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# PERFORMANCE–BASED EPC CONTRACTING: A PRELIMINARY STUDY OF THE CHALLENGES OF ENGINEERING PROCUREMENT AND CONSTRUCTION PROJECTS IN NIGERIA

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Engineering Procurement and Construction (EPC) project harnesses contractors ' ingenuity towards delivering value by affording them flexibility in procurement. However, while EPC projects in developed economies are generally characterized as delivering value in procurement, those in Nigeria are not. The challenges responsible for these under-performances within the Nigerian construction industry remains largely unknown, this is in spite of the 2014 Federal Government Procurement Guidelines which advocated for the implementation of EPC projects using performance-based contract (PBC). Therefore, this paper aims to identify potential challenges facing EPC projects with the view to providing a structure to investigate PBC related challenges for an ongoing PhD research. The report in this paper is the outcome of a preliminary investigation involving an EPC contracting organization and a client organization in the energy sector. The interview technique was used to collect data from two respondents (one from each organization) with experience of 15 and 30 years respectively. The data collected were analysed using qualitative content analysis. The preliminary findings revealed two distinct sets of challenges, client- and contractor-specific. For instance, client-specific challenges include: "loss of control", "non-assurance of quality", and "lack of performance evaluation criteria". Contractor-specific challenges include: "client's inexperience in EPC projects", "inaccuracies contained in BOQs" and "pricing issues". Those challenges clearly have their root causes to the non-implementation of EPC projects based on PBC. This finding points to the fact that EPC projects in Nigeria are mainly based on non-PBC. With the emergence of these challenges, going further thereof, the main investigation will infuse them in a structured interview survey toward discovering the root causes of these challenges. It is hoped that such discoveries will lead to getting the ingredients necessary for developing strategies for the implementation of EPC project using PBC in the Nigerian Construction industry.

Keywords: energy sector, engineering procurement and construction (EPC), Nigeria, performance-based contracting (PBC), implementation

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# INTRODUCTION

Engineering, Procurement and Construction (EPC) approach is a rapid project delivery method that is increasingly being used for mega projects in developing economies (Singh & Tiwari, 2015). The EPC approach integrates the design, procurement and construction processes simultaneously to achieve high efficiency (Hale, Shrestha, Gibson, & Migliaccio, 2009; Guo, Xu, Zhang, & Tu, 2010), while contractors in this form of contract are not only solely responsible for these diverse aspects of the projects, but are also in charge of the quality, time and cost (Yeo & Ning 2002). EPC projects in developed economies are generally characterized as delivering value in procurement (Natalya, Navaid & Cesar, 2005; Kavanagh, 2016); however, those in Nigeria are not (Giwa, 2010; Ekweozor, 2013; Eberhard & Gratwick 2012; Eberhard, Gratwick, Morella & Antmann, 2016). The challenges responsible for these under-performances within the Nigerian construction industry remains largely unknown, this is in spite of the 2014 Federal Government Procurement Guidelines which advocated for the implementation of EPC projects using performance-based contract (PBC).

Performance Based Contract (PBC) is a contractual approach that delegates service delivery to private providers by the use of appropriate methodologies under legally binding agreements that tie at least a portion of a contractor's payment, contract extensions, or contract renewals to the achievement of specific, measurable performance standards and requirements (An & Shuai, 2011; DLA PIPER, 2011; Principles & Practice of Public Procurement, 2012; Selviaridis & Wynstra, 2015). The underlying logic of PBC is an emphasis on the specification and evaluation of outputs or outcomes rather than inputs, activities or processes required to achieve performance (Martin, 2007). The use of PBC in projects has led to cost reduction and value for money solutions (Natalya, et.al., 2005; Kavanagh, 2016), while the acquisitions of highly innovative technologies are increased because it gives the contractor the flexibility in proposing new and creative solutions with an increased profit margin (Hypko, Tilebein & Gleich, 2010). With the rapid change experienced within the construction sector, government agencies and private clients in developed and developing countries are increasingly using PBC because it is considered to lead to efficiency and effectiveness in the achievement of procurement goals, enhances accountability and minimizes corruption ( Ang, Groosman & Scholten, 2005; Greiling, 2006; Bergman & Lundberg, 2013). It is also considered as a useful tool to minimise the opportunistic behavior of contractors (Ambaw & Telgen, 2017).

In spite of the move by the Nigerian government towards the use of PBC in EPC projects, the EPC industry is observed to have suffered considerable setbacks in term of completion of projects within time and budget including excessive contract termination payments (Giwa, 2010; Mohammed & Isah, 2012; KPMG International, 2015) with service delivery generally regarded as being poor and substandard (Idris, Kura & Bashir, 2013). The World Bank sample Performance-based Management and Maintenance of Road Networks (PMMR) which was pilot tested in Kaduna State in 2011 with four road projects executed under the Rural Access and Mobility Project (RAMP 1) also suffered the absence and lack of establishment of a fully functional road management unit especially in terms of management and monitoring of compliance (Giwa, 2020). While examining the challenges of

execution and the nature of EPC, researchers observed that Clients are exposed to contractor's manipulations which could lead to cost escalation and underperformances (Yeo & Ning, 2002). This situation is said to be worse for most EPC clients in Nigeria given their relative inexperience in EPC contracts and its non-implementation as a PBC system (Giwa, 2020; Ogbu & Ehigiator–Irughe, 2020). These problems and challenges could perhaps be as a result of lack of strategy to implement PBC in EPC contracts in the Nigerian Construction Industry.

In an effort to resolve some of the issues generating from the implementation of EPC contracts, Kumar & Kumar (2004) developed a conceptual framework for service delivery strategy and implementation in an oil & gas industry that considers product characteristics and customer operational/ organisational features, however; the framework is suitable for use only at the managerial level to bridge the gap between the maintenance task and task execution level. In (2007), Kumar & Markeset also identified current practices in the Norwegian Oil & Gas industry's service strategy influencing factors namely geographical location, maintenance needs, operating environment and operational requirements and developed a framework which takes into account these influencing factors. The research focused on external and internal services needed to support (or perform) Oil & Gas operation and maintenance activities and may likely not be suitable for adaptation in other industries and countries given the peculiarity of projects and political settings. In Israel, Shohet & Nobili (2015) developed and implemented a PBC framework based on six key performance indicators that could assist an organization in developing a contract, but the framework fail to consider user satisfaction and risk assessment required to determine the risk of potential failures of the performance indicators. In Malaysia, Anwar, Shariff, Chia, Jie, Riazi, & Nawi, (2016) adopted seven sequential steps as proposed by the Office of Federal Procurement Policy, Pennsylvania to the practice of PBC; however the study did not propose any guidelines for the practice of PBC in developing countries. The available PBC frameworks emphasises result rather than processes and they are not structured along the developmental phases of an EPC project. Most were designed to suit the problems encountered in a particular country while others are sector specific which may not be ideal for use in the EPC sector in Nigeria. There is a knowledge gap in the implementation of PBC system within the developmental phases of EPC projects. As revealed in the study of Ambaw & Telgen, (2017), PBC can minimise some of the most common problems of public procurement in developing countries, and this presupposes that the problems of EPC projects in Nigeria may not abate without the appropriate PBC frameworks in place for its implementation.

This paper looks into the potential challenges facing EPC projects within the Nigerian Construction Industry with the view to providing a structure to investigate PBC related issues for an ongoing PhD research. The main investigation will infuse the findings in a structured interview survey with a goal of developing a framework for the implementation of PBC in EPC projects in the Nigerian construction industry. It is hoped that such discoveries will provide a way to positively address the underperformances of EPC project within the Nigerian Construction Industry.

## Concept of Engineering Procurement and Construction (EPC) contracts

The construction industry is currently making efficient use of an innovative procurement approach in the name of Engineering Procurement and Construction (EPC) contracts (Singh & Tiwari, 2015). EPC is a fixed phrase which originated from U.S.A. project circle and is categorised under Integrated Engineering Contracts which deal with construction issues with greater sophistication than other types of construction contracts (An & Shuai, 2011, DLA PIPER, 2011). Some countries also use EPC as a variant of design and build (DB) (Ang et al. 2005; Murdoch & Hughes, 2008) or in the form of Turnkey projects (Ellsworth, 2003) and EPC is now being used as part of the DB market for large and complex industrial projects most of which are in the oil and gas, power, processing and mining industries (Xia & Chan, 2008; Kevin, 2013). Under the EPC approach, the Contractor is, just as under the DB arrangement, still the one-stop shop for all implementation activities beyond the basic design to include the detail design and, sometimes, also undertake the preceding Front-End Engineering design [FEED] work (Salmon, 2020). This form of contract, as described by FIDIC, are contracts where one entity takes total responsibility for the design and execution of an engineering project to provide a fully equipped facility, ready for operation whilst the owner is only responsible for proposing the anticipated target, functional requirement and design standard of the project. According to Salmon, (2020), the client's team will also be more deeply involved in approving the Contractor's work during the implementation process. Such deeper involvement is primarily needed to ensure that suitable 'checks and balances 'are employed to confirm, as far as possible, that the completed facility can be operated safely. Similarly, the Institution of Civil Engineers (ICE, 2004) while analysing the need to monitor EPC projects, proposed a condition of contract which also held the contractors responsible for all aspects of design and construction. Thus, EPC contracts have enormous construction scale and involve substantial capital investments, growing construction complexities, vulnerabilities and uncertainties (Wei et al., 2012).

## Concepts of Performance based contract (PBC)

The concept of performance based contracting is not new and has been in use for a long time especially in design and build (DB) projects under the private finance initiative (PFI) where payment is based on the performance of a facility, rather than based on work in progress. This PFI approach to construction in other parts of the world has been referred to design, build, finance and operates (DBFO), and sometimes build, own, operate, transfer (BOOT) (Murdoch & Hughes, 2008). A major feature underlying the successes of PBCs is the payments for performance or service levels obligations defined in the contract and not on the amount of works and services executed; however, how to achieve the stipulated output is left to the contractors to decide (Hypko, et al., 2010). Thus, a contractor under this strategy is not obligated to follow the detailed technical specifications of the client; instead, the contractor accepts full responsibility for how to achieve the desired outcome (Sols, Nowick & Verma, 2007; Glas & Essig, 2008). This approach implies a transfer of risks to the contractor (Doerr et al., 2005) who would need assets that are worth more than the potential losses that might occur in the event that the facility failed to perform (Murdoch & Hughes, 2008) but, conversely, encourages the contractor to improve performance during the contract period according to the implemented incentives and sanctions (Randall, Nowick, Deshpande & Lusch, 2014). Hence the

choice and application of innovative technology / materials, work selection, design and delivery, processes and management are all up to the contractor as long as there is compliance with the relevant laws and regulations (Doerr Lewis & Eaton, 2005; Guide to PBRMC, 2018).

# METHODOLOGY

## Research Method

Qualitative research method was adopted for this work because it is ideal in identifying and examining the characteristic and structure of a phenomena/ events in their natural context (Jonker & Pennink, 2010). In this study, the barriers to the implementation of performance based contracting system were examined from the point of view of the participants in their various organisations. The 'open 'attitude required in the qualitative approach will enable the researcher to understand how the participants experience their situation within a specific context which in this case is within the EPC industry.

## Sample selection

According to Kumar (2011), sample sizes do not occupy a significant place in qualitative research; so in order to obtain a broad picture of the challenges facing the EPC projects, a preliminary investigation was conducted on a selected EPC contracting organization and a client organization that is active and have undertaken minimum of ten (10) EPC projects in the energy sector of the Nigerian Construction Industry. These two organisations were selected from the target population with aim of having access to relevant data in the area of study and also to be able to compare and contrast their respective opinions based on the perceived challenges experienced within the sector. Purposive sampling was used to select the participants that were drawn from each of the sector. The inclusive criteria is their active involvement in the implementation of EPC projects from the pre-contract and up to the execution and handing over stages of the project and must have worked on more than five (5) projects with a minimum of (10) years working experience. A Consultant Architect who has been handling the contractual aspect of the EPC contracting within the client organisation and a Chief Engineer within the contracting organisation with 15 and 30 years working experience respectively fell into these categories. They were both willing and available to participate in the preliminary investigation.

## Data collection Instruments

Qualitative interview technique was adopted with the use of open ended questions to elicit information from the participants while a theoretical review was carried out to construct questions that fit the purposive research and to add rigor (Sekaran, 1984).The structured interviews lasted for 60minutes and 75minutes respectively. A table was prepared to compare the result of the findings from each participant using qualitative content analysis and the data was analysed manually based on the structured themes developed for the interview.

# RESULT AND DISCUSSION

**Table 1: Respondents reasons for the non-use of PBC**

**What are the key issues surrounding the non-use of PBC in EPC projects in Nigeria?**

| Interviewee 1 (Client Organisation) | Interviewee 2 (Contracting Organisation) |
|---|---|
| Most EPC contracts are usually for heavy engineering projects and most rely on imported materials and equipment. Importation and clearing is a challenge in terms of timeline where EPC contractor must have given an estimated timeline to complete the project..... | Importation and clearing at the port is a challenge in terms of meeting the timelines<br><br>The client rely more on the consultants and usually follows the consultant's dictates and recommendations on the use and nature of the procurement system to be used. |
| There is need to define upfront the measurement criteria and because it is not finite, there is that flexibility which makes it become challenging<br><br>Because EPC is a multi –disciplinary conceptual project, a lot of collaboration is required and there are instances where you cannot work according to the BOQ because what is on the drawings may not fit 100% into the work on site. | There are challenges in deploying such models because the contract price is not prepared and calculated based on the new design but based on certain understanding of how a model which is similar to the design at hand should work.<br><br>The price is set by the client and not by the contractor and most cost estimates do not reflect the correct price needed to execute the works. Variation will therefore set in. |

**Table 2: Respondents awareness of PBC**

**Are you perhaps aware of the 2014 procurement guidelines within the energy sector? If so why is it not being implemented?**

| Interviewee 1 (Client Organisation) | Interviewee 2 (Contracting Organisation) |
|---|---|
| Yes. Consultants do not usually recommend this contracting system because they believe that they will loss control over the contractor's deliverables.<br><br>PBC is not easily adopted especially with the understanding that if the client pays on performance, the client gets the performance but may not get value for his money and time is of essence. | Yes. The client relies mostly on the consultants to implement this guidelines, but the consultants would rather go with the traditional procurement system because do not see it as a viable option meant to accelerate the project. |

**Table 3: Respondents ways of expressing their objectives to the contractors**

**How do you express the purpose and needs of your project to the contractors?**

| Interviewee 1 (Client Organisation) | Interviewee 2 (Contracting Organisation) |
|---|---|
| The regular consultants are used to the prescriptive specifications rather than the functional but majority employs a combination of the two usually called a hybrid. | There is no universal means of communication but majority uses a hybrid specification. |

**Table 4: Respondents structure of payment**

| What is the structure of the payment, and is payment performance linked? | |
|---|---|
| Interviewee 1 (Client Organisation) | Interviewee 2 (Contracting Organisation) |
| Depends on the contractor. Sometimes 15% down payment, letter of credit for another 25 or 30% which is used to secure 50% of the payment. Balance is paid at the end of the project. We also use milestone payment and deferred payment whereby the balance is spread out based on the agreement with the contractor. | Some clients pay pre-mobilisation, the contractor get to site, set up their equipment and upon that they now mobilise based on milestone and at the end of the project, they demobilize and pay retention and final fees. |
| No. payment is not performance linked. When going with milestone payment, procurement system is not generic, you can tweak it. | Yes. Milestone payment is performance linked. |

**Table 5: Challenges involved in the implementation of EPC projects as enumerated by the respondents.**

| What are the challenges involved in the implementation of EPC projects? | |
|---|---|
| Interviewee 1 (Client Organisation) | Interviewee 2 (Contracting Organisation) |

**Table 6: Respondents use of incentives.**

| Do you use incentives to encourage the contractors to ensure a better performance? | |
|---|---|
| Interviewee 1 (Client Organisation) | Interviewee 2 (Contracting Organisation) |
| No. if a client chooses a contractor to perform a certain service; it means the contractor has presented himself to have the capability to deliver the project. The client will therefore not give an incentive to deliver. | None, except for a promise that you will be considered favourably in other projects. |

**Table 7: Respondents opinion on ways to achieve improved performance**

| What in your opinion can be done to improve upon the existing performance of EPC projects in Nigeria? | |
|---|---|
| Interviewee 1 (Client Organisation) | Interviewee 2 (Contracting Organisation) |
| To define output performance | Attitude of the parties should change especially the project and procurement leads. |
| To build in monitoring processes at different stages such as testing and inspection and documentation | Fulfillment of obligations from the client that obstruct the progress of the work of the contractor |
| Clients should engage consultants that are versed in the concept and processes of EPC contracts. | Sincerity of contract not to over labour the other party for most contracts are skewed to favour the client and contractor would have to be smart to improvise or otherwise cheat the client. |

The following analyses are the outcome of the interviews

1. Key Issues involved in the non-use of PBC- as shown in table 1, the issues common to the parties is the importation challenge which is a risk factor in PBC. As noted in previous research, the contractor may not be able to exercise any influence on external conditions (Buse, Freiling & Weissenfels, 2001; Hypko et al., 2010); however, researchers also opined that contractors may be averse to increased risk especially when they perceive that they possess limited capacity to manage them (Abedi & Haghifam 2013; Gruneberg et al., 2007). The data also indicated the lack of institutional capacity on the part of the client to make them rely solely on the consultants and undefined measurement criteria by the contractors to enable the clients link it to measurable goals. This is importantly consistent with literature (Doerr et al., 2005; Schoenmaker & Bruijn, 2016) as one of the key factors militating against the use of PBC in other countries. Pricing issue seems to be unique to the EPC industry in Nigeria; however, literature recognizes that if the contract is properly designed considering performance end results, PBC can help to improve the procurement by plugging the leaks found in the traditional procurement system (Ambaw & Telgen, 2017).

2. Awareness of PBC guidelines- in table 2, the data indicates that the respondents are aware of the PBC guidelines but the clients prefer the traditional methods so as not to loss control over the contractors 'deliverables and may not be fully assured of the quality. This is in alignment with the findings of Doerr et al., (2005) of the difficulty in promoting performance based oriented approach that is different from the traditional mindset. Burguet & Che (2004) also observe that when procurement entities procure new technologies in PBC, non-standard goods and services are usually difficult to evaluate objectively and as such the Contractor may fail to meet the required expectations in terms of quality (Hughes & Kabiri, 2013). As compared to the traditional approach, PBC holds contractors accountable for providing a specific service, which can be measured in terms of "quality, outputs and outcomes" (Martin, 2000).

3. Ways of expressing the objectives of the project- tables 3 indicates that the clients uses a hybrid of both the prescriptive and functional means of expressing the project objectives to the contractors; however, Sultana, Rahman, & Chowdhury, (2012) are of the opinion that even though there is nothing wrong with the use of detailed specifications for procurement of some goods and services, PBC uses qualitative criteria which helps to achieve the intended result. Using PBC is considered to be a solution for these problems in the procurement system since procuring entities does not have to describe the detailed technical specification but just simply specify the expected results to be achieved (Ambaw & Telgen, 2017).

4. Structure of payment- the response in table 4 indicates that milestone payment seems to be the preferred means of payment but the client is of the opinion that payment is not performance linked while the contractor believes that milestone payment is performance linked. McLellan, Kemp, Brooks & Carise, (2008) observed that milestone payment is common because service output /outcome may be non-verifiable and contractors are too often reluctant to

agree to contracts where payment is totally linked to performance due to the resultant financial risks. Other forms of payment are also dependent on the parties as opined by Donna, Jennifer & Carrie (2004) for it is difficult to develop the payment structure that is directly linked to performance.

5. Implementation challenges- table 5 highlights the implementation challenges experienced by the respondents in their respective organisations. The challenges identified here are consistent with what is obtainable in other developing economies, such as: incapability of the contractor and competitiveness (Dennis & William, 2003); difficulty in measuring performance (Datta & Roy, 2011; Anwar et al., 2016); enhancement of corruption in public procurement (Burguet & Che, 2004, Schoenmaker & Bruijn, 2016; Ambaw & Telgen, 2017); lack of training and experience (Donna et al., 2004)) and unfamiliarity with the contracting system (Anwar et al., 2016) including unanticipated environmental problems (Hughes & Kabiri, 2013) have been identified in other researches. Because of the inherent implementation challenges in PBC, Loulakis, (2013) advised that it is important for the procuring entities to have a clear understanding of these problems as well as a strategy for dealing with them in the procurement and contracting of projects.

6. Use of incentives- table 6 shows that the respondents both agree that incentives are not used to motivate the contractors into achieving a better performance. This is contrary to one of the basic features of PBC. Datta & Roy, (2011) observed that PBC uses key performance indicators (KPIs) and incentives to improve upon the outcome of projects during the contract period; however, within the context of EPC contracts, literature noted that the willingness of the employer to discuss any incentives for earlier completion or better performance is not discussed within the framework of the EPC negotiations nor is it included in the tender (EPC Guide, 2013). However, if the employer desires to reduce project costs, this can be achieved by setting up incentives for the contractor by allowing them to participate to a certain percentage in any savings yielded by the contractor.

7. Ways of achieving improved performance- the respondents in table 7 are of the opinion that output performance should be well defined as a way of improving the performance of the projects. Monitoring strategies as well as the employment of experienced consultants are necessary towards achieving a proper implementation of the projects. Parties to the contract should also try to adapt and be more receptive towards the use of PBC while fulfilling their various obligations on a fair contract that puts into consideration the interest of the contracting parties. A full implementation of PBC in the EPC contracts in Nigeria will assist in overcoming the disadvantages of the traditional method of contracting (Guide to PBRMC, 2018).

## CONCLUSION

EPC projects in developed economies have been characterized as delivering value in procurement while those in Nigeria is surrounded by a number of problems that is hindering it from achieving value for money. To this end, the objective of this preliminary study is to identify the challenges responsible for the under-

performances experienced within the EPC sector of the Nigerian Construction industry. The data analysis revealed that the implementation of EPC projects in Nigeria are not performance based and there is a need for a framework to be developed to ensure a full implementation of PBC in EPC projects to overcome the reported challenges. With the emergence of these findings, going further thereof, the main investigation will infuse them in a structured interview survey toward discovering other issues relating to the EPC sector of Nigerian economy. It is hoped that such discoveries will lead to getting the ingredients necessary for developing a framework for the implementation of EPC project as a PBC system in the Nigerian Construction industry. This study major contribution to knowledge is that it suggests the need for the full implementation of EPC as a PBC project so as to gain control of the full benefits of PBC in Nigeria. The framework will put into consideration the peculiar challenges encountered in practice and propose a solution that will enhance the knowledge base of clients in building institutional capacities and improve the capability of contractors towards the achievement of project goals.

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