceptions and implementation of incentives. It is increasingly accepted that construction development encompasses a wide range of participants within a 'product system'. This broad view incorporates the participants which include government building material suppliers, consultants (QS; Architect; Structural, electrical and mechanical engineer), general contractors, specialist contractors, the labour workforce, owners, professional associations, private capital producers and user of public infrastructure, vendors and distributors, testing services companies, educational institutions, certification bodies etc. There is therefore need for active networking between and among them. It was thus stated that different ways of looking into development have taken place in the construction industry over the years. Describing development process could be seen in different forms and will arise in different places within the overall building and construction process. The construction industry involves a wide range of participants as earlier stated and all of these participants have roles to play in the contribution to construction development practices.

3. METHOD OF STUDY

The study utilizes a descriptive research approach to examine the various reforms have shifted the focus on sustainable infrastructure, from a public sector-led to a private sector-led economy, and how this has created opportunities for massive investment from within and outside Nigeria. A descriptive research literature review was thus carried out to provide a summary of existing

research on a public sector involvement in infrastructure procurement and provide a broad overview of its historical backdrop. Deploying the descriptive approach, the study highlights the potential cost engineering and financial management functions during procurement processes, which would be required in the packaging of sustainable infrastructure projects. The study spotlights Quantity Surveyors' expertise in cost management, contract administration, and risk mitigation, in terms of how such skills are essential for ensuring that private sector led projects deliver value for money, efficiency, and long-term sustainability. Particularly, the study discusses and provides details of Quantity Surveying functions which are necessary in negotiating fair and balanced contracts that protect the interests of both the public and private sectors. The study demonstrates how the knowledge of contract law and risk management is crucial in ensuring that the Public Private Partnership agreement is robust and minimizes potential disputes. It further shows how such knowledge utilization in the procurement of infrastructure will translate into several key benefits that will lead to significant cost savings for taxpayers. The study thus descriptively surveys and highlights the numerous opportunities for exercising cost engineering and financial management functions in Nigeria's public sector procurement reforms, and how Quantity Surveyors can strategically position themselves to tap into these emerging professional opportunities.

4. RESULTS AND DISCUSSION

4.1 Infrastructure Procurement Methods Reforms-Private Sector Involvement

The variants of procurement methods available today metamorphosed from the need to improve construction project delivery, that is, project completion within budget and time [18]. It was emphasized procurement methods on optimizing all parameters involved in project delivery namely, time, cost and quality. Traditionally, construction projects start with the client's brief on which designs are based. The Architect and engineers prepare designs, in collaboration with a quantity surveyor who advises on the cost implications of design variables. The tender process afterwards produces the contractor for the execution of the work. On the award, the successful contractor executes the work as designed under the supervision of the consultants. Thus, the approach separates the design, tendering process and construction as separate tasks. This separation of activities also led to the sequencing of activities in which design is completed before construction commences. This has become the "traditional sequence" and it is now referred to as Design-Bid-Build. Other variants of procurement methods not following this format became the "non-conventional procurement method".

In construction, especially for publicly procured projects, the need for innovative approaches and practices cannot be underestimated. This is because this is where development itself begins. The way and manner a construction project is procured could affect the degree of contribution to innovative practices, ranging from the clients' organizational practices, the way and method of selection of contractors, the delivery approach adopted and the type of contract. All of these have their share in either inhibiting innovation or encouraging development and innovative practices. The use of Information and Communication Technology in procurement has recently drawn great attention and has been adopted by an increasing number of private and public organizations. This, however, is an innovative method in construction procurement usually referred to as E-procurement and E-Tendering. The benefits of this E-procurement are so much appreciated and cherished by the construction industry (where this is practiced). It was submitted that E-Procurement can provide benefits to construction organizations which include the elimination of manual processes to free up the time of procurement personnel. He listed e-purchasing, e-tendering, e-catalogue and e-purchasing cards as current practices of e-procurement. This is one of the areas the QS plays a major role since he is the one in charge of prequalification and selection of the most competent contractor to handle the project at hand.

Others maintained that there are innovative methods of procuring maintenance activities for all products and services under one contract and for a long term. More and more clients are outsourcing maintenance to private industry and several innovative practices are being used in several countries. Some aspects of maintenance were outsourced earlier, especially distinctive type items, but now changes have occurred and maintenance is moving in the direction of fully integrated client services, in which most services and products are procured under one contract. This is a very interesting idea for progressive innovation because it creates different market opportunities and a possibility of new companies/existing companies to be formed, merged, partnered and displaced. Furthermore, there are newly created maintenance contracts, including a special one called Performance Specified Maintenance Contract (PSMC) which has integrated almost all the maintenance activities and procured them for a specified length of time. Some maintenance contract methods and practices that provide the most potential for development include Long-term agreements greater than 7 years, Partnering (both client and sub-contractors, Lump sum contracts, Using quality-based contractor selection criteria, Utilizing outcome-based criteria, Ability to use innovation throughout the length of the contract, Incentives and disincentives and Pilot project using PSMC type model. Maintenance development is probably more easily introduced because these activities need to be performed on a routine basis and there is a continuous search for better practices and refinements. In addition to the built asset, the QS employed also monitors facilities management/maintenance operation. The concerns with this practice centre around the 'belt and braces' way (i.e. the use of two or more actions) in which the certification is being carried out and the fact that firms are signing off multi-million naira schemes, for very little fee and are

effectively acting as unpaid insurance agents, with any claim being covered by professional indemnity insurance.

Private Sector-Led Infrastructure Procurement is one of the major reforms in public infrastructure procurement. The private sector plays a crucial role in public infrastructure procurement through various innovations such as Public-Private Partnerships (PPPs), Concessions, BOT models, Private Finance Initiatives (PFI), Design-Build-Finance-Operate-Maintain (DBFOM). PPPs involve collaboration between the public and private sectors to finance, design, construct, and operate public infrastructure projects. The private sector brings in expertise, capital, and efficiency, while the public sector ensures the project serves public interest. Concessions grant private entities the right to operate and maintain public infrastructure assets for a specific period. This allows the private sector to leverage its expertise in management and operations [18, 19]. In BOT models, the private sector finances, designs, and constructs infrastructure, operates it for a period, and then transfers it back to the public sector. This approach is particularly beneficial for large-scale projects requiring significant investment. PFI involves the private sector financing the upfront costs of public infrastructure projects, with the public sector making payments over an agreed period. This allows governments to spread the cost of infrastructure development over time. DBFOM is a comprehensive approach where the private sector takes responsibility for all aspects of the project, from design and financing to construction, operation, and maintenance. This approach can lead to cost-effective and efficient project delivery.

There are several benefits, challenges and considerations that must be borne in mind when adopting Private Sector Initiative in Public Infrastructure Procurement. Private sector participation brings in additional capital and resources, accelerating infrastructure development. Private sector expertise and efficiency can lead to cost-effective and innovative project solutions [20]. PPPs allow for risk sharing between the public and private sectors, reducing the burden on taxpayers. Private sector involvement can enhance the quality and efficiency of public infrastructure services. Challenges and Considerations inherent in Private Sector Initiative in Public Infrastructure Procurement are in terms of contractual complexity, potential for cost overruns and transparency and accountability. PPPs require complex contracts to ensure alignment of interests and risk allocation between the public and private sectors. Private sector involvement does not guarantee cost savings and can sometimes lead to higher costs. It is crucial to maintain transparency and accountability in PPPs to ensure public trust and value for money. As such, although private sector initiative plays a vital role in public infrastructure procurement, offering numerous benefits such as increased investment, efficiency, and innovation, careful planning, risk management, and transparent governance are essential to ensure successful PPPs and maximize the benefits for the public sector.

Private sector-led infrastructure procurement projects, go as far back as the 1600s as stated in a research on Perspective on Procuring Public Works Project. They stated that early types of public infrastructure projects that involved the private sector include the turnpikes built in the UK and the USA, and also the water facilities that the French delivered through the concession approach. It was only until the introduction of the Private Finance Initiative during the 1990s in the UK, that the approach became recognized worldwide as an effective way of delivering value for money public infrastructure and services. It was stated in a revised work that Public-Private Partnerships are arrangements where the public and private sectors both bring their complementary skills to a project, with varying levels of involvement and responsibility, to provide public services or projects. The term "public-private partnership" in sustainable infrastructure can be defined in two folds. First, it relates to the provision of public services or public infrastructure. Second, it necessitates the transfer of risk between partners. Arrangements that do not include these two concepts are not technically "public-private partnerships". The definition embraced by The Canadian Council for Public-Private Partnerships, for example further supports this definition as follows: ―A cooperative venture between the public and private sectors, built on the expertise of each partner, which best meets clearly defined public needs through the appropriate allocation of resources, risks and rewards. Public-private partnerships span a spectrum of models that progressively engage the expertise or capital of the private sector [21].

Given the current economic veracities of global financial meltdown coupled with dwindling oil prices and the continuous rise of the Dollar to Naira exchange rate; all levels of Government are experiencing budget constraints. There should be an informed acceptance of sustainable infrastructure as a method of meeting the needs of the public, especially in infrastructural development. Fortunately, the Nigerian Government particularly at the Federal level has embarked on and has passed the Infrastructural Concession and Regulatory Sustainable Infrastructures Commission (ICRC) with its board already re-constituted. Lagos state has successfully applied sustainable infrastructures in Transportation, Waste disposal and Management, Power Generation, Road construction, Parks, etc. This is corroborated in a KPMG report. It was reported the success of sustainable infrastructures in the following sectors: Rail, Roads, Ports, Airports, Schools, Colleges and Universities, Housing, Libraries, Museums, Parks, Courthouses, Jails/Correctional Facilities, Hospitals, Information Technology, Energy/Renewable, Water/Wastewater. A typical sustainable infrastructure example would be a hospital building financed and constructed by a private developer and then leased to the hospital authority. The private sector developer then acts as the landlord, providing housekeeping and other non-medical services, while the hospital itself provides medical services. PFIs are typically run on a fifteen to thirty-year contract, with the consortium

being paid back in predefined instalments, conditional on performance. On expiry of the contract, ownership of the project‘s assets normally reverts to the public sector.

The evolution of procurement methods stems from the need to enhance construction project delivery, ensuring projects are completed within budget and on schedule [22]. It was emphasized that procurement methods aim to optimize key project delivery parameters: time, cost, and quality.

Traditionally, construction projects begin with the client’s brief, forming the basis for design. Architects and engineers collaborate on designs, while quantity surveyors assess cost implications. The subsequent tender process selects a contractor for project execution. Upon award, the contractor carries out the work as designed under consultant supervision. This sequential process—design, tendering, and construction—is known as the Design-Bid-Build method. Other procurement methods deviating from this sequence are categorized as non-conventional.

Innovative approaches are essential in publicly procured construction projects, as they influence project outcomes. The procurement method impacts innovation through client practices, contractor selection, delivery models, and contract types. Information and Communication Technology (ICT) has introduced E-procurement and E-tendering, streamlining processes and enhancing efficiency. It was identified that key E-procurement practices, including E-purchasing, E-tendering, E-catalogues, and E-purchasing cards. Quantity surveyors play a critical role in prequalification and contractor selection, ensuring competent project execution.

It was highlighted that innovative maintenance procurement methods, emphasize long-term contracts integrating multiple services. Many clients now outsource maintenance to private industry, fostering innovation and market opportunities. Performance Specified Maintenance Contracts (PSMC) consolidate maintenance activities under a single agreement. Progressive practices include long-term agreements (over seven years), quality-based contractor selection, innovation incentives, and outcome-based criteria. Maintenance contracts promote continuous improvement, making them a strategic avenue for innovation. Quantity surveyors also oversee facility management, ensuring compliance with financial and quality standards.

Private Sector-Led Infrastructure Procurement represents a significant reform in public infrastructure development. Through Public-Private Partnerships (PPPs), Concessions, Build-Operate-Transfer (BOT) models, Private Finance Initiatives (PFI), and Design-Build-Finance-Operate-Maintain (DBFOM), the private sector contributes expertise, capital, and efficiency. PPPs facilitate collaboration between public and private entities to fund, design, construct, and operate projects. Concessions grant private entities operational control over infrastructure assets for a defined period. BOT models involve private financing, construction, and operation before transferring the asset to the public sector. PFI allows private entities to finance public projects upfront, with governments repaying over time. DBFOM integrates all project phases under private sector management, enhancing efficiency and cost-effectiveness.

Private sector participation accelerates infrastructure development by injecting capital and fostering innovation. However, challenges include contractual complexity, potential cost overruns, and the need for transparency and accountability. PPP contracts must align interests and risks between stakeholders. While private involvement can reduce public expenditure, cost efficiency is not guaranteed. Maintaining transparency ensures public trust and value for money. Despite these challenges, private sector participation offers significant benefits when supported by careful planning, risk management, and governance.

Historically, private sector involvement in public infrastructure dates back to the 1600s, with turnpike roads in the UK and USA and water supply concessions in France. The Private Finance Initiative, introduced in the UK in the 1990s, popularized this approach globally. PPPs can be defined as collaborative arrangements leveraging public and private sector expertise. It was also emphasized that PPPs entail both public service provision and risk transfer between partners. The Canadian Council for Public-Private Partnerships describes PPPs as cooperative ventures allocating resources, risks, and rewards to best meet public needs [23].

Amid global financial instability, fluctuating oil prices, and currency depreciation, governments face budget constraints. Sustainable infrastructure procurement provides a viable solution for public infrastructure development. The Nigerian government has institutionalized sustainable infrastructure practices through the Infrastructure Concession and Regulatory Commission (ICRC). Lagos State has successfully implemented sustainable infrastructure in transportation, waste management, power generation, and road construction. Other studies reported similar successes in rail, roads, ports, airports, schools, universities, healthcare, energy, and water management.

A typical sustainable infrastructure example is a privately financed and constructed hospital, leased to a hospital authority. The private sector manages non-medical services, while the hospital provides healthcare. PFIs operate on long-term contracts (15–30 years), with payments linked to performance. At contract expiry, asset ownership reverts to the public sector. This approach enhances efficiency while reducing the immediate financial burden on governments [24].

4.2 Cost Engineering and Financial Management Functions in Private Sector Initiatives

Quantity surveyors play a crucial role in public infrastructure procurement, by carrying out cost engineering and financial management functions, necessary to ensure value for money and efficient project delivery. Their key functions include carrying out feasibility studies, Cost Planning and Estimation,

Tendering and Contract Administration, Dispute Resolution, Final account preparation and value management. Quantity surveyors provide accurate cost estimates during the initial planning stages, helping to determine project viability and budget allocation. They develop detailed cost plans, monitor project expenditures, and identify potential cost overruns to maintain budgetary control. Quantity surveyors prepare bills of quantities, which are detailed lists of materials and work required for the project. This forms the basis for contractor bidding. They assist in negotiating fair and competitive contracts with contractors, ensuring that the project is delivered within budget. Quantity surveyors monitor contract compliance, measure work completed, and certify payments to contractors. Quantity surveyors act as independent experts in resolving disputes between the client and contractor regarding contract terms, variations, and payment claims. They prepare the final account, which includes all costs incurred during the project, ensuring accurate and fair settlement with the contractor. Quantity surveyors identify cost-effective alternatives and innovative solutions to optimize project costs without compromising quality or functionality. They consider the long-term costs of the project, including maintenance and energy consumption, to ensure sustainable and cost-effective infrastructure.

Quantity surveyors play a pivotal role in the success of private sector initiatives in public infrastructure procurement. Their expertise is invaluable in navigating the complexities of these projects and ensuring value for money. The Roles of Quantity Surveyors in Private Sector Initiatives thus include:

- Feasibility Studies and Cost Planning: They conduct detailed cost analyses to assess the financial viability of PPP projects, considering factors like construction costs, operating expenses, and long-term maintenance. Their expertise helps determine the appropriate pricing models and risk allocation mechanisms within the PPP agreement.
- Tendering and Contract Negotiation: Quantity surveyors prepare detailed bills of quantities, which form the basis for competitive bidding by private sector consortiums. They assist in negotiating fair and balanced contracts that protect the interests of both the public and private sectors. Their knowledge of contract law and risk management is crucial in ensuring that the PPP agreement is robust and minimizes potential disputes.
- Project Monitoring and Cost Control: Throughout the project lifecycle, quantity surveyors monitor progress, measure work completed, and certify payments to the private sector partner. They play a key role in identifying and mitigating potential cost overruns, ensuring that the project stays within budget.
- Dispute Resolution: In case of disagreements between the public and private sectors, quantity surveyors act as independent experts to resolve disputes related to contract interpretation, variations, and payment claims. Their impartial assessment helps maintain a constructive relationship between the partners.
- Value Engineering and Optimization: Quantity surveyors continuously seek ways to optimize project costs without compromising quality or functionality. They identify cost-effective alternatives and innovative solutions to enhance the overall value proposition of the PPP.
- Life-Cycle Costing and Sustainability: They consider the long-term costs of the project, including maintenance and operating expenses, to ensure the financial sustainability of the PPP. They also advise on incorporating sustainable design and construction practices to minimize environmental impact.

By performing these functions, quantity surveyors contribute significantly to the success of public infrastructure projects, ensuring they are delivered on time, within budget, and to the required quality standards. Their expertise in cost management, contract administration, and risk mitigation is essential for ensuring that these projects deliver value for money, efficiency, and long-term sustainability. This translates into several key benefits in Public Infrastructure Procurement. Effective cost management and value engineering lead to significant cost savings for taxpayers. Thorough risk assessment and mitigation strategies minimize the likelihood of project delays and cost overruns. Efficient procurement processes and contract administration ensure timely project completion. Detailed documentation and independent verification enhance transparency and accountability in public spending. Quantity surveyors are therefore essential professionals in the public infrastructure sector, playing a vital role in ensuring value for money, efficient project delivery, and sustainable infrastructure development.

In Nigeria, private sector led infrastructure procurement is beginning to gain momentum. At a two-day seminar by NIQS, on―Private Finance Initiative―As A Veritable Tool For Infrastructure Development in An Emerging Economy held in November 2011, it was recommended to the Federal Government to back the private sector‘s infrastructure financing initiative. The body said that the private sector is ready to invest in tackling Nigeria‘s infrastructure challenge estimated at around N30 trillion but only if the appropriate environment and incentives are put in place by the government. Global Construction (2020)in her report ranking has it that Nigeria is one of the emerging economies, with great prospects in construction development and predicts that the value of construction in emerging countries, including Nigeria, will more than double in the next 11 years. Also, in a report presented while addressing the audience at a seminar organized by the Lagos Branch of the Nigerian Institute of Quantity Surveyors on Private finance initiative as a veritable tool for infrastructure development in an emerging economy, said the sustainable infrastructure model remains the solution by which the nation can revamp its economy and pursue its dream of becoming a top 20 economy in the world. He urged the Federal, and state governments and

their agencies to, as a matter of exigency, bring out and process the viewpoints of the private sector which is the engine for sustainable job creation.

Various reforms have shifted the focus on sustainable infrastructure, from a public sector-led to a private sector-led economy, creating opportunities for massive investment from within and outside Nigeria. This has created great opportunities for the Quantity Surveying profession, given that sustainable infrastructure seems to be the preferred procurement method by all tiers of government. Quantity Surveyors therefore need to position themselves to tap into these opportunities. As sustainable infrastructure has become a national focus, the involvement of the Quantity Surveyors will bring the profession to the limelight nationally and remain relevant to national policy and plan.

To further enhance our understanding of the role of Quantity Surveyors in sustainable infrastructure development, future research could explore comparative studies across different regions or countries to identify variations in challenges and practices. This would involve examining how cultural, economic, and regulatory differences impact the roles and effectiveness of Quantity Surveyors. Additionally, a longitudinal study could provide insights into the evolving dynamics of the profession over time, especially in response to technological advancements, changes in industry regulations, and emerging sustainability trends. Furthermore, investigating the impact of specific interventions, such as educational programs or policy changes, on the visibility and effectiveness of Quantity Surveyors could offer practical recommendations for enhancing their contributions to sustainable infrastructure development. Incorporating the perspectives of other stakeholders in the construction industry, such as architects, engineers, and policymakers, would also contribute to a more comprehensive understanding of the collaborative efforts needed for sustainable development.

The delayed recognition and identity crisis within the built environment industry, as revealed by the historical perspective, underscore the need for proactive marketing strategies to enhance the visibility and leadership of Quantity Surveyors. Despite facing challenges such as low awareness and prevailing cost-saving mentalities in the informal sector, Quantity Surveyors persist in providing services, necessitating intensified outreach and awareness initiatives. The global review highlights the dynamic landscape of the Quantity Surveying profession, emphasizing the significance of diversification, ethical practices, and adaptability to industry changes for sustained relevance and leadership. Overall, this study provides valuable insights into the challenges and opportunities faced by Quantity Surveyors, urging a strategic approach to enhance their impact in fostering sustainable infrastructure development.

The shift from a public sector-led to a private sector-led economy in Nigeria has created vast investment opportunities in sustainable infrastructure. This transition has positioned sustainable infrastructure as the preferred procurement method across all tiers of government. As a result, Quantity Surveyors have a unique opportunity to enhance their relevance and visibility within national policy and planning frameworks. To maximize these opportunities, Quantity Surveyors must proactively adapt to the evolving industry landscape and strategically position themselves within the sustainability discourse.

The historical perspective presented in the research contributes to a deeper understanding of the delayed recognition and identity crisis that Quantity Surveying has faced within the built environment industry. By tracing the profession's evolution, the study provides valuable insights into the challenges Quantity Surveyors have encountered and the subsequent need for strategic marketing initiatives to enhance their visibility and leadership. This historical context offers a foundation for future discussions and research on the positioning of Quantity Surveyors within the broader construction landscape. Overall, the research provides a comprehensive examination of the Quantity Surveying profession, encompassing historical contexts, contemporary challenges, and strategic recommendations, thereby enriching the understanding of the profession's dynamics in the context of sustainable infrastructure development.

5. CONCLUSION

This study makes a significant contribution to knowledge by shedding light on the multifaceted role of Quantity Surveyors (QS) in sustainable infrastructure development. This study has underscored the importance of diversification, ethical practices, and adaptability in navigating industry shifts in the Quantity Surveying profession. By embracing these principles, Quantity Surveyors can maintain relevance and establish themselves as indispensable players in sustainable infrastructure development. The historical perspective reveals the profession’s struggles with recognition and identity within the built environment industry. By tracing its evolution, the study highlights the necessity of strategic marketing initiatives to enhance visibility and leadership. The findings provide a foundation for ongoing discussions and research on the positioning of Quantity Surveyors within the broader construction landscape. By addressing contemporary challenges and proposing strategic recommendations, this study enriches the understanding of the profession’s dynamics and reinforces its role in fostering sustainable infrastructure development.

To further understand and strengthen the role of Quantity Surveyors in sustainable infrastructure development, future research could explore comparative studies across different regions or countries. These studies would help identify variations in challenges, practices, and regulatory influences affecting the profession. Examining cultural, economic, and legal factors could provide insights into the adaptability and effectiveness of Quantity Surveyors in different contexts.

Additionally, a longitudinal study could track the profession’s evolution over time, offering a deeper

understanding of the impacts of technological advancements, industry regulations, and emerging sustainability trends. Research could also assess the effectiveness of specific interventions—such as educational programs and policy reforms—in enhancing the visibility and impact of Quantity Surveyors. Furthermore, incorporating perspectives from other key stakeholders in the construction industry, including architects, engineers, and policymakers, would foster a more holistic approach to sustainable development.

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7. AUTHOR CONTRIBUTIONS

All the authors have been contributed equally to finish this work.

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REFERENCES

1. Cheung, Esther & Chan, Albert & Kajewski, Stephen. (2010). The researcher's perspective on procuring public works projects. Structural Survey. 28. 300-313. 10.1108/02630801011070993.
2. Oyedele, Olufemi. (2012). Public-Private Partnership (PPP) and Infrastructure Provision in Nigeria.
3. A Dairu (2015) Critical Success Factors of Public-Private-Partnership ... (PDF) African Journals Online.
4. Course Hero (2022) Construction Industry Rich Enough to Drive the Economy. ... *Conference on PFI as a Veritable Tool For Infrastructure Development in an Emerging Economy*. https://www.coursehero.com/file/p5goo7t/Public-Private-Partnerships-as-a-Veritable-Tool-for-Infrastr/
5. Brooke K and Thomas (2008). *Parties in a Public-Private Partnership – The Way Forward*
6. Diko M.H. (2012). Quantity Surveyors Seek Inclusion In Procurement Process. *The Guardian*. www.ngrwuardiannews.com – retreieved 20th November, 2012
7. Akin Adewo (2016) Emerging Developments In Nigerian Construction Industry: The Roles Of Quantity Surveyors. *Department of Quantity Surveying, Federal University of Technology, Akure P.M.B. 701, Ondo State*
8. Babalola B. (2006). Harnessing the Opportunities at the Grassroots to make the Quantity Surveying Profession competent in the National and International Markets. NIQS Biennial Conference in Calabar, November 22nd – 25th
9. Awodele O.A., Ogunsemi D.R. and Adeniyi O.O. (2012). An Appraisal of Private Sector Participation in Infrastructure Development in the Nigeria Construction Industry. *The Quantity Surveyor*, January – June vol. 1
10. Ayodeji, O & Ogunsemi, Deji & Awodele, Oluwaseyi. (2017). An examination of the management of quantity surveying firms in Nigeria. 10.13140/RG.2.2.35118.51525.
11. Jagun O. (2021). Climate change and global disasters; Developing sustainable infrastructures to achieve economic growth amidst declining economic resources. *NIQS Biennial Conference in Abuja*, November 17th – 20th
12. Hartenberger, U., Lorenz, D. & Lützkendorf, T. (2013). A shared built environment professional identity through education and training. Building Research & Information, 41(1), 60-76. doi: 10.1080/09613218.2013.736202
13. Cartlidge, D. (2017). New aspects of quantity surveying practice. Routledge
14. Olowookere, E. O. (1985). Construction industry in Nigeria. *Journal for Building and Civil Engineering Contractors in Nigeria*, 2(2), 6–10.
15. Idoro, G. I. (2009). Influence of Quality Performance on Clients' Patronage of Indigenous and Expatriate Construction Contractors in Nigeria. *Journal of Civil Engineering and Management*, 16, 65 – 73.
16. Mbamali, I., and Okotie, A. J. (2012). An assessment of the threats and opportunities of globalization on building practice in Nigeria. *American International Journal of Contemporary Research*, 2(4), 143–150.
17. Osofisan A.O. (revised. 2017). Innovation as an Agent of Change in the Nigerian Building Industry; *Journal of the Nigerian Institute of Building*, 17-22.
18. CIB (2004). *Globalization and Construction: Meeting the Challenges; Reaping the Benefits.* Write up for the Call for Papers, http://www.sce.ait.ac.th/GC2004 [Accessed 18th July 2023].
19. Ameh O.J and Odusanmi K.T. (2010). Professional Ambivalence Towards Ethics in the Nigeria Construction Industry. *Journal of Professional in Engineering Education & Practice*.
20. Blaise A.M. and Manley K. (revised. 2017). Key Influences on Construction Innovation, *Cooperative Research Centre for Construction Innovation Publication*, 4(3), 143-154.
21. Babatunde S.O., Opawole A. and Ujaddughe I.C. (2016). Report on An Appraisal of Project Procurement Methods in the Nigeria Construction Industry. *Civil Engineering Dimension*, Vol. 14

22. Debbattista Mario (2005). The Public-Private Partnerships Procurement Process, Concept and Procurement Stages. *https://finance.gov.mt/image.aspx?site=MF1N&ref=ppp eminar2* – retrieved 1st August, 2012.
23. Stephenson et al (2006). E-Procurement: An Assessment of UK Practice in Construction. *Construction Industry Board Publication*, 32-226.
24. Pakkala P. (2020). *Innovation Project Delivery Methods for Infrastructure, an International Perspective*.