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# JOURNAL OF CONSTRUCTION INNOVATION AND COST MANAGEMENT

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# EDITORIAL

The vision for this Journal was borne out of the need for publication of high-quality research papers on innovation and cost management. This comes at a time when myriads of journals have become a dump site for falsified, misleading and arbitrarily researched projects. This brings a need for a journal driven by scientific competency, editorial integrity and ethical rigor- JCICM prides itself in filling this gap. With cities becoming mega and smart, infrastructures are facing increasing needs to innovate and transform in an era of volatility and disruption. JCICM is committed to dissecting, discussing and disseminating research outcomes that can inform strategic policies, business decisions and research directions, in the age long tradition of academic writing with flavour of local and global value.

Famakin, Oshodi and Ibironke have carried out a study into the Performance of Quantity Surveying Firms. Strategic Learning Assessment Map (Slam) Framework is utilized to assess the knowledge stock- learning-flow-performance (KS-LF-P) in quantity surveying firms. The authors collected data from quantity surveyors through a firm wide Cross sectional survey. The SLAM model was tested using exploratory factor analysis, correlation analysis and multiple regression analysis. A strong positive relationship between knowledge stocks, learning flows and the performance of quantity surveying firms was indicated. Also, it was discovered that the level of individual performance in an organization is influenced by the feed forward learning flow which ultimately shows that performance of Quantity surveyors at organizational level is strongly tied to provision of learning strategies to improve their knowledge base, skill sets and competencies.

Leadership, team capability, firm structure and strategy as parameters of multi-cultural team management in small and medium-sized construction firms are largely underdeveloped areas in the body of knowledge. Zakariyyah, Dada, Ijaola, Ameh and Olaniyan observed that the top dimensions of leadership capability, organizational structure and strategy and team capability are creativity in designs/construction processes; periodic site meeting to monitor and review performances and clear roles and responsibilities respectively. A convenience sampling technique through field survey was carried out with the aid of questionnaires to test the Multi- Cultural Team Management parameters. With the aid of descriptive and inferential statistics, they established that multi-cultural team management could be better improved if indigenous construction firms work on having good leadership that can identify the different parameters and dimensions to project and organizational management and devise means of instituting, reviewing and maintaining such to the advantage of the firm.

Onukwube and Oyewo contend that Site management is a key occupational category in the construction industry. In a study of predominant performance criteria and its influence on time performance, they conducted a simple random survey of 78 respondents to identify performance measure of construction site managers. It was revealed that, Contract Managers or Owners of firms scored construction site managers averagely as regards their performance. The study therefore proposed planned training to improve productivity, communication skills, work ethics and team building of construction site managers.

Total Quality Management has been suggested as a strategy to solve performance problems in the construction industry. Bello, Zakariyyah, and Soyingbe critically assesses the understanding of this novel concept for proper implementation by identifying factors pivotal to defining quality, assessing construction stakeholders' perception of quality as culture and the evaluation of prevalent barriers to quality culture implementation for the purpose of improved quality performance. A survey of forty-one construction stakeholders comprising of clients, consultants and contractors were selected using purposive sampling to test their underlying quality culture. The study discovered that quality culture criteria involve conformity to specification used on a project, beating client's expectations and elimination of defects in the product and process. Also, a lack of standardisation in processes and arbitral solutions to issues rather than a holistic solution could serve as a constraint to implementation of the total quality management system. Bello, Zakariyyah and Soyingbe concluded that culture must be imbibed into the DNA of a firm's policy and process for it to be functional and

effective; it must not just be on paper but diligently executed and consistently monitored.

Public Procurement is essential as it is a route to provision of developmental infrastructure which is a vital organ in developing the economies of developing countries such as Nigeria. Nigeria's failing projects and high abandon rate has been blamed on the flawed procurement system-examining the quality and frequency of use of prequalification criteria on public procurement projects is a step in solving a National dilemma. Ajayi, executes this undertaking with a survey of 373 construction professionals particularly in the public procurement sector and discovered that the prequalification criteria vital to selection of competent contractors are; current fixed asset, professional and technical expertise, past project experience, Health and Safety regulation and work currently executed by the contractor.

Prefabrication has been touted as the required solution to assuaging the dearth of housing facilities and help reduce overcrowding on current housing facilities in Nigeria. Oloto, Adebayo and Iweka give an overview of the state of the art of Prefabrication in Nigeria. From their systematic literature review of recent publication on Prefabrication, they established that financial factors, training availability, government incentive and leadership, managerial and expertise issues could serve as inhibitors to the adoption of prefabrication or modular housing units. However, a concerted effort between the private sector and a sincere public sector leadership would drive the process and enable a rapid adoption of the novel building concept.

Health and Safety is an ever-important discourse in construction as it concerns human wellness which is vital to human performance and sustainability. The recent trend in building collapse during construction calls for a urgent overview of health and safety insurance policies in the Nigerian construction industry. Ameh and Farinde noted that despite availability of regulations and laws on site safety and health of workers, fatalities and injuries remain unabated. Ameh and Farinde thereby investigate contractor's compliance with available health and safety regulations. They discovered that there is a significant difference in compliance with health and safety regulations by multinational/foreign firms, and indigenous firms. They consequently recommended enforcement of safety regulations by the government as that is crucial to enabling the available law. Continuous aggressive awareness campaign is also suggested to ensure clients and contractors alike understand health and safety requirements for workers.

Akinsiku and Oyediran opined that the construction business environment holds constraint to healthy competition against the Nigerian Indigenous contractors. They maintained that the majority of high net worth projects in the country are executed by foreign contractors who form only 5% of the contractors in the country. The study in investigating the causes of inability of Nigerian Indigenous Construction Contractors to undertake massive construction projects discovered that factors such as; poor monitoring, controlling and funding challenges, bankruptcy and cost overruns, technical issues, site organization and layout, and materials and construction methods are debilitating factors beating down the competitiveness of Nigerian contractor as against their counterparts from foreign nations.

Foreign Direct Investment (FDI) inflow is critical in developing and diversifying the Nigerian economy, which is dependent on the state of infrastructure within the country. Babalola and Fayomi investigated the influence of macroeconomic variables on FDI inflows in the Nigerian construction sector. An ex-post facto survey using secondary data based on annual time series data of the Central Bank of Nigeria (CBN) and National Bureau of Statistics (NBS) was used for the study. It was discovered that the exchange rate has a positive but significant impact on FDI inflows and that FDI inflows influence the construction sector in Nigeria. Invariably, improving the infrastructure base of the country is vital in attracting FDI inflows which is also imperative in boosting the construction industry's opportunity to meet infrastructure deficit.

Saka and Ogunsemi examined the causal relationship between the Nigerian Construction Sector (NCS) output and Gross Fixed Capital Formation (GFCF) and the Gross Domestic Product (GDP) using Nigerian Time Series Data (TSD) from 1970 through 2013. Vector error correction Model (VECM) framework was utilized in carrying out the empirical investigation and results showed that NCS positively causes GFCF and GDP growth which invariably implies that Nigeria can accelerate its GFCF and GDP growth by increasing investment in NCS.

# Performance of Quantity Surveying Firms Using the Strategic Learning Assessment Map (Slam) Framework

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Organizational learning is of vital importance to business organisations, due to its positive relationship with business performance. Because the performance of quantity surveying firms influences the outcome of construction projects, learning within the organization is essential. The purpose of the study is to assess the performance of quantity surveying firms using Strategic Learning Assessment Map (SLAM) framework. Using the SLAM framework, five constructs of organizational learning were examined and compared with performance measures. Cross-sectional survey approach was used for the administration of questionnaires to quantity surveyors who are employees in quantity surveying firms. The SLAM model was used to examine the knowledge stock-learning-flow-performance (KS-LF-P) in quantity surveying firms. Exploratory factor analysis, correlation analysis and multiple regression analysis were then used to test the SLAM model. The findings indicate that there is a strong positive relationship between knowledge stocks, learning flows and the performance of quantity surveying firms; and the feed forward learning flow influence the level of individual performance in the organization. The findings demonstrate that facilitating learning at organizational level is valuable for improving performance.

**Keywords:** Knowledge stocks, learning flows, organizational performance, quantity surveying firms, SLAM framework.

## INTRODUCTION

The construction sector plays a major role in the economic development process of any nation. This assertion has been reverberated in several studies investigating the linkage between the construction sector and the economy (Chiang, Tao & Wong, 2015; Rameezdeen & Ramachandra, 2008). Despite the importance of this sector, several scholars have continuously investigated and proposed new techniques or approaches meant to improve project performance. Last planner system is a good illustration of such techniques (see Hamzeh, Zankoul & Rouhana, 2015; Priven & Sacks, 2016). Thus far, previous studies have identified shortage of materials and resources, unavailability of experienced and qualified personnel, poor quality of materials and equipment, owner competence and climatic condition among others as factors affecting the performance of construction projects (Aje, Odusami & Ogunsemi, 2009; Bagaya & Song, 2016; Santoso & Soeng, 2016). A critical look at factors influencing performance of construction projects reveal that human-related factors (such as unavailability of experienced and qualified personnel, contractor management capability, etc.) can be addressed by the construction professionals (Chan, Scott & Chan, 2004; Sweis, Bisharat, Bisharat & Sweis, 2014). In contrast, factors such as finance might not be within the construction professional's control (Antón, Rodríguez & López, 2011). To improve project outcome, there is a need to holistically address the identified factors. However, the present study focuses on addressing human-related factors. Thus, it is suggested that improving the skill sets

of construction professionals through the learning of 'best' practices could lead to improved project outcome. Knowledge acquired by individuals, through learning and experience, would result in improvements in project performance and sustain the growth of the construction sector. The term 'learning' refers to a social phenomenon which occurs within a social context in an individual and leads to knowledge creation (Akinci & Sadler- Smith, 2018; Jarvis, 1987; Klinge, 2015). The process of executing tasks results in changes in behaviour and cognition at individual, group or organizational level and this has an impact on the effectiveness of organizational learning (Matsuo, 2005). This form of learning is termed internal organizational learning. According to Siebenhüner (2005), internal organizational learning process can be viewed as "changes in the internal cognitions, norms and rules of an organization building on reflections by individual members of an organization". Recent evidence suggests that organisation learning is positively related to project outcomes and organisational performance (Lee & Lee 2014; Wu & Fang, 2010). The outcome of the learning process results in intellectual capital development supports growth and generates innovation (Dulaimi & Ang, 2009). In an increasingly dynamic business environment, there is a need to develop and harness existing information and knowledge learnt at organizational level. This results in a competitive advantage and improved performance.

Studies investigating organizational learning have gained prominence over the years (Dereli, Durmuşoğlu, Delibaş & Avlanmaz, 2011; Durst & Runar Edvardsson, 2012). Similarly, there has been an increasing focus on organizational learning and knowledge management in construction management research. However, a large majority of organizational learning studies in construction management are targeted at contracting organizations (Shokri-Ghasabeh & Chileshe, 2014; Walker & Johannes, 2001). In contrast, organizational learning in consulting companies within the construction industry has received less attention. Thus, the present study reports the findings of a quantitative study which assesses the aspects of organizational learning and performance in quantity surveying firms using the Strategic Learning Assessment Map (SLAM) framework.

First, a background to the research section presents a review of previous studies on organizational learning, performance and SLAM framework. The underlying science behind the choice of research approach is discussed in the methodology section. In the research method section, the procedure and sampling techniques used in this study are described. Fifty-five quantity surveyors responded to the questions relating to organizational learning and related practices. In the discussion section, the results of the present study are discussed in relation to similar studies found in literature. Finally, the inferences drawn from the findings of the study are highlighted in the conclusion section. Also, the significances of findings, limitations of the study and area for further studies are presented.

**Organizational Learning**

Organizational learning is an established field of study in social sciences. However, it is imperative to note that the term 'organizational learning' has been operationalized in different ways. This is largely due to the lens or academic discipline of the concerned scholar. From the definitions in Table 1, the common theme that emerges from these definitions reveal that organizational learning is a dynamic process of transforming information into knowledge. This enables business organizations to develop their intellectual capital, which provides the engine for growth, the power to manage change and help to generate innovations (Dulaimi & Ang, 2009). Hence, it is reasonable to suggest that the ability of quantity surveying firms to learn and constantly improve operational process is vital to improving financial performance and increasing its market share in the construction industry

**Table 1: Definitions of organizational learning**

| Author(s) | Definition |
|---|---|
| Chauhan and Bontis (1994) | Organizational learning is a dynamic process that occurs through different levels and dimensions within the organization. |
| Argyris (1996) | Organizational learning emerges when organizations acquire information (knowledge, understandings, know-how, techniques and procedures) of any kind by any means. |
| Senge (1999) | Organizational learning is a continuous testing of experience and its transformation into knowledge available to the whole organization and relevant to their mission. |
| Huysman (2000) | Organizational learning is the process through which an organization constructs knowledge or reconstructs existing knowledge. |
| Garcia and Vano (2002) | Organizational learning can be understood as a collective phenomenon in which new knowledge is acquired by the members of an organization with the aim of settling, as well as developing, the core competences in the firm, taking individual learning as the basic starting point. |
| Van der Heijden (2004) | Organizational learning is a process of exploring new knowledge resources and internalizing employees' experiences into the organization. |
| Lopez et al. (2005) | Organizational learning can be defined as a dynamic process of creation, acquisition, and integration of knowledge aimed at the development of resources and capabilities that contribute to better organizational performance. |
| Panayides (2007) | Organizational learning refers to the organization-wide activity of creating and using knowledge to enhance competitive advantage. |
| Bustinza et al. (2010) | Organizational learning is a dynamic process which enables the firm to adapt to changing environments, so making it easier for it to change established behaviour patterns and routines. |

**Performance**

The concept 'performance' is a multidimensional concept which has been measured using different variables in several studies (De Menezes & Kelliher, 2011; Shaw, 2011). Even though the concept of 'performance' has achieved prominence amongst interested parties, considerable variance still exists in relation to how the term is conceptualized or measured (Venkatraman & Prescott, 1990). Waggoner, Neely and Kennerley (1999) acknowledges that the index for measuring organizational performance has evolved over long period of time. A review of the indicators of organizational performance reveals that a wide range of variables (such as personnel cost, sales growth, return on equity, customer service quality, labour hours per ton, accident rate, etc.) have been used as metrics for assessment (Shaw, 2011). Based on Shaw (2011), it is reasonable to suggest a few trends that emerged from literature on assessment of organizational performance namely: (1) a shift away from financial to non-financial metrics; (2) expanding the focus from owners of the business to other stakeholder groups (e.g. customer satisfaction); (3) the use of indicators that capture present performance rather than past performance (e.g. customer waiting time); and (4) the use of indicators that are not considered confidential, especially for private-owned firms.

In Bontis, Crossan and Hulland (2002), five constructs ("our group meets its performance targets", "our organization is successful", "individuals are generally happy working here", "our organization meets its clients' needs", and "our organization's future performance is secure") were used to measure business performance under the SLAM framework of organizational learning. While a variety of metrics have been suggested for measuring business performance, the constructs of individual performance, group performance and organisational performance

will be used in this study because of its reliability, extensive use and non-confidential nature (see Bontis et al. 2002; Real, Leal & Roldán, 2006).

**Learning and Performance Using the Slam Framework**

The basic elements of any learning process include knowledge, people and the organization. However, knowledge is dynamic and transmitted from one level to another. Several theories have suggested the process of knowledge creation and the flow among different level, such as Nonaka's theory (Nonaka, 1994), Huber's theory (Huber, 1991), the 4-I framework (Crossan, Lane & White, 1999) and the SLAM framework (Bontis & Crossan 1999), amongst others. The *4-I*framework suggests that learning takes place via social and psychological process at three levels: individual (*intuition*), group (*interpretation and integration*) and organizational (*institutionalization*) (Crossan et al., 1999). The levels (*4-I*) are linked through feed-forward and feedback flows. Bapuji and Crossan (2004) describe the feed-forward flow as a process where learning at individual level is transmitted through group and organizational level. The knowledge generated becomes institutionalized at the organizational level. In contrast, the term feedback flow is viewed as the process where knowledge embedded at organization level is transmitted to individuals within the establishment (Oh, 2009). On the other hand, the transfer of knowledge and experience within the organization translates into procedures, roadmaps, routines and database required for organizational performance (Gareis & Huemann, 2000). The sequential application of these standard processes and procedures through standard practices ensure the success of construction projects (de Carvalho, Patah & Bido, 2015). Hence, the general performance of construction projects begins with the transfer of knowledge and experience within the organization.

SLAM builds on and operationalizes the 4-I framework (Bontis et al., 2002). Knowledge stock refers to knowledge generated and retained within the same level. In contrast, knowledge flow refers to knowledge generated and transmitted within different levels. Lack of stability between the two concept leads to continuous application of existing knowledge domiciled within the organization. This is largely due to the hierarchical structure within the organization which ensures that knowledge retained within the organization is transmitted to its employees at individual levels (Oh, 2009). This leads to continuous application of existing knowledge and prevent creative activities meant to generate new knowledge required to meet changing needs of clients. This phenomenon is termed 'learning trap' (Bapuji & Crossan, 2004). To address likely learning traps, there is a need to constantly unlearn obsolete or inappropriate knowledge stored in organizational memory. The process of learning and unlearning within an organization facilitates continuous improvement in knowledge gained at organizational level and ensures a balance is maintained between feedback and feed-forward learning (Huber, 1991).

In recent years, academic disciplines, processes and systems within the construction industry has evolved to meet with changing clients' needs. For instance, the traditional method of procuring projects (Design-Bid-Build) has evolved into a more integrated process (e.g. Integrated Project Delivery). These new procurement systems have led to changes in the roles and responsibilities of quantity surveying firms in construction projects. Therefore, the SLAM framework is adopted in the present study as a measurement tool for assessing organizational learning, due to its ability to capture the dynamic process of knowledge flows among different levels of learning.

Research focused on organizational learning has a long history, with a recent growth in the number of published studies (Bapuji & Crossan, 2004; Oh & Kuchinke, 2017; Zhou, Battaglia & Frey, 2018). Though several organizational learning frameworks exist in literature (Crossan et al., 1999; Edwards, 2016; Huber, 1991), Crossan et al (1999) point out that only a few capture the friction that occurs between exploring new knowledge while concurrently exploiting what has been learnt (this phenomenon is called strategic renewal). It is imperative to note that the SLAM framework has been used to test the relationship between various dimensions of organisational learning and performance in the mutual fund (Crossan

et al., 1999) and manufacturing industry (Real et al., 2006, 2014). The SLAM framework is adopted in this study because it captures the important components (i.e. individual, group and organizational level) and integrates the process of organizational learning. Similarly, the SLAM framework views organizational learning as a dynamic process and this responds to the changes in business environment to sustain competitive advantage.

**Conceptual Model**

The review of literature presented in the preceding section highlights the importance of knowledge stocks and learning flows in an organization. Due to the increasing complexity of construction projects and improvements in the practices within the sector, there is a constant need for quantity surveying firms to learn, unlearn and relearn to meet the changing needs of clients. Hence, a conceptual model was developed to explain the possible relationships and impact of knowledge stocks (individual, group and organization knowledge), learning flows (feed forward and feed-back) on the performance (individual, group and organization performance) of quantity surveying firms. Several hypotheses were established to test and explain the possible relationships between knowledge stocks, learning flows and performance of quantity surveying firms namely:

(1) knowledge stocks and learning flows has significant effect on individual performance of quantity surveying firms; (2) knowledge stocks and learning flows has significant effect on group performance of quantity surveying firms; (3) knowledge stocks and learning flows has significant effect on organization performance of quantity surveying firms; (4) knowledge stocks significantly influences feed forward learning flows; and (5) knowledge stocks significantly affects feed-back learning flows.

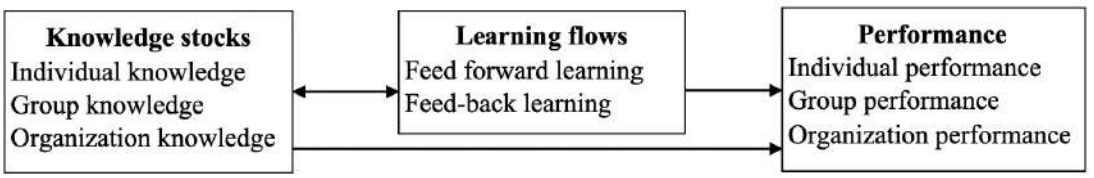


**Figure 1: Conceptual Model between Knowledge Stocks, Learning Flows and Performance of Quantity Surveying Firms**

To assess learning mediums, questionnaires were administered to quantity surveyors working in quantity surveying firms. The survey instrument contained three main sections: (1) background information of respondents; (2) knowledge stocks and learning flows; and (3) performance-related outcomes. Based on previously validated SLAM framework, three knowledge stocks (i.e., individual level, group level and organization level), two learning flows (e.g., feed forward and feed-back) were included, and three performance measures (i.e., individual, group and organization performance) were identified and included in the study (Bontis et al., 2002). The SLAM framework was chosen because of its ability to predict knowledge creation flow through the feed-forward and feed-back learning flows. The responses were rated on a five-point Likert type of scale. This was done to measure the response of participants relating to the 45 items on knowledge stocks and learning flows as well as 9 items on performance. The score for the level of agreement with each knowledge stocks, learning flows and performance measures was calculated by summing up ratings of relevant items.

Success of construction projects in the construction industry has often been measured using cost, time and quality parameters (Toor & Ogunlana 2010). However, proper planning and management of cost contributes significantly to timely completion and quality of construction projects. In the Nigerian construction industry, quantity surveyors are saddled with the responsibility of the cost management of construction projects. The accuracy of cost plans and the outcomes of construction projects are

influenced by the knowledge and competence of quantity surveyors. Similarly, a thorough understanding of the learning flow in the organization can enhance the procedures for planning and budgeting of cost for construction projects. Hence, the study has been limited to the quantity surveyors to understand the learning flow in quantity surveying firms.

Lagos, the economic hub of Nigeria was chosen because about 75% of the quantity surveying firms either operate or have their operational head offices within Lagos (Fagbemi, 2008). Out of the 78 consulting firms registered with the QSRBN and up-to-date as at 2015 (more than 75% with operational head offices within Lagos), eighteen firms were purposively selected based on the following criteria: (1) duly registered with QSRBN; and (2) had employees with varied levels of experience (i.e., considered as an important component in the process of learning). The cadres are determined based on the number of years and experience of the employees in the organization. To ensure the validity of the second criteria, four cadres common to quantity surveying firms in Nigeria were established before their selection for the study, namely trainee quantity surveyor (TQs), assistant quantity surveyor (AQs), quantity surveyor (Qs) and senior quantity surveyor (SQs). Trainee Qs were included in this study because it is believed that they have acquired some level of knowledge about the profession and could contribute to the activities of the organization.

In this study, TQs are quantity surveyors with no experience at all (i.e., students on industrial training), AQs are fresh graduates who must have gathered a minimum of 2 years' experience in the construction industry during their industrial internship and the compulsory National Youth Service Corps, Qs have a minimum of 5 years' experience while SQs have over 10 years of experience. Four questionnaires each were sent to selected quantity surveying

## DISCUSSION

### Factor Analysis and Reliability of Performance Measures

In order to identify performance measures with similar characteristics, the items were subjected to factor analysis. The nine factors in Bontis et al (2002) for measuring performance were subjected to principal components analysis (PCA) using the Varimax rotation. Prior to performing the Principal Component Analysis (PCA), the suitability of the data for factor analysis was assessed. The Kaiser-Meyer-Olkin (KMO) value was 0.835, exceeding the recommended value of 0.5 and Bartlett's Test of Sphericity reached statistical significance ($p < 0.05$) which makes the data suitable for factor analysis (Field, 2005). Furthermore, the sample to item ratios for the measures of performance is 6:1 which is adequate with the minimum firms for the established cadres of quantity surveyors as pointed out earlier. Out of the questionnaires distributed, 55 were returned with one of them inadequately filled and was removed from the data set. The remaining 54 questionnaires were used for the data analysis. From the data set, 33% of the respondents were TQs, 19% were AQs, 28% were Qs and 20% were SQs. The response rates of the four groups were relatively close, indicating that the results were not overly biased towards any of the groupings.

The data collected were analysed using SPSS version 20.0. Firstly, the 9-item scale for measuring performance was analysed by principal component factor analysis with Varimax rotation in the study. Secondly, Cronbach alpha values were calculated to ensure the internal consistency of each performance measures, knowledge stocks and learning flows. Lastly, multiple regression analysis was used to investigate the predictive ability of the knowledge stocks and learning flows on the performance of quantity surveying firms. requirement of 5:1 suggested for factor analysis (Hair, Black, Babin and Anderson, 2010; Tabachnick and Fidell, 2007). Factor loadings of all the items obtained and the alpha values were higher than 0.6 (Pallant 2011). The details are as shown in Table 2.

Three factors were extracted from the analysis which included organizational performance (P1), group performance (P2) and individual performance (P3). The three factors explain 82.6% of the total variance. Cronbach's alpha values

were then checked to ensure the reliabilities of the three factors. All the reliabilities of the three factors were acceptable because they had Cronbach alpha values greater than 0.7 (Hair et al., 2010). The items, factor loadings and the Cronbach alpha values of the factors are summarized in Table 2.

**Table 2: Scale items, factor loading and Cronbach alpha for performance measures**

| Factors | Nature | Item | Description | Factor loading | Alpha (α) |
|---|---|---|---|---|---|
| P1-Organization | + | 3 | Our organization's future performance is secure | 0.834 | 0.913 |
| Performance | + | 4 | Our organization is well reputable within the industry | 0.775 | |
| | + | 1 | Our organization is successful | 0.759 | |
| | + | 2 | Our organization can meet client's requirement | 0.685 | |
| P2-Group | + | 5 | Our groups perform well as a team | 0.839 | 0.875 |
| Performance | + | 6 | Our groups can make strong contribution to the organization | 0.838 | |
| | + | 7 | Our group can meet the performance targets | 0.776 | |
| P3-Individual | + | 8 | Individuals are generally happy working here | 0.831 | 0.776 |
| Performance | + | 9 | Individuals feel satisfaction to their own performance | 0.830 | |

**Note:** All items were measured on a 5-point scale ranging from "strongly disagree" to "strongly agree" Kaiser-Meyer-Olkin = 0.835% variance explained is 82.6%

**Reliability Analysis of Knowledge Stocks and Learning Flows**

To test the internal consistency of knowledge stocks and learning flows in a quantity surveying firm, reliability analysis was conducted. The three knowledge stocks (individual, group and organization) and learning flows (forward and backward) all have Cronbach alpha values greater than 0.7, indicating that they are reliable (Hair et al., 2010; see Table 3).

**Table 3: Scale Items and Reliability Values for Knowledge Stocks and Learning Flows**

| S/N | Description | α-value |
|---|---|---|
| | **K1-Individual level knowledge** | |
| 1. | Individuals are current and knowledgeable about their work. | 0.819 |
| 2. | Individuals are aware of the critical issues that affect their work. | |
| 3. | Individuals can feel a sense of success in what they do. | |
| 4. | Individuals can develop many new insights in their work. | |
| 5. | Individuals can feel confident in their work. | |
| 6. | Individuals can feel a sense of pride in their work | |
| 7. | Individuals can feel a sense of job satisfaction in what they do | |
| 8. | Individuals can have a feel of job security | |
| 9. | Individuals can have a high level of energy at work | |

| S/N | Description | α-value |
|---|---|---|
| 10. | Individuals are able to grow through their work. | |
| 11. | Individuals have a clear sense of direction in their work. | |
| 12. | Individuals are able to break out of traditional mind-sets to see things in different ways. | |
| | **K2-Group level knowledge** | |
| 13. | Regular meeting is held within the team. | 0.835 |
| 14. | In meetings, we seek to understand everyone's point of view. | |
| 15. | We share our successes within the group. | |
| 16. | We share our failure within the group. | |
| 17. | We have effective conflict resolution when working in groups. | |
| 18. | Adaptability of groups in the organization is high. | |
| 19. | Groups have a common understanding of departmental issues. | |
| 20. | Different points of view are encouraged in group work | |
| 21. | Groups rethink decisions when presented with new information. | |
| | **K3-Organization level knowledge** | |
| 22. | Organization organises seminar/symposium to improve members of staff | 0.867 |
| 23. | Organization allows members of staff to attend seminar/symposium. | |
| 24. | We have a strategy that positions us well for the future. | |
| 25. | The organizational structure can support the strategic direction. | |
| 26. | The organizational structure allows us to work effectively. | |
| 27. | Operational procedures exist in the organization. | |
| 28. | Operational procedures allow us to work effectively | |
| 29. | The organization's culture could be considered as innovative. | |
| 30. | We have a realistic but challenging vision for the organization. | |
| 31. | Organization has the systems to implement our strategy. | |
| 32. | We have company files and database that are kept up-to-date | |
| | **L1-Feed forward learning flow** | |
| 33. | Lessons learnt by one group are actively shared with others. | 0.856 |
| 34. | Individuals have input into the organization's strategy. | |
| 35. | Groups propose innovative solutions to organization-wide issues | |
| 36. | Recommendations by groups are adopted by the organization. | |
| 37. | Time is not wasted doing something already done by other people but on something more worthwhile. | |
| 38. | Individuals collect information for everyone to use. | |
| 39. | Individuals challenge the assumptions of the group. | |
| 40. | The company utilizes the intelligence of its workforce. | |
| 41. | The group of the organization knows what the other groups are doing. | |
| 42. | Outcomes of the group are used to improve products, services and processes | |
| | **L2-Feed-back learning flow** | |
| 43. | Policy and procedures is established to guide the individual's work. | 0.845 |
| 44. | Rewards systems recognize the contribution made by groups. | |
| 45. | Group decisions are supported by individuals. | |
| 46. | All individuals inside the organization understand the vision and goals of the organization. | |
| 47. | Organisation has a database to store information and it's easily accessible by individuals. | |
| 48. | Organization's database and files can provide the useful information to individuals to do the work. | |
| 49. | Information systems make it is easily for individuals to share information. | |
| 50. | Cross-training, job rotation and special assignment are used for individuals to gain different experiences and develop flexible workforce. | |

**Multiple regression analysis between knowledge stocks, learning flows and performance**

Multiple regression analysis was conducted to explore the interdependent relationship between knowledge stocks, learning flows and performance. The stepwise method was selected in this multiple regression analysis. The knowledge stocks and learning flows were selected as independent variables in the multiple regression analysis to investigate the linear relationships between the three levels of performance. The result of the multiple regression analysis is shown in Table 4. Model 1 showed that individual performance in the organization was only positively associated with the feed forward learning flow (L1), which could explain 32.8% of the variance. Group performance in Model 2 was found to be positively associated with organization level knowledge (K3) and group level knowledge (K2), explaining 60.3% of the variance. Organization level performance was found in Model 3 to be only positively associated with organization level knowledge (K3), explaining 53.1% of the variance.

Furthermore, interdependent relationship between knowledge stocks and learning flows were examined by multiple regression analysis. The knowledge stocks were selected as the independent variable to investigate the linear relationship with the learning flows. The result is also shown in Table 4. Model 4 showed that feed forward learning flow was positively associated with group level knowledge (K2) and organization level knowledge (K3), explaining 58.7% of the variance while in Model 5, feed- back learning flow was positively associated with organization level knowledge (K3) and group level knowledge (K2), explaining about 63.0% of the variance

**Table 4: Regression Model for knowledge stocks, learning flows and performance**

| | Model | β | S. E. | Sig. | VIF | R | $R^2$ | ANOVA | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | F | Sig. |
| **1** | **Individual performance** | ← | | **Knowledge stocks and learning flows** | | | | | |
| | Constant | 3.042 | 1.012 | 0.004 | | 0.573 | 0.328 | 25.428 | 0.000 |
| | L1: Feed forward learning flow | 0.135 | 0.027 | 0.000 | 1.000 | | | | |
| **2** | **Group performance** | | | **Knowledge stocks and learning flows** | | | | | |
| | Constant | 1.713 | 1.315 | 0.199 | | 0.777 | 0.603 | 38.753 | 0.000 |
| | K3: Organization level knowledge | 0.183 | 0.043 | 0.000 | 2.046 | | | | |
| | K2: Group level knowledge | 0.109 | 0.046 | 0.022 | 2.046 | | | | |
| **3** | **Organization performance** | ← | | | **knowledge stocks and learning flows** | | | | |
| | Constant | 3.770 | 1.842 | 0.046 | | 0.729 | 0.531 | 58.991 | 0.000 |
| | K3: Organization level knowledge | 0.331 | 0.043 | 0.000 | 1.000 | | | | |
| **4** | **Feed forward learning flows** | ← | | **Knowledge stocks** | | | | | |
| | Constant | 7.324 | 3.662 | 0.051 | | 0.766 | 0.587 | 36.295 | 0.000 |
| | K2: Group level knowledge | 0.473 | 0.129 | 0.001 | 2.046 | | | | |
| | K3: Organization level knowledge | 0.331 | 0.120 | 0.008 | 2.046 | | | | |
| **5** | **Feed-back learning flows** | ← | | **Knowledge stocks** | | | | | |
| | Constant | 4.025 | 2.814 | 0.159 | | 0.794 | 0.630 | 43.377 | 0.000 |
| | K3: Organization level knowledge | 0.412 | 0.092 | 0.000 | 2.046 | | | | |
| | K2: Group level knowledge | 0.249 | 0.099 | 0.015 | 2.046 | | | | |

**Note:** S.E. = standard error; Sig. = significance; VIF = variance inflation factor.

## DISCUSSION AND CONCLUSION

Based on the analysis shown in Table 4, a knowledge stock-learning flow-performance (KS-LF-P) model was developed for quantity surveying firms in Nigeria which is shown in Figure 2. It was revealed that feed forward learning flow can be predicted by group knowledge and organization knowledge while the feed-back learning flow was the reverse order of the prediction in the feed forward learning flow. Of the learning flows, only the feed forward learning flow was found to predict individual performance with no other relationship between the learning flows and performance. Relationships also exist between the knowledge stocks and performance. The model shows that group knowledge and organization knowledge could predict group performance while organization knowledge will predict only the organization performance. None of the knowledge stocks could predict individual performance.

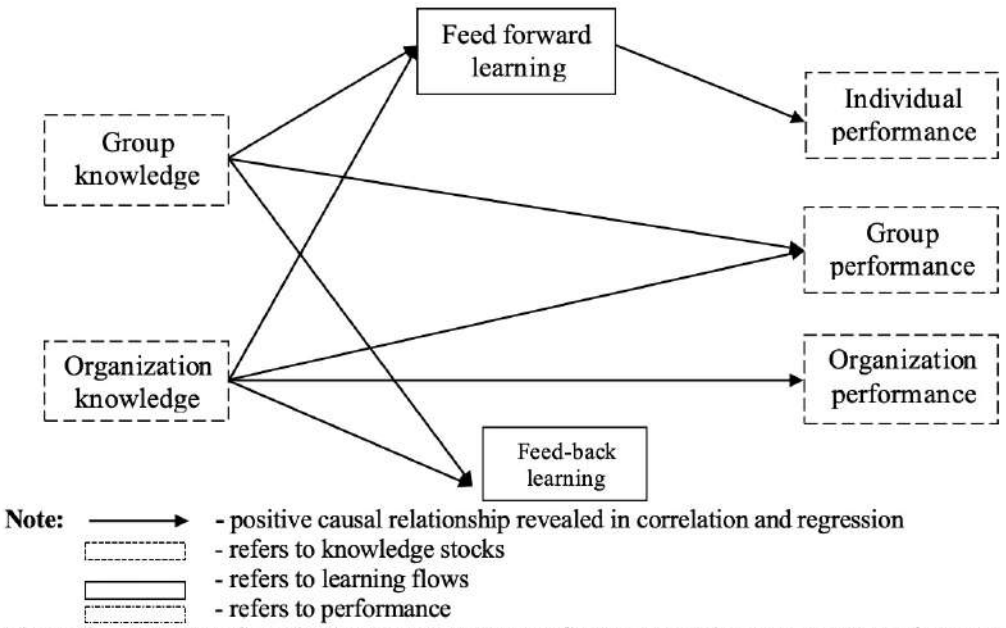


**Figure 2 Interrelationships between Knowledge Stocks, Learning Flows and Performance of Quantity Surveying Firms**

The study revealed that there is a relationship between the different levels of knowledge and the different levels of performance. This is consistent with previous findings that a strong positive relationship exists between organizational learning and performance of an organization (Goh et al., 2012; Hussein et al., 2014; Jiang & Li, 2008; Theriou & Chatzoglou 2014).

The study also revealed that the feed learning flow in a quantity surveying firm begins with the group knowledge. This finding is however inconsistent with the SLAM framework that indicates that learning flow begins with the individual knowledge (Bontis et al., 2002). The inconsistency may be caused by differences in organization structure and culture. The feed forward learning shows that the learning flow begins from the group knowledge to the organization knowledge stocks indicating that the individual knowledge does not significantly contribute to the learning flow in quantity surveying firms. This may be due to the fact that in most quantity surveying firms, the team is made up of individuals with different level of experience in handling projects (i.e. an AQs and/or TQs in the organization may be attached to a Qs/SQs). The SQs leads the group and collaborates with colleagues to complete assigned

tasks. Tasks are executed by integrating individual experiences and knowledge at group level. The completion of the task in an efficient manner is critical to attaining success and organizational performance. The findings of the present study show that feed-back learning flow begin from the organization knowledge to the group knowledge which ensures that there is a balance in the system, which is consistent with those reported in Bontis et al. (2002).

The study also indicated that individual performance is the resultant effect of the feed forward learning flow process. This reflects that the performance of an individual in an organization is a product of integrating his idea, experience and knowledge in the group and organization. Due to the similarity in the content of the curriculum used for academic training and mode of assigning task, it is important for quantity surveyors to integrate knowledge (i.e. competence, experience, ideas, etc.) in order to contribute significantly to group and organizational performance. The performance of the group is the resultant effect of the integration of the knowledge of group members and some additional contribution from the organization (see Table 4 and Figure 2)

## CONCLUSION AND FURTHER STUDIES

The construction industry is increasingly dynamic and quantity surveying firms (performing cost and contract management function) could exploit the use of organizational learning for competitive advantage and sustained growth. The present study aims at investigating the relationship between organisational learning and performance using the SLAM framework. Previously validated scale for measuring key variables were identified and adopted in the study. This ensured that valid inferences can be drawn from the results of the cross-sectional survey.

Three levels of performance were established from factor analysis using the performance measures by Bontis et al (2002). Although the result of the correlation analysis shows that all the knowledge stocks and learning flows are significantly related, only the group and organization knowledge stock and the feed forward learning flow will significantly influence any level of performance in the organization. Therefore, quantity surveying firms should give priority to activities that will encourage meeting and improving collaboration at group and organization levels. This will create an atmosphere for individuals to share opinions and ideas which is vital for improving performance. Also, open plan office and holding events for team building (such as lunch, coffee break, etc.) will stimulate discussions among employees which can result in group learning within the organization. Furthermore, firms can organize workshop, in-service training and mentoring programs which can motivate younger quantity surveyors to ask questions thereby providing an atmosphere for learning. Finally, continual professional development can be organized by professional bodies to update quantity surveyors on technological advances in the profession. This can induce learning and ensure the performance of quantity surveying firms in Nigeria.

Although the study has established the relationship between organizational learning and performance, the relatively small sample size and the use of self-report survey may limit the ability to generalize the result. However, some measures were put in place to reduce the possibility of bias. Firstly, the scales used for measurement were selected from previously validated studies and statistically tested for reliability. Secondly, selected firms were duly registered and licensed to practice quantity surveying in Nigeria. Lastly, selected firms have a minimum of 5 employees with varied level of experience, which is believed will facilitate learning within the organization. Therefore, it is believed that the actions taken will eliminate bias in the study and can form the basis for further large-scale studies. The study can also be replicated among other professionals in the construction industry.

The present study has revealed the relationship between knowledge stocks, learning flows and performance in quantity surveying firms. In order to cross-validate the results of the current questionnaire survey and further explore the implications of the study, triangulation method using personal interviews and an objective

approach (e.g., case studies) is suggested in future studies. The results of the case study approach will provide definitive evidence of the impact of the SLAM framework on the performance of firms, and also establish a complex relationship between knowledge stocks, learning flows and performance in quantity surveying firms.

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# Multi-Cultural Team Management Parameters and Dimensions for Indigenous Construction Firms in Lagos, Nigeria

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Research has established the relevance of leadership capability, team capability and firm structure and strategy in multi-cultural team management. However, studies on leadership, team capability, firm structure and strategy as parameters of multi-cultural team management in small and medium-sized construction firms have received little attention. The purpose of this paper is to highlight the dimensions of the core of capability development as multi- cultural team management parameters. These core dimensions are project leadership capability, team capability and firm's structure and strategy. The objective of the study was achieved by conducting a field survey using convenience sampling technique. A Multi-Cultural Team Management Parameters' (MCTMP) Questionnaire was developed and used to collect data for the study. Analysis was conducted using descriptive and inferential statistics. The results showed that the respondents agreed with most of the dimensions of the three parameters of multi-cultural team management. The study concludes that creativity in designs/construction processes; periodic site meeting to monitor and review performances and clear roles and responsibilities are the top dimensions of leadership capability, organisational structure and strategy and team capability respectively. It was thus recommended that indigenous construction firms work on having good leadership that can identify the different parameters and dimensions to project and organisational management and devise means of instituting, reviewing and maintaining such to the advantage of the firm.

**Keywords:** Capability, firm strategy, firm structure, multi-cultural team, organisation.

## INTRODUCTION

Uncertainties and challenges in the construction industry require constant evolving requirements towards the management of projects and teams. These are evident in the assertions made below. Mintzbeng (1979) opined that the approach in resolving ambiguity and unpredictability brought about by changes is related to the organisational configuration adopted. Nelson and winter (2002) submitted that organisations act as social-agents by responding to routines, procedures, practices and norms built over time. Ogbonna and Harris (2000) affirmed that construction projects are embedded in historical, social and institutional contexts and thus, are shaped by organisational characteristics. Dauber, Fink and Yolles (2012) inferred that the cultural backgrounds and configurations generated by the various project participants mould firms' output. Managers are thus faced with a series of daunting task amidst the dynamisms of the construction industry work environment and intense competition. These factors therefore make core capabilities a necessary tool/skill for leaders and mangers especially in a multicultural team. From the perspective of organisational development, the importance of interdisciplinary and multi-cultural teams amongst other factors is inferred (Zhang & Liu, 2006; Gill, 2006). Multi-cultural team entails the integration of the energy and synergy of individuals from different backgrounds, thereby resulting to creative approaches of resolving issues (Baiden, Price & Dainty, 2006). Proponents of multi-cultural team argue that differences in culture of work group or team results in a greater variance of ideas, thus leading to higher quality problem-solving skill. This improved problem-solving skill results from increased and diverse perspectives of styles, knowledge and insights that are valuable

to resolving complex problems (Scott-Young & Samson, 2008). This argument, however, relies on the idea that diversity brings in skill variability. Consequently, cultural diversity in work places brings value to an organisation, thereby improving performance (Beyene, Shi & Wu, 2016). The above studies do not only emphasize relationship between multi-cultural team success and its drivers (Beyene, Shi & Wu, 2016) but also characterize an organisation as a complete system in which capabilities are developed to resolve both internal and external challenges.

Previous studies on multi-cultural team addressed the issue from different perspectives. The need to develop innovative skills and capabilities in managing multi-cultural team was emphasized in the study of Alshawi and Ingirige (2003) and Blayse and Manley (2004). From the perspective of information, communication and culture, the works of Ochieng and Price (2009) and Brett, Behfar and Kern (2009) are foremost. On challenges, Ochieng and Price (2009) affirm leadership emphatic skill and effective communication as undertone to multi-cultural team management. Some authors have made efforts to develop multi-cultural team models by using certain variables in piecemeal. For instance, Pinto, Slevin and English (2009) used trust among project team members while Miller, Fields, Kumar and Ortiz (2000) used leadership.

At the core of capabilities development are strategic intent domain and organisational culture, structure and strategy as well as individual/ group knowledge domain (Gill, 2006).Though, a number of studies have been conducted on multi-cultural team and other variables, studies that relate multi-cultural team parameters to the core of capabilities' development are sparse. This study therefore assessed multi-cultural team parameters in small and medium-sized construction firms based on the core of capability development. This was achieved by measuring strategic internet domain from leaders' capability, while individual/group knowledge domain was assessed from team capability and the third domain using organisational structure and strategy. The study is significant in its potential to highlight the prevalent components of the three parameters of multi-cultural team with a view to developing these criteria for improved project and organisational performance.

**Relationship between Multi-Cultural Team Management Parameters and Project Outcome**

The three core criteria to project success according to Stare (2012) are management of projects, project organisational culture and client- contractor behaviour. Factors such as management support, roles and responsibilities, methodology, competing priorities, skilled personnel are embedded in project organisational culture. Ibrahim, Costello, & Wilkinson, (2013) highlighted clarity on roles, responsibilities and authority while Thomas & Mengel (2008) suggested alignment of project and organisational structures. Chua, Kog and Loh (1999) stressed project manager's commitment and involvement while experienced and qualified personnel were emphasised by Nguyen, Ogunlana and Lan (2004) and Enshassi and Abushaban (2009); thereby giving further support to management of multicultural team as an important aspect of human resource management.

Ofori (2012) highlights directing, co-coordinating, mobilising, motivating, persuading and visioning as key components of leadership and believed that leadership is needed in all aspects of construction. He further emphasized that leadership is required for expertise, professionalism, and innovation particularly in the context of construction hostile environment and its associated challenges (Ofori, 2003 & 2012).

Furthermore, Haas & Hansen (2005) opined that competitive performance does not depend on how much an organisation knows but on how it utilizes what is known. Utilising what is known can be said to be an integral part of leadership function. Muda and Nadrah, (2013) observe that team capability comprises personal integrity, working within industry, customer focus, quality, communication/interpersonal skill, developing/ empowering people and working as a team. They suggest that they are the needed capabilities among construction industry team leaders.

Organisational structure and strategy relate to firm sizes as well as other organisational

variables. The team and leadership capability in any given set of organisation thus depend on the culture, structure and strategy (Chew & Sharma, 2005). Elmualim, Green, Larsen and Kao (2006); Cheah, Kang and Chew, (2007) as well as Darawong, Igel and Badir, (2016) believe culture; structure and strategy are dynamic capabilities. They affirm that these capabilities are needed for innovativeness and competitive advantage. When these capabilities and organisational factors are not well managed, project consequences such as cost and time overruns, delays, profit and overhead reduction, lack of trust as well as low quality projects often result (Jefferies, Gameson & Rowlinson 2002; Hoonakker, Carayon & Loushine, 2010).

## RESEARCH METHOD

The study employed a survey research approach. A Multi-Cultural Team Management Parameters (MCTMP) Questionnaire was administered on 21 construction firms that have on-going projects with multi-cultural teams, in Lagos Metropolis, Nigeria. Forty-four questionnaires were administered, two questionnaires per firm: one for a manager and the other one for a supervisor. From literature review and prior interview with the construction firms, multi-cultural team parameters were categorised under three sub- groups namely: leadership capability, team capability and organisational structure and strategy. Each subgroup was measured with a number of dimensions as shown in the appendix. The respondents were required to express their opinions on the parameters and the dimensions as subsets of multi-cultural team management, on a Likert type scale of 1-5 ('strongly disagree' as 1 to 'strongly agree' as 5). The most prevalent dimensions under each sub group were assessed using mean item score. The Cronbach's Alpha value for the 29 variables in the questionnaire was 0.863, this coefficient was higher than the minimum recommended value of 0.7. This is an indication that the research instrument is reliable. Independent t-test was conducted to know whether there is a significant difference in the perceptions of the firms on the parameters and the dimensions.

## DISCUSSION

### Multi-cultural Team Management Parameters and Dimensions

This section assessed multi-cultural team management parameters and the dimensions. The parameters are three, namely; leadership capability, team capability and organisational structure and strategy, each with its dimensions. The results are as presented in Tables 1, 2 and 3.

### Leadership Capability for Multicultural Team Management

The descriptive statistics for leadership capability parameter as a subgroup of multi-cultural team management is as presented in Table 1.

**Table 1: Assessment of Leadership Capability for Multicultural Project Team Parameters**

| Leadership capabilities | Mean |
|---|---|
| Creativity in designs and construction processes | 4.31 |
| Clear communication between and among members | 4.22 |
| Development of improved quality products to satisfy clients | 4.22 |
| Technological innovation adoption | 4.11 |
| The leadership has the interest of the team at heart | 4.10 |
| Initiation of various skills development among each other | 4.06 |
| Ability to tackle complex designs and construction problems | 4.00 |
| Task and project implementation to reduce cost and time overrun | 3.97 |
| Enhanced decision making processes through consensus | 3.90 |
| Conflicts and disputes resolution | 3.89 |

| Leadership capabilities | Mean |
|---|---|
| Aiming at competitive advantage attainment | 3.71 |
| Overall | 4.05 |

**Note:**1.00-1.49 for 1, strongly disagree; 1.50-2.49 for 2, disagree; 2.50-3.49 for 3, indifferent ; 3.50-4.49 for 4, agree and 4.50-5.00 for 5, strongly agree.

Table 1 shows the result for the dimensions of leadership capability. The respondents agreed that the eleven dimensions of leadership are important factors to multi-cultural team management. The topmost factor is creativity in designs and construction processes with the least as aiming at competitive advantage attainment. This result implies that all the enumerated leadership capabilities are essential based on a mean score that is greater than 3.50.

**Organisational Structure and Strategy Parameters for Multi-cultural Project Team Management**

The descriptive statistics for organisational structure and strategy is as presented in Table 2.

**Table 2: Assessment of Organisation Structure and Strategy for Multicultural Project Team**

| Organisation Structure and Strategy Capability | Mean |
|---|---|
| Periodic site meeting to monitor and review performances | 4.32 |
| Planning, coordination and monitoring tools are in place | 4.12 |
| Access to wider information on firm functioning and project management | 4.03 |
| Organisation flexibility / openness | 3.98 |
| Centralised decision making processes | 3.75 |
| Stereotypes organisational structure and strategy | 3.52 |
| National culture of top management members | 3.47 |
| The preferred culture of the larger percentage of the team members is reflected | 3.41 |
| Rewards, promotion and appointments are restricted to the top management | 3.10 |
| None provision of vision and mission statement | 3.05 |
| Overall | 3.68 |

The respondents agreed with six of the organisational structure and strategy dimensions. However, decisions were not reached on the importance of four factors as important to multi-cultural team management parameters. The four factors are: national culture of top management, the preferred culture of the larger percentage of the team members, rewards, promotion and appointments' restriction to top management and none provision of vision and mission statement.

**Team Capability Parameters for Multicultural Project Team Management**

The descriptive statistics for team capability is as presented in Table .3.

**Table 3: Assessment of Team Capability for Multicultural Project Team Management**

| Team Composition Capability | Mean |
|---|---|
| Team members assigned roles and responsibilities are clear and explicit | 4.16 |
| Team members are clear on individual roles in relations to the team as a whole | 4.12 |
| Team members are willing to put in their best as a result of motivation and incentives received | 4.06 |

| Team Composition Capability | Mean |
|---|---|
| Team member willing to use previous knowledge gained to help with unforeseen | 4.04 |
| Team members are employed based on the possession of the needed expertise | 3.90 |
| Team members educational background is of importance | 3.88 |
| Team members are willing to take initiative for unassigned tasks | 3.55 |
| Team members are ready to put in the best as other jobs are not guaranteed | 3.51 |
| Overall | 3.91 |

Table 3 reveals the result of team capability parameter for multi-cultural project team. The result shows that the team members agreed that all the factors are germane. Team members assigned with clear and explicit roles and responsibilities have the highest mean score (4.16). The least ranked factor however, is team members being ready to put in their best as other jobs are not guaranteed. Overall, there is a general agreement of a mean score of 3.91 among the respondents for team capability as a dimension of multi-cultural team management in construction.

**Test of Hypothesis**

Hypothesis 1 (H1): A hypothesis was postulated to find out whether there is any significant difference in the perception of the construction firms on the parameters and dimensions of Multi- cultural team management. The hypothesis states that there is no significant difference in the perceptions of construction firms on leadership capability, organisational structure and strategy as well as team capability as parameters of Multicultural team management in construction firms in Lagos, Nigeria. The hypothesis was tested using t-test. The decision rule is to accept H1 if the p-value is greater than 0.05 at ($p \leq 0.05$), otherwise accept H0. The results are presented in Table 4.

**Table 4: Test of Significant Difference in Multicultural Team Management Parameters and Dimensions in Construction Firms**

| Multicultural Team Parameters | N | MS | SD | t-test | p-val. | Sig | Remarks |
|---|---|---|---|---|---|---|---|
| Leadership capabilities | | | | -1.022 | 0.269 | NS | Accept |
| Manager | 23 | 3.86 | 0.493 | | | | |
| Supervisor | 22 | 3.99 | 0.331 | | | | |
| Structure and Strategy | | | | -0.513 | 0.133 | NS | Accept |
| Manager | 23 | 3.53 | 0.582 | | | | |
| Supervisor | 22 | 3.61 | 0.468 | | | | |
| Team capabilities | | | | -0.512 | 0.525 | NS | Accept |
| Manager | 23 | 3.92 | 0.360 | | | | |
| Supervisor | 22 | 3.85 | 0.451 | | | | |

MS=mean score, SD=standard deviation, NS= not significant, SS=significant, Significant at $p \leq 0.05$

The t-test showing the differences in the means of leadership capability, team capability as well as structure and strategy for the two groups of respondents is depicted in Table 4. The result shows a non-significant difference in all the parameters of multi-cultural capability. This means the hypothesis that states that there is no significant difference in the perception of both managers and supervisors on leadership capability, organisational structure and strategy as well as team capability as parameters of multi-cultural team management in construction firms in Lagos, is accepted. This result implies that the 3 parameters are important in multi-cultural team.

For the dimensions, the p-values are all greater than the critical value (0.05) indicating that the hypothesis is also accepted. This is an indication that most of the 29 variables/dimensions are paramount. However the dimension of structure and strategy that has to do with access to wider information as well as the dimension of team that has to do with motivation and incentives received have p-value of 0.01. This means the hypotheses for these two dimensions are rejected. The implication of the result is that there is a difference in the respondents' perception on the means of getting wider information and how issues that relate to rewards and incentives are resolved. This table was not however presented due to its size in this write up.

Generally, these results reveal that there is no statistical difference in the perceptions of the respondents on the 3 parameters and most of the dimensions of multi-cultural team capability. Managers and supervisors thus need to identify the parameters and the dimensions and use such to the advantage of the firm.

**Discussion of Findings**

Majority of the respondents agreed with leadership capability, team capability and organisational structure and strategy as the parameters of multi-cultural team management in construction firms. On leadership, 7 dimensions that ranged from creativity in designs and construction processes; clear communication between and among members; development of improved quality products to satisfy clients; technological innovation adoption; leadership having the interest of the team at heart; initiation of various skills development among each other through the ability to tackle complex designs and construction problems were strongly agreed to. These dimensions have been researched into as resources and capabilities needed for improved performance (Olotuah & Taiwo, 2015; Baiden, Price & Dainty, 2006; Dainty, Moore & Murray, 2007). Other dimensions such as task and project implementation to reduce cost and time overrun; enhanced decision making processes through consensus; and conflicts and disputes resolution, though with lower statistical values here are prerequisite to growth and performance (Odusami, Iyagba & Omirin, 2003; Stare, 2012; Ofori, 2012; Ejohwomu, Oshodi & Onifade, 2016).

Periodic site meeting to monitor and review performances, planning, coordination and monitoring tools put in place as well as getting access to wider information on firms' functioning were dimensions that were strongly agreed to by the construction firms under organisational structure and strategy as a parameter to multi-cultural team management. On the parameter of team capability, dimensions such as clear and explicit roles and responsibilities; clear individual tasks, willingness to put in the best and team member willingness to use previous knowledge are the topmost dimensions strongly agreed to.

These findings are similar to the studies of Kant and Jagbir (2019) where the authors concluded that material management, waste reduction, scope and change management are pre-requisites to reducing time and cost overruns in projects. The study of Gewanlal and Bekker (2015) in South-African construction firms also affirm that adequate consideration of issues relating to level of knowledge, experience and mutual agreement among participants should be considered to minimise the consequences on projects.

The test of hypothesis revealed that there is no significant difference in the perception of the managers and the supervisors on the three parameters of multi-cultural team. On the dimensions, however, the managers and the supervisors differ on assess to wider information and teams putting in their best due to reward and incentive received.

## CONCLUSION AND FURTHER STUDIES

This study concludes that there is agreement on the perceptions of the respondents on the parameters and most of the dimensions of multi-cultural team capability. The firms only differ on issues relating to access to wider information on organisational functioning and teams putting in their best due to rewards and incentives received. That is, for effective multi-cultural tem management, the need for current information and the access to it is of utmost importance.

In addition, the prevalent dimensions of the 3 parameters are highlighted.

The prevalence of the dimensions of multi-cultural team capability such as 'creativity in design and construction' (Leadership capability),

'periodic site meeting' (Structure and Strategy) and 'clear and explicit roles and responsibilities' (Team capability) should be enhanced, monitored and tailored towards the success of multi-cultural team management and project delivery. This can be achieved by providing the needed leadership capabilities. As various structures and strategies have distinct impacts on performance, there is a need to identify the prevailing structure and strategy and be able to adapt it to the benefit of the firm. Finally, team integration should be designed based on the leadership, structure and strategy and current information in the industry.

The hypothesis on leadership capability dimensions are all accepted. This further stresses the importance of the right mind at the helms of affairs. Project leaders thus, need to be well equipped with every managerial tool for task and activities coordination to realise project objectives. On team capability, there is a disagreement on teams putting in their best due to incentives received. Based on the nature of construction and the need to have a well-knitted team, workers should be committed to their duties for quality to be delivered, rather than incentive/reward based delivery. Construction team leaders/supervisors should therefore nurture an integrated multi-cultural team that is committed to quality delivery. Further studies are to be conducted on multicultural team capability and the influence on specific aspect of project or organisational performance.

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# Performance measure of construction site managers on South-Western Nigeria

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Site management is a key occupational category in the construction industry. Extant literature has blamed construction site managers as contributing to time overrun due to errors in production management of construction projects. The purpose of this study is to determine predominant performance criteria and its influence on time performance. Using simple random sampling technique, seventy-eight (78) respondents that responded to the research instrument were used for the study. The objectives of the study were resolved using mean item score and regression analysis. The findings indicate that most of the construction site managers were rated average on the identified performance criteria by their direct boss (contracts manager). Site managers' scores identified time performance factors high in improving time performance. Identified performance criteria had a strong positive impact on time performance of construction projects. The study recommends among others, planned training to improve productivity, communication skills, work ethics and team building of construction site managers.

**Keywords:** Construction site manager; Performance criteria; Time performance

## INTRODUCTION

According to Styhre and Josephson (2007), construction site managers carry out one of the challenging jobs in the construction process. Site management is characterized by a high work load, long working hours and many conflicting parties to deal with including management, subordinates, and the client. They are prone to stress and if not well trained with the required skills may perform below average. Yaghoobi and Haddadi (2016) in their study found that site managers contribute to time overrun. Such contributing factors like forgetfulness, carelessness, deficient judgement had been identified as errors committed by site managers and all these result in unnecessary work at construction sites.

One of the essential requirements of any construction organization is to evaluate and monitor employee performance as this helps in giving feedback to them on their performance level and stimulates them to work harder (Hanna & Bruce, 1997). Employee performance can be defined as the achieved work outcomes for each job function during a specified period of time (Deadrick & Gardner 2000). Performance evaluation or appraisal is "a formal, structured system of measuring and evaluating an employee's job related attributes, behaviours, and outcomes to assess an employee's productivity and judge whether he or she will perform as or more effectively in the future, so that the employee, the organization, and society all benefit (Shaout & Al-Shammari,1998). Performance of construction site managers refers to a systematic process for obtaining valid information about their performance and the factors that affect their performance (Yaghoobi & Haddadi, 2016). Performance assessment is an important task for construction companies as it helps in highlighting the main criteria resulting in the poor performance of site managers (Yung- YuLin & Nai-Hsin Pan, 2014). Performance has behavioural and outcome perspectives. The behavioural perspective defines performance in terms of measurable behaviours relevant to the achievement of organizational goals. The outcome perspective refers to the objective consequences of behaviour. Thus, in project context, the outcome perspective will evaluate performance on the basis of project outcomes such as quality and time.

Performance of construction workers can be evaluated either objectively or subjectively (Vinchor, Schippmann, Switzer & Roth 1998). Objective measures reduce both intentional and

unintentional biases such as leniency and halo errors (Siders, George & Dharwadkar, 2001). Job performance measures are known to be criterion measures (Campbell, McCloy, Oppler, & Sager, 1993). Researchers of this school have investigated different clusters of performance criteria. Borman and Motowidlo (1997b) classified job performance into task performance (job specific behaviours, such as core job responsibilities) and contextual performance (non job-specific behaviours, such as cooperation, interest)

Arazi, Mahmoud and Mohamad (2011) stipulate that construction project's time refers to the estimated period within which the project will start and finish. According to Arazi et al. (2011), the extent to which construction project meet time target determines its effectiveness. Consequently, time performance of construction projects can be judged based on a number of factors, such as completion within predetermined project duration, average delay experienced, irregular payments, time expended on implementation of variation orders and time needed to rectify defects that occurred during construction and defect liability period.

Unfortunately, construction project still experience unexpected delay and untimely delivery. The work of (Khamidi, Khan & Idris, 2011) attributed difficulty in completing construction project within predetermined time to its unique nature, improper planning, and poor management of construction time. Apart from the work of Mustapha and Naoum (1997) that examined "criterion measures for determining the effectiveness of site managers", limited research had been done in this domain of study. Dulaimi and Langford (1999) tested the relationship between project managers' performance criteria and project performance (time, cost), their result suggested that certain aspects of project managers' performance criteria (organizing, coordinating) are significantly related to project performance. Similar works need to be replicated for construction site managers using time performance. Hence this study aims to identify predominant criteria for measuring the performance of construction site managers, identify predominant factors influencing time performance of construction projects and determine the impact of performance measures on time performance of construction site managers

**Performance Measures**

The prevalent performance evaluation in the construction industry is by ratings, which are subjective evaluations obtained from sources including supervisors, peers, subordinates, self, or even customers, with supervisors being the most commonly used source followed by peers (Viswesvaran, Ones & Schmidt, 1996).

Viswesvaran (1993) empirically identified ten popular component dimensions of job performance. They are productivity, quality, leadership, communication competence, administrative competence, effort, interpersonal competence, job knowledge, compliance with or acceptance of authority, and overall job performance. The study of Hanna and Brusoe (1997) identified 11 criteria for evaluating supervisors' job performance in electrical construction contractors, which include leadership, personal conduct, communication skills, quality of work, ability to deal with problems, delegation of responsibility, work ethics, initiative, accepts responsibility, ability to work with others, and knowledge of work. Dainty, Cheng & Moore (2003) based on their logistic regression analysis, found 12 competencies helping to distinguish between superior and average performers. These competencies are achievement orientation, initiative, information seeking, focus on client's needs, impact and influence, directiveness, teamwork and cooperation, team leadership, analytical thinking, conceptual thinking, self-control, and flexibility.

Igbaria (1991) studied the antecedents and consequences of job performance of management information system professionals. The resulting factor analysis of 17 job performance qualities produced two categories of job performance measures. Task category consists of ability, job knowledge, productivity, creativity, quality of work, initiative, judgment, planning, accuracy, and responsibility. Relationship category consists of cooperation, honesty, interpersonal relationship, attitude, dependability, communication skills,

and punctuality. Another research group in the United Kingdom, when studying superior managers' behavioural attributes, extracted nine factors of performance effectiveness criteria for construction, which are team building, leadership, decision making, trust, honesty and integrity, communication, understanding and applications, self-motivation, and external relations (Moore, Cheng & Dainty 2003).

**Factors Affecting Time Performance**

Various researchers have identified factors that can enhance time performance of construction projects. Research by (Tumi, Omran, Pakir, 2009; Danso & Antwi, 2012; Rahman, Memon, Magapan,Qbai & Azis, 2012) demonstrated that adequate pre- and post- contract planning, effective supervision of workforce, satisfaction of clients' needs and use of tools and techniques can improve time performance of construction projects. The study of (Enshasi, Al-Naffar, Kumaraswamy, 2009; Kaliba, Maya & Mumba, 2009; Pai and Bharat, 2013; Aziz, 2013) identified adequate project funding, commitment of construction companies top management and effective communication among workforce as factors that can improve time performance of construction projects. Empirically (Memon, Rahman & Azis, 2013; Gunduz, Nielsen & Ozdemir, 2013) established that the use of skilled craftsmen, enforcement of quality policy on site, on the job training of craftsmen and ability to read and interpret drawings can improve time performance of construction projects.

**Relationship between Performance Measures and Project Performance**

Different theoretical frameworks have been developed to understand the mechanisms underlying the relationship between performance measures and project performance. Dulaimi and Langford (1999) tested the relationship between project manager's behaviour and project performance (time, cost). Their results suggested that certain aspects of a PM's behaviour (that is organizing and coordinating) are significantly related to project performance. Gransberg, Dillion, Reynolds & Boyd (1999) studied the effect of partnership on project performance. They found that the continuous partnership results in improved project performance across the entire program. Brown and Adams (2000) investigated the impact of building project management on project outputs. Their results indicate that building project management does not have a significant impact on project performance. Odusami, Iyagba & Omirin (2003) examined the effects of project leadership and team composition on overall construction project performance in Nigeria. Results indicate that significant relationships were found among a project leader's professional qualification, his leadership style, team composition, and overall project performance, but the project leader's profession was not related significantly to overall project performance. However, research into performance measures as an independent variable to explore its relationship with time performance is lacking. The present study represents an original inquiry that contributes to the existing literature in the study domain.

**RESEARCH METHOD**

The data for the study were collected through questionnaire addressed to site managers and contracts manager in contractors' organizations within the Nigerian construction industry. Additionally, archival data relating to performance criteria, factors affecting time performance were also sourced. Prior to data collection, pilot study was carried out using the initial draft of the questionnaire to ensure that the research instrument would establish the most productive form of data analysis. The input and the results generated from the pilot study were used to refine the questionnaire before the industry- wide survey was carried out. Reliability test was also conducted on the research instruments using Cronbach's alpha (a). The reliability coefficients for the instrument relating to performance criteria and the archival data were found to be 0.862 and 0.921 respectively. This signifies that the instruments used for the study were reliable.

In order to have a defined sample size, 462 construction companies in Lagos state that have current financial status with Federation of

Construction Industry (FOCI) were retrieved from their web site. Using a stratified sampling technique, one out of every construction company in the sample frame was selected and given the research instrument. A total of 154 questionnaires were distributed to site managers of selected construction companies and another set of questionnaires were also given to contracts manager for the evaluation of site managers' performance. A total of 78 questionnaires were retrieved from the respondents and used for this study.

**DISCUSSION**

From the biographical information of the respondents presented in Table 3; civil engineers constitute the largest majority of the respondents. This is seconded by builders and lastly architects

This agrees with the employment structure of most construction companies in the study area.

**Table 1: Biographical Information of Site Managers**

| Profession | Frequency | Percentage |
|---|---|---|
| Civil Engineers | 38 | 48.72% |
| Builders | 30 | 38.46% |
| Architects | 10 | 12.82% |
| Total | 78 | 100.0% |
| Industry Experience of Site Managers | | |
| Less than 10 years | 15 | 19.23% |
| 11- 20 years | 25 | 32.05% |
| 21-30 years | 25 | 32.05% |
| More than 30 years | 3 | 16.67% |
| Total | 78 | 100.0% |

With regards to industry based experience of the respondents, most of the study samples have between (11-30) years' work experience in the industry. This means that most of the respondents have relevant experience to make contribution to the study.

**Predominant Performance Measures**

Based on the responses of the respondents as tabulated in Table 2; four performance criteria (productivity, communication skills, team building and job knowledge) were adjudged as very important by the respondents on the one hand while the remaining thirteen performance criteria (analytical thinking, work ethics, quality of work, interpersonal relationship, dependability, planning, leadership, ability to deal with problems, initiative, ability to accept responsibility, focus on clients' needs, punctuality and ability to take decisions) were adjudged to be important on the other, by same respondents. Findings in the adjudged very important performance criteria is consistent with the findings of Viswesvaran (1993), Hanna and Brusoe (1997), and Dainty et al (2003); in that their respective studies identified these performance criteria as very important.

**Table 2: Performance Criteria of Construction Site Managers**

| Performance Criteria | M.I.S. |
|---|---|
| Productivity (quantity of work done) | 0.86 |
| Communication skills | 0.83 |
| Team building | 0.81 |
| Job knowledge | 0.80 |
| Analytical thinking | 0.79 |
| Work ethics | 0.78 |

| Performance Criteria | M.I.S. |
|---|---|
| Quality of work | 0.76 |
| Interpersonal relationship | 0.75 |
| Dependability | 0.73 |
| Planning | 0.71 |
| Leadership | 0.70 |
| Ability to deal with problems | 0.69 |
| Initiative | 0.67 |
| Accepts responsibility | 0.66 |
| Focus on Clients needs | 0.65 |
| Punctuality | 0.64 |
| Ability to take decision | 0.60 |

(0.80-0.99) very important criteria; (0.60-0.79) important criteria; M.I.S = Mean Item Score

The predominant performance criteria are both objective and subjective performance measures and this confirms the findings of Vinchor et.al. (1998) that performance of construction workers can be evaluated both objectively and subjectively. Although Siders et.al.(2001) is of the opinion that emphasis should be on objective measures so as to reduce intentional and unintentional biases (leniency and halo errors) inherent in subjective performance measures.

Evaluation of Construction Site Managers Performance

Table 3 depicts the result of performance evaluation of construction site managers. Construction site managers were evaluated as good on (quality of work, ability to deal with problems, analytical thinking, leadership and interpersonal relationship). Mustapha and Naoum (1998) in their study of factors influencing the effectiveness of construction site managers also identified some of these factors as highly effective. The main divergence of this result with the findings of Mustapha and Naoum (1998) is that the direct supervisors scored construction site managers higher than the scores contracts manager gave to site managers in this study. Site managers were scored average performance on (Accepts responsibility, job knowledge, planning, productivity, team building, communication skills, ability to take decisions, focus on clients' needs, dependability and work ethics). Their performance evaluation on their initiative and punctuality was poor. This performance evaluation is consistent with the findings of Styhre and Josephon (2007) that the nature of work of construction site managers is stressful and if lacking in required skills may result in poor performance.

**Table 3: Evaluation of Construction Site Managers Performance**

| Performance Criteria | M.I.S |
|---|---|
| Quality of work | 0.66 |
| Ability to deal with problems | 0.65 |
| Analytical thinking | 0.63 |
| Leadership | 0.62 |
| Interpersonal relationship | 0.61 |
| Accepts responsibility | 0.56 |
| Job knowledge | 0.55 |
| Planning | 0.52 |
| Productivity | 0.49 |
| Team building | 0.48 |

| Performance Criteria | M.I.S |
|---|---|
| Communication skills | 0.47 |
| Ability to take decision | 0.46 |
| Focus on clients' needs | 0.45 |
| Dependability | 0.44 |
| Work ethics | 0.43 |
| Initiative | 0.25 |
| Punctuality | 0.21 |

(0.80-0.99) excellent; (0.60-0.79) good; (0.40-0.59) average; (0.20-0.39) poor; (0.00-0.19) very poor; M.I.S = Mean Item Score

**Factors Affecting Construction Time Performance**

The results in Table 4 indicate factors affecting construction time performance. Based on the responses of the respondents, adequate project funding and adequate pre- and post- contract planning of projects have very high improvement on construction time performance. This agrees with the findings of Enshasi et.al. (2009); Kaliba et.al.(2009); Pai and Bharat, (2013) and Azis, (2013) in that in their various studies, these two factors were ranked as predominant factors that affect construction time performance. Eight factors (effective supervision of workforce, commitment of top management, effective communication among the workforce, use of skilled craftsmen, enforcement of quality policy on site, on the job training of craftsmen, ability to read and interpret drawings and satisfaction of client's needs) were adjudged by the respondents as factors that have high improvement on construction time performance. This finding agrees with the research output of Tumi et al. (2009); Danso & Antwi, (2012); Rahman et.al. (2012) that demonstrated that effective supervision of workforce and satisfaction of clients' needs can improve construction time performance. This result is also consistent with the research findings of Memon et al. (2013) and Gunduz, (2013). Their studies found out that the use of skilled craftsmen, enforcement of quality policy on site and on the job training of craftsmen can improve construction time performance.

**Table 4: Factors affecting Construction Time Performance**

| S/N | FACTORS | M.I.S |
|---|---|---|
| 1 | Adequate project funding | 0.920 |
| 2 | Adequate pre and post contract planning | 0.915 |
| 3 | Effective supervision of work force | 0.762 |
| 4 | Commitment of top management of construction companies | 0.758 |
| 5 | Effective communication among the workforce | 0.752 |
| 6 | Use of Skilled Craftsmen | 0.728 |
| 7 | Enforcement of quality policy on site | 0.694 |
| 8 | On the job training of craftsmen | 0.689 |
| 9 | Ability to read and interpret drawings | 0.652 |
| 10 | Satisfaction of client's need | 0.610 |
| 11 | Effective use of tools and techniques | 0.552 |

0.800-0.999 (very high improvement); 0.600-0.799 (high improvement); 0.400-0.599 (moderate improvement) 0.200-0.399 (low improvement); 0.000-1.999 (very low improvement)

**Impact of Performance Criteria on Construction Time Performance**

ANOVA result in table 5 relating to the impact of performance criteria on construction project time performance is very high with a p-value of 0.031 ($P \leq 0.05$).

This also means that performance criteria are directly related to construction project time performance. This confirms the findings of Dulami and Langford (1999) that some performance measures are significantly related to project performance. This result further reinforces the research output of Gransberg et al. (1999) and Odusami et al (2003) that established significant relationship between project leaders' qualification and project performance. The implication of this result is that acquiring skills in predominant performance measures will enhance construction time performance

**Table 5: One Way Analysis of Variance of Impact of Performance Criteria of Construction Project Time Performance (N = 78)**

| Source of Variation | DF | SS | MS | F-Ratio | P-Value | Remarks |
|---|---|---|---|---|---|---|
| Between groups | 2 | 1,411.133 | 671.200 | 3.580 | 0.031 | S* |
| Within groups | 76 | 13,621.123 | 189.275 | | | |
| Total | 78 | 15,032.256 | | | | |

*Significant at P≤0.05; DF= Degree of freedom; SS= Sum of Square; MS =Mean sum

## CONCLUSION AND FURTHER STUDIES

The purpose of our study was to determine predominant performance criteria and its influence on construction time performance. We contribute to extant literature by identifying predominant performance criteria and factors influencing construction time performance. Secondly by determining the level of impact of performance criteria on construction time performance, we have added incremental knowledge in this domain of study. Our results were consistent with (Igbaria, 1991; Viswesvaran, 1993; Hanna & Brusoe, 1997, Dainty et.al.2003).

These findings further strengthen our understanding that most of the predominant performance measures can be used to evaluate the performance of various designations within the construction industry. The findings of this study that performance criteria had significant impact

on construction time performance is consistent with the findings of Odusami et.al.(2003) that established significant relationship between some biographical data of the project leader and project performance. A major contribution of this study is that we have been able to identify predominant performance criteria and factors influencing construction time performance. Secondly, we were able to establish that performance criteria have positive significant impact on construction time performance. The study recommends that construction site managers should be trained to acquire skills on the predominant performance criteria as this will enhance construction time performance. We measured construction site managers' performance solely from the perspective of their supervisors. It would be useful for future research to complement supervisory judgement with perception of peers.

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# Quality Culture Implementation and Militating Factors in Construction Organisations in Nigeria

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Total Quality Management (TQM) has been proffered as a means to solving performance problem. Despite the benefits of TQM, construction stakeholders are yet to fully implement TQM and use the technique in resolving quality issues in Nigeria. Quality culture has been highlighted as key to TQM yet there is a dearth of research into quality culture in the Nigerian construction industry and thus the need to examine quality culture among construction organisations. The aim of the study is to assess the understanding of quality culture for proper implementation by identifying factors used in defining quality, assessing construction of stakeholders' perception of quality as culture and the evaluation of prevalent barriers to quality culture implementation for the purpose of improved quality performance. Forty-one construction organisations comprising client, consulting and contracting organisations participated in a purposively selected sample. Mean score and analysis of variance test were used to understand the underlying quality culture being examined. The findings revealed that conformity to specification, customer satisfaction and elimination of defects are perceived to be quality culture criteria, while factors such as lack of standardisation , tendency to cure symptom rather than get to the root cause of a problem, are considered as the constraints. It is advocated that quality should be defined and embraced as a cultural phenomenon while project managers or business owners should embrace quality culture from perspectives of dealing with the problem rather than curing the symptoms syndrome.

**Keywords:** Construction organisation, quality culture, quality culture barriers, quality culture implementation, quality perception.

## INTRODUCTION

Achieving total quality management requires all members of an organisation to participate in processes improvement. However, process improvement is partly related to the overall success that often stems from the underlying culture in the organisation for long term customer satisfaction. The concept of quality has been the focus of attention in a number of organisations (be it private or public) across a range of disciplines (Kazaz, Ulubeyli&Turker, 2004). The finished product in any industry should be manufactured to a required standard, one that provides customer satisfaction and value for money (Rustom&Amer, 2006). Therefore, in order for construction clients and end users of completed facilities to realise best value, the concept of quality culture must be stressed in the industry to improve the quality of product and services offered by various organisations (Idrus&Sodangi, 2010). Construction organisations impact the quality of life for building facilities and play a major role in a nation's economy and development. The growth of a country and its development status is generally determined by the quality of its infrastructure and construction projects. Scholars

tend to agree that the origin of any organisational culture is grounded in a rich set of assumptions about the nature of the world and human relationships (Tharp 2009). The culture in any organisation is formed by the beliefs, behaviours, norms, dominant values, rules and the climate (DTI, 2001; Schein (2011). According to Schein (2011), organisational culture is a set of commonly held values and beliefs 'deep' within the organisation with myriad of behavioural patterns that combine to mould the organisation's identity. Therefore, organisational culture is used to describe the shared beliefs, perceptions, and expectations of individuals in an organisation

(Boan&Funderburk, 2003). It guides and controls employee behaviour and action (Thomas, Marosszeky, Karim, Davis, &McGeorge; 2002). Forbes Insight (2014) described culture of quality as a continuum with one end being that of perception and the other, embracement of quality vision. At the first end, the quality program is perceived as a mere set of slogans in the organisation while at the other, each and every employee from entry level to the seat of the chief executive embrace the organisation's quality vision, values and goals as a way of life. Poor quality of construction in Nigeria has been generally attributed to human attitudinal problems and lack of implementable standards (Oyedele, Jaiyeoba, Kadiri, Folagbade, Tijani, & Salami, 2015).

The dominant theme in much of the available management literature emphasizes interest in culture as an instrument for improving organisational performance (Harvey &Stensaker, 2008). DTI (2001) stresses that understanding the culture of an organisation, and the use of its knowledge to successfully map the steps needed to accomplish a successful change, is an important part of the quality journey. Thus, the need to achieve quality of finished product in construction industry is as important as any other industry (Rustom & Amer, 2006). Quality has been a major imperative lacking in Nigerian construction industry with a number of construction firms operating poor salary package for the workers. This is established in the works ofFagbenle, Ogunde, and Owolabi (2011). Thus, construction labour tend to focus more on the number of hours spent on the work and quantity of work done rather than the quality of work executed. Oyedele et al., (2015) advocated the need to create culture and awareness of quality in the Nigerian construction industry. This confirms lack of quality culture practice which weighs heavily on the observed problem of the perception of quality in construction industry in Nigeria. Also, the industry encounters different constraints in the implementation of quality culture. In regards to this, all stakeholders involved in construction projects have a role to play in order to deliver a quality product. This study is set to assess the perception of quality in construction organisations with a hypothesis that thereis no significant difference between the perception of quality among client, consultant and contracting organisations on the one hand and also small, medium and large construction organisations on the other. It also assesses the constraints encountered in the implementation of quality culture in Nigeria with the aim of improving the emphasis on the understanding of quality culture for proper implementation. Therefore, practitioners in the Nigeria construction industry are provided with additional document in TQM that is useful in implementing quality culture. This work provides basis for further research in the academia having established the perception of quality culture and militating factors in its implementation in Nigeria.

**Relationship among Culture, Quality and Performance**

Lack of success in construction quality is a global issue. According to FIDIC (2004), failure to achieve appropriate quality of construction is a worldwide problem. Today, the construction industry is one with poor quality emphasis compared to other sectors like manufacturing and service sectors. Many criticisms have been directed to the industry for generally poor workmanship (Sodangi, Idrus&Khamidi; 2010). The final product, the processes, the parties and the materials are under tremendous pressure and criticisms for better quality in construction (Mahmood, Mohammed, Misnan, Yusof&Bakri; 2006) as failure of any of the parties will seriously affect the quality of the final project (Sodangi et al., 2010). This implies that organisational culture is a primary factor in relation to organisational ills or success as the case may be. The leadership skills that are prevalent in an individual or an organisation thus, become a factor of performance. Since leaders mould culture, the norms, values and practices that are apparent in any form of establishment will have a resultant effect on the final outcome.

The study by Adenfelt and Lagerstrom (2006) revealed that culture is a great enabler in knowledge acquisition and management. Marrewijk (2007) discussed likely challenges a firm would face when the culture and the structure do not align. Cheung, Wong and Wu (2011) emphasized the

need for perfect cultural orientation for successful project outcome. Summarily, the importance of culture to employees' understanding of the firm, the expected behaviour, the needed tools for greater achievement and performance had been emphasized and this is corroborated in the work of Bulach, Lunenburg and Potter, (2012). Quality performances of projects are adversely affected by the different factors according toJha and Iyer (2006). This includes; conflict among project participants; hostile socio-economic environment; harsh climatic condition; PM's ignorance and lack of knowledge; faulty project conceptualization; and aggressive competition during tendering whileWindapo (2018) highlighted formal education, training, task- oriented ideals and futuristic decisions as drivers of quality.

**The Perception of Quality**

Project success measures have long been established on the criteria of cost, time and quality (Chan, Scott & Lam, 2002). The concept of quality has long been analysed by numerous representatives from many academic and business backgrounds (Ruþevièius, 2006). The concept of quality rests on its management. Defining quality is not as easy as it may seem, because different people have different ideas of what constitutes quality. Quality is only useful and of value (PHCC, 1996) when it means the same thing to all the people in an organisation. Arditi and Gunaydin (1997) define quality in terms of conformance to the agreed requirements of the customer and a product or service free of deficiencies. Customer needs are the key driver of organisation quality programs although few organisations actively involve c ustomers in formal quality discussions (Forbes Insight, 2014). Quality in construction is directly connected with conformance to specifications fitness for use (Mahmood et al., 2006). The construction industry tends to define quality as the ability of products and processes to conform to the established requirements. These requirements are established characteristics of a product, process or service as specified in the contractual agreement (Sodangi et al., 2010). Ruþevièius (2006) concluded that quality should be defined in terms of the total sum of a product's features that ascribe its suitability to meet all expressed and implied consumer needs as determined by the product's conditions of use and its purpose. Construction quality in particular, can be seen as very difficult to define due to the uniqueness of its methods, product and work force that can be involved in a single project (Farooqui& Ahmed, 2009). Despite this, one universal and common definition of quality is yet to be agreed upon (Ruþevièius, 2006) hence, the need to know the perception of construction organisations in defining quality in the Nigerian construction industry which will eventually help stakeholders in the industry to hinge quality culture practice on the perceived norm for improved performance in comparison to best practice.

**Constraints in Implementing Quality Culture**

The need for quality and its instutionalization in construction has been emphasised. Several attempts by a number of firms have been jeopardised by a series of challenges or barriers ranging from hostile environment conditions, lack of technology advancement, leaders' ignorance among others (Jha&Iyer, 2006;Hoonakker, Carayon&Loushine, 2010; Al-Jalahma&Gallear, 2010)). Implementing quality culture and neglecting potential quality culture implementation constraints result in poor quality of product. It, therefore, becomes imperative that construction organisations understand and address the barriers, before and during project execution. Previous researchers grouped the barrier in attaining quality into categories such as top management barriers, planning barriers, operational barriers, process barriers, resource barriers, cultural barriers and environmental barriers. In practice, these barriers need to be identified and addressed in order to facilitate the introduction of the high-performance management practices required (PHCC, 1996; Aoieong, Tang & Ahmed, 2002; Shen& Tam, 2002).

**RESEARCH METHOD**

Quantitative data collection was done through a questionnaire survey and the data analyses were carried out using statistical package

for social sciences (SPSS). Surveys are useful in describing the characteristics of large population and ensuring accurate data from targeted sample. Also, a more accurate result from which conclusions are drawn and important decisions taken is ensured. A sample of 123 was purposively selected from contracting, consulting and client organizations in Lagos State. A total of 12 factors were identified from literature for the perception of quality culture while 14 factors were identified for the constraints in the implementation of quality culture accordingly. Measures of central tendency and dispersion were used to observe the underlying quality culture issues set out to be discovered. A total of 89 questionnaires were received from the respondents which represents 72% response rate. The demographic data revealed that senior staff constituted the highest proportion (39%), site engineer 15% and project manager (15%). Ten percent of respondents are quality control officers, 7% are assistants to senior officers, 5% managing directors, 5% partners, and 5% are construction manager. The respondents are professionally qualified. Corporate members account for 66% of the respondents while 2% of the respondents are fellows of their professional institutes. Organisational distribution includes 42% consulting firms, 40% contracting firms and 18% of client organizations. The size of organisation of respondents indicates that organisations surveyed are predominantly large and medium sized companies, each having 41% respondents while small sized firms accounts for 18%.

**Presentation and Analysis of Data**

In order to establish the concept of quality from the perception of the respondents, a three point Likert type of scale (3-Strongly agree, 2-agree and 1-not agree) was used to assess the perception of quality in the Nigerian construction industry. Table 1 reveals the perception of quality by various respondents. The respondents, based on their experiences in construction, strongly agreed that conformance to specification, customer satisfaction, elimination of defects and meeting contract requirement are the top most quality culture issues. They also agreed that other eight quality culture issues were also agreed by respondents since none of the variables fall below the Mean scale of 2 and the least rated variable is quality culture is perceived as a cultural phenomenon. Thus, it can be concluded that quality in the Nigerian construction industry is strongly perceived as conformance to specification, customer satisfaction, elimination of defects and meeting the contract requirement and they barely perceived it as a cultural phenomenon.

**Table 1: Perception of Quality**

| Perception | Mean |
|---|---|
| Conformance to specification | 2.81 |
| Customer satisfaction | 2.73 |
| Elimination of defects | 2.53 |
| Meeting the contract requirement | 2.51 |
| Minimization of rework | 2.49 |
| An asset of value | 2.48 |
| A competitive advantage | 2.45 |
| Minimization of cost | 2.36 |
| Scope achievement | 2.34 |

| | |
|---|---|
| An organizational ideology | 2.31 |
| A tool /technique to increase profit | 2.15 |
| A cultural phenomenon* | 2.01 |

N=89, *N=87

**Analysis of Variance Test on the Perception of Quality among Groups of Firms**

An analysis of variance (ANOVA) test was also carried out at 95% confidence level to determine whether the three groups of firms have different perceptions of quality. In Table 2, the p-values ($p<0.05$) of the three groups reveal that the three groups of firms have the same perception about quality as there is no significant difference in their perception of quality.

**Table 2: Analysis of Variance Test on Perception of Quality among Three Groups of Firms**

| Perception of quality Measures | Contractor | Client | Consultant | f-value | p-value | Decision |
|---|---|---|---|---|---|---|
| Customer satisfaction | 2.70 | 2.69 | 2.78 | .235 | .791 | NS |
| Minimization of rework | 2.35 | 2.50 | 2.64 | 1.675 | .193 | NS |
| Scope achievement | 2.27 | 2.38 | 2.40 | .304 | .738 | NS |
| Minimization of cost | 2.45 | 2.45 | 2.22 | .998 | .373 | NS |
| Conformance to specification | 2.81 | 2.94 | 2.75 | 1.091 | .341 | NS |
| Elimination of defects | 2.67 | 2.31 | 2.47 | 2.506 | .088 | NS |
| A tool /technique to increase profit | 2.24 | 1.94 | 2.14 | 1.124 | .330 | NS |
| A competitive advantage | 2.56 | 2.31 | 2.39 | 1.403 | .252 | NS |
| An asset of value | 2.64 | 2.44 | 2.33 | 2.811 | .066 | NS |
| A cultural phenomenon | 2.02 | 1.88 | 2.06 | .358 | .700 | NS |
| An organizational ideology | 2.24 | 2.38 | 2.36 | .379 | .686 | NS |
| Meeting the contract requirement | 2.54 | 2.44 | 2.50 | .152 | .859 | NS |

N=population=89, NS=not significant

Thus, by way of inference, quality in the Nigerian Construction industry is perceived as conformance to specification, customer satisfaction and meeting the contract requirement as ranked in Table 1. The analysis revealed that clients and contractors strongly define quality as conformance to specification whereas consultants' foremost definition is customer satisfaction. It follows that while contractors understand the need to conform to specification as required by the clients, the consultant would want to ensure that the client (customer) is satisfied with the product. Therefore, the challenge of quality performance in the industry is in the process where workers need to see quality achievement as a way of life for company's mission and not just a slogan for company's vision.

**Analysis of Variance Test on the Perception of Quality among Size of Firms**

A further analysis of variances (ANOVA) test was carried out at 95% confidence level to determine whether the three sizes of construction organisations differ in their perceptions of quality. Table 3 shows the result of the ANOVA test. The p-values ($p<0.05$) of the three sizes; large, medium and small organisations revealed that the three groups of firms have the same perception about quality except in two variables; 'Scope achievement' and 'a cultural phenomenon'. The three levels of organisations ranked these two perception variables low based on the 3 point Likert Scale with small size organisation recording the lowest Mean of 2.00 (agree) and 1.40 (not agree) for 'Scope achievement' and 'a cultural phenomenon' respectively. While

medium size organisations recorded Mean of 2.53 and 2.22, large organisations recorded 2.31 and 2.06 respectively. These two perception variables have a significant difference ($p<0.05$) among the organisations. Therefore, organisations might not perceive quality as 'scope achievement' and 'cultural phenomenon' as implied by the low ranking of these perception variables and the organization's disagreement on these perceptions. Importantly, small organisations would neither see quality as 'a cultural phenomenon' nor 'scope achievement'. This is an insight to the reason why projects handled by small scale organisations experience more delays with poor quality, after all quality is not perceived as a cultural phenomenon in their organisations

**Table 3: Analysis of Variance Test on Perception of Quality among Different Sizes of Organisation**

| Perceptions | Large | Medium | Small | Overall Mean | F | Sig |
|---|---|---|---|---|---|---|
| Customer satisfaction | 2.64 | 2.84 | 2.68 | 2.73 | 1.316 | .274 |
| Minimization of rework | 2.44 | 2.59 | 2.38 | 2.49 | .749 | .476 |
| Scope achievement | 2.31 | 2.53 | 2.00 | 2.34 | 3.153 | .048 |
| Minimization of cost | 2.44 | 2.43 | 2.00 | 2.36 | 2.263 | .110 |
| Conformance to specification | 2.75 | 2.86 | 2.81 | 2.81 | .668 | .515 |
| Elimination of defects | 2.47 | 2.62 | 2.44 | 2.53 | .824 | .442 |
| A tool /technique to increase profit | 2.17 | 2.21 | 1.93 | 2.15 | .955 | .389 |
| A competitive advantage | 2.36 | 2.57 | 2.38 | 2.45 | 1.307 | .276 |
| An asset of value | 2.47 | 2.54 | 2.38 | 2.48 | .450 | .639 |
| A cultural phenomenon | 2.06 | 2.22 | 1.40 | 2.01 | 8.105 | .001 |
| An organizational ideology | 2.28 | 2.35 | 2.31 | 2.31 | .115 | .892 |
| Meeting the contract requirement | 2.47 | 2.54 | 2.54 | 2.51 | .108 | .898 |

**Constraints Militating the Implementation of Quality Culture in Construction Works in Nigeria**

Table 4 describes the constraints involved in the implementation of quality culture in construction works in Nigeria. Using a 5 point Likert Scale, the top three constraints with the highest degree of importance are perception of quality, lack of standardisation, tendency to cure symptom rather than get to the root cause of a problem. However, no operation to benchmark, difficulty in measuring result and unique nature of construction were ranked least. Interestingly, there is no general definition of quality in construction; however it is the highest ranked constraint affecting the implementation of quality culture in construction works in Nigeria. Thus, it is safe to infer that organisations should have a clear perception of quality that would be vigorously implemented as a culture of the organisation.

**Table 4: Constraints Militating against the Implementation of Quality Culture**

| Constraints | Mean |
|---|---|
| Perception of quality* | 3.78 |
| Lack of standardization | 3.76 |
| Tendency to cure symptom rather than get to the root cause of a problem | 3.75 |
| Lack of planning for quality | 3.65 |
| Lack of expertise | 3.65 |
| Transient (unstable) workforce | 3.55 |
| Lack of top management support | 3.49 |
| Low bid subcontracting | 3.45 |
| Lack of funds | 3.44 |

| Constraints | Mean |
|---|---|
| Low education levels of field force* | 3.44 |
| Unawareness of quality improvement programme* | 3.43 |
| No operation to benchmark* | 3.33 |
| Difficulty in measuring result | 3.04 |
| Unique nature of construction | 3.00 |

N=89, *N=88

Table 4 describes the constraints involved in the implementation of quality culture in construction works in Nigeria. The table reflects a mean score that is between 3.00 and 3.78 on the 5point Likert scale. As presented in Table 4, the top three constraints with the highest degree of importance are perception of quality (3.78), lack of standardisation (3.76), tendency to cure symptom rather than get to the root cause of a problem (3.75). However, no operation to benchmark (3.33), difficulty in measuring result (3.04) and unique nature of construction (3.00) were ranked least. Interestingly, there is no agreed general definition of quality in construction; perception of quality is the highest ranked constraint affecting the implementation of quality culture in construction works in Nigeria. This implies the need to emphasize more and further researches in quality culture for the academic and the industry.

## DISCUSSION

Construction organisations in Nigeria strongly perceive quality as conformance to specification, customer satisfaction, elimination of defects and meeting contract requirements. This finding agrees with the report of Arditi and Gunyadin, (1997) that quality is perceived as conformance to agreed requirements of customer. It also corroborates Mahmood et al. (2006) that quality in construction is directly connected with conformance to specifications. However, the study of Rupevieius (2006) advocated that quality should be defined in terms of the total sum of a product's features that ascribe its suitability to meet all expressed and implied customer needs. In contrast Arditi and Gunyadin (1997) added that a product can be of high quality and yet it may not meet customer's needs and vice versa. Therefore, the study revealed the definition of quality to include all the 12 identified factors in this research for proper implementation for achieving quality performance. Construction organisations in Nigeria majorly perceive quality as conformance to specification, customer satisfaction, elimination of defects and meeting contract requirements. Construction organisations neither strongly perceive quality as an organisational ideology nor a cultural phenomenon. The organisations might not perceive quality as 'scope achievement' and 'a cultural phenomenon'. Majorly, small organisations would not see quality as 'scope achievement' a link to the reason why projects handled by small scale organisations might experience more delays with low quality output after all quality is not necessarily perceived as a cultural phenomenon in their organisations. This study also revealed the major hurdles in the course of implementing quality culture in construction works in Nigeria. These include perception of quality, lack of standardization, tendency to cure symptoms rather than get to the root of the problem and lack of planning for quality. The study of Shaari (2010) revealed lack of understanding as the highest constraint to the implementation of quality culture in companies and this corroborated the findings of this research in which stakeholders barely perceive quality as a cultural phenomenon hence, the revelation for the need to create more awareness and education for quality culture practice in the industry.

## CONCLUSION AND FURTHER STUDIES

The findings of the research revealed the perception of quality across the types and sizes of construction organisations in Nigeria. There is strong indication that the construction industry professionals perceive quality as consisting of conformance to specification, customer satisfaction, defects elimination and compliance with contract requirements. There are other eight

elements that they believed should be part of quality expression. It is noteworthy that quality is also perceived as cultural phenomenon but not as strongly as others. The implications of these perceptions are fundamental. They help to set the benchmark for definition of quality as essential knowledge parameter. Secondly the elements of quality perception also help to outline what could constitute quality control parameters in driving quality practice in construction.

Perception of quality was found to be the major constraint affecting the implementation of quality culture in Nigeria. Other major constraints affecting implementation of quality include lack of standardization, tendency to cure symptoms rather than get to the root of the problem and lack of planning for quality.

There is need for construction organisations to embrace all the variables that determines quality after all the focus is on satisfying the customer as the consultants embraced customer satisfaction as the most important factor in defining quality. Organisations would not be able to satisfy the customers if any of the determinants of quality is lacking most importantly the right understanding and or perception of quality. Quality should be a key objective of construction organisation hence, a cultural phenomenon and an organisation ideology in the right perspective. There must be culture of quality in organisations, the result of which will lead the industry to a better quality achievement on construction products.

In terms of contribution to knowledge, in the body of curriculum for teaching, all these elements agreed to should be entrenched. Quality control strategies manuals in organizations could use the 12 factors to design their quality control and assurance. It could be a checklist for quality control. Therefore, this research emphasises the need for construction workers and practitioners to embrace quality achievement as a way of life in the construction process for attaining company's mission and not just a slogan for company's vision. In addition great effort is required from the management to develop the whole company quality culture by planning for quality through the vision and mission statement of organisations. It is obvious that this study did not examine the relative weight of these quality parameters. It is hereby recommended that a further study to classify and weight the quality parameters could be done.

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# Contractor Prequalification Criteria (CPC) use in Public Procurement Projects (PPPs) in Nigeria

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Contractor Selection Process is a tedious task for the Decision Makers (DMs) due to multiple criteria involved both at prequalification and tender evaluation stages. It becomes necessary to identify Contractor Prequalification Criteria (CPC) use for Public Procurement Projects in order to assist the Decision Makers (DMs). Thus, the purpose of the study is to assess the frequency of prequalification criteria use for Public Procurement Projects. Survey research design was used and the population comprises construction professionals and public clients organization. This study was carried out at Lagos and the Federal Capital Territory, Abuja in Nigeria. Stratified random sampling technique was used and data were collected using questionnaires. A total of 373 questionnaires were distributed and 290 were used for the analysis. It gives a response rate of 78%. Statistical Package for Social Science (SPSS) was used to analyse the data using frequency, percentage, t-test and Spearman Rank correlation. The findings shown that current fixed asset, skill including professional technical expertise such as qualification with experience, past performance, provision of Health and Safety regulation and capacity of work handled presently were frequently used Contractor Prequalification Criteria (CPC) identified. There is also an agreement between public clients and consulting organisation on the frequency of use Contractor Prequalification Criteria (CPC). In conclusion, public clients and consulting organisation should use the same CPC for public procurement projects to ensure objective judgement of the criteria. The study recommended that current fixed asset, technical skill, past performance, capacity of contractor and provision of Health and Safety should be a yardstick for evaluating CPC.

**Keywords:** Contractor Prequalification Criteria (CPC), Contractor Selection Process (CSP), Decision Makers (DMs), Public procurement projects, Tendering

## INTRODUCTION

The construction industry is unique and complex which entails a lot of risk and uncertainty (Tarawneh, 2004). Though the industry contributes to a nation's Gross Domestic Product (GDP) and aids the social development of a country by creating employment and infrastructure (Adeagbo, 2014; Okoye, 2016), yet there are a lot of challenges facing the industry which emanates from the clients, construction professionals and the contractors. This is basically due to the fragmented nature of the industry with a lot of team players who are involved in the implementation of projects. These team players determine the success or failure of construction projects. Project Team Integration (PTI), especially through communication in deciding the right contractor, helps to prevent time and cost overruns, conflict, substandard work and rework (Zala & Bhatt, 2011). According to Alhazmi and McCaffer (2000) in Huang (2011), the selection of the appropriate contractor for Public Procurement Projects (PPPs) contributes to successful projects in terms of ability to complete the project with reference to time, cost and quality standard.

Selecting contractor for PPPs is a tedious task due to the parties involved (Holt, Olomolaiye & Harris, 1994). However, this has to be done at the early stage of the contract programme, that is, at the design stage. It entails a decision to be made by the client representatives. There is however difficulty in taking the right decision by the Decision Makers (DMs) due to the numerous criteria involved and also putting into consideration the client's goal. As a result of these challenges, several decision tools have

been developed to assist the DMs. These decision tools are both qualitative and quantitative in nature. The decision tools include Analytical Hierarchy Process (AHP) (Anagnostopoulous & Vavatsikos, 2006; Ajayi, 2016), Bespoke Approach (BA) (Holt, 1998), Cluster Analysis (CA) (Holt, 1998), Multi- attribute Analysis (MAA) (Holt et al., 1994), Evidential Reasoning Approach (ERA) (Somez, Yang & Holt, 2001), Fuzzy Set Theory (FST) (Marzouk, 2008), Artificial Neural Network(ANN) (Cheng & Li, 2004) and Topsis (Cristobal, 2011; Alpekin & Alpekin, 2017).

According to Hatush and Skitmore (1998) cited in Pongpeng and Liston (2003a), there is the assumption that only one DM takes a decision as regards the selection process. Pongpeng and Liston (2003a) opine that for government projects, multiple decision makers are involved. As a result of multiple DMs, the problem of assigning weight to each criterion is an issue. This is due to different opinions, experiences, beliefs and judgments on assigning weight to the criterion. Thus, the problem of ranking the criterion becomes an issue among the DMs. It creates subjective judgment, bias and favouritism (Ajayi & Ogunsanmi, 2013). Thus, DMs needs to be careful in taking a cohesive decision due to the multi-criteria nature involved in the Contractor Selection Process (CSP) which could be both qualitative and quantitative.

CSP involves prequalification and tender evaluation stages (Ogunsanmi & Bamisile, 1997: Alzober & Yaakub, 2014). At these stages, the DMs are involved and according to Russell (1992), pre-qualification was identified as one of the decision domain. The prequalification stage is the process before tendering procedures, which allows clients to choose the most suitable candidate from amongst those declaring their willingness to participate in the tendering process. Tender evaluation occurs at the post tender stage. This involves prequalifying contractors who are successful at the prequalification stage (Salama, El-Sawah & El-Samadony, 2006).

Prequalification involves screening of the ontractors for PPPs according to a set of criteria. The criteria are subjective, imprecise and qualitative in nature. The criteria include financial, experience, managerial capability, contractor reputation and Health and Safety. These pre-qualification criteria are usually comprehensive and give a clear picture of the contractors. Most of these contractors provide the information by sourcing for them as a document. This might be the reason why most Nigeria contractors scale through the prequalification exercise (Aje, 2008). It will affect the performance of the project in terms of time, cost and quality because accurate data were not provided by the contractors at the prequalification stage.

An effective prequalification process will help the clients to prevent insolvency and

eliminate incompetent and inexperienced contractor. The process will also act as external auditing of the contractor ability. There have been studies on prequalification in Saudi Arabia (Bubshait & Al-Gobali, 1996), in Australia (Ng, Skitmore & Smith, 1999), in Uk (Holt et al., 1994; Jenning & Holt, 1998) in USA (Russell, 1992) in Thailand (Pongpeng & Liston, 2003b),in Jordan (Tarawneh, 2004), in Turkey (Alpekin & Alpekin, 2017) and in Nigeria (Egwunatum, et al, 2012; Ajayi & Ogunsanmi, 2013). No significant studies on the frequency of prequalification criteria being used in public procurement projects.

A related study by Wong, Holt and Cooper (2000) and Cristobal (2011) considered the weakness of using the lowest bidder as the criterion for contractor selection unlike Huang (2011) that suggested the use of lower bidder. Puri and Tiwari (2014) are of the opinion that using the lowest tender price affects the quality of the project. In Nigeria, there are no standardized criteria for public projects thus; clients use different methods in evaluating contractors' capabilities and assigned relative importance to the criteria. This has led to informal relationship between public officials, project teams and contractors. There is therefore a need for assessment of pre-qualification criteria for project success and objectivity in the procedure of selecting the suitable contractor. A proactive action is required to ensure a value based procurement system that will achieve the expectation of the government in terms of development and economy of the nation. Thus, this study will evaluate the prequalification criteria use for public procurement projects

with a view to assist the client on the criteria to be considered for public procurement projects and to enable the DMs to come up with an objective judgment in CSP.

**Hypothesis of the study:**

1. There is no agreement between client and consulting organisations' on the frequency of use of prequalification criteria.

**Prequalification process**

Russell and Skibniewski (1988) opined that the actual process of contractor prequalification has received little attention in the past. They described the contractor prequalification process along with the decision-making strategies and the factors that influence the process. The process entails dimensional weighing, two-step prequalification, dimension - wide strategy, prequalification formula and subjective judgment. Ng and Skitmore (2002) opined that prequalification processes can be viewed from these perspectives: formulation of decision criteria, screening, overall suitability assessment, reviewing and final selection.

According to Spear (2005), prequalification process is an important step in establishing an effective contractor Safety Health and Environment (SH & E) program. The prequalification process involves the appropriate Contractor providing the Client with completed Pre - Qualification Questionnaire (PQQ). The purpose of the questionnaire is to identify the contractor organisation with the effective safety program. It is then evaluated by the clients' representatives.

Prequalification is a decision making exercise that involves input from various parties (Russell & Skibniewski, 1988 in Khosrowshahi, 2001). The criteria are set up by the decision unit within the client organisation. These criteria differ from one organisation to the other. A typical prequalification procedure according to Merna and Smith (1990) in Khosrowshahi (2001) entails, initial selection, request submission - advertisement, receive submission, initial appraisal, initial assessment, subjective and objective assessment, final assessment and invitation to tender.

The use of an in-house contractor database is becoming much more widely accepted and provided it is regularly updated, it can become an essential part of the selection procedure. In some clients' organisation in Nigeria, it is made compulsory that contractors must register with the company before they can be invited to tender. Registration according to Odusami (1988) is of paramount importance. A general list of factors can be considered when selecting contractors, although not all contracts will include all the factors and the importance placed on these factors could vary from project to project and from client to client (Holt, Olomolaiye & Harris, 1994; Potter & Sanvido, 1994).

Prequalification process entails formulation of decision criteria to form the basis for the prequalification assessment. A prequalification questionnaire is then produced according to the selected criteria. This questionnaire is sent to all interested contractors for completion. The contractors are screened according to decision criteria highlighted by the client's organisation (Holt et al, 1994). Table 1 gives a summary of previous researchers and their prequalification criteria. Dimensional weighting method (Russell & Skibneiewski, 1988; El-Sawalhi et al., 2007), Two-step prequalification method, Dimension-wide strategy method (Russell & Skienbwski, 1988), Prequalification formula method (Alsugair, 1999) and Subjective judgment method were identified screening procedure to be used.

The Overall suitability assessment is more comprehensive than the above screening process. It involves a number of quantitative and qualitative assessments. The financial, technical and managerial abilities of these contractors are the focus of the investigation at this stage. Those who passed this stage are included in the next stage (Hatush & Skitmore, 1997). In Nigeria, according to Budget Monitoring and Price Intelligences Unit (BMPIU) (2005), the criteria used at the Federal level are evidence of incorporation with the Federal Ministry of Works in relevant category, company audited account for three years stamped by certified auditor, evidence of tax clearance certificate for the last three years, annual Value Added Tax (VAT) registration,

technical and personality skill, availability of plant and equipment and recently, evidence of pension contribution, compliance with industrial training fund and verifiable current NSITF compliance certificate. Contractors are required to provide all these documents for the purpose of prequalification. Any contractors without any of these documents are disqualified from prequalification.

The Nigeria construction industry had not been strictly following the prequalification procedure. This is often due to inadequate time available to the prequalifiers for contractors prequalification and the fact that prequalifiers sometimes base their judgments on paperwork. Thus prequalification in such cases may favour those who can source for this document without having the significant requirement for the project.

When this method is used, contractors on the standing list are reviewed before including them on the tender list. The client representative reassessed the key criteria such as financial standing, management structure, health and safety. Obiegbu (2005) opined that contractors that score above 70% are successful contractor for prequalification. After reviewing the contractors' criteria, those qualified are invited for the final selection. It entails invitation of qualified contractors for tender evaluation. This process is based on the contractors' recent tendering performance and opportunities. These processes are important for competent contractors to be eligible for the tender. At this stage, the ineligible contractors would have been eliminated.

## RESEARCH METHOD

Survey research design was used for this study and the population of the study comprises of public clients' and consulting organisation. The list of the construction professionals were obtained from their respective professional bodies. The consulting organisation comprised of Architects (415), Builders (387), Engineers (450) and Quantity Surveyors (450) from the study areas. Stratified random sampling technique was used to select the respondents. The sample size was calculated using Cochran formula. It gives a sample size of 373 with sample ratio of 0.1865. From the sample size calculated, 313 were from consulting firms and 60 were from public clients' organization. A total of 420 questionnaires were distributed and 290 were retrieved and used for the analysis. It gives a response rate of 69%.

$n_0$ (Cochran formula) = $(t^2 \times s^2) / d^2$

Where: $n_0$ = sample size; t = t value for the acceptable margin of error (t =1.96); s =estimate of variance in the population distribution (standard deviation ($SD^2$); d = acceptable margin of error (0.05). This study was carried out in Lagos state and Federal Capital Territory, Abuja because of high percentages of clients' and consulting organisations in the two cities. The increasing rate of urbanization has resulted in pressure on land use in Lagos; hence it involves a lot of construction activities (Adelekan, 2013) to meet the expectation of its populace. Abuja is the Federal Capital of Nigeria (FGN) and it is centrally located geographically. Abuja is also the seat of government where the majority of construction projects are going on and where government projects are approved. Most organisations, government ministries, and agencies have moved to Abuja, resulting in an increase in population with the migration of construction organisation in order to accommodate the level of development (Adelekan, 2013). The data collection instrument used was questionnaire, this was administered to public clients and consulting organisations in order to avoid the possibility of a low response rate (Field, 2009). 373 questionnaires were distributed and 290 were collected giving a response rate of 78%.

Statistical Package for Social Sciences (SPSS) was used for the analysis. Frequency, percentage, t-test for proportion and Spearman Rank Correlation statistical tools were used to generate the result from the data. This study was subjected to a reliability test using pre - test method. The reliability of the scale for the questionnaires was tested using Cronbach's alpha method which was found to be 0.79. The result suggested that the questionnaires are highly reliable and there was an internal consistency. This is judging from the fact that, 0.79 is greater than 0.70 minimum reliability level (Asika, 2002; Field, 2009).

## DISCUSSION

### Background information of the respondents

From Table 2, 66% of the respondents were from consulting organisation and 59% were from public clients' organisation in Lagos State. In Abuja, 34% were from consulting organisation and 41% were from clients' organisation. Lagos State recorded the highest percentage of consulting and public clients' organisations because it is the commercial and economic nerve centre of the country while Abuja is the seat of administration in Nigeria. The table clearly shows that 20% Architects, 20% Engineers, 18% Builders and 42% Quantity Surveyors are from consulting organisation. While 20% Architects, 30% Engineers, 4% Builders and 46% Quantity Surveyors are from public clients' organisation. It shows the extent of involvement of Quantity Surveyors in the selection of competent contractors for projects. This is because they report on evaluation and examination of the tender after prequalification of the contractors by checking arithmetic errors and the unit rate to ensure an appropriate contractor is awarded the contract. 42% of the respondents have been with the industry for less than 10 years, 36% between 11 -20years, 17% between 21 – 30 years and only 5% of the respondents had been in the industry for more than 30years in a consulting organisation. For public clients' organisation 34% of the respondents have been in the industry for less than 10years, 43% between 11 – 20years, 20% between 21 – 30 years and 2% for more than 30years.

The table also reveals that majority of projects executed by consulting firms were between 51million – 100 million naira (33%) while the majority of projects executed by public clients' organisation were government projects, of value between 101million – 500 million nairas (44%) as indicated in the table. These findings were in agreement with the study of Egwunatum et al., (2012) where the highest ranked project value was over $1582278.50 ($1 = ₦158). This is due to the value of the project executed by consulting and public clients' organisations; it thus requires proper screening exercise for contractors selected to man projects to ensure completion to time, cost and quality standard. Public clients' organisation obtained the list of their contractors through advert or media (38%) and from those who have registered with them (26%). The least method of selecting contractors by clients' organisation is through the type of ownership (2%). It therefore implies that contractors that were interested in bidding for projects from any clients' organisations must have registered with that organisation before they could be invited for prequalification and tender evaluation. Therefore, to prevent incompetent contractors from being awarded the contract, clients' organisation ensures competition among the contractors through the use of open method of tendering for purpose of transparency, public accountability and fairness in selecting the appropriate contractor.

**Table 2: Background Information of Respondents**

| Background Information | Consultant | | Public Clients' | |
|---|---|---|---|---|
| | Frequency | Percentage (%) | Frequency | Percentage (%) |
| Location | | | | |
| Lagos | 130 | 66 | 55 | 59 |
| Abuja | 67 | 34 | 38 | 41 |
| Total | 197 | 100 | 93 | 100 |
| Professional Discipline | | | | |
| Architects | 39 | 20 | 18 | 20 |
| Engineers | 38 | 20 | 28 | 30 |
| Builders | 34 | 18 | 4 | 4 |
| Quantity surveyors | 81 | 42 | 43 | 46 |
| Total | 192 | 100 | 93 | 100 |

| Background Information | Consultant | | Public Clients' | |
|---|---|---|---|---|
| | Frequency | Percentage (%) | Frequency | Percentage (%) |
| Experience in the construction industry | | | | |
| Less than 10 years | 81 | 42 | 32 | 34 |
| 11-20 years | 71 | 36 | 40 | 43 |
| 21-30 years | 34 | 17 | 19 | 20 |
| More than 30 years | 8 | 5 | 2 | 2 |
| Total | 194 | 100 | 93 | 100 |
| Total value of projects executed in Naira (#) | | | | |
| Less than 50 million | 28 | 18 | 5 | 7 |
| 51million-100 million | 52 | 33 | 10 | 15 |
| 101-500 million | 48 | 31 | 30 | 44 |
| 501million-1billion | 28 | 18 | 23 | 34 |
| Total | 156 | 100 | 68 | 100 |
| Contractors' list for CSP | | | | |
| From those contractors who have registered with the client | 69 | 28 | 29 | 26 |
| Recommendation from the project consultant | 76 | 30 | 13 | 12 |
| Responses through the advert or media | 58 | 23 | 43 | 38 |
| Through experience | 32 | 13 | 15 | 13 |
| Through company registered | 11 | 4 | 11 | 9 |
| Type of ownership | 4 | 2 | 2 | 2 |
| Total | 250 | 100 | 113 | 100 |

**List of Contractors for Prequalification**

From table 3, 80% of consulting organisation obtained the list of contractors for prequalification on standing list for project of certain types and sizes and 20% based on ad – hoc list for a particular project. 76% of clients' organisation obtained the list of contractors on ad – hoc list. It shows that all the respondents from public clients' and consulting organisations agreed that the list of prequalified contractors was obtained from standing list based on the type of projects. Thus, such contractors must have registered with that organisation. In the study of Jennings and Holt (1998) in UK cited in Huang (2011), it was discovered that most contractors were prequalified using "per project (ad-hoc list for a particular project) however, standing list is usually used by small firms (turnover less than £5M). In a similar study by Holt et al. (1995) cited in Huang (2011), on tendering practices in UK, about 70% public and 55% private clients agreed in using standing list to prequalify contractors for award of contract. Huang (2011) however opposed this method because there is usually a gap between the company being prequalified on the standing list and the tendering procedure and in this period there may be unfavourable changes in the construction company. Thus he advised that instead of standing list, prequalified contractors should be prequalified using "per project" method

**Table 1: Previous Researchers' on Prequalification Criteria**

| Prequalification criteria | Sources |
|---|---|
| Financial capability | Hunt et al, (1966); Merna and Smith(1990); Moselhi(1993); Yusif and Odeyinka (1993); Holt et al, (1995); Bubshait and Al- Gobali (1996); Kumaraswamy (1996); Holt (1996); Russel (1996); Holt (1997); Hatush and Skitmore (1997); Ng and Skitmore (1999); Graham and Hardaker (2001); Palaneeswaran and Kumaraswamy (2001);Mangitung and Emsley (2002); Alarcon and Mourgues (2002); Mahdi et al, (2002); El – Sawalhi et al, (2007); Plebankiewiez (2010); Huang (2011); Idrus et al, (2011); Puthitha (2011); Nieto – Morote and Ruz – Vila (2012); Puri and Tiwari (2014); Alzober and Yaakub (2014) |
| Experience capability | Bubshait and Al-Gobali (1996); Holt (1996); Palaneeswaran and Kumaraswamy (2001);Mangitung and Emsley (2002); Alarcon and Mourgues (2002); Mahdi et al, (2002); Lai et al, (2004); Topeu (2004); Ogunsemi and Aje (2006) El – Sawalhi et al, (2007); Huang (2011) |
| Technical capability | Hunt et al, (1966); Merna and Smith(1990); Yusif and Odeyinka (1993); Russel (1996); Hatush and Skitmore (1997); Graham and Hardaker (2001); Topeu (2004); El – Sawalhi et al, (2007); Puthitha (2011); Huang (2011); Nieto – Morote and Ruz – Vila (2012); Puri and Tiwari (2014); Alzober and Yaakub (2014) |
| Management capability | Merna and Smith(1990); Bubshait and Al-Gobali (1996); Holt (1996); Palaneeswaran and Kumaraswamy (2001);Mangitung and Emsley (2002); Huang (2011); Nieto – Morote and Ruz – Vila (2012); Puri and Tiwari (2014) |
| Health and Safety | Moselhi(1993); Holt (1997); Ng and Skitmore (1999); Lai et al, (2004); El – Sawalhi et al, (2007); Puri and Tiwari (2014) |
| Contractors' reputation | Graham and Hardaker (2001); El – Sawalhi et al, (2007); Huang (2011) |
| Past performance | Hunt et al (1966); Yusif and Odeyinka (1993); Holt (1996); Holt (1997); Hatush and Skitmore(1997); Mahdi et al, (2002) Topeu (2004); Puthitha (2011); Alzober and Yaakub (2014) |
| Organisation structure | Merna and Smith(1990); Moselhi(1993); Holt (1996); Holt (1997); El – Sawalhi et al, (2007); Puri and Tiwari (2014); Alzober and Yaakub (2014) |

**Table 3: List for Prequalification**

| Prequalification list | Consulting organisation (Freq.) | % | Clients' organisation (Freq.) | % |
|---|---|---|---|---|
| Standing list for project of certain types and sizes | 151 | 80 | 65 | 76 |
| An ad-hoc list for a particular project | 39 | 20 | 21 | 24 |
| Total | 190 | 100 | 86 | 100 |

Freq. = Frequency; % = Percentage

**Review of Contractors' Information on Standing List**

Due to the technicality involved in prequalification and tender evaluation procedure for purpose of selecting an appropriate contractor for a proposed project, it shows that the information submitted by the contractors needs to be reviewed. From table 4, consulting organisation respondents agreed they review contractors' data annually (42%). It was followed by once in a while (32%), and bi-annually (13%).

While clients' organisation also reviewed contractors' data annually (47%) and once in a while (31%). In the study of Huang (2011) on

analysis of a selection of project contractor, he agreed that contractor data should be updated in a given period of time due to time lapse between the period contractors is qualified and when it submits its bid. Thus, it is important that contractors' data should be reviewed in support of the study of Huang (2011).

**Table 4: Review of Contractors' Information on Standing List**

| Review of contractors information | Consulting organisation (Freq.) | % | Clients' organisation (Freq.) | % |
|---|---|---|---|---|
| Never | 4 | 2 | 3 | 3 |
| Annually | 81 | 42 | 41 | 47 |
| Once in a while | 62 | 32 | 27 | 31 |
| Bi-annually | 25 | 13 | 5 | 6 |
| Half-yearly | 22 | 11 | 11 | 13 |
| Total | 194 | 100 | 87 | 100 |

Freq. = Frequency; % = Percentage

**Frequency of prequalification on type of projects**

From table 5, it reveals that the most ranked project by consulting organisation were commercial (MIS = 0.83), residential (MIS = 0.79) and industrial (MIS = 0.72) projects. It was followed by religion (MIS = 0.64) and transport (MIS = 0.61) projects. For clients' organisation, the most ranked projects were commercial projects (MIS = 0.84), residential (MIS = 0.80) and industrial (MIS = 0.73) projects. It was followed by religion (MIS = 0.69) and transport (MIS = 0.66) projects. Overall the most ranked projects were commercial (MIS = 0.83), residential (MIS = 0.80) and industrial (MIS = 0.73) projects. It was followed by religion (MIS = 0.64) and transport (MIS = 0.63) projects. The respondents in both organisations ranked the type of projects for prequalification the same way. They are commercial, residential, industrial, religion and transport. It could be as a result of the value of the project and their functionality. In the study of Salama et al. (2006) in Egypt, they concluded that prequalification should be carried out no matter how intricate the project. They however, prequalified electromechanical, industrial and utility projects rather than building projects. Egwunatum et al, (2012) study in Niger Delta, Nigeria found out that building construction (41%) are more often prequalified than civil engineering (34%), industrial (13%) and heavy process (13%) engineering.

**Table 5: Frequency of Prequalification on Type of Projects**

| Type of projects | Clients' organisation | | |
|---|---|---|---|
| | MIS | MIS | MIS |
| Commercial | 0.83 | 0.84 | 0.83 |
| Residential | 0.79 | 0.83 | 0.80 |
| Industrial | 0.72 | 0.75 | 0.73 |
| Religion | 0.64 | 0.69 | 0.64 |
| Transport | 0.61 | 0.66 | 0.63 |

Very often = 4; often = 3; rarely = 2; never = 1; MIS = Mean Item Score;

**Frequency of Prequalification on Type of Procurements**

From the frequency obtained, the highest type of procurements by consulting organisation respondents was construction management (MIS = 0.77) as shown in Table 6. It was followed with design and build (MIS = 0.77), management contracting (MIS = 0.75) and traditional (MIS = 0.75) forms of procurement. The least is turnkey (MIS = 0.74) procurement method. For clients

organisation, design and build (MIS = 0.85) form of procurement were ranked as the highest form of procurement. It could be as a result of high risk involved in design and build form of procurement where design is separated from construction. It is followed with construction management (MIS = 0.79), management contracting (MIS = 0.75) and traditional (MIS = 0.74) forms of procurement. Overall, both organisations ranked the forms of procurement the same way with the highest being design and build (MIS = 0.80) and the least turnkey procurement method.

**Table 6: Frequency of Prequalification on Type of Procurements**

| Type of procurements | Clients' organisation | | |
|---|---|---|---|
| | MIS | MIS | MIS |
| Design and build | 0.77 | 0.85 | 0.80 |
| Construction management | 0.78 | 0.79 | 0.78 |
| Management contracting | 0.75 | 0.75 | 0.75 |
| Traditional | 0.75 | 0.74 | 0.75 |
| Turnkey | 0.74 | 0.67 | 0.71 |

Very often = 4; often = 3; rarely = 2; never = 1; MIS = Mean Item Score;

**Frequency of Prequalification Criteria Use by Consulting and Client Organisations**

Table 7 shows the frequency of use of contractors' prequalification criteria. Consulting organisation top classfieed and frequently used financial criteria were current fixed assets (85%), balance sheet statement (81%), subcontractors (77%) and annual turnover (75%). It was followed by income statement (68%), supplier (68%), liquidity (64%), long term borrowing (54%), medium term borrowing (53%) and short term borrowing (52%). For public clients', the top ranked frequently used financial criteria were current fixed assets (81%), liquidity (79%) and subcontractors (78%). It was also followed by income statement (71%), supplier (61%), short term borrowing (61%), long term borrowing (58%) and medium term borrowing (56%). The least frequently used financial criteria from both organisations were profitability (20%; 33%).

For experience criteria, the variables were ordered respectively as; used criteria from consultants' organisation were technical skills (98%), skill including professional technical expertise such as qualification with experience expertise (97%), type of projects (96%) and ability to handle projects (95%) and the least was national or local catchment (52%). It was followed by ability to meet target date (95%), size of the past project completed (94%), ability of skilled craftsmen (93%), level of technology (93%), and ability to perform on site (92%). Public clients top ranked used experience criteria were technical skills (97%), ability to handle project (97%), skill including professional technical expertise such as qualification with experience expertise (96%), type of projects (94%) and ability to meet target dates (94%). It was followed by size of past projects completed (93%), ability of skilled craftsmen (93%), ability to perform on-site (91%), availability to owned construction equipment for quality assurance (90%) level of technology (89%) and ability to control and organize contract (89%). The least ranked frequently used was national or local catchment (65%).

For managerial capability criteria, the most used criteria from both organisations are: past performance (97%; 96%), quality control programme and quality of works on past projects (96%, 95%), quality workmanship (89%; 83%) and possession of quality assurance certificate (79%; 73%). For health and safety criteria, the most identified variables from both organisations were provision of health and safety regulation (90%; 88%), company safety policy (87%; 89%), and level of adherence to health and safety regulation (86%; 88%) and the least ranked was experience in noise control (38%; 54%). Contractors' reputation and image criteria, top ranked frequently used from both organisations were the amount of projects executed in the past 5 years (90%; 85%), permanent place of business (76%; 81%), capacity

of work handled presently (96%; 87%) and financial penalties previously levied in respect of failures to perform the terms of contract (67%; 70%) and the least was litigation tendency (50%; 60%).

The results show that organisation prequalified contractors but there are no particular prequalification criteria been used. Thus clients' organisations advertise for contractors using open method of tendering and attached an expression of interest which stated the prequalification criteria for the projects. Different prequalification criteria were been used depending on the type of projects or procurement method for the project. In the study of Hatush and Skitmore (1997) cited in Sonmez et al, (2001) found out that clients used similar set of contractor selection criteria but they were ranked differently. Russell (1996) cited in Huang (2011) listed contractor prequalification criteria used as preliminary screening criteria (references, reputation, past performance), construction resources (financial, technical, status of current work program) and project specific criteria. While Palaneeswaran and Kumaraswamy (2000) divided prequalification criteria into responsiveness, promptness, realism and completeness, meeting deadlines, correctness and valid information and totality in providing information, responsibility, obeying the law and complying with local government regulations, standards and bylaws, quality system and safety system, competence recourse (financial, machinery, plant and equipment, human resources), experience, constraints (current workload, subcontracts and guarantees).

**Table 7: Use of Contractors' Prequalification Criteria**

| Prequalification criteria | Clients' | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **N** | **F** | *%* | **N** | **F** | *%* | **N** | **F** | *%* |
| **A. Financial criteria** | | | | | | | | | |
| Current fixed asset | 17 | 14 | 85 | 84 | 75 | 81 | 25 | 22 | 8 |
| | 5 | 9 | | | | | 9 | 4 | 7 |
| Subcontractors | 18 | 14 | 77 | 81 | 63 | 78 | 26 | 20 | 7 |
| | 1 | 0 | | | | | 2 | 3 | 8 |
| Balance sheet statement | 17 | 14 | 81 | 88 | 57 | 65 | 26 | 19 | 7 |
| | 5 | 2 | | | | | 3 | 9 | 6 |
| Annual turnover | 17 | 13 | 75 | 84 | 63 | 75 | 26 | 19 | 7 |
| | 9 | 4 | | | | | 3 | 7 | 5 |
| Income statement | 17 | 13 | 68 | 87 | 62 | 71 | 26 | 19 | 7 |
| | 7 | 3 | | | | | 4 | 5 | 4 |
| Liquidity | 17 | 11 | 64 | 84 | 66 | 79 | 25 | 17 | 6 |
| | 3 | 1 | | | | | 7 | 7 | 9 |
| Supplier | 17 | 12 | 68 | 83 | 51 | 61 | 26 | 17 | 6 |
| | 9 | 1 | | | | | 2 | 2 | 6 |
| Long term borrowing | 17 | 91 | 54 | 78 | 45 | 58 | 24 | 13 | 5 |
| | 0 | | | | | | 8 | 6 | 5 |
| Short term borrowing | 17 | 90 | 52 | 86 | 52 | 61 | 25 | 14 | 5 |
| | 2 | | | | | | 8 | 2 | 5 |
| Medium term borrowing | 16 | 90 | 53 | 78 | 44 | 56 | 24 | 13 | 5 |
| | 9 | | | | | | 7 | 4 | 4 |
| profitability | 16 | 33 | 20 | 75 | 25 | 33 | 25 | 58 | 2 |
| | 4 | | | | | | 9 | | 4 |
| **B. Experience criteria** | | | | | | | | | |
| Skill including professional technical | 19 | 18 | 97 | 90 | 86 | 96 | 28 | 27 | 9 |
| expertise such as qualification with | 1 | 6 | | | | | 1 | 2 | 7 |
| experience | | | | | | | | | |

| Prequalification criteria | Clients' | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | F | % | N | F | % | N | F | % |
| Technical skills | 18 | 18 | 98 | 89 | 86 | 97 | 27 | 26 | 9 |
| | 4 | 0 | | | | | 3 | 6 | 7 |
| Ability to handle project | 19 | 18 | 95 | 93 | 90 | 97 | 28 | 27 | 9 |
| | 0 | 1 | | | | | 3 | 1 | 6 |
| Type of past projects completed | 18 | 18 | 96 | 90 | 85 | 94 | 27 | 26 | 9 |
| | 9 | 2 | | | | | 9 | 7 | 6 |
| Ability to meet target dates | 18 | 17 | 95 | 90 | 85 | 94 | 27 | 25 | 9 |
| | 3 | 3 | | | | | 3 | 8 | 5 |
| Size of past projects completed | 18 | 17 | 94 | 90 | 84 | 93 | 27 | 25 | 9 |
| | 5 | 4 | | | | | 5 | 8 | 4 |
| Availability of skilled craftsmen | 18 | 17 | 93 | 89 | 83 | 93 | 27 | 25 | 9 |
| | 6 | 2 | | | | | 5 | 5 | 3 |
| Level of technology | 18 | 16 | 93 | 89 | 79 | 89 | 27 | 24 | 9 |
| | 1 | 9 | | | | | 0 | 8 | 2 |
| Ability to perform on site | 18 | 16 | 92 | 92 | 84 | 91 | 27 | 25 | 9 |
| | 4 | 9 | | | | | 6 | 3 | 2 |
| Availability of owned construction | 19 | 17 | 90 | 93 | 84 | 90 | 28 | 25 | 9 |
| equipment for quality assurance | 1 | 1 | | | | | 4 | 5 | 0 |
| Ability to control and organize contract | 18 | 16 | 89 | 92 | 82 | 89 | 27 | 24 | 8 |
| | 5 | 5 | | | | | 7 | 7 | 9 |
| Availability of supervisors | 18 | 16 | 88 | 90 | 73 | 81 | 27 | 23 | 8 |
| | 8 | 5 | | | | | 8 | 8 | 6 |
| Ability to efficiently integrates resources | 18 | 15 | 86 | 92 | 75 | 82 | 27 | 23 | 8 |
| | 5 | 9 | | | | | 7 | 4 | 5 |
| National or local catchment | 17 | 90 | 52 | 83 | 54 | 65 | 25 | 14 | 5 |
| | 4 | | | | | | 7 | 4 | 6 |
| **C. Managerial Capability criteria** | | | | | | | | | |
| Past performance | 18 | 17 | 97 | 88 | 84 | 96 | 27 | 26 | 9 |
| | 2 | 7 | | | | | 0 | 1 | 7 |
| Quality control programme and quality of | 18 | 18 | 96 | 92 | 87 | 95 | 28 | 26 | 9 |
| works on past projects | 8 | 0 | | | | | 0 | 7 | 5 |
| Quality of workmanship | 18 | 17 | 90 | 89 | 74 | 83 | 27 | 24 | 8 |
| | 8 | 0 | | | | | 7 | 4 | 8 |
| Possession of quality assurance certificate | 18 | 14 | 79 | 93 | 68 | 73 | 27 | 21 | 7 |
| | 4 | 5 | | | | | 7 | 3 | 7 |
| **D. Health and Safety criteria** | | | | | | | | | |
| Provision of health and safety regulation | 19 | 17 | 90 | 86 | 76 | 88 | 27 | 25 | 9 |
| | 3 | 4 | | | | | 9 | 0 | 0 |
| Company safety policy | 19 | 16 | 87 | 89 | 79 | 89 | 28 | 24 | 8 |
| | 3 | 8 | | | | | 2 | 7 | 8 |
| Level of adherence to health and safety | 19 | 16 | 86 | 86 | 76 | 88 | 28 | 24 | 8 |
| regulation | 4 | 7 | | | | | 0 | 3 | 7 |
| Safety record available | 18 | 14 | 78 | 87 | 66 | 76 | 27 | 21 | 7 |
| | 8 | 6 | | | | | 5 | 2 | 7 |
| Confidence in design and flexibility in | 18 | 14 | 76 | 86 | 65 | 76 | 27 | 20 | 7 |
| accommodating design input by client | 8 | 3 | | | | | 4 | 8 | 6 |
| Accident book | 18 | 11 | 60 | 86 | 56 | 65 | 27 | 16 | 6 |
| | 7 | 2 | | | | | 3 | 8 | 2 |

| Prequalification criteria | Clients' | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | F | % | N | F | % | N | F | % |
| Experience in noise control | 190 | 72 | 38 | 84 | 45 | 54 | 274 | 117 | 43 |
| **E. Contractors' reputation and image** | | | | | | | | | |
| Capacity of work handled presently | 193 | 185 | 96 | 86 | 75 | 87 | 279 | 260 | 93 |
| Amount of projects executed in the past 5 years | 194 | 175 | 90 | 87 | 74 | 85 | 281 | 249 | 89 |
| Permanent place of business | 192 | 147 | 76 | 85 | 69 | 81 | 277 | 216 | 78 |
| Past and present experience in regard to legal claims | 191 | 137 | 72 | 84 | 66 | 79 | 275 | 203 | 74 |
| Financial penalties previously levied in respect of failures to perform the terms of contract | 190 | 128 | 67 | 84 | 59 | 70 | 274 | 187 | 68 |
| Litigation tendency | 179 | 90 | 50 | 84 | 50 | 60 | 263 | 140 | 53 |

N = Number, F =Frequency, % = percentage

**Level of Agreement between Public Clients and Consulting Organisations**

From table 8, there was an agreement between public clients' and consultant organisation on frequency of use of contractors' prequalification criteria because, t-test calculated (tcal.) for financial, experience, managerial capability, health and safety and contractors' reputation and image ($t_{cal.}$ = 9.13, 13.98, 6.99, 5.93, 9.80) is greater than t-test tabulated ($t_{tab.}$). Thus, the alternate hypothesis (H1) is accepted. The Spearman rank correlation (r) for public clients' and consulting organisations as indicated in Table 8 shows a positive correlation among the variables. From this study, it shows that prequalification criteria requirements for any construction projects were according to the clients' objectives/goal, hence the consultant must comprehend the effort of the clients' for project performance in terms of time, cost and quality. Mangitung and Emsley (2002) study on decision criteria for periodic prequalification in the UK found that there was no significant difference between the frequency of use of periodic prequalification criteria among client and contractor using chi-square. This study opposes that of Mangitung and Emsley (2002) probably because the methodology differs.

**Table 8: Agreement between Public Clients' and Consulting Organisation on Frequency of Use Prequalification Criteria**

| Prequalification criteria | Spearman rank correlation Public clients' ($r_1$) | Spearman rank correlation Consultants ($r_2$) | $t_{cal.}$ | $t_{tab.}$ | Sig. | Remark |
|---|---|---|---|---|---|---|
| Financial | 0.95 | 0.95 | 9.13 | 2.262 | S | H1 accepted |
| Experience | 0.97 | 0.97 | 13.98 | 2.179 | S | H1 accepted |
| Managerial capability | 0.00 | 0.97 | 6.99 | 3.182 | S | H1 accepted |
| Health and safety | 0.96 | 0.96 | 5.93 | 3.182 | S | H1 accepted |
| Contractors' reputation and image | 0.98 | 0.98 | 9.80 | 2.776 | S | H1 accepted |

$\alpha = 0.05$`; $t_{cal.}$ = t-test calculated; $t_{tab.}$ = t- test tabulated; Sig. = Significant; $H_1$ =Alternate hypothesis

## CONCLUSION AND FURTHER STUDIES

This study attempts to assess frequently use contractor prequalification criteria for public procurement projects. Prequalification is the screening of contractors by a set of criteria in order to prepare the prequalified contractors for tendering thus it required a systematic procedure for selecting these prequalified contractors. The results from this study show that contractors are prequalified from a standing list from the clients' organisation. That implies that such contractors must have registered with the client organization before they could be included in the prequalification list. Such list of prequalified contractors is reviewed annually as indicated in this study. It will ensure expunging the incapable contractors from being involved in CSP. Design and Build procurement method and commercial form of project was identified as the most rank frequency prequalification process among others. The most frequently used contractor prequalification criteria were current fixed assets, technical, skill including professional technical expertise such as qualification with experience expertise, type of projects, ability to handle projects, past performance, quality control programme and quality of works on past projects, quality workmanship, provision of health and safety regulation, company safety policy, amount of projects executed in the past 5 years and permanent place of business. The results show that organisation prequalified contractors but there are no particular prequalification criteria been used. Thus clients' organisations advertise for contractors using open method of tendering and attached an expression of interest which stated the prequalification criteria for the projects.

Different prequalification criteria were been used depending on the type of projects or procurement method for the project. There is an agreement between public clients and consulting organization on frequency of use contractor prequalification criteria. In conclusion, prequalification criteria requirements for public procurement projects should be according to clients' objectives and goals. Thus the consultants must comprehend the effort of the clients in ensuring the project is completed within time, cost and quality standard. According to Jenning and Holt (1998), the prequalification process in the UK lacks assessment prior to tender and long-term confidence. However, in Nigeria, the prequalification process is being assessed but in-depth investigation of the contractors' data is lacking. Having seen the importance of prequalification to CSP, greater effort should be given to the exercise to ensure only successful prequalified contractors is invited for tendering.

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# Enablers and Inhibitors of Prefabrication Construction for Housing: An Overview

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Prefabrication enablers and inhibitors in the housing construction sector differ over time and vary from country to country. To adopt this technology, awareness on current trends and the latest innovations should be increased by reviewing previous studies. The objective of this study is to conduct a revision of common enablers and inhibitors of prefabrication adoption, taking into consideration the experience gained and reported by several developing countries. The study captures common enablers and inhibitors of prefabrication in Nigeria, with 4 developing countries within the research, as very little literatures exists that identifies perceived factors that encourage the adoption of prefabrication, which are unique to the Nigeria housing construction industry. The study adopts a literature survey qualitative technique, with 24 current literature researches on prefabrication and its enabling and inhibiting factors towards implementation and adoption randomly selected and reviewed in order to capture, and analyse similar trends which cut across 4 identified developing countries located in Asia and Africa. Results showed that technical factors were predominantly the highest ranking factors that influenced the adoption or deterrent of prefabrication. Though other factors are important, further investigation on the technical factors and the development of strategies for eliminating inhibiting factors and improving on the enabling factors is required. Prefabrication enablers should be improved upon by continuously meeting clients' needs and respond to the global, social and environmental challenges, thereby preparing grounds for organizations to find out ways of reducing the inhibitors and ensuring a smooth transition to prefabrication construction based project delivery.

**Keywords**: Enablers, Inhibitors, Prefabrication, Housing Construction Industry

## INTRODUCTION

There is an advocate for a radical change in housing delivery methods in several developed countries, including the UK, USA, Australia, and South Africa (Rahimiana, Goulding, Akintoye, & Kolo, 2017). This change suggests that a paradigm shift from the conventional construction approach to a more innovative housing production processes like prefabrication should be adopted (Dada, 2013). Distinct benefits of using offsite production like greater certainty of outcomes, deliveries and effective costs control, time compression of site activities, improved site logistics, quality benefits, reduction of snagging and rework , and health and safety benefits (Tezel, Koskela, Gosling, & Kumar, 2017), are some of the many reasons for this suggestive shift in innovative housing construction methodology. However, reviews made by this study on current research by various scholars (Elnaas, 2014; Blismas, Pasquire, & Gibb, 2006; Navaratnam, Ngo, Gunawardena, & Henderson, 2019) show the incentives for adopting prefabrication may differ in different regions (Xiahou, Yuan, Liu, Tang, & Li, 2018). El-Abidi and Ghazalia (2015) equally stated that based on previous studies, prefabricated building usage motivations in the construction sector differ over time and vary from country to country. While the promotion of prefabrication in developing countries is still at the initial stage (Adebayo & Dixon-Ogebchi, 2017), a systematical analysis of the enabling and inhibiting factors would help decision makers get a comprehensive understanding of prefabrication development and select proper strategies to promote this construction method. As cities evolve and exponentially expand, the need for space to live, work, and play remains the same. How the housing construction industry organizes, arranges, designs, and builds those spaces,

however, inevitably needs to be revolutionized. With cities worldwide on the cusp of one of the largest building sprees in history, architects, engineers, and construction workers need to be ready for radical change. The 2018 Revision of World Urbanization Prospects produced by the Population Division of the UN Department of Economic and Social Affairs (UN DESA) notes that future increase in the size of the world's urban population are expected to be highly concentrated in just a few countries like India, China and Nigeria, who will account for 35% of the projected growth of the world's urban population between 2018 and 2050 (United Nations, 2018). Rapid population growth is therefore leading to a major and inevitable demand for new urban infrastructure in many large developing cities in Africa, South America and Asia (Muggah & Hill, 2018). These developing cities are not void of housing shortage.

People need safer and more comfortable places to live, and prices need to be reasonable. Prefabrication construction is a cost-efficient, fast and sustainable building technology for large housing projects that don't compromise on quality and can solve housing shortage issues pertinent in developing countries. Recent calls have been launched worldwide for the "revival" of innovative approaches such as the prefabrication building system (Pan, Gibb, & Dainty, 2008), which is under numerous nomenclatures in different countries like the UK and Malaysia, who refer to this technology as an Offsite Modern Method of Construction (offsite-MMC) (Alonso- Zandari & Hashemi , 2016) and Industrialize Building Method (IBM) (Kamar, Azman, & Nawi, 2014) respectively, in order to improve construction within the housing industry, meet market demand; and furthermore, overcome the dependence on skilled labour. Despite the well documented benefits of prefabrication as a method for advancing housing construction output (Blismas & Wakefield, 2009; Alazzaz & Whyte, 2014; Pasquire, Gibb, & Blimass, 2004; Heinz & Wamelink, 2015), this method of housing construction witnesses factors that inhibit its adoption for sustainable housing development. This paper provides a review of academic work done in the area of prefabrication within four selected developing countries: India, China, Malaysia, and Nigeria. This is because these countries have on-going economic activities, current initiatives to import construction materials, increasing interest of researchers in understating the adoption of prefabrication so that lessons could be learned, and knowledge transfer between developing and developed countries within the area of new methods of construction including prefabrication. The literature reviewed from these countries, hope to give more insight into the similarity, difference and uniqueness of the factors that enable or inhibit prefabrication adoption.

**Prefabrication Construction Method: Definition and Overview**

Over the past few decades, the construction sector in several nations has experienced poor performance and low productivity (Nadim & Goulding, 2010). The labour intensive nature of the industry and shrinking levels of professional skills and craftsmanship has been key factors hampering productivity growth (Abdel-Wahab & Vogl, 2011). As a way forward in resolving the problem of productivity, limitations to traditional on-site construction has been the introduction of off-site construction methods such as prefabrication and modularization with a view to increase efficiency and standardize the management of quality (Alazzaz & Whyte, 2012). It is increasingly becoming a major alternative technique and strategic direction compared to the traditional in-situ method (Alazzaz & Whyte, 2014).

Prefabrication in housing construction is defined in different ways by different authors. However, some of the definitions are narrowed in explanations, yet in line with general definitions. On the one hand, Tatum (1986) defines prefabrication as the transferring stage of construction activities from field to an off-site production facility. A more detailed definition given by Björnfot and Sardén (2008) is that prefabrication is the making of construction components at a place different from the point of final assembly, and may lead to better control of the inherent complexity within the construction process. On the other, Chiang, Cahn, and Lok (2006) define prefabrication

as manufacturing and pre-assembly process, generally taking place at a specialized facility, in which various materials are joined to form a component part of the final installation. It can also be defined as a manufacturing and pre-assembly process, whereby, construction components are made at a location different from the place of final assembly, under specialized facilities with different materials, may lead to better control of the inherent complexity within the construction process (Senaratne, Ekanayake, & Siriwardena, 2010). The Modular Building Institute defines "prefabrication" as the process of manufacturing and assembling the major building components at remote offsite locations for their subsequent installation on construction site (MBI, 2010). Operationally, prefabrication is a construction innovation, which aims to take away the construction activities (as much as possible) from the project site to the factory in order to ensure better quality and safer production under controlled working conditions (Shahzad, Mbachu, & Domingo, 2015). This construction approach is seen as being more environmentally friendly, safer and productive than the conventional stick-built approach (Arif & Egbu, 2010; Azman, Ahamad, Majid, & Hanafi, 2010). Prefabrication encompasses the construction of all building components that is a part of a larger final assembly (Gibb, 1999). Prefabrication is an offsite manufacturing process that takes place at a specialized facility in which various materials and building systems are joined to form a component or part of a larger final installation (Haas, O'Connor, Eickmann, & Fagerlund, 2000). Work is done at a remote location for increased construction speed and quality (Schoenborn, 2012).

"Prefabrication production" borrows key ideas from the manufacturing industry. In the latter, products are modularized and components are standardized. On-site labour is replaced with an off-site machine. Although scope is reduced, productivity, quality, and cost are improved by batch production in a controlled environment. In some sectors of the housing industry where the construction process is sufficiently repetitive, the concept of the prefabricated housing can be applied to achieve greater productivity, higher quality and lower cost for construction projects (Xu, 2010). Thus, the following definition of prefabrication can be put forward by this study and its scope on housing construction, while incorporating key attributes of afore-mentioned definitions, as 'a rapid production procedure, where building components are coupled off-site within a mechanized controlled environment with the sole aim of heightening productivity and providing mass housing considered for habitation as marketable end-products for targeted end users'. Prefabrication has some unique features such as centralization of production, mass production, standardization, specialization, effective organization, integration, repetition, lightweight components, factory production (Pheng & Chuan, 2001; Tam, V., Tam, Zeng, & Ng, 2007). These unique features facilitate effective construction techniques in terms of quality, time, cost, function, productivity, safety, waste minimization, and sustainability. Further, it offers benefits such as saving site space; on-site less labour intensive operations; and, opportunities for good architecture. Features of prefabrication on sustainable construction include: increase the potential of improved supply chain integration of green materials; safer working conditions; easier recycle of materials in an off-site environment; enhance flexibility and adaptability; reduced overall life cycle cost; reduced environment impact; and, reduced economic impact (Kim & Bae, 2010). These merits of prefabrication confirm its appropriateness, whilst identification of the associated demerits may lead to possible improvements to enhance the soundness of the prefabrication technique for building construction. A number of studies (Tam et al., 2007; Waskett, 2001; Adebayo & Dixon-Ogbechi, 2017; Kamar, Azman, & Nawi, 2014) identify key issues in prefabrication. These are: higher initial construction cost, time-consuming for design, construction planning, procurements and approval procedures, use of extensive mechanization and automation leads to significant waste; overproduction, waiting time, transportation, over processing, inventories, moving, making defective parts or products,

lack of variety in design, high technology usage, required well-trained people, issues related to site, high-quality control techniques and more efficient testing. Furthermore, Waskett (2001) identified barriers to apply prefabrication in the construction industry such as a general image; perceived performance; customer expectations; perceived value; industry culture; and product awareness. These demerits and barriers should be reduced or eliminated to reap the optimal benefits from prefabrication. Since prefabrication is a manufacturing process found in construction, techniques which are used to improve the manufacturing processes of factory productions in other industries could be applied to it.

Prefabrication is a radical innovation within the housing system because the dominant methods for completing a project are entirely restructured. According to Slaughter (1998), all previous linkages and interactions may be irrelevant for a radical innovation, not only with respect to the systems but also the ties among organizations. Prefabrication has been used extensively and widely for many years around the world. Pre-assembly, prefabrication, modularization, system building and industrialized buildings are the terms which have been frequently used to describe that the manufacture of building components are constructed either on-site or off-site in a factory covering manufactured, modular an pre-cut or pre-engineered systems (Wong, Hao, & Ho, 2003). The terms, however, are often interchangeably used and their precise definitions depend heavily on the users' experience and understanding, which differs from country to country. In this research, prefabrication is preferred with special emphasis on the building components made and assembled off-site in a factory. Off-site fabrication is a topic of international interest and provides an effective construction technique in terms of quality, time, cost, function, productivity, and safety. Prefabrication is adopted worldwide as the ideal means of producing an immense array of elements from structural members, cladding units, and bathrooms to fully-finished modular buildings. As many prefabrication technologies deliver a better product because the building is done in a quality controlled, sheltered environment, the move to more prefabrication in the housing industry is inevitable. It is seen as one of the tenets of improving construction in the 21st century (Egan, 1998; Yeung, Chan & Chan, 2002). This is also echoed by Raysford (2000), who states that a much greater emphasis on off- site assembly is one of the key ingredients to changing the construction culture to retain and recruit talent and at the same time deliver improvements in performance required by increasingly demanding clients. Though prefabrication production is arguably an application in manufacturing settings that can be applied as a potential way to improve and overcome the issue of housing shortage through rapid offsite production, there remain pertinent deterrents of this innovative approach to housing construction. The need to understand and appreciate the enablers and inhibitors of prefabrication from different perspectives across the globe captured by various scholars is paramount to assist in decision making amongst policymakers, end-users and manufacturers of such technologies.

**Enablers and Inhibitors of Prefabrication Adoption: An Overview**

To date, an impressive number of studies have been launched on the perceived perception of prefabrication construction (Alazzaz & Whyte, 2014). Over the past few decades, the construction sector in several nations has experienced poor performance and low productivity (Nadim & Goulding, 2010). The labour intensive natures of the industry and shrinking levels of professional skills and craftsmanship have been key factors hampering productivity growth (Abdel-Wahab & Vogl, 2011). As a way forward in resolving the problems of productivity limitations to traditional on-site construction has been the introduction of off-site construction methods such as prefabrication and (Alazzaz & Whyte, 2012). The main reason for industry's endorsement of off-site production methods has been a perceived improvement in productivity (Bernstein, Morton, Gudgle, & Russo, 2010). While there has been a substantial body of research which has focused on the perceived enablers of prefabrication

construction, there has been relatively little research that has compared these perceived enablers across the board from the perspectives of various researches in different countries that have embraced this method of construction. Blismas. et al. (2006) has discussed the advantages of prefabrication techniques in terms of time, quality, cost, productivity, people/manpower, and process. Furthermore, they have documented major benefits as the speed of construction, higher quality, lower cost, increased certainty, less wastage, greater productivity, less manpower, health and safety risks, environmental impact and simplified construction process. However, the implementation or adoption decision of prefabrication is influenced by factors such as location, land use, density, volume, user needs, labour and environmental conditions (Gibb & Isack, 2003). Though there are benefits of off-site construction, the trend of prefabrication take-up in construction is different in different countries (Arif, Bendi, Sawhney, & Iyer, 2012). Though prefabrication is not a new technology the application, drivers and consequences are to be explored from a perception of current expertise and management practice (Gibb, 2000).

After a rigorous review of literature, some of the articles were identified that presented a range of issues under enablers and inhibitor. In order to investigate the enablers and inhibitor, studies like Pan, Gibb, and Dainty (2007) considered cost certainty, time certainty, on-site duration minimization, high quality achievement, health and safety risk reduction, reduction in environmental impact during construction, environmental performance maximization during life cycle, restricted site specifics, addressing skills shortages, government promotion, revisions to building regulations, implementing as part of company strategy and client's influences. In the context of a project, Badir, Kadir, and Hashim, (2007), examined the role of key players as enablers of prefabrication construction take-up. The key players identified are the client, designer, contractor, architect, supplier and statutory authorities.

Prefabrication construction also needs to consider a long-term perspective. Economic, environmental, social contexts and perspectives influence the stature of offsite construction (Arif & Egbu, 2010). According to Arif and Egbu (2010), barriers were examined against a range of factors including the nature of system and complexity, labor and skills, client's initiation, previous experience, legal influence and response to innovation. During this study the authors identified that skill shortage; client's influence and promotion were added to the list of factors influencing the adoption of offsite construction and were included in the survey presented to the participants. Edge, et al. (2002) found that house buyers are so strongly influenced by negative perceptions of the post-war 'prefab' that they will resist any innovations in-house construction which affect what a 'traditional' house looks like. The human perception barrier, grounded in the historical failure of offsite practices, also exists among architects and other designers (Pan, Dainty, & Gibb, 2004). This, coupled with technical difficulties (e.g. site specifics, logistics, interfacing problems), high costs (where economies of scale are not possible) and the fragmented structure of the supply chain inhibits designers' acceptance of off-site technologies (Pan et al., 2004). Theses inhibiting trends cut across different developed counties where prefabrication is already being practiced. A cultural shift is equally noticed as a challenge to orient people towards prefabrication construction in developing economies (Arif & Egbu, 2010). This can be further dealt with attitude, education, and motivation. The above-discussed factors were noticed in most of the past research. Arif and Egbu (2010) also stated that these factors can be contextualized for other countries. Hence the current paper considered the existing literature to investigate enablers and inhibitors to prefabrication construction in several countries well known for the building method.

**Enablers and Inhibitors of Prefabrication Construction for Housing in Developing Countries**

For the purpose of this study, four developing countries (India, China, Malaysia, and Nigeria) have been identified, and literatures regarding prefabrication in these regions have

been reviewed, analyzed and documented, to shed more light on the similarities or difference in opinions on the enablers on inhibitors of prefabrication adoption.

In India, the rapid growth of the construction industry has influenced key players in the industry to adopt alternative technologies addressing time, cost and quality. Survey results revealed that there is significant offsite usage in Indian construction industry (Arif, Bendi, & Sawhney, 2012). Data gathered by Arif, Bendi, and Sawhney (2012), through a survey of 17 high-level managers from some of the largest stakeholder organizations of the construction sector in India, suggested that the influence of time and cost were major enablers of the adoption of prefabrication construction. Majority of the respondents agreed to the assurance of time and cost certainty. This again proves that the construction industry is time and cost driven having a third-factor quality. The survey results further stress the need to address time, cost and quality while implementing alternative technologies in the construction industry. The documented results of Arif, Bendi and Sawhney, (2012), also pointed that absence of adequate building codes standards and practices and lack of sufficient information or knowledge of prefabrication were major inhibitors of prefabrication construction implementation in India. In the context, the respondents also highlighted that an ineffective building planning system in India was hindering the speed of prefabrication uptake. The belief that "prefabrication is more expensive than conventional systems" has a high occurrence in the literature review but surprisingly this factor was not highlighted by the present respondents. Reduced quality, longer lead-in times and reluctance to innovation were strongly disagreed as barriers which mirror the findings of previous researchers (Goodier & Gibb, 2007). Dinoj and Kokila (2018) also carried out a research with the clear objective of highlighting the major barriers that inhibit the adoption of prefabrication technique in India, by conducting a survey which yielded 65 valid responsive respondents out of the 155 questionnaires sent out. The main inhibitors obtained from the survey were improper transportation facilities, logistical limitations to design and the perception that prefabrication is more expensive than traditional construction method. (Dinoj & Kokila, 2018) explained that this was due to India's building industry's focus on cost-effective construction especially where times impact on overall cost of a project has little influence on the approach to construction in less developed areas. Since technology is not widely used there was a high dependency on factory sites which are far, as a result, transportation cost increases, logistical limitations for design, and simultaneously construction cost also increases (Dinoj & Kokila, 2018). While the results of Arif et. al., (2012) did not highlight respondents views of prefabrication as being more expensive than the conventional method of construction as an inhibitor to adoption, the results of Dinoj and Kokila (201 8), clearly indicated that respondents perceived prefabrication being expensive than conventional building methods as major inhibitors. This may be due to the characteristics of the sample population both researchers chose to investigate. While Dinoj and Kokila (2018) conducted research with respondents who were 17 senior level executives and influential key players in public and private sectors in India; Arif, Bendi, and Sawhney (2012), focused on stakeholders in the construction industry which included client, designers, contractors, offsite suppliers, and manufacturers. The biases on the expensive procedure of prefabrication as against the conventional method are opinions reflective of top management decision makers versus general stakeholders' within the building industry. Smith and Narayanamurthy (2008), however interestingly shared an entirely different view on the ethical dilemmas on technology transfer and its acceptance. The authors were of the opinion that technology transfer has the potential of influencing government, economy, and culture of both the transferring and the receiving nations, therefore opening too many ethical dilemmas, bordering culture and value. Prefabrication according to Smith and Narayanamurthy (2008) will continue to grow in India as the demand for fast affordable housing increases. However, technology transfer of the prefabrication process,

including materials and digital tools, can affect the environment, economy, and culture of the receiving country negatively. Risks associated with the transfer of prefabrication technology such as; host country not having adequate infrastructure, manufacturing and/or professional prowess to accept it, were part of the views documented in the paper. These were strongly believed to be inhibitors on the adoption of prefabrication.

The construction sector in China accounts for about 6.5 percent of the total GDP, employing about 42 million people in 71,863 construction-related enterprises (Zhai, Reed, & Mills, 2014; Egbu, 2016). Along with the growth of the construction sector, there has been reforms and arrival of international construction companies in China, resulting into the uptake of new construction techniques like prefabrication, but also recognized as OSM in the Chinese construction sector (Malik, Khalfan, & Tayyab, 2014). Jaillon, Poon, and Chiang (2009) have identified that, for Hong Kong, the waste reduction benefit from adopting OSM is 52%, which is a significant savings on the island struggling to find landfill sites. Tam et al. (2007) concluded that although there are many inhibitors to OSM in Hong Kong, skilled supervision could lead to achieving a better environment and quality of the final product. Jaillon and Poon (2008) and Jaillon et al. (2009) highlighted some of the inhibitors to the implementation of OSM in Hong Kong which include; conflict with traditional design and construction processes and practices, lack of incentives for adopting OSM, lack of support from client due to overall high cost and lack of skilled labour and other factors. Arif and Egbu (2010) also identified the challenge of cultural change within the construction industry where on-site construction has been practiced for many decades, as an inhibiting factor. This is also a similar factor earlier mentioned in this paper by Smith and Narayanamurthy (2008) within the India construction industry. Arif and Egbu (2010) suggested that, through education and motivation, one would be able to bring this change within the industry to move to prefabrication construction. This also would require strong leadership and government support in various countries (Malik et al., 2014). Zhai et al. (2014) conducted their research by identifying six factors inhibiting the adoption of the OSM within the Chinese context including "constructability implementation," "social climate and attitudes," "architectural performance," "costing," "supply chain," and "preparatory stage." Despite all these barriers, Hong (2007) points out that OSM has increasingly become a major alternative construction method in China. One of the major reasons for OSM adoption is to meet the demand for increased quantity and quality housing stock combined with achieving environmental sustainability (Zhai et. al., 2014). Another recent study by Zhang and Skitmore (2012) focuses especially on adoption of OSM in the residential housing sector. The research presents lists of the enablers and inhibitors of OSM implementation in China. They concluded (after the analysis of the survey and case studies) that there were two major hurdles for the adoption of OSM in China; OSM is not a cost-effective construction method in comparison to the traditional construction method; and there are insufficient manufacturers of prefabricated construction components for OSM to be viable on any scale throughout the country. They feared that insensitive design and planning decisions in order to exploit the potential of OSM to achieve the cheapest cost could put off the prospective buyers and residents of the housing stock (Malik et al., 2014). On the other hand, Xiahou, Yuan, Liu, Tang, and Li (2018) identified fifteen enablers of prefabrication or Construction Industrialization as is it preferably referred to in China.

Based on published international journal articles, the identified enabling factors were grouped into three categories, namely, external development, transformation and upgrade of the construction industry, and strategies selected by the government. These three categories represent three major driving forces that put forward the development of CI in China. That is, the development of CI is not only pushed by the macro-development or pulled by the government, but it is also a self-driven process. Among the 15 CI enabling factors, pilot programs set up by the government were considered to be the most important in CI promotion. It was greatly perceived that pilot programs directly

demonstrate the merits of CI to the public, which would help to increase awareness and acceptance by the society. Within the construction industry, the improvement of productivity, quality, and management were also considered as the priority incentives to promote CI in China. Currently, with the rapid urbanization of China, a higher quality production is needed in major cities. To achieve such goals, the traditional extensive methods of management are no longer able to meet the current requirements (Xiahou et al., 2018).

Industrialized Building System (IBS) is the term coined by the industry and government in Malaysia to represent the adoption of construction industrialization and the use of prefabrication of components in building construction (Fauzi, 2017). Fauzi, (2017) carried out an IBS survey report to measure the perception of contractors in Malaysia in the adoption of IBS in construction. The report was able to identify the most important drivers for contractors to use IBS as follows; for achieving high quality, gaining speed of construction, minimizing on-site duration, demands from the client, and addressing skill shortage. The research also reveals that the main attribute to the lack of contractors embracing IBS is rarely purely technical in origin which is more related to the organizational strategy and soft issues which underpin the capability of the organization to successfully implement IBS. In the study conducted by Kamar et al. (2014), the characteristics of the population sample were category G7 contractors because of their influence on the course of direction of the construction industry. In addition, G7 contractors comprised the largest group of CIDB's contractors' classification registered as IBS contractors. The objective of this contractors' survey was to identify the most popular IBS system and the drivers and barriers to the use of IBS. Based on the results, the most important drivers for contractors to use IBS were achieving high quality, gaining speed of construction, minimizing onsite duration, client demand and addressing skill shortage. In contrast, factors such as energy saving, building's regulation and dealing with adverse weather condition were less important to the contractors. The most significant barrier restricting the use of IBS for contractors was higher construction cost, followed by high capital investment, difficulties in achieving economies of scale, inability to freeze design early and complex interfacing and lack of knowledge in IBS. Other factors related to the level of IT, building regulation and code and standard were not considered relevant by the contractors. The survey reveals that the factors responsible for the contractors' lack of acceptance toward IBS are rarely purely technical in origin.

**Enablers and Inhibitors of Prefabrication Construction for Housing in Nigeria**

The current housing situation in Nigeria demands speed in the delivery of housing (Kolo, Leilabadi, & Goulding, 2014). Many scholars ascertained that there are several benefits associated with the use of prefabrication (e.g., Arif, Bendi, & Sawhney, 2012; Arif & Egbu, 2010; Goulding et al., 2014; Pan et al., 2004). Regardless of these benefits, yet, there are barriers that hinder its adoption such as high costs, negative image etc. (Arif, Bendi, & Sawhney, 2012). The factors currently driving the demand for prefabricated systems are the establishment of special economic zones where new corporate offices are coming up, the need for convenient alternatives to conventional construction techniques, fast-paced urbanization in emerging regions, and growing investor interest in the real estate sector worldwide.

The development of the real estate industry in developing countries and the burgeoning demand for prefabricated building systems will have a positive impact on the growth of this market (Rahimiana, Goulding, Akintoye, & Kolo, 2017; Olamilokun, 2015; Opara, 2012; Kolo, Rahimian, & Goulding, 2014; Adebayo & Dixon-Ogbechi, 2017), this research was able to capture some of these enablers with anticipation that future research will prioritize also on identifying drivers of the prefabrication construction method. It seems previous literature on prefabrication in Nigeria presents an underlying bias already of the method of construction, thus the focus on barriers than drivers. However, Adebayo and Dixon-Ogbechi (2017), identified factors that promote the adoption of the prefabricated methodology

for housing delivery by developers in Lagos state. The characteristics of the population sample were private developers and the need to sample and analyze their views and perceived efficiency of the private sector in contrast to the corrupt and sluggish public sector was crucial in the adoption of prefabrication for rapid housing delivery. Adebayo and Dixon-Ogbechi (2017) identified from data collated, 6 top ranking enablers of prefabrication, out of the 16 perceived enablers provided in the survey questionnaire. These were economies of scale derived from bulk purchase, mass production and standardization; faster project completion time; greater quality control due to production in a controlled environment; cost-effectiveness due to minimal wastage and materials maximization; cost-effectiveness due to reduced site labor; cost-effectiveness due to less site material.

According to Olamilokun (2015), a thorough review of the research by Olatunji (2008), found the following: top management support and commitment, education and skills development, client interest in the use of lean construction in their project, commitment and cooperation of professional bodies, attitudinal change, government policy and availability of trained professionals are among the facilitators to adopting lean construction principles across organizations. Ayodeji, Selekere, Joshua, Kukoyi and Omuh (2016) also carried out studies on 100 prefabricated homeowners and occupants, and 25 professionals with knowledge and skill in the construction of prefabricated buildings in Lagos state. The major enabling factor of influence identified amongst the professionals was the shorter duration of assembling than the conventional method. Despite the aforementioned enablers/drivers, seminal literature has also highlighted a myriad of inhibitor/barriers that can hinder the successful adoption of prefabrication in different countries (e.g., Goulding, Rahimian, Arif, & Sharp, 2014; Arif, Bendi & Sawhney, 2012; Jonsson & Rudberg, 2013; PrefabNZ, 2013).

Acknowledging these issues, this research purposefully investigated these barriers from secondary data evidence regarding their likelihood to shape/inform the research context of Nigeria. Though Pan, Dainty, and Gibb (2004) identified two barriers to the adoption of prefabrication, namely human barriers and technical barriers, Kolo, Leilabadi, and Goulding (2016) further identified a third barrier; the industrial barrier. One of the initial industrial barriers is that of perceived cost (Rahimiana, Goulding, Akintoye, & Kolo, 2017). Opara (2011) also identified high cost as a barrier to the adoption of prefabrication in Nigeria. Initial cost has been acknowledged as the main barrier to the adoption of prefabrication in many countries, for example, India (Arif, Bendi, & Sawhney, 2012); New Zealand (PrefabNZ, 2013); and Nigeria (Opara, 2011). Arif, Goulding, and Rahimian (2012) suggested that it is more important for the offsite industry to focus more on visualization and simulation technologies (pilot projects) as a means of increasing awareness of prefabrication. These could be government or private pilot initiations. Manufacturing capacity was another barrier to the adoption of prefabrication These issues are not as apparent in countries where prefabrication has already been established, (e.g. UK, US, Japan and Nordic countries) as these tend to have a robust supply chain including manufacturing factories to support the prefabrication market. However, in countries like Nigeria, there are only a few factories involved in the manufacturing of prefabrication components which certainly hinders the adoption of prefabrication (Rahimian et. al., 2017). This inhibition to adoption was also identified by Scofield, Wilkinson, Potangaroa, and Rotimi (2009). Scofield et al., (2009), stated that countries that are more established in the use of prefabrication, for instance, UK, US, Japan etc. have a good number of factories that are into the manufacturing of prefabrication components.

In Nigeria, there are quite a number of factories involved in the manufacture of prefabrication components but very few produce on a large scale enough to carter for the enormous housing demands in Nigeria. Examples are: HFP Engineering Limited; Nigerite Limited; Tempo-housing Nigeria Limited; and Nigeria Portable Cabins, to mention a few. Certainly, Nigeria needs to have more factories manufacturing prefabrication components to meet increasing and future demands. Another reason for inhibition

to adopting this form of building technology according to Rahimian et. al., (2017) is that prefabricated housing was used during periods of high demand (e.g. First and Second World Wars with various types of housing system based on pre-cast/in-situ concrete, timber, steel/iron variants); and the resultant product was relatively "low quality", with a short lifespan.

Although prefabrication has advanced significantly from this era, Opara (2011) confirmed that similar negative perception still is a real human barrier for the adoption of prefabrication in Nigeria. Ayodeji (2016) also identified in his research that the two highest ranking inhibitors to the adoption of prefabrication perceived by professionals in the building industry were the initial high cost of machinery setup and the lack of awareness by the public regarding the prefabricated method of construction.

Other barriers that are technical and associated with the adoption of prefabrication are the lack of suitable building codes and standards (Goulding et al., 2014). This also poses a major problem in Nigeria, where no official codes or standards exist to guide the use of prefabrication (Rahimian et. al., 2017). Arif, Bendi, & Sawhney (2012) also identified the negative perception and inadequate building codes/standards. In the opinion of Arif, Bendi, and Sawhney (2012), prefabricated housing was used in the U.K during periods of high demand, that is after the world wars and most of these buildings were of low quality and standard. As a result, there was a general notion that factory manufactured buildings are of low quality but current research shows otherwise. Arif, Bendi, & Sawhney (2012) identified improved quality as one of the major drivers of the adoption of prefabrication. This is compounded when factoring in the shortage of skilled workers and labor-specific requirements for prefabrication deployment (Goulding et al., 2014). This problem is expounded in countries like Nigeria where the prefabrication industry is relatively small and reliant on expatriate skills (Opara, 2012). The construction sector needs to train construction professionals in the area of prefabrication. This training will create more awareness among professionals and also potential clients (Kolo et al., 2014).

## RESEARCH METHOD

The study adopted a systematic review of literature using qualitative technique. An electronic search was carried out using Google search with the search terms: prefabrication; developing countries; adoption of prefabrication etc. The literature search was focused on recent (less than 6 years) and relevant publications in prefabrication amongst the four selected countries. Other literature provided more in-depth understanding of the phenomenon. A total of twenty-four (24) current and relevant literature researches on prefabrication and its enabling and inhibiting factors towards implementation and adoption were randomly selected and reviewed in order to capture, and analysis similar trends which cut across four (4) identified developing countries located in Asia and Africa. 6 papers from each selected countries, that research on prefabrication and factors that either inhibited or enabled its adoption were reviewed. At least ten studies are needed for a review as recommended by Cochrane handbook (2011).

## DISCUSSION

A total of twenty-four (24) current literature researches on prefabrication and its enabling and inhibiting factors towards implementation and adoption were reviewed in order to capture, and analysis the similar trends which cut across four (4) identified developing countries located in Asia and Africa, so as to provide future directions on ways to further encourage the widespread adoption of prefabrication. Several types of research have been conducted in various countries to investigate factors that could affect the successful adoption of prefabrication Olamilokun (2015). Abubakar et al. (2010) classified these barriers into six categories namely; financial, educational, governmental, attitudinal, managerial and technical issues, which were based on a thorough and critical review of international literature. This research, however, argued that these six (6) categories could either be enablers or inhibitors and not necessarily inhibitors alone, therefore categorizing the enabling and inhibiting factors respectively under

each identified issue. In summary, the research observed after identifying the enabling and inhibiting factors within the selected literature that technical factors were predominantly the highest ranking factors that influenced the adoption or deterrent of prefabrication as seen in Table 1. This was determined by the number of times it was indicated in the literature reviewed. Though other factors are important, there is a need to investigate further on the technical factors and develop strategies of eliminating the inhibiting factors and improving on the enabling factors if prefabrication must be adopted. Educational factors were the least represented in the literature selected and reviewed. This shows that a lot of stakeholders in the housing construction industry are knowledgeable of this construction method but not necessarily implementing the technique. Table 1 shows a summary of the identified factors which cut across the four selected countries.

**Table 1: A Summary of Identified Enabling and Inhibiting Factors**

| DEVELOPING COUNTRIES | FACTORS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Management | | Financial | | Educational | | Governmental | | Technical | | Human Attitudinal | |
| | *E* | *I* | *E* | *I* | *E* | *I* | *E* | *I* | *E* | *I* | *E* | *I* |
| INDIA N (4) | • | •• | • | | | | | | • | ••••• | | •• |
| CHINA N(8) | •• | ••• | | • | | | •• | | • | •••• | | ••• |
| | | | | | | | | | • | | | |
| | | | | | | | | | • | | | |
| | | | | | | | | | • | | | |
| MALAYSIA N(2) | | • | | ••• | | • | | | • | •••• | | |
| | | | | | | | | | • | | | |
| NIGERIA | | | | | | | | | • | | | |
| | • | • | •• | • | • | • | •• | | • | ••• | • | • |
| N(10) | | | | | | | | | • | | • | |
| | | | | | | | | | • | | | |
| | | | | | | | | | • | | | |
| | | | | | | | | | • | | | |
| | | | | | | | | | • | | | |

Note: E-Enablers, I-Inhibitors, N-Number of reviewed literature, • identified factors in the literature

## CONCLUSION AND FURTHER STUDIES

In pursuance of this, the ultimate goal of this research will be in future researches, to develop a roadmap that will facilitate the effective adoption of prefabrication in Nigeria. This paper presented a series of underpinning steps based on the views of various researchers on the enabling and inhibiting factors to prefabrication adoption. Whilst prefabrication inhibitors have been highlighted within the Nigerian context, there is an exigent need to investigate these issues further, as it is important to proffer solutions to this environment e.g. infrastructure and local suitable materials for prefabrication. This paper has been constructed using the existing literature related to prefabrication in the context of developing countries. The proposed prefabrication adoption strategies could be formed by developing a framework for further research relating to prefabrication in developing countries. As such, it may be useful for housing policy makers, construction executives, managers, designers, developers, and scholars to rethink about housing issues by conducting future empirical research within and beyond the domain of construction. The study has established findings on the potential enablers and inhibitors of the prefabrication construction in four selected developing countries. It is recommended that the enablers be tremendously improved upon. This would be achieved by continuously meeting clients' needs and respond to the global, social and environmental challenges. This should prepare grounds for organizations to find out ways of reducing the inhibitors and ensuring a smooth transition from the traditional construction approach to prefabrication construction based project delivery ultimately in the Nigerian construction industry. Government, housing construction agencies and organizations, should

increase involvement of pilot projects at private and government levels as strategies for increased acceptance and not necessarily awareness, as the study shows that knowledge of prefabrication was the least indicator in Table 1. It is critical to conduct a systematic analysis of the driving and inhibiting factors for the decision makers to understand the incentives of prefabrication development and help them to select proper strategies. For the comprehensive realization of prefabrication benefits to developing countries, more research that is rooted in understanding the theory of manufacturing and construction is strongly recommended and will be useful in developing a suitable roadmap for the successful adoption of prefabrication in Nigeria.

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# Construction Contractors' Compliance to Health and Safety Insurance Policies in Lagos State

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Construction workers are continuously liable to health and safety issues which pose major problems and concerns to productivity in the construction industry. Despite availability of health and safety policies with specific insurance and risk management considerations; injuries, fatalities and death from construction related activities appear unabated, which suggests possible non- compliance of contractors to established health and safety regulations. This study examines contractors' compliance to health and safety insurance policies in Lagos State, with a view to stemming high risks of hazard occurrence. Survey research design was adopted and data were collected using questionnaires. Descriptive statistics was used for the analysis. Results show that there is a significant difference in the awareness of contractors on health and safety insurance policies for construction projects. Furthermore, results show that there is a significant difference in the level of compliance to Health and Safety policies between foreign/ multi- national and indigenous construction firms. Based on these findings, it was recommended that there should be continuous enlightenment by the regulatory agencies on insurance policies to increase the level of awareness of contractors on health and safety insurance policies for construction project. Also, stakeholders in the industry should initiate modalities for monitoring contractors' compliance to identified health and safety insurance policies in Lagos State, thereby fostering a high level compliance and also ensuring consistency in compliance.

**Keywords:** Contractor, construction, health and safety, insurance policies, productivity

## INTRODUCTION

Building construction activities in most developing countries is labour intensive and involves working at heights, underground, confined spaces, handling loads manually, handling hazardous substances, exposure to noises, dusts, power/electrical cables and use of plants and equipment (Ahmed, 2008). Apart from providing employment for those directly involved with construction and other economic benefits offered by the building industry, the activities nonetheless poses severe health and safety hazards to the workers (Farooqui, Arif & Rafeeqi, 2008). More so, there is the risk of building collapse that could endanger not only the lives of the workers but users of such facilities (Ahmed, 2008). Studies have established that a wide disparity exist in occupational accident rates between developed and developing countries (Hamalainen, Takala & Saarela, 2006). There are three times as many fatalities on construction sites in developing countries than in the industrialized ones (HSE book, 2006; King & Hudson, 1985). In view of the inherent hazards related to building construction, Okeola (2009) established that health and safety being an inevitable aspect of construction should be a primary concern to building contractors.

Health and safety (H & S) in the Nigerian building industry is a critical concept that cannot be ignored especially in the light of persistent cases of building collapse. For example, notable cases of building collapse with high human casualties in Nigeria include: a church building that collapsed in Calabar during worship service in which over 50 lives were lost in 2015, a guest house under construction that collapsed within the premises of Synagogue Church of All Nations in Lagos killing over 120 people in 2015, a five storey Lekki Garden building that collapsed leaving over 35 persons dead and several others injured in 2016. While writing this paper, another building under construction collapsed in the Federal Capital Territory (FCT) Abuja leaving many of the workers buried in the rubbles. There are several others cases of building collapse throughout Nigeria that were not reported. Aksorn, and Hadikusumo (2007)

opined that the high risks of hazards occurrence in building construction need to be well prepared for before actual occurrence. As it were, insurance policies play a significant role in instilling health and safety consciousness in the building sector, insuring against liability for injury arising out of hazardous nature of building construction. H&S consciousness will compel contractors to comply with policies and regulations that will significantly help in controlling the rate at which hazardous events unfold, while violation of laid down rules as established by policies has its contributory effect towards increased rate of hazardous event during a construction process. Lee and Halpin (2003) reported that in many of the countries where safety legislation exists, the regulatory authority is weak or non-existent and employers 'pay lip service' to regulation. Compliance of the contractors on what norms the policies postulates is most imperative in ensuring health and safety in the construction industry of developing countries. According to Lingard and Rowlinson (2005), in a bid to comply with insurance policies to avoid conflict with the law, contractors put in place measures which engender safety consciousness on construction sites. Such measures according to Idoro (2007) include holding regular health and safety training, having an up to date accident register, and ensuring that hazards are prevented. Previous researches on health and safety in the construction industry centred around identifying prevailing types of accidents on construction sites (Abdul Rahim et al. 2008, Ohdo et al., 2011) and causes of accidents on construction sites (Hosseinian & Torghabeh, 2012; Ali, Kamaruzzaman, & Sing, 2010). However, internet search reveals nothing on contractors' compliance to health and safety insurance policies. It is against this background that this research sets out to examine the awareness of contractors on health and safety insurance policies for construction project, their level of compliance to health and safety policies and challenges facing local and foreign contractors in complying with health and safety insurance policies in Lagos, Nigeria.

## LITERATURE REVIEW

Nigeria is adjudged the most populous country in Africa and also the largest economy in Africa (World Bank, 2016). The Nigerian construction industry plays an important role in the nation's economy. In 2017 the sector's contribution to national Gross Domestic Product GDP stood at 3.77% (National Bureau of Statistics, 2018). In spite of the socio-economic significance of the construction sector, its reputation with reference to occupational health and safety is not pleasurable. This has been attributed to poor consideration for H&S management measures and practices in construction project delivery process (Belel & Mahmud, 2012). Despite being a party to the Geneva Occupational Safety and Health Convention 1981, Nigeria continues to lag behind in the implementation of occupational H&S practices (Adeogun & Okafor, 2013). According to Idoro (2011), even contractors with the best safety records in Nigeria still record substantially high number of injuries on sites. A survey of 42 Nigerian contractors revealed such poor performance rate of five injuries per worker and 2 accidents per 100 workers even among some of the best performing firms (Idoro, 2011). According to Ezenwa (2001), these figures are often even worse in practice as a result of a culture of under-reporting and concealment. Other studies have further highlighted a high prevalence of non-compliance with safety regulations that require organisations to report accidents (Diugwu et al. 2012). Whilst there have been occupational health and safety legislations governing work and work environments in Nigeria (e.g. Factories Act of 1990 and Employee's Compensation Act of 2011), some have attributed the poor safety performance to dysfunctional H&S laws and regulations (Diugwu et al. 2012).

Construction insurance is a practice of exchanging a contingent claim for a fixed payment to protect the interests of parties involved in a construction project (Ashworth 2001). Construction insurance is a major method of managing risks in the construction industry. Shola (2017) posits that its primary function is to transfer certain risks from clients, contractors, subcontractors and other parties involved in the construction project to insurers in order to provide contingent funding in time of difficulty. Purchasing the proper insurance can be one of the most important administrative decisions a contractor will make. It is necessary to

first identify and describe the various insurance brands that are purchased in the construction marketplace, and to briefly describe what each type will generally cover.

Builder's Liability Insurance - Section 64 of the Insurance Act requires that every owner or contractor of any building under construction with more than two floors must take out an Insurance Policy to cover liability against construction risks caused by his or her negligence or that of his or her workers, agents or consultants which may result in death, bodily injury or property damage to workers on site or members of the public. This insurance policy also covers liability for collapse of buildings under construction.

**Builder's Risk Insurance**

Builder's Risk Insurance is a form of property insurance that protects the building or project against physical loss or damage from external causes during construction. The protection provided depends upon the terms of the written policy, but usually includes materials and supplies to be used on the project. These items are insured while held in temporary storage before delivery, during transit to the jobsite, and after delivery while awaiting installation (Clough, 1981). The hazards covered by this insurance vary. The policy may protect against loss due to fire, vandalism and miscellaneous mischief, lightning, wind, smoke, explosion, and other types of physical damage (this is the primary purpose of this insurance). Some common exclusion stated within the policy are damages due to freezing, explosion of steam boilers or pipes, glass breakage, subsidence and settling, earthquake and floods (Stokes, 1990).

**Equipment Floater Insurance**

Construction equipment and machinery used on the project is subject to damage and can be protected by what is known as an equipment floater policy. This policy covers equipment that moves from job to job (the equipment "floats"). The equipment covered, often referred to as off-road vehicles, is not licensed and includes dozers, scrapers, power shovels, loaders, cranes, pumps, and pavers. The major losses that typically occur are due to theft and vandalism. No liability component is attached as the policy only covers damage to the equipment (Hinze, 1990).

**Key Man Insurance**

Key Man Insurance is essentially a life insurance policy written on company principals. It will protect the company from heavy losses that may result from the death of one or more principals (key men) of the firm. There may also be a clause that will provide benefit if a principal is disabled and unable to work (Hinze, 1990).

**Automobile Insurance**

There are two broad categories of risk involved when a contractor operates automobiles. First, there is loss or damage to the contractor's own vehicles caused by collision, fire, theft, vandalism, or other hazards. Second, there is liability for bodily injury to third parties or damage to their property caused in some way by the operation of the contractor's licensed vehicles. Automobile liability coverage will cover any vehicle fitting into one of three categories -owned automobiles, hired or rented automobiles, and non-owned automobiles such as employees' personal automobiles used in conjunction with official business. The coverage will provide for legal defence and payment of damages resulting from damage to persons or property due to the operation of vehicles fitting into one of the categories listed above (Stokes, 1990).

**Worker's Compensation Insurance**

Worker's compensation law was enacted to give statutory protection to employees injured on the job. Worker's compensation insurance provides medical care and other benefits for the contractor's employees in the event that they are injured on the job. The principle behind worker's compensation is that on-the-job injury or death of a worker is a cost of doing business and should be borne by the industry. The fundamental objective is for injured workers to receive prompt medical attention and monetary assistance. Another principle behind worker's compensation is that of strict liability of the employer, regardless of any fault by the employee. Contributory negligence of the employee will not affect the employer's liability, except in cases where the worker was under the influence of drugs or alcohol (Clough, 1981). The

insurance is required for most employees, i.e., exemptions include domestic servants, farm labour, casual employees, independent contractors, and workers in religious or charitable organizations. Also exempted in some states are businesses that employ less than a specified number of employees (Stokes, 1990).

In six states, known as "monopolistic fund" states, the insurance fund is run by the state. The contractor is required to purchase the insurance from the state rather than from a private insurer. In all other states the insurance can be bought like any other type of insurance (Stokes, 1990).

Premiums are based primarily on three factors: the employer's safety experience on prior construction projects, the type of craft, and the geographic location. For the first factor, it is obvious that if a particular contractor has an outstanding safety record, the premiums will be lower than a contractor who has a poor safety record. An "experience modification rating" is assigned to each company that reflects the frequency of injuries and the monetary loss suffered over a three-year period. This rating is a multiplier that effectively raises or lowers the premiums. The second factor is associated with the craft, as this is related generally to the degree of risk involved. For example, a roofer has a higher degree of day-to-day risk than a concrete sidewalk installer. This difference results in various premium rates based on the industry loss history for each craft in the state. For the third factor, different states have varying injury experiences across all types of crafts. This results in some states having much higher premiums than others (Hinze, 1990).

## RESEARCH METHOD

Survey method was considered suitable and adopted in this study. The population of the study comprises construction professionals in contracting and consulting organisations in Lagos State. The choice of these core respondents as the target population was on the basis that they are involved throughout the various stages of construction projects. Also, the study chose to be conducted in Lagos State on the premise that 75% of construction firms in Nigeria are either based in Lagos States or have their branches located in Lagos (Fagbemi, 2008). One hundred (100) construction professionals (contractors, architects, builders, quantity surveyors and engineers) in Lagos State were used as sample size for this study. The projected sample size was chosen as a result of unavailability of data of construction contractors who are involved with construction projects within Lagos metropolis. This was backed up by Holloway (2007) which suggests that a sample size of about 100 respondents is appropriate for any academic research. This research adopts a purposive sampling technique. The choice of purposive sampling technique was hinged on the fact that the study is directed towards a defined group of respondents who are best able to respond to the research issues. This helps the researcher in this study to take decision about the individual participants who are most likely to contribute appropriate data in terms of relevance and depth. Structured questionnaire was adopted in this study for data gathering. This research instrument was designed to capture the demographic data, and other data relating to the study objectives using appropriate measuring tools.

## DISCUSSION

Demographic Characteristics of the Respondents Table 1 shows the results of the demographic characteristics of the respondents. Out of the 134 respondents, 46 were engaged as contractors while 88 were engaged as consultants'/client representatives. Overwhelming percentage of the respondents from the two categories, 85% and 100% of contractors and consultants'/client representatives respectively were above 31 years old. In terms of their academic qualification, 31(67%) of contractors and 30(71%) of consultants'/client representative had a minimum of bachelor's degree in built environment related discipline. This implies that the respondents are quite knowledgeable in construction and know what is expected of contractors in terms of compliance to health and safety. With regards to their experience in construction works, 29(63%) and 38(90%) of contractor and consultant/client representative respectively had more than six years' construction experience, which implies adequate exposure to construction activities.

**Table 1: Demographic Characteristics of the Respondents**

| | Contractors | | Client/Consultants | | Total | |
|---|---|---|---|---|---|---|
| **Demographic Variables** | **F** | % | **F** | % | **F** | % |
| Age group | | | | | | |
| 18- 30 | 7 | 15.3 | - | - | 7 | 8.0 |
| 31-40 | 30 | 65.2 | 23 | 54.8 | 53 | 60.2 |
| 41-50 | 9 | 19.6 | 16 | 38.1 | 25 | 28.4 |
| 51 and above | - | - | 3 | 7.1 | 3 | 3.4 |
| Highest level of education | | | | | | |
| OND | - | - | 3 | 7.1 | 3 | 3.4 |
| HND | 15 | 32.6 | 9 | 21.4 | 24 | 27.3 |
| B.Sc/B.Tech/B.Eng | 14 | 30.4 | 20 | 47.6 | 34 | 38.6 |
| M.Sc/M.Tech/ M.Eng | 14 | 30.4 | 9 | 21.4 | 23 | 26.1 |
| Others | 3 | 6.5 | 1 | 2.4 | 4 | 4.5 |
| Years of Construction Experience | | | | | | |
| 1-5 years | 17 | 37.0 | 4 | 9.5 | 21 | 23.9 |
| 6-10 years | 11 | 23.9 | 9 | 21.4 | 20 | 22.7 |
| 10-15 years | 12 | 26.1 | 21 | 50.0 | 33 | 37.5 |
| 15-20 years | 6 | 13.0 | 2 | 4.8 | 8 | 9.1 |
| Above 21 years | - | - | 6 | 14.3 | 6 | 6.8 |

**Awareness on Health and Safety Insurance Policies for Construction Project**

The level of awareness was measured on a 3- point Likert scale ranging from fully aware, partially aware and not at all aware. Results as presented in Table 2 show that Construction All Risks (CAR) insurance, Workers' Compensation Insurance and Employer's Liability Insurance are more reputable among the respondents than other insurance policies. Construction All Risks (CAR) usually provides cover against damage to the project under construction, inclusive of items in storage and in transit to the construction site, and materials and equipment meant to be engaged in the implementation of the construction project. Workers' compensation insurance on the other hand is usually purchased by employers for the coverage of employment-related injuries and illnesses. It is an insurance coverage that covers lost wages and medical treatment resulting from an employee's work-related injury or illness and also covers services needed to help an employee recover and return to work. Employer's Liability Insurance is an insurance policy which covers the contractors in the event that a worker decides to sue for an accident sustained, or an illness suffered, in the cause of work. It usually protects employers from liabilities arising from disease, fatality, or injury to employees resulting from workplace conditions or practices. It also provides liability insurance for third-party bodily injury and property damage that may arise out of the construction operations.

Least ranked among the insurance policies are Personal Injury Liability Insurance, Completed Operations and Products Liability Insurance, and Operations-Premises Liability Insurance. Personal injury liability insurance is meant to cover the insured contractor from lawsuits filed over issues like defamation, libel and slander. It also protects against lawsuits involving false arrest, unlawful imprisonment and malicious prosecution related to construction projects implemented. Completed Operations and Products Liability Insurance on the other hand is a coverage that protects the insured contractor in the event of claims caused by project they have completed and delivered. Operations-Premises Liability Insurance ideally provides cover for any hazards that are likely to occur, or might cause harm to the business entity as a whole. Mahalingam and Levitt (2007) assert that one of the critical safety issues affecting compliance is low awareness.

**Table 2: Awareness of Contractors on Health and Safety Insurance Policies for Construction Projects**

| Insurance Policies | Mean | Std. Deviation |
|---|---|---|
| Construction All Risks (CAR) | 2.35 | 0.431 |
| Workers' compensation insurance | 2.24 | 0.547 |
| Employer's Liability Insurance | 2.22 | 0.846 |
| Builders Risk Insurance | 2.2 | 0.630 |
| Controlled Insurance Plan (CIP) | 2.13 | 0.533 |
| Contractual Liability Insurance | 2.09 | 0.707 |
| Professional indemnity insurance | 1.98 | 0.742 |
| Professional Liability | 1.98 | 0.701 |
| Umbrella Excess Liability Insurance | 1.93 | 1.115 |
| Explosion, Collapse, Or Underground Liability Insurance | 1.93 | 1.087 |
| Elevator Liability Insurance | 1.76 | 0.828 |
| Contractor's/Owner's Protective Liability Insurance | 1.76 | 1.303 |
| Personal Injury Liability Insurance | 1.76 | 0.759 |
| Completed Operations and Products Liability Insurance | 1.74 | 0.977 |
| Operations-Premises Liability Insurance | 1.72 | 0.977 |

**Health and Safety Insurance Policies Frequently Used by Construction Firms in Lagos State**

Respondents were asked to rate frequency of use of fifteen health and safety insurance policies identified from previous studies on a 5-point Likert scale using Never, Rare, Sometimes, Often and Always. The result presented in Table 3 indicate that Construction All Risks (CAR) Insurance, Employer's Liability Insurance, Professional Liability Insurance, Builders Risk Insurance, Professional indemnity insurance and Controlled Insurance Plan (CIP) all falls under the category of insurance policies sometimes used by the construction firms in Lagos State. Least ranked among the frequently used insurance policies are Umbrella Excess Liability Insurance, Completed Operations and Products Liability Insurance, and Elevator Liability Insurance policies. This group of rarely used policies never the less have their relevance pertaining to construction activities. Umbrella Excess

Liability Insurance has the potential of providing for unforeseen occurrences that could call for the contracting firm to bear financial liability. Elevator Liability Insurance is meant to provide coverage against loss due to legal liability for bodily injury resulting from maintenance, or use of elevators, escalators, lifts, or hoists. It is meant to cover medical treatment for injuries sustained on the job, lost wages due to injuries, and even death *benefits* to families of deceased member of staff. Completed Operations and Products Liability Insurance also provides coverage for the contractor should a claim arise traceable to work done for a client and the client is not satisfied with. Perhaps, one of the reasons why these policies are rarely used is because they could be categorized under CAR. Dunning (2009) posit that contractors' compliance to Health and Safety insurance policies in Building construction projects could be said to be on the low key in the Nigerian building industry.

**Table 3: Health and Safety Insurance Policies Frequently Used by Construction Firms in Lagos State**

| Health and Safety Insurance Policies | Mean | Std. Deviation |
|---|---|---|
| Construction All Risks (CAR) Insurance | 3.41 | 0.550 |
| Employer's Liability Insurance | 3.11 | 0.415 |
| Professional Liability Insurance | 3.09 | 0.544 |
| Builders Risk Insurance | 3.09 | 0.850 |

| Health and Safety Insurance Policies | Mean | Std. Deviation |
|---|---|---|
| Professional indemnity insurance | 3.04 | 0.617 |
| Controlled Insurance Plan (CIP) | 3.02 | 0.668 |
| Workers' compensation insurance | 2.96 | 0.634 |
| Explosion, Collapse, Or Underground Liability Insurance | 2.91 | 0.780 |
| Contractual Liability Insurance | 2.89 | 0.636 |
| Operations-Premises Liability Insurance | 2.83 | 0.759 |
| Personal Injury Liability Insurance | 2.63 | 0.517 |
| Contractor's/Owner's Protective Liability Insurance | 2.63 | 0.715 |
| Umbrella Excess Liability Insurance | 2.54 | 0.718 |
| Completed Operations and Products Liability Insurance | 2.46 | 0.894 |
| Elevator Liability Insurance | 2.39 | 0.705 |

*1= never, 2= rare, 3= sometimes, 4=often, 5= always, MS= Mean Score, N=Number of respondents (46)*

**Contractors' Compliance to Identified Health and Safety Insurance Policies in Lagos State**

According to Lingard and Rowlinson (2005) compliance focus on applying measures designed to comply with legal requirements with the regulator being primarily more concerned with improved outcomes than prosecution results. Contractor compliance therefore deals with actions that contractors take to create a platform on which health and safety is ensured fostering a construction setting in which workers will be trained and motivated to perform safe and productive construction work (Taylor, 2012). Contractors' compliance to 15 variables pertaining to H&S insurance policies were measured on a 5- point Likert scale ranging from "no compliance" (rated 1) to "full compliance" (rated 5). The results presented in Table 4 revealed that contractors fully complied with policies such as: providing a written H&S procedure in the organization, making H&S plan available before the commencement of any construction project in the organization, briefing the employees on H&S procedure prior to commencement of any day work, providing regular H&S training and making H&S procedure accessible to employees in the organisation. Cheyne, Tomás and Cox, (2002) assert that compliance with policies inform of regulations, at individual level significantly help in controlling the rate at which hazardous event unfold, while violation of laid down rules has its contributory effect towards increased rate of hazardous event during a process. The results presented support Charles (2007) views that contractors are meant to be observant of safety rules and regulations on site, brief the project participants on the expected standards before commencing work on site, establish a medium for prompt and adequate communication of health and safety issues. Variables with low compliance include organization carry out health and safety evaluations and surveillance and giving prompt and adequate attention to communication of H&S issues to key players.

**Table 4: Contractors Compliance to Identified Health and Safety Insurance Policies in Lagos State**

| | Mean | Std. Deviation |
|---|---|---|
| There is a written Health and Safety procedure in the organization | 4.76 | 0.550 |
| Health and Safety plan is made available before the commencement of any construction project in the organization | 4.64 | 0.415 |
| There is always health and safety briefing before commencement of any day work | 4.6 | 0.544 |
| Workers are adequately trained in Health and Safety | 4.57 | 0.850 |
| Health and Safety procedure are accessible to employees in the organization | 4.57 | 0.617 |

| | Mean | Std. Deviation |
|---|---|---|
| There is strict monitoring of health and safety policy and proper keeping of safety records in the organization | 4.48 | 0.668 |
| Safety plan is made available specifically for each job, outlining how the safety aspects of the particular job will be managed | 4.4 | 0.634 |
| Organization always ensure the adequate provision of standardised health and safety devices for workers | 4.36 | 0.780 |
| There is notices on Health and Safety at conspicuous position in the organization | 4.33 | 0.636 |
| Observation of standing health and safety rules and regulations on site is enforced during construction | 4.29 | 0.759 |
| Suggestions and contribution made by employees on health and safety issues are promptly responded to | 4.14 | 0.517 |
| Scheduled reviews of health and safety standards at work site | 4.14 | 0.715 |
| There is continuous basic training and education in health and safety for workers in the organization | 4.02 | 0.718 |
| Organization carry out health and safety evaluations and surveillance | 3.9 | 0.894 |
| Attention is given to prompt and adequate communication of health and safety issues to key players | 3.88 | 0.705 |

*1= No compliance, 2= Very low compliance, 3= Low compliance, 4= Moderate, 5= Full compliance, MS= Mean Score, N=Number of respondents (42)*

**Challenges Facing Contractors in Complying with Health and Safety Insurance Policies in Lagos State**

Despite the good rate of compliance to H&S insurance policies claimed by the contractors, the study sought to identify certain challenges facing contractors in complying with H&S insurance policies in Lagos state. The result presented in Table 5 shows that on the part of the Indigenous Contraction Firms (ICF), cost implication of H&S policies (MS= 4.61), followed by Poor management commitment, Fear of not recouping investment in health and safety facilities and Poor leadership (MS=4.59 & 4.2) respectively. On the contrary, the Multinational Construction Firms (MMCF) rated Poor management commitment, Poor leadership Cost implication of H&S policies respectively. It is interesting to note that both categories of firms have same challenges, the magnitude notwithstanding.

Health and safety insurance facilities truly attract additional cost to the contractor while such cost are categorized as sunk cost and are irrecoverable. The challenge of poor leadership is more so identified; when the leadership lack the ability to provide direction, and motivation for compliance with health and safety, compliance naturally becomes difficult. Leadership input is considered a significant factor in ensuring contractors comply with health and safety insurance policies. Idubor and Oisamoje, (2013) posit that compliance to and enforcement of occupational health and safety legislations have generally been described as poor having link with issues such as lack of concern, lack of accurate records and poor statutory regulations. According to Foo, (2006) the financial aspect is of utmost importance as nothing is free of charge in implementation of safety practices at construction sites and that someone has to pay for it. Patrick (2008) highlighted that there is an urgency to allocate a fraction of budget on the safety and health cost in the contract for both the public and private projects.

Least ranked are, Continuity in business with mean score of 3.7 from ICF perspective, while the same with mean score of 3.17 from MCF perspective; Time to time replacement of health and safety facilities had a mean score of 3.63 from ICF perspective, while Fear of not recouping investment in health and safety facilities had a mean score of 3.40 from MCF perspective; Lack of awareness followed with mean score of 3.46 from indigenous construction firms perspective while

the same factor is similarly ranked with mean score of 3.33 from MCF perspective. Issues dealing in Fear of not recouping investment in health and safety facilities, Continuity in business, Time to time replacement of health and safety facilities, and Lack of awareness are noted as least challenges that contractors are faced with in complying with health and safety insurance policies. The thought of continuity in business therefore could become a challenge if the contractor is sceptical about continuity in business or have the future plan of quitting operation and shifting towards other lines of business. Investing into health and safety facilities in such situation may not appeal to the instinct of the contractor. Time to time replacement of health and safety facilities is another area of challenge while this cannot be overruled as facilities are been put to use from time to time. The continuous use of facilities would result in facilities losing value or depreciating and overtime facilities may not perform intended purpose any more, requiring that the facilities be replaced. The need for replacement of health and safety facilities therefore poses challenge for contractors complying with health and safety insurance policies. Of critical issue is the challenge of lack of awareness of the various insurance policies and the imperatives of complying with the policies. Contractors seem not aware of the importance of the need for complying with health and safety insurance policies. However, Odeyinka, (2000) posits that it is the principal responsibility of contractors in the building industry to be at the fore front of compliance with the laid down health and safety policies established by insurance.

**Table 5: Challenges Facing Contractors in Complying with Health and Safety Insurance Policies in Lagos State**

| | ICFs | | MCFs | |
|---|---|---|---|---|
| | **Mean** | **Std. Deviation** | **Mean** | **Std. Deviation** |
| Cost implication of health and safety policies | 4.61 | 1.322 | 3.79 | 1.360 |
| Poor management commitment | 4.59 | 0.951 | 4.31 | 0.493 |
| Fear of not recouping investment in health and safety facilities | 4.2 | 0.964 | 3.4 | 0.885 |
| Poor leadership | 4.2 | 0.715 | 4.07 | 0.580 |
| Absence of health and safety plan | 4.13 | 1.311 | 3.64 | 1.104 |
| Poor safety discipline | 4.00 | 1.043 | 3.71 | 1.033 |
| Absence of clearly stated safety rules | 3.74 | 1.243 | 3.48 | 1.394 |
| Continuity in business | 3.7 | 0.973 | 3.17 | 0.859 |
| Time to time replacement of health and safety facilities | 3.63 | 1.167 | 3.48 | 1.133 |
| Lack of awareness | 3.46 | 1.254 | 3.33 | 1.435 |

*1= Strongly Disagree, 2= Disagree, 3= Indifferent, 4= Agree, 5= Strongly Agree, TS= Total Score, MS= Mean Score*

## CONCLUSION AND FURTHER STUDIES

The purpose of this study was to examine contractors' compliance to health and safety insurance policies in Lagos State, with a view to stemming high risks of hazards occurrence. Survey questionnaires were administered on construction professionals in construction and contracting organizations within the construction industry in Lagos state. Results show significant difference in the level of awareness and compliance of contractors to health and safety insurance policies between foreign and indigenous construction firms. The implication is that, adequate insurance cover will compel the insurance companies to strictly monitor the contractors' operations and enforce compliance thereby averting hazards to the workers and the projects and liabilities to the insurer.

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# Constraints of Nigeria Indigenous Construction Contractors (NICCS) In a Competitive Business Environment

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Nigeria Indigenous Construction Contractor (NICC) is facing a lot of constraints among which are the quest for survival and relevance in the Nigeria construction sector. Majority of high net-worth construction projects are awarded and executed by foreigners' managed firms which constitute less than 5 percent of the total number of construction companies operating in Nigeria. This has put the NCCs into a precarious condition as the nation's construction sector is completely monopolized by foreigners. However, the NICCs are the architects of their own misfortune as over the years, researchers have observed that the outputs of construction activities by NICCs fall below the expected quality standard required, as such, clients' preference for foreigners' managed construction companies. This study sets out to investigate the causes of these constraints and why NICCs are majorly predisposed to poor project performance. The study adopted the review of literatures as well as the use of questionnaire to elicit information from construction practitioners. The study identified 19 factors, ranked in order of importance on why clients prefer foreigners' managed construction enterprise in Nigeria. Factor analysis was used to group these factors into 5 principal factors namely: poor monitoring, controlling and funding challenges, bankruptcy and cost overruns, technical issues, site organization and layout, and materials and construction methods. The findings of the study will assist in improving the competitiveness of NICCs, by so doing; reduce the cost of construction as the competition nest of performing contractors in Nigeria would be widened.

**Keywords:** Capacity, competition, infrastructure, patronage, performance

## INTRODUCTION

The population and economy of Nigeria is fast growing. As such, there is the need for massive investment in infrastructure to sustain her current level of growth. Nedozi, Obasanmi and Ighata (2014) opined that investing in infrastructure will drive Nigeria's economic growth, provide jobs, raise the quality of life, deliver vital services and contribute to macroeconomic stability. Adeagbo (2014) supported this assertion by admonishing that for sustainable and national economic development, infrastructure provision should be taken seriously. However, Nigeria has massive infrastructural deficit estimated at $300 billion, representing 25 percent of the nation's Gross Domestic Product (Balogun, 2016). With this level of deficit, it would be difficult for Nigeria to attain Millennium Developmental Goal of sustainability within its economy. Although successive governments have tried to invest in infrastructural funding, yet, improvement in this area has been very minimal.

The Federal Government of Nigeria recognizes this phenomenon as opined by the Minister of Finance that government investment in critical infrastructure across the country would unlock job, create wealth and strengthens economic development across all states in Nigeria (Nnabugwu, 2017). According to Oluwakiyesi(2011), Nigeria's physical infrastructural gap is prevalent in the transportation sector – road, rail, airports, and seaports. Furthermore, The World Bank (2016) reported that Nigeria has a whopping housing deficit of 17million units as at 2013 with the cost estimated to be N60 trillion ($200billion). To bridge this massive housing and infrastructural deficit, spending within the construction sector alone in Nigeria is estimated to grow annually from $23 billion in 2013 to $77 billion in 2025 (Balogun, 2016).

These are huge figures which hitherto provide ample opportunities for players in the Nigeria construction sector of the economy. However, intensive infrastructure provision and mammoth construction activities may be hampered by inadequate capacity, and constraints of capacity

development of Nigeria Indigenous Construction Contractors (NICCs). The capacity development of NICCs is crucial to bridging the present-day infrastructural gap of the nation. There exist ample opportunities for the growth and profitability of the construction sector in Nigeria but is the NICC ready to tap into this? To tap into this opportunity, Sawhney, Agnihotri and Paul (2014) suggested that considerable effort should be made to boost the capacity of the sector, reduce wastages, improve competencies and increase project performance which should be paramount to the development the NICCs.

Nonetheless, the construction industry is globally confronted with many challenges. These challenges are paramount in developing countries and are more of socio-economic stress, resource shortages, institutional flaws and a general inability to deal with the key regulatory issues of the industry (Ofori, 2000; Gale & Fellows, 1990). These difficulties as identified by Selleh (2009) include economic instability, scares resources, relatively unskilled labour forces, low-level productivity, excessive wastages, poor infrastructure, fraudulent practices, financial difficulties, government influence, activities of the informal sector and inability to adopt best practices.

The implication of these resulted in the inability of construction enterprises to hire permanent staff, their lack of effective management, poor management accounting, lack of profits, inaccurate estimating, and under-pricing. (Rwelamila, Lobelo& Ebohon, 1997; Agumba, Adegoke & Otiena, 2005; Inuwa, Wanyona & Diang'a, 2014).

In the study by Chilipunde (2010), the lack of technical skills required in project implementation, deficiency in understanding of the contract documentation and the preparation and submission of tenders are huge constraints facing construction enterprises which should be ironed out as a matter of urgency. This view was corroborated by Kayanula and Quartey (2000); Ramokolo and Smallwood (2008); in which it was discovered that the lack of contracting business capacity in terms of managerial know-how places significant constraints on small construction enterprises development and growth. According to Songer, Chinowsky and Butler (2006), the construction industry is severely faced with leadership challenges, issues relating to workforce development, lack of qualified and skilled personnel, aging workforce; and the need to deal with issues such as teamwork, communication, training and education. The consequence of this according to Ogunlana (2010) results in the Nigerian government's lack of confidence in the participant of the construction sector and most importantly, the NICCs. In Nigeria, few companies, mainly foreign corporations control a large percentage of the total workload of the construction industry, while a large number of small and medium-sized enterprises, usually indigenous firms share a meagre percentage of the construction workload (Idoro, 2004). According to

Idoro (2010), the practice remains a concern to stakeholders in the construction industry because it does not promote indigenous participation, capacity building and technological development in the construction industry and it constitutes unnecessary drain of the nation's scarce foreign exchange. Idoro (2010) explains that the preference given to foreign contractors in the award of construction contracts is because clients view their work quality better than that of NICCs. Therefore, Idoro (2012), strongly advocates that there is the need (for indigenous contractors) to regain the confidence of clients by improving on their performance which is a function of their capacity to deliver.

Capacity improvement of construction contractors is very important, not only for the contractor's development but also to the government of the day and the people. Report by CIB (1999) suggested that the capacity development of construction contractors will improve the effectiveness of the construction industry to meet the demand for building and civil engineering products, this, in turn, will support sustained national economic growth and social development objectives.

**Challenges Facing Nigeria Indigenous Construction Contractors (NICCs)**

The importance of the construction sector

of any country cannot be over-emphasized. It is one of the largest employers of labour, and contributes substantially to the Gross Domestic Products (GDP) of most countries (Chiang, Tao & Wong, 2015; Gregori & Pietroforte, 2015). Major economic developments are often achieved via a consistent and vibrant construction sector. In most developing economies, the construction industry helps in galvanizing economic activities which in turn leads to development and growth. In Nigeria, the economy has grown considerably owing to the activities of the construction industry. Olowookere (1988) reported that close to 60% of Nigeria's capital investment was provided by the construction sector and as well as about 30% of the country's Gross Domestic Product. This increase in economic activities will generate high demands for construction activities. In other words "construction activities drive the economy, while the economy drives construction productivity".

However, NICCs have been denied fair share of major construction activities in the country; high net- worth projects are often awarded to the few construction companies managed by foreigners who exhibit high technical and managerial quality with easy access to funding and high-quality project execution (Ogbebor, 2002; Oseni, 2002; Akintude, 2003, Idoro, 2007). Nigeria construction contractors have over the years being plagued with poor project performance regarding meeting completion dates, work quality, and capital management. Most indigenous contractors complete construction contracts at sums greater than the initial contract sums and within time frames more than the pre-planned completion time schedule (Mansfield, Ugwu & Doran 1994). Rwelamila, Henjewele and Mkandawire (2013) opined that concerted efforts are to be exerted to address capacity constraints of construction contractors which are likely to stifle construction growth.

Aniekwu and Okpala (1987) identified the problems confronting Nigeria's construction contractors and classified it as both systemic and structural. Notable among the challenges are lack of easy access to credit facilities (Adam, 1997), lack of well-structured regulatory authority (Aibinu & Odeyinka, 2006), cost and time overruns, poor quality projects, health and safety issues (Elinwa & Joshua, 2001; Mansfield, Ugwu & Doran 1994), and most importantly, continual dominance of the industry by the foreign contractors to the disadvantage of the Nigeria construction contractors (Oluwakiyesi, 2011; Idoro, 2007). Emuze (2011) opine that cost overruns could exacerbate budget constraint problems, time overruns and construction delays may impede service delivery, while poor quality project is likely to increase maintenance cost and shorten the service life of infrastructure. Poor health and safety practices would increase both industry and public fatalities.

The operations of NICCs are characterized by lack of performance and incompetence when compared with their foreign counterparts, and this has adversely affected their patronage in the contracting business (Aibinu & Jagboro, 2002). Evaluation of NICCs in most studies revealed that their project performance is characterized by cost and time overrun, poor quality, poor management, financial difficulties, poor planning and high frequency of litigations and project abandonment (Mansfield, Ugwu & Doran 1994; Adams, 1997; Achuenu, Izam & Bustani, 2000; Bala, Bello, Kolo, & Bustani, 2009; Yilmaz &Ergonul, 2011; Odediran, Adeyinka, Opatunji & Morakinyo, 2012; Oladimeji & Ojo, 2012). The probable reasons for low patronage of NCC most especially in connection with high net-worth project procurement includes shortage in the availability and supply of adequate manpower and material resources, ambiguous process of construction execution, geographical effect of weather, inadequate monitoring of workers' activities, lack of dedication to duties by workers and difficulty of workers adapting to changes in construction module (Bala, et al., 2009).

The few foreigners' managed construction firms with perceived higher capacity with good capacity development take advantage of the weaknesses of NICCs. A study by Aniekwu and Audu (2010) revealed that the foreign constructing contractors make up 5 percent of the total population of registered contractors while their indigenous counterparts are 95 percent of the total

contractors. However, the foreign contractors are better patronized with the majority of the high net- worth jobs awarded to them. These and many other factors have placed the NICCs at a disadvantage with little or no patronage in the procurement of high net- worth project when compared with the foreign contractors as enormous demand for infrastructural needs. Inexperience, lack of appropriate strategic planning, the absence of appropriate planning techniques, little knowledge of variables likely to influence planning process, and inappropriate comprehension of performance measurement index are grossly responsible for the under-performance and lack of patronage of Nigeria contracting contractors' project performance (Inuwa, 2014). Ugochukwu and Onyekwena (2014) noted that due to the poor performance of NCC, Nigeria government could not entrust its construction project to them. The government prefers to award its complex and capital-intensive projects to foreign construction company operating in Nigeria.

According to Adams (1997), there have been concerted efforts at promoting Nigeria's contractors' involvement and increase their participation in the construction industry. However, the efforts have not been successful. In this regard, this current study sets out to address this issue of the low contracting capacity of Nigeria Construction Contractors and its effects on business patronage. Features of Nigeria Construction Industry

The Nigerian construction industry is made up of two groups; the organized and liberal groups (Dantata, 2008). The organized groups consist of the formalized and registered construction firms that carry out building production and construction management in Nigeria (Onengiyeofori, 2016). They can be foreigners managed or indigenously managed and are usually composed of skilled and unskilled workers with full employment in the firms. These groups of contractors have permanent office addresses and sometimes buildings or office complexes of their own. They own relevant construction equipment and have permanent office staff. The liberal or unorganized construction group consist of people who are involved in the construction process without requisite construction knowledge; they found themselves in the industry by providence. They are usually characterized with no permanent office address; they make use of freelance labourers as they do not have permanently employed skilled workers, no permanent equipment of their own as they prefer to rent. Unfortunate as the case may be, this is the group of contractors that dominate the Nigeria construction market.

In Nigeria, few companies' mainly foreign corporations control a large percentage of the total workload of the construction industry, while a large number of small and medium-sized enterprises, usually indigenous firms share a meagre percentage of the construction workload (Idoro, 2004). According to Idoro (2010) much preferences is given to expatriate contractors over their indigenous contractors in the award of construction contracts as they view their performance regarding quality standard of work as being better than indigenous contractors. The NICCs have not been able to meet up with the demand expected of it. The performance of NICCs has over the years being plagued with poor project performance regarding meeting completion deadlines, work quality, and capital management. Most projects are completed at sums greater than the initial contract sums and within time frames of more than the pre-planned completion time (Mansfield, Ugwu & Doran 1994).

The lack of requisite construction management knowledge by the owners of this construction outfit and their failure to have the right project team make them susceptible to business failure and poor project performance (Inuwa, Wanyona & Diang'a, 2014). Therefore, Idoro (2012), advocates the need for indigenous contractors to regain the confidence of clients by improving on their performance.

In the face of all these challenges, the NICCs have grown rapidly in recent years with a high rate of expansion more than any sector of Nigeria economy. However, majority of NICCs are largely unregistered, operate haphazardly and have very little formal business systems. They constitute the largest percentage of total contractors and employ very few permanent staff, usually less than ten

employees. NICCs are either family owned business or solely owned in which the business dies when the owner is no more.

## RESEARCH METHOD

Debois (2016) asserted that questionnaires are cost- efficient, practical, gives speedy results, maintains user anonymity, and can cover all aspects of a topic. Therefore, a questionnaire was used to elicit information from consultants and clients involved in construction activities in Lagos state. The survey questions were designed in a manner such that the questions were simple and unambiguous. This method intended to guarantee the participation of many respondents as it is difficult at times to elicit information from construction professionals because of their very busy schedules. The target population for this study are primary stakeholders involved in construction projects. This includes private sector clients and consultants.

The design of the questionnaire for this study was structured and multiple-choice type. The survey consists primarily of two parts:

Section A, this encompasses the background information of respondents; this section consists of six questions aimed at assessing the suitability and reliability of the responses from the respondents for the study. It focuses on the form of ownership of the respondents' film, their organization type, professional background, minimum academic qualification, industry's experience and types of projects involved.

Section B, this was designed in line with the purpose of this study. To elicit responses on why clients, prefer foreign contractor to indigenous contractor. 20 factors were identified, and the respondents were asked to rank these factors based on their experience on previous projects using a Likert scale of 1 – 5 with 1 being the lowest perception (not important) and 5 being the highest (very important)

Data collected were analysed using descriptive statistics for the respondent's background information. Mean score was used for the ranking of identified 25 and 18 factors on challenges being faced by indigenous contractors how to improve the performance of indigenous contractors respectively. Kruskal-Wallis test was employed to determine whether there is statistically significant difference in the perception of respondents in the ranking of these factors. Factor analysis was conducted to determine the relationships among the identified 20 factors.

| | | Client | Kruskal- Wallis sig | | | | |
|---|---|---|---|---|---|---|---|
| | | N=19 | | | | | |
| | Mean | Std. Dev. | Mean | Std. Dev. | Mean | Std. Dev. | |
| Poor monitoring and controlling strategy | 3.04 | 0.985 | 3.05 | 1.008 | 3.00 | 0.943 | 0.811 |
| Inability to meet work quality | 2.81 | 1.002 | 2.84 | 0.977 | 2.74 | 1.098 | 0.696 |
| Unavailability of funds | 2.80 | 1.047 | 2.82 | 1.107 | 2.74 | 0.872 | 0.897 |
| Poor project performance in terms of meeting completion dates | 2.72 | 0.914 | 2.64 | 0.910 | 2.95 | 0.911 | 0.174 |
| Use of poor quality materials | 2.66 | 0.940 | 2.58 | 0.896 | 2.89 | 1.049 | 0.178 |
| Management of project within a schedule time period | 2.61 | 1.004 | 2.56 | 1.014 | 2.74 | 0.991 | 0.441 |
| Poor quality work on the part of our local contractors | 2.53 | 1.088 | 2.55 | 1.086 | 2.47 | 1.124 | 0.817 |
| Poor design | 2.50 | 0.940 | 2.42 | 0.875 | 2.74 | 1.098 | 0.279 |
| Lack of understanding of the project | 2.49 | 1.126 | 2.44 | 1.118 | 2.63 | 1.165 | 0.525 |
| Unavailability of machinery and equipment | 2.42 | 0.876 | 2.49 | 0.900 | 2.21 | 0.787 | 0.261 |
| Lack of experience in executing construction works | 2.42 | 0.907 | 2.49 | 0.920 | 2.21 | 0.855 | 0.325 |

| | | Client | Kruskal- Wallis sig | | | | |
|---|---|---|---|---|---|---|---|
| | | N=19 | | | | | |
| | Mean | Std. Dev. | Mean | Std. Dev. | Mean | Std. Dev. | |
| Poor storage of materials | 2.41 | 1.019 | 2.40 | 1.082 | 2.42 | 0.838 | 0.898 |
| Poor site layout | 2.39 | 1.057 | 2.35 | 1.075 | 2.53 | 1.020 | 0.437 |
| Contractors in construction project often led to bankruptcy and project abandonment | 2.38 | 0.989 | 2.35 | 0.947 | 2.47 | 1.124 | 0.661 |
| Shortage of labour, plant and materials | 2.36 | 0.959 | 2.35 | 1.004 | 2.42 | 0.838 | 0.567 |
| Completion of construction contracts at sums greater than initial sums | 2.36 | 0.973 | 2.36 | 0.969 | 2.37 | 1.012 | 0.896 |

**DISCUSSION**

Why Clients Prefer Foreign Contractors to Indigenous Contractors Table 1 presents the ranking of the perception of respondents on why clients prefer foreigners' managed construction firm to indigenous construction firms. The analysis of the ranking regarding the overall mean score values for 20 identified factors ranges from 2.05–3.04. Poor monitoring and controlling strategy have the highest overall score of 3.04, while all other 19 factors range from 2.07–2.81, these includes inability to meet work quality, unavailability of funds, poor project performance in terms of meeting completion dates, use of poor quality materials, management of project within a scheduled time period, poor quality work on the part of our local contractors with mean values of 2.81, 2.80, 2.72, 2.66, 2.61and 2.53. The five least factors are; completion of construction contracts at sums greater than initial sums, use of inappropriate construction methods, more waiting periods, poor safety culture, and, slow in making decisions concerning the projects in this order with means of 2.36, 2.36, 2.27, 2.24, and 2.07.

However, the ranking of the perception of consultants and clients vary from the overall ranking. While the five highest ranked factors by consultants agree with the overall ranking, the ranking by clients except for poor monitoring and controlling strategy (3.00) was more ranked than others. The client ranked poor project performance in terms of meeting completion dates (2.95), use of poor quality materials (2.89), inability to meet work quality (2.74), and unavailability of funds (2.74) respectively. To test if there exist any significant difference in the perceptions of consultants and client as to why foreign contractors are preferred to local contractors in the analysis of the ranking, Kruskal-Wallis test at a significance level of 5% was performed. The results show that there is no statistically significant difference in the perceptions of respondents group on why clients prefer foreign contractor as the p-value of the factors is greater than 0.05. This implies that both the perception of consultants and clients are harmonious.

**Table 1: Reason why construction clients prefer foreign contractors**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Use of inappropriate construction methods | 2.36 | 0.853 | 2.42 | 0.854 | 2.21 | 0.855 | 0.525 |
| More waiting periods | 2.27 | 1.150 | 2.35 | 1.092 | 2.05 | 1.311 | 0.148 |
| Poor safety culture | 2.24 | 0.873 | 2.20 | 0.869 | 2.37 | 0.895 | 0.395 |
| Slow in making decisions concerning the projects | 2.07 | 0.849 | 2.09 | 0.845 | 2.00 | 0.882 | 0.663 |

**Factor Analysis**

Norusis (2000) explains that factor analysis helps to detect clusters of related variables and reduce the number of variables by bringing inter- correlated variables together under more all- purpose, principal variables. Although the identified factors affecting the performance of indigenous contractor have been ranked, the purpose of this study is to identify the key inter-correlated factors that predispose indigenous

contractors to poor performance and subsequently limits their patronage to little net- worth project. To categorize and classify these factors appropriately, factor analysis was used to investigate the pattern of the relationship that exists. Principal factor extraction with varimax orthogonal rotation was carried out on the identified factor. Before carrying out the test of the factors, factor analysis test requires that various tests for the appropriateness of the factor extraction be carried out. These include the

Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, measure of sampling adequacy (MSA) and Barlett test of sphericity.

Table 2 shows the outcome of the rotated component matrix of the 20 identified reasons why foreign contractors are preferred to local contractors. The analysis produced a 5-factor solution with eigenvalues greater than 1. The minimum eigenvalue is 4.54 while the maximum is 7.99 with a cumulative percentage of variance explained by the extracted 5-factors being 66.23%. The variables with higher loadings on a factor play a more significant role in naming the factor. Thus, the 5-factor groupings extracted are interpreted as:

Factor 1: poor monitoring, controlling and funding challenges
Factor 2: bankruptcy and cost overruns
Factor 3: technical issues
Factor 4: site organization and layout
Factor 5: materials and construction methods

**Table 2: Factor analysis groupings using varimax orthogonal rotation.**

| Factors | Factor 1 | Factor 2 | Factor 3 | Factor 4 | Factor 5 |
|---|---|---|---|---|---|
| Poor monitoring and controlling strategy | 0.88 | | | | |
| Shortage of labour, plant and materials | 0.78 | | | | |
| Unavailability of funds | 0.77 | | | | |
| Inability to meet work quality | 0.76 | | | | |
| Lack of experience in executing construction works | 0.69 | | | | |
| Poor project performance in terms of meeting completion dates | 0.65 | | | | |
| Bankruptcy and project abandonment | | 0.72 | | | |
| Completion of construction contracts at sums greater than initial sums | | 0.71 | | | |
| Poor design | | 0.52 | | | |
| More waiting periods | | | 0.76 | | |
| Poor quality of work | | | 0.58 | | |
| Lack of understanding of the project | | | 0.48 | | |
| Poor storage of materials | | | | 0.83 | |
| Poor site layout | | | | 0.59 | |
| Slow decision making | | | | 0.52 | |
| Use of poor quality materials | | | | | 0.84 |
| Poor safety culture | | | | | 0.83 |
| Unavailability of machinery and equipment | | | | | 0.80 |
| Management of project within a schedule period | | | | | 0.59 |
| Use of inappropriate construction methods | | | | | 0.57 |
| Eigen Value | 7.19 | 5.36 | 7.99 | 7.31 | 4.54 |
| Percentage of variance explained | 24.68 | 7.99 | 7.31 | 7.08 | 19.17 |
| Cumulative percentage of variance explained | 24.68 | 32.67 | 39.98 | 47.07 | 66.23 |
| Kaiser-Meyer-Olkin measure of sampling adequacy = 0.515 | | | | | |
| Bartlett test of sphericity = 285.760, significance p = 0.000 | | | | | |

**Factor 1: Poor Monitoring, Controlling and Funding Challenges**

This factor grouping represents 24.68% of the total variance. The major components factors of poor monitoring, controlling and funding challenges are poor monitoring and controlling strategy, shortage of labour, plant, and materials, unavailability of funds, and inability to meet work quality among others. These components loadings are high, viz 0.88, 0.78, 0.77 and 0.76 respectively. It is evident that poor monitoring and control of construction projects leads to poor construction outputs, delays in execution of critical works items. Funding challenges lead to the inability of indigenous contractors to purchase required materials, plants and machinery that will guarantee an increase in the rate of construction output. Plants and machinery do not only make construction jobs easy, safe and quicker, but the proper use also reduces the overall cost mostly for large contracts, guarantees quality output, safety, speed and timely completion of projects. However, this is a challenge being encountered by indigenous contracting organizations.

Factor 2: Bankruptcy and Cost Overruns This grouping accounts for 7.99% of the total variance of the reason why clients prefer foreign contractors to indigenous contractors. It consists of three components which are: bankruptcy and project abandonment, completion of construction contracts at sums greater than initial sums, and poor design. Lack of patronage of indigenous contractors does lead to bankruptcy and insolvency. According to Ugochukwu and Onyekwena (2014), bankruptcy results in poor project execution and abandonment. Related to bankruptcy is the issues of completion of construction contracts at sums greater than initial sums, this has been identified as the major outcomes of projects executed by indigenous contractors (Mansfield, Ugwu& Doran 1994). Poor design often leads to final construction contract sums being greater than the initial sums. A poorly designed building will always be reviewed with wide modifications from the existing design that will lead to increase in the initial contract sum. It is therefore not surprising that these three factors loaded together.

**Factor 3: Technical Issues**

This factor account for 7.31% of the variance explained of why foreign contractors are preferred to local contractors. The three components include more waiting periods, poor quality of work, lack of understanding of the project. Idle time is the waste of construction manpower because of late delivery of equipment or materials, changes in design and not having sufficient experience in the work to be done. Idle time increases the burden on Contractors and ultimately affects the project. The lack of understanding of the project leads to idle time and in most cases results in poor quality of works. Idoro (2010) found out that construction clients rate project executed by foreign contractors higher regarding defects observed after the construction than those executed by indigenous contractors. This is an indictment on the ability of indigenous contracts, except the trend of poor quality construction is halted; it might be difficult for indigenous contractors to regain the confidence of clients in them to handle high net-worth construction project.

**Factor 4: Site Organization and Layout**

This factor grouping has the least percent of variance; the group represents 7.08% of the variance explained. The three components include poor storage of materials, poor site layout, and slow decision making. Adequate and proper site organization and layout guarantees that the works are undertaken efficiently and safely. Precise sizing and location of temporary facilities help reduce travel times, site bottleneck, idle times, and help to ensure the effectiveness of the workplace with better worker confidence. Adequate storage of materials ensures that construction materials are constantly available for workers to prevent idle time which often leads to time overruns. Site storage entails the provision of ample storage space, protection, and handling for materials, components and equipment that are to be readily available on site during the building process. Failure to properly plan for storage can lead to site congestion, having excess materials on site than storage space can accommodate.

Excessive materials on site can lead to pilfering, improper handling which may lead to materials shortage.

**Factor 5: Materials and Construction Methods**

This is the second most important factor loadings with 19.17% of the variance explained. It is not surprising these factors loaded together. Issues such as the use of poor quality materials, poor safety culture, unavailability of machinery and equipment are all components of this factor with loading factors of 0.84, 0.83, and 0.80 respectively. The other two factor loadings are management of project within a schedule period, use of inappropriate construction methods with loading factor of 0.59 and 0.57 respectively. Some contractors tend to cut corners by the use of poor quality materials to get more profit. However, this act has done more harm than good as it tends to limit the level of indigenous contractor's patronage. Another reason is that the majority of indigenous contractor tender for work without adequate provision for their profits and overheads. It is doing the construction phase that they tend to make more profit by the use of poor materials. Agwu and Olele (2014) opined that construction workers are three times more likely to be killed and twice as likely to be injured as workers in other occupations. This emphasizes the need for safety consciousness on construction sites. Construction accidents have direct and indirect cost. Direct costs are: hospital bills, premiums for accident benefits, liability and property loss while the indirect costs are: time lost in attending burial ceremonies, time lost in the investigation, idle time, damaged equipment and losses arising from site closure. Incidences like this should necessitate the need for a proactive safety culture in construction processes (Laufer & Ledbetter, 1986). It is therefore pertinent that indigenous contractors should know that not only does site safety guarantees performance, it also increases construction profitability. Other factors such as adequate scheduling and the use of the most appropriate construction method will ensure the free flow of construction activities and ensure prompt project delivery within the stipulated time.

**CONCLUSION AND FURTHER STUDIES**

There is no gain saying that opportunities exist for NCCs if only they can improve on the constraints as identified in this study. This study, by the groupings of factor analysis generated five major areas NCCs should focus on, they are: (i) poor monitoring, controlling and funding challenges, (ii) bankruptcy and cost overruns, (iii) technical issues, (iv) site organization and layout, and (v) materials and construction methods. The ability of NCCs to work around these five specific areas will help improve on their capacities to deliver high performing projects by so doing increase the confidence of construction clients in their ability to deliver successful projects. Furthermore, the NCCs can be of great significance in the economic and sustainable development of Nigeria. The huge deficit in the country's infrastructure will encourage and promote their patronage only if the challenges presently being faced by NCCs are surmounted. On the reason why client patronizes foreigners' managed contractors, the study found that poor monitoring and controlling strategy, inability to meet work quality, unavailability of funds, and poor project performance in terms of meeting completion dates as well as the use of poor quality materials. NCCs should concentrate on this basic area for its capacity improvement. In conclusion, the ability of NCC to compete with the foreign firms will help to foster competitions and drive a healthy competition among contractors of which construction clients and the Nigeria economy will be the greatest beneficiaries.

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# Macroeconomic Variables and Foreign Direct Investment (FDI) Inflows in the Nigerian Construction Sector

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The inconsistence of the macroeconomic variables performance and the low gross domestic savings can be attributed to the low infrastructure development in Nigeria. To reduce the problem of poor infrastructure development in Nigeria, capital must be mobilized from the high income countries to increase the present low gross domestic savings. The aim of this study is to investigate the influence of macroeconomic variables on FDI inflows in the Nigerian construction sector. The methodology adopted for this study was an ex-post facto survey research because it was based on existing or secondary data. Annual time series data of the FDI inflows in the Nigerian construction sector, Foreign exchange rates, inflation rates, and interest rates were used. Archive materials from Central Bank of Nigeria (CBN) and National Bureau of Statistics (NBS), annual data from 1990 to 2016 were used for analysis. The variables for this study were tested for stationarity. The unit root test results revealed that the variables were non-stationary at levels but they attained stationarity at first difference. The regression analysis of Ordinary Least Square (OLS) method was used to analyse the data. The result revealed that exchange rate has positive impact but not significant. The result also indicated that interest rate and inflation rate have negative impact on FDI inflows but not significant respectively. Johansen Co- integrated test conducted revealed that there existed a long-run relationship among the variables in the study. The study also established from the Johansen Co-integrated test that FDI and construction sector is significantly co- integrated, indicating a valid relationship at 5%. The result from the OLS model indicated that causality that exists between FDI and the construction sector is bi-directional. Hence construction sector influence FDI inflows as well as FDI inflows influence construction sector in Nigeria. The causality between FDI and the construction sector should encourage policy decisions that will improve the FDI inflows, which by extension would translate to boosting the construction industry's opportunity to meet infrastructure deficit.

**Keywords:** Construction sector; Economic growth; FDI; Macroeconomic variables; Nigeria

## INTRODUCTION

Construction sector is an important and significant sector in any economy. According to Ekpo (2011), construction sector is an important variable of progress in the drive for economic sustainable development of any nation especially the Less Developed Countries (LDCs) such as Nigeria. In China for example, the construction sector accounts for a large percentage of the country's Gross Domestic Product (GDP), since it represents the cornerstone of the country's domestic economy (European Small & Medium-Sized Enterprise Centre, 2013). The construction sector in China, for example, has been receiving boost since 2010. In particular, the percentage contribution of the sector to the total GDP was 15 percent in 2010 (Spire Research & Consulting Pty Ltd, 2011). In Nigeria, the construction sector contributes between 3 and 6 percent to the country's GDP from 1960 during its independence to the 1980's after which the economy experienced recession and the GDP dropped to 1 percent, then later rose again to 3 percent in 2012 (Isa, Jimoh & Achuenu, 2013). The contribution of the construction sector to the economy can be attributed to both internal and external factors. One of the external factors that can significantly contribute to the construction sector growth under favourable economic policy management is the FDI.

FDI is regarded as an important input in the development of any nation because no country is an "island" or self-sufficient on her own. FDI helps to stimulate economic growth and development (Orji, 2004). According to the Organization for Economic Co-operation and Development

[OECD] (2002), FDI can be defined as "an integral part of the international economic system and a major catalyst for economic development or flow of capital and human resources from one country to another". It went further that FDI is part of the economic system that stimulates growth by assisting in the provision of infrastructural facilities especially in the LDCs. One of the problems confronting most LDCs in Sub-Sahara Africa, Nigeria inclusive, is low gross domestic savings. The problem can be minimized by encouraging FDI in these countries, to maximize advantages (Ebekozien, Ugochukwu & Okoye, 2015). The fact that the contribution of the FDI in the development of any country is inevitable, it requires that there must be economic stability in the receiving country.

Ajuwon (2016) analysed the FDI inflows to Nigeria and was of the opinion that the Nigerian's share of FDI inflows to Africa decreased from 35.3 percent in 1990 to 13.6 percent in 2000, then came up to 16.3 percent in 2005 and then to 14.1 percent in 2010. The FDI inflows to Africa declined in 2016 by 3 percent to $59 billion and also the FDI inflows to West Africa grew by 12 percent to $11.4 billion in 2016, supported by recovering investment in Nigeria (United Nations Conference on Trade and Development (UNCTAD), World Investment Report 2017). This fluctuation in FDI inflows was attributed to the performance of the economy as a result of uncertainty in the macroeconomic environment prevailing in the country. This uncertainty emanated from the macroeconomic variables behaviour, such as exchange rates, resource prices, interest rates, and changes in policies and rules of business transactions in the country. Othman, Jafari and Sarmidi (2014) believed that the impact of FDI on economic growth will depend on the development of a functional and viable financial market which may also depend on the macroeconomic variables or monetary policy of the receiving country. Functional financial markets will promote the development of local firms which will facilitate emergence of new technologies that will gain from technology transfer and this will improve all round capacities and development of the host country with respect to FDI inflows.

For about four decades now, the macroeconomic environment in Nigeria has not been performing satisfactorily to cause considerable growth in every sector of the economy. For instance, the average GDP growth rate of 3.95 percent achieved between 1970 and 2008 caused a low growth rate of 1.49 percent in per capita income terms (Umoh, Jacob & Chukwu, 2012). According to Agbaeze, Nwosu and Nwoba (2017), macroeconomic variables are part of the factors influencing FDI decisions and investment climate in a given economy. In Nigeria, some environmental factors such as high inflation rate, poor infrastructure, high interest rate on capital, unfavourable exchange rate and unnecessary barrier to trade and inflows of capital have contributed to the low inflows of FDI to every sector in the Nigerian economy (Agbaeze, et al, 2017). A study carried out by Siklar and Kocanman (2018) on the relationship between FDI and macroeconomic stability in Turkey revealed that fluctuation in inflation and real exchange rate has negative effect on FDI in Turkey, therefore government must come up with policy that would create stable macroeconomic environment to attract a higher volume of FDI inflows into the country.

The aim of this study is to find out whether macroeconomic variables in Nigeria influence the FDI inflows in the construction sector of the Nigerian economy. The study objectives are: to investigate the influence of inflation rate on FDI inflows to the Nigerian construction sector; to determine whether exchange rate influences FDI inflows to the Nigerian construction sector and find out whether interest rate influence FDI inflows to the Nigeria construction sector.

This study is very important because of the significance of the construction sector and the FDI in the development of any economy. Solution to the fluctuation and volatility of the Nigerian macroeconomic environment will go a long way to boost the economy, enhance sustainable development and increase the FDI inflows to the construction sector of the economy. The study will also add to the existing knowledge therefore useful to all stakeholders in the construction sector and the economy in Nigeria and outside Nigeria.

The study is divided into sections: literature review, method of research, analysis, discussions, conclusions and recommendations.

**Construction Sector and Its Relevance to Economic Development in Nigeria**

The construction sector is a unique and important sector in the economic development of any nation. It is responsible for physical infrastructure development which is required by other sectors of the economy. According to Ekpo (2011), construction sector is a critical factor in the economic advancement of nations especially LDCs such as Nigeria. The construction sector contributed 3 percent to the Nigerian GDP in 2002, compared to manufacturing sector that contributed 4 percent in the same year (Anyanwu, 2007). To Polycarp and Ubangari (2017), there was a decline in the contribution of construction sector to the Nigerian economy between 2014 and 2016. For example, the contribution of the construction sector in the third quarter of 2015 was 5.34 percent and this went down to 2.81 percent in the third quarter of 2016. This drastic change was attributed to economic recession experienced by government at this period.

According to Dutse (2008), in the developed countries, the construction sector is the highest employer of labour, but in the developing countries such as Nigeria, it is expected to be the second highest employer of labour after agriculture sector. Akindoyeni (2011) also asserted that in the conduct of economic activities, construction sector is always used by government as the stimulus for the buoyancy of the economy. Okoye (2016) was of the opinion that construction sector drives the social and economic development of any nation because almost all sectors depend on their products for their operations. Iheme and Chiagorom (2018) described construction sector as a section that is normally used to explain the performance of an economy due to its reliability and connections with other sectors in an economy.

Following a study carried out by Abubakar, Abdullahi and Bala (2018) on the relationship between the Nigerian construction industry and the GDP between 1990 and 2015, it was discovered that despite the problems of the volatility in the macroeconomic variables in the economy, the construction output still granger-cause the GDP, which implies that there is correlational relationship between the growth of construction output and the GPD in Nigeria. This finding supports the fact that construction industry is important to the development of the Nigeria economy. The construction sector of any country also performs various activities which enhance effective sectoral linkages and ensures sustainable economic development (Ademola & Badiru, 2016).

On the historical overview of the Nigerian construction sector, according to Akindoyeni (2011), the organized construction contracting began in Nigeria in 1940s with few foreign companies coming into operation. With the oil-boom of 1970s, there was an upward trend in the Nigerian construction activities to the end of the second republic in 1983. It can be said that the sector witnessed increasing upsurge in construction activities in the past but activities in the sector were dominated by expatriate companies with few indigenous companies (Idoro, 2009). Due to the performance of the Nigerian economy, the construction sector is still struggling with a lot of challenges, ranging from inadequate technical and managerial problems, insufficient financial capability to material and equipment capital base (Ofori, 2001). However,

regardless of all these challenges confronting the construction sector in Nigeria, the sector is still full of inherent potentials, such as self-sufficiency in cement production that will stabilize the materials sector and the huge deficit in physical infrastructure (road, rail, airport and sea port) that will help in creating opportunities for sustainable development (Oluwakiyesi, 2011). The construction sector in developed, emerging and developing countries can be seen as the sector of the economy that through planning, design, construction, maintenance, repair and operation, transforms various resources into constructed facilities. Various physical, public and private facilities produced by this sector ranges from residential and non-residential buildings to heavy engineering construction, and these physical

facilities play a crucial and highly visible role in the process of development (Kheni, Gibb & Dainty, 2008).

According to Mogbo (2004), the infrastructure development in Nigeria is inadequate and of a poor state, when compared with those in Europe, North America and Japan. He also went further to say that infrastructure facilities in the Nigerian economy is weak and characterized by uneven distribution, decay and unstable which can be attributed to neglect and macroeconomic environment prevailing within the economy. According to Okoye, Mbakwe and Igbo (2018), the construction sector plays a vital role in the economic growth of Nigeria. However, this has been affected by the recent economic recession which has caused major risks for the construction sector. Also, the budget revenues have been reduced and as a result, investment in infrastructural facilities by the government is crippled. World Bank (2010) reported that more than one hundred million Nigerians do not have access electricity supply. Adelegan (2000) also observed the transportation infrastructure facilities in Nigeria to be generally poor. Road, rail, air and water transportation systems are in deplorable conditions, while most rural areas are not properly linked to the rest of the country thereby affecting development.

The state of a country's physical infrastructure development will determine such country's prospect for economic sustainability and development. The development of basic physical infrastructure in Nigeria is faced with challenges thereby contributing to low economic development in all the sectors of the economy. In the World Economic Forum's 2016 to 2017 Global competitive index ranking, Nigeria was at the bottom, that is, 132 out of 138 countries (Institute of Security Studies, 2017). This report also indicates that serious policy must be instituted by policy makers in Nigeria to counter the effect of basic physical infrastructure deficit in Nigeria for sustainable economic development.

**Construction Sector, Economic Growth and FDI Influence in Nigeria**

Development of the construction sector in any economy is indisputable due to its immense contribution to the economic development of the nation. The construction sector is a subset of an economy at large. Anything that affects a given economy will affect its construction sector. Some researches were carried out on the relationship between construction sector and related economy. Isa et. al. (2013), reported that the economic growth of Nigeria is directly related to her construction sector. That is, if the Nigerian economy growth is high, the contribution of the construction sector will also be high. Lopes (1997) established that there exists a direct relationship between the level of GDP per capita and the level of the construction sector activity in Sub-Sahara Africa.

The gross domestic savings of the Nigerian economy is very low hence the need for external intervention in form of FDI so as to boost economic growth (Ebekozien et al., 2015). FDI inflow into the construction sector especially for the development of the Nigerian infrastructure facilities will go a long way in the development of the Nigerian economy. Ogunjimi and Amune (2017) claimed that every country of the world, especially developing countries like Nigeria seek for FDI as part of their major source of external finance because FDI affords countries to get capital externally without much effort. FDI is one of the reliable and easy means through which a country can get capital to augment domestic savings for infrastructural development (Adeoye,

2009). FDI facilitates the provision of external finances for the implementation of infrastructure projects, assisting the local construction companies especially those that lack capital and expertise to execute projects (Zhorzhohani, 2016). This same author also emphasized that FDI assistance in projects could lead to increase in construction demand thereby creating opportunities for domestic companies. A study conducted by Ebekozien, Ugochukwu and Okoye (2015), revealed that there is a poor flow of FDI into the Nigerian construction sector, when compared with other sectors of the economy. From the findings, the study discovered that in Granger sense, the Granger Causality is bi- directional. This therefore suggests that FDI is an important catalyst for sustainable growth and development

of the construction sector in Nigeria, and that the level of infrastructure facilities available in the country would determine the extent of FDI attraction into the economy.

Table 1, shows the inflows of FDI into the construction sector during the military regime between 1984 and 1998, and also during the democratic regime between 1999 and 2017 in Nigeria. From table 1, the highest FDI inflow into the construction sector during the military regime was #3, 888.30 million. During that period, the FDI inflow into the construction sector of the Nigerian economy was inconsistent which could be attributed to political unrest at the time. Also from table 1, the highest FDI inflow into the Nigerian construction sector during the democratic regime between 1999 and 2017 was #12, 702.50 million in the year 2008; this shows a positive flow of FDI into the construction sector. From table 1, it was equally observed that there was an improvement in the FDI inflows into the construction sector of the Nigerian economy during the democratic era which can be attributed to various economic measures introduced during this period of time to boost FDI attraction into the economy.

**Table 1: FDI Inflows to the Economy and the Construction Sector between 1989 and 2017**

| Year | Total FDI inflows in the economy | FDI inflows to construction sector | Percentage FDI inflows in construction |
|---|---|---|---|
| 1989 | 10,899.90 | 481.80 | 4.40 |
| 1990 | 10,436.10 | 743.60 | 7.10 |
| 1991 | 12,244.20 | 1,471.60 | 12.00 |
| 1992 | 20,512.70 | 1,406.60 | 6.90 |
| 1993 | 67,787.00 | 71.20 | 0.10 |
| 1994 | 70,713.70 | 1,707.00 | 2.40 |
| 1995 | 119,391.60 | 1,553.00 | 1.30 |
| 1996 | 122,600.90 | 1,864.30 | 1.50 |
| 1997 | 128,331.90 | 1,259.80 | 1.00 |
| 1998 | 152,410.90 | 3,888.30 | 2.60 |
| 1999 | 154,190.40 | 3,995.90 | 2.60 |
| 2000 | 157,508.60 | 3,995,90 | 2.50 |
| 2001 | 161,441.60 | 4211.90 | 2.60 |
| 2002 | 166,631.60 | 4,293.90 | 2.60 |
| 2003 | 179,687,60 | 4,545.80 | 2.50 |
| 2004 | 249,639.30 | 5,194.10 | 2.10 |
| 2005 | 324,129.30 | 6,713.30 | 2.10 |
| 2006 | 482,447.60 | 10,461.10 | 2.20 |
| 2007 | 552,498.60 | 12,030.20 | 2.10 |
| 2008 | 586,309.70 | 12,702.59 | 2.20 |
| 2009 | 441,271.10 | 8,25.50 | 2.20 |
| 2010 | 440,136.10 | 9,284,86 | 2.10 |
| 2011 | 463,239.30 | 10,191.26 | 2.20 |
| 2012 | 459,397.10 | 10,106.74 | 2.20 |
| 2013 | 502,473,20 | 11,556.88 | 2.30 |
| 2014 | 530,354.80 | 12,196.16 | 2.30 |
| 2015 | 284,575,69 | 5,976.09 | 2.10 |
| 2016 | 314,231.11 | 4,713.47 | 1.50 |
| 2017 | 299,142.00 | 5,085.40 | 1.70 |

Source: Ebekozien, Abdul-Aziz and Jaafar (2018)

**Influence of Macroeconomic Factors on FDI Inflows to Construction Sector in Nigeria**

There are four major factors that attract FDI into a country. These are access to resources, access to market, efficient gains and acquisition of strategic assets. These factors can be hindered as a result of the macroeconomic prevailing in a country (Mehta, 2012). Kariuki (2015) worked on the determinants of FDI inflow in the African Union, came up with the findings that high risk has a negative effect on FDI inflows; that political and financial risk affect FDI inflows negatively; that there is a positive relationship between commodity price index performance of any country has a positive effect on the FDI inflows; and that the degree of openness to trade has a positive effect on the FDI inflows. In a study carried out by Dondashe and Phiri (2018) on the determinants of FDI in South Africa (Do macroeconomic variables matter?), using capita GDP, the inflation rate, government size, real interest rate, and terms of trade openness; it was discovered that all the macroeconomic employed were positively related to FDI except inflation rate.

A study carried out by Prakash and Kumar (2017) using panel data analysis, revealed that variables such as market size, labour cost, infrastructure, currency value and capital formation were very essential determinants of FDI inflows of BRICS countries, therefore based on the findings of this study, the authors recommended a robust industrial production to boost the performance of domestic economy. Another study carried out by Siklar and Kocanman (2018) on the relationship between FDI and macroeconomic stability in Turkey discovered that fluctuation in inflation and real exchange rate have a negative effect on FDI in Turkey and therefore recommended that Turkey create favourable atmosphere that would provide stable macroeconomic environment in order to attract higher volumes of FDI.

Following a study carried out by Oloyede and Kolapo (2018) on the sensitivity of FDI to macroeconomic variables in Nigeria of which they employed the following variables, FDI as the dependent variable, GDP, population and openness to trade as the independent variables. The ordinary least square model for this study revealed that inflation rate; population and openness to trade have positive influence on FDI, while economic growth has a negative influence on FDI. This study also revealed that unemployment, exchange rate and interest rate have negative influence on FDI inflows into Nigeria in the short run. Finally, this study recommends that managers of the Nigerian economy intensify measures to control interest rate and exchange rate fluctuation so as to attract FDI inflows into the Nigerian economy.

A major factor responsible for the low level attraction of FDI to Nigeria is the low level of savings and deficit infrastructure development in the country. The macroeconomic prevalence in Nigeria is also not favourable to attract FDI as few existing fixed assets are in deplorable states. The interest rate is high, exchange rate is unstable, crude oil (which is the major source of revenue for the country) is not stable and the rate of unemployment in the economy is very high (Ogunjimi & Amune, 2017).

**RESEARCH METHOD**

This study examined the influence of macroeconomic variables on the contribution to FDI inflows in the construction sector in Nigeria. The study made use of secondary data sources first because of the nature of data involved and second on the basis of the well-developed knowledge in the field of economics, as economic data could easily be sourced from national statistical sources. The sources of the data used for this study are: Central Bank of Nigeria (CBN) and the National Bureau of Statistics (NBS). The data were collated from the annual basis between 1990 and 2016. The variables used in the study are defined as follows:

FDI_CS represents the total inflows of FDI inflows in construction sector between the period of the study, 1990 and 2016. It is measured in Million US$.

Real Interest Rate (INTR): The real interest rate is the nominal interest rate adjusted for expected inflation rate and is measured as the difference in the nominal interest rate and the expected inflation rate in the economy. It is

measured in percentage.

Real Exchange Rate (EXR): Real exchange rate is defined as the nominal exchange rate that takes into account the inflation difference among nations. It is the rate at which a country currency is compared with the currency of other countries.

Inflation Rate (INF): Inflation rate is based on the consumer price index. It is a percentage change in the price of goods and services in the economy within a given period of time.

In the study, FDI_CS is the dependent variable while interest rate, inflation rate and exchange rate are the explanatory or independent variables. The study uses both descriptive and inferential statistics to analyze and evaluate the results. Descriptive statistic is used to evaluate the properties of the data while the inferential statistic is used for correlation analysis, regression analysis, unit root test and cointegration analysis. Pearson correlation is used for correlation analysis to know the direction of relationship between variables. Ordinary Least square method is used for regression analysis to measure the strength and significance of relationship. Augmented Dickey-Fuller Test Statistics and Phillip Peron unit root test were used to test data stationarity. Johansen Co-integration test is used for data integration. E-views 7 software is used for data analysis.

## DISCUSSION

The data analysis is divided into descriptive and inferential statistics.

### Descriptive statistics

The section below shows the descriptive analysis of the variables engaged in the study.

The Table 2 shows the descriptive properties of the studied variables over the period - 1990 to 2016. Jarque-bera statistics test of the goodness of fit of the sample data if normally distributed, the Jarque-bera statistics will have a chi square distribution with two degrees of freedom. The skewness statistics shows that FDI_CS, INTR, EXR, are negatively skewed. For inflation rate, skewness statistic is positive. The results shown that the interest rate has the highest rate of change among all the variables whereas the inflation rate has the lowest rate of change. Standard deviation depicts that FDI_CS values are more vulnerable to deviation as against the expected values whereas the inflation has the least potential to deviate from the expected figures.

**Table 2: Descriptive Statistics of the Variables for the Study**

| | FDI_CS | INTR | EXR | INF |
|---|---|---|---|---|
| Mean | 19.03 | 24.39 | 2.52 | 3.16 |
| Median | 19.31 | 24.41 | 2.53 | 3.08 |
| Maximum | 22.41 | 25.82 | 1.32 | 4.43 |
| Minimum | 13.81 | 22.56 | 3.53 | 1.56 |
| Std deviation | 1.94 | 0.83 | 0.54 | 0.78 |
| Skewness | 0.44 | 0.30 | 0.17 | 0.008 |
| Kurtosis | 3.12 | 2.41 | 2.65 | 1.73 |
| Jarque-Bera | 1.29 | 1.16 | 0.39 | 2.61 |
| Probability | 0.52 | 0.55 | 0.82 | 0.26 |
| Observation | 27 | 27 | 27 | 27 |

Table 3, shows the correlation matrix test of the variables for the study. Table 3 shows that FDI_CS is positively correlated to all three variables, interest rate, exchange rate and inflation rate. It indicates presence of integration in the market and it may be due to high flow of capital in the economy. The lower level of correlation of inflation attracts more opportunities for the foreigners to invest in construction sector in Nigeria.

**Table 3: Correlation Matrix**

| | FDI_CS | INTR | INF | EXR |
|---|---|---|---|---|
| FDI_CS | 1.000 | 0.912 | -0.007 | 0.908 |
| INTR | 0.912 | 1.000 | -0.183 | 0.903 |
| INF | 0.007 | -0.103 | 1.000 | -0.158 |
| EXR | 0.908 | 0.930 | -0.158 | 1.000 |

**4.2 Regression Analysis**

To ensure good model, the one that would be suitable for policy recommendation, unit root test must be carried out on the variables so as to make sure that they are stationary. After which regression model can then be determined. Two stationary tests were conducted using Augmented Dickey fuller (ADF) and Phillip Peron test. These results are shown on Table 4, and Table 5.

**Table 4: Stationary Test Using Augmented Dickey Fuller (ADF) Test**

| Variable | Level | | First Difference | | Decision | | |
|---|---|---|---|---|---|---|---|
| | Intercept | Trend Intercept | None | Intercept | Trend Intercept | None | |
| FDI_CS | -1.283 | -4.281 | 1.316 | -9.043 | -8.959 | -8.338 | I(1) |
| INTR | -0.814 | -2.587 | 2.940 | -7.580 | -2.587 | -2.940 | I(1) |
| INF | -3.068 | -3.250 | -0.860 | -5.364 | -5.371 | -5.471 | I(1) |
| EXR | 0.459 | -2.810 | 4.881 | -4.298 | -4.382 | -2.684 | I(1) |

**Table 5: Stationary Test Using Phillip Peron**

| Variable | Level | | First Difference | | Decision | | |
|---|---|---|---|---|---|---|---|
| | Intercept | Trend Intercept | None | Intercept | Trend Intercept | None | |
| FDI_SC | -2.645 | -6.120 | 1.607 | -10.391 | -10.133 | -9.363 | I(1) |
| INTR | -0.184 | -2.315 | 3.735 | -5.349 | -5.224 | -4.016 | I(1) |
| INF | 3.013 | -3.071 | -0.894 | -6.179 | -6.077 | -6.262 | I(1) |
| EXR | -1.354 | -4.310 | -0.303 | -11.618 | -11.781 | -2.684 | I(1) |

From Table 4 and Table 5, the results of the tests show that all the variables are non- stationary at level but are stationary at first difference, with intercept, trend and intercept, and none.

Table 6 shows the Johansen Co- integration of the variables for the study. From the Table, the Log Likelihood Ratio (LR) satisfied three equations at 5% significant level.

Johanson Co-integration Test is used to test co- integration series of variables. The results show null hypothesis rejection at 5% significance. Log likelihood ratio satisfied co-integration equation at 5% significance level. The assumption which is used in this co-integration test is intercepted with no trend and vector regression (VAR) with linear deterministic trend.

| Observation 27 | | | | |
|---|---|---|---|---|
| Series: FDI_CS, INTR, INF, EXR | | | | |
| Lag 1 to 1 | | | | |
| Eigen Value | Likelihood Ratio | 5% Critical Value | 1% Critical Value | Hypothesized No of CE(s) |
| 0.536 | 72.742 | 46.19 | 53.35 | None[xx] |
| 0.479 | 44.285 | 28.86 | 36.55 | At most 1[xx] |
| 0.405 | 20.097 | 14.51 | 24.14 | At most 2[xx] |
| 0.023 | 0.847 | 4.67 | 7.56 | At most 3[xx] |

[xx]denote Hypothesis rejected at 5% and 1% significant level

Table 7, shows the Least Square Estimation used for the study. Ordinary Least Square technique is used for time series data to test the strength and significance of the explanatory variables against the dependent variable. The results significantly disclosed that the value of coefficient of interest rate, inflation & exchange rate are positive & significant at 1% level, hence it can be concluded that all the three explanatory variables are positively related to the dependent variable, FDI. This implies that exchange rate and FDI contribution influences Nigeria construction sector. Also that, inflation rate and FDI contribution influences the Nigeria construction sector and that interest rate and FDI's contribution influences the construction sector in Nigeria. The model shows a positive relationship, which implies that a change in one variable will certainly result in correspondent change in the other. The model established the fact that a unit increase change in the FDI inflow into the construction sector of the economy will bring about increase in construction sector.

**Table 7: Least Square Estimation**

| Dependent variable: FDI_CS Sample 1: 27 | | | | |
|---|---|---|---|---|
| Included observation: 27 | | | | |
| Variable | Coefficient | Std. Error | T-statistics | Prob. |
| INTR | 1.260 | 0.358 | 3.519 | 0.0012 |
| INF | 0.624 | 0.205 | 3.041 | 0.0044 |
| EXR | 1.066 | 0.303 | 2.780 | 0.0088 |
| C | -13.524 | 7.588 | -1.782 | 0.0834 |

| | | | |
|---|---|---|---|
| R-Squared | 0.8879 | Mean dependent var. | 19.0387 |
| Adjusted R Squared | 0.8783 | S.D. dependent var. | 1.9477 |
| S.E of Regression | 0.6772 | Akaike info criterion | 2.1554 |
| Sum Squared Raid | 16.0546 | Schwarz criterion | 2.3260 |
| Log Likelihood | -38.0310 | F-statistic | 92.4527 |
| Durbin Watson Statistics | 1.8665 | Pro (F-statistics). | 0.0000 |

So, any increase in the three explanatory variables would cause an increase in FDI which invariably affects construction sector in Nigeria, therefore government should focus on stabilizing these variables to attract more FDI to the country in order to further support growth of industries, especially the construction industry. The coefficient values explained the beta coefficients of the explanatory variables and their effects on the dependent variables. The resultant equation can be expressed mathematically as:

FDI_CS = -12.83 + 1.26 INR + 0.62 INF+ 1.06 EXRATE + e

FDI_CS represents FDI inflow in construction sector between 1990 and 2016. INR represents the nominal interest rate adjusted for expected inflation rate between 1990 and 1916. INF represents inflation rate between 1990 and 1916, EXRATE represents between 1990 and 1916 and e represents error term.

Probability of F-statistics also shows that the model is overall significant at 1% level. The value of R2 denotes that about 89% of the variations in dependent variable are explained by the variations in the explanatory variables.

## CONCLUSION AND FURTHER STUDIES

This study evaluates the influence of macroeconomic variables on FDI inflow to the Nigerian construction sector. Annual time series data were employed. This study used OLS estimation method and Johansen co-integration test to ascertain the long run relationship between the variables under investigation. The study revealed from the OLS results that causality between the FDI inflow and the construction

sector is bi-directional. This implies that the construction sector influences the FDI inflow and at the same time the FDI inflow influences the construction sector.

The implication of the construction sector influencing FDI inflow is that the infrastructure facilities on ground can determine the level of FDI inflow in an economy. At the same time the FDI inflow to the country can lead to an improvement in the growth of the construction sector. From the study it was also that macroeconomic variables such as interest rate, inflation rates and exchange rates have significant positive impact on FDI inflow on the economy as a whole, likewise the construction sector.

The recommendations of this are as follows: the monetary authorities must ensure that the macroeconomic variables are stable and also the socio-economic environments are conducive so as to increase FDI inflow into the construction sector of the economy; Government must create policies that would improve the economy in terms of per capita growth and this will attract FDI inflow in to the construction sector; Government must also fully liberalize exchange rate regime devoid of multiple exchange rates so as to attract more FDI inflow into the economy.

Based on the importance of this study, the following areas are identified as needed further research: Macroeconomic factors, FDI inflows in the construction sector and the Nigerian economy growth; Inflationary dynamics and the FDI inflows in the Nigerian construction sector; and Exchange rate Volatility and the FDI inflows in the Nigerian construction sector.

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# Nigerian Construction Sector, Domestic Fixed Capital Formation and Gross Domestic Product of Nigeria

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Domestic Fixed Capital (DFC) is one of the most fundamental requirements for economic diversification. The slow growth of DFC has been identified as one of the most important challenges facing sub Saharan Africa. The study empirically examined the causal relationship between the Nigerian Construction Sector (NCS) output and Gross Fixed Capital Formation (GFCF) and the Gross Domestic Product (GDP) using Nigerian Time Series Data (TSD) from 1970 through 2013. The empirical investigation is carried out using vector error correction Model (VECM) framework. Data is sourced from United Nations Statistic Department (UNSD). The results of the co-integration test suggest the existence of a long-run relationship between the NCS, GFCF and GDP. The results show that the NCS positively causes GFCF and GDP growth. The finding implies that Nigeria can accelerate its GFCF and GDP growth by increasing investment in the NCS.

**Keywords:** Nigerian construction sector, gross fixed capital formation, gross domestic product

## INTRODUCTION

Domestic Capital Formation (DFC) or physical infrastructure is one of the fundamental requirements for Gross Domestic Product (GDP) growth and development. Thus, the growth of human resources must be accompanied by capital accumulation for sustained growth and development (Kuznets & Jenks, 1961; Umo, 1979). The Chinese economic growth and development strategy has been characterized by a high growth rate of DFC (Okonjo-Iweala, 2010). The slow growth rate of DFC has since been identified as one of the most important challenges facing Less Developed Countries (LDCs) especially in Africa (Calderón & Servén, 2008). The poor state of DFC in Africa cuts national economic growth by two percentage points every year and reduces productivity by as much as 40 percent (Foster & Briceño-Garmendia, 2010). Thus, virtually all strategies for African economic development list DFC as a top priority (Calderón & Servén, 2008). The debate on the role of DFC in economic development has been inspired by the increasing pressures of fiscal adjustment in most economies resulting in decreasing public sector participation in DFC; and the increasing Private (sector) Participation in Infrastructure (PPI). This reflects an increasing reliance on market mechanisms leading to Public Private Partnerships (PPPs) in public DFC for example roads, rail and ports (Calderon, 2009).The construction sector (CNS) is the single largest contributor to the DFC, and it is responsible for at least 50 percent of the DFC in LDCs including Nigeria. Thus, the slow rate of growth of construction goods and by extension the DFC is responsible for the slow GDP growth rate, unemployment and poverty elongation of most LDCs (see BBC, 2013; Doumbia-Henry,

2003; DPW, 2001; Hillebrandt, 1984, Ofori, 2000; Pietroforte & Gregori, 2006; Rwelamila, 2006; Seaden & Manseau, 2001; UNCHS, 1984; Wells, 1984 ; World Bank , 1984 etc.). In contrast to the extant literature focus which dwells on the impact of DFC on GDP growth (See for example Prest and Stewart, 1953; Hawkins, 1959; Aboyade, 1966; Hooley, 1967; Umo, 1979; Akpokodje, 2000; & Ebajemito *et al.*, 2004), this study examined the impact of the CNS on the DFC and GDP growth. Studies on the effect of the CNS on the Gross Fixed Capital Formation (GFCF) are hard to find in the body of literature. It is against the backdrop that this study examined the impact of the Nigerian Construction Sector (NCS) on the GFCF and the GDP using the Vector Autoregression (VAR) methodology.

**LITERATURE REVIEW**

The roles of DFC in growth and development are critical and have been confirmed by classical, neoclassical and modern growth theories (see for example Smith 1776; Keynes 1936; Robinson, 1949). The Harrod (1939)-Domar (1946) Model delineates a functional economic relationship in which the growth rate of Gross Domestic Product (GDP) (g) directly depends on the national saving ratio (s) and inversely on the national capital/output ratio (k) so that it is written as $g = s/k$. The Solow (1956) exogenous growth model postulates that output is produced using labour and DFC. The New (Endogenous) Growth Models of Romer (1990) comprises four factors: capital, labour, human capital and technology. Thus, in summary, all the growth models recognised DFC as one of the pillars of economic growth. In spite of the importance of DFC, the needs for fiscal adjustment in Africa have forced cuts in public DFC spending. Unfortunately this has not been matched by a corresponding increase in private DFC, hence the insufficient provision of DFC and slow growth (see for example Easterly & Servén, 2003; Blanchard & Giavazzi, 2004 etc.). Perkins et al., (2005) and Kularatne (2005) report a bi-directional relationship between DFC and the GDP. Lederman et al., (2005) find that the efficient provision of DFC is crucial for the success of trade-liberalization strategies aimed at optimal resource allocation and export growth.

A growing body of literature focused on theoretical and empirical contribution of DFC to productivity and growth in Africa (Ndulu, 2006; Ayogu, 2007). Wheeler, (1984), Faruqee, (1994);

Arbache, et al., (2008); Kingombe, (2011) identifies inadequate DFC, poor human capital, political instability and inappropriate policies as major constraints of growth in Africa. Easterly and Levine (1997) suggest that the ethnic diversity in Africa may explain inappropriate policy decisions and inefficient provision of public DFC in the region. Ayogu (1999) finds a strong association between DFC and output in Nigeria. Reinikka and Svensson (1999) find a significant negative effect of unreliable electricity on investment in Uganda. Limao & Venables (2001) Elbadawi et al., (2006) Behar & Manners (2008) find that inadequate DFC result in high transportation costs that hamper intra and inter-regional trades. Diao and Yanoma (2003) show that growth in the agricultural sector is constrained by a high marketing cost, which reflects poor transportation. Estache et al., (2005) discovered that roads, power and telecommunications DFC contributes significantly to long-run growth in Africa. Lumbila (2005) opines that inadequate DFC may negatively affect FDI impact on African economic growth.

Boopen (2006) examines the growth impacts of transportation DFC using both cross sectional and panel data estimation for a sample of 38 SSAs and a sample of 13 SIDS over the years 1980-2000. The study concludes that transportation DFC has a significant effect on the GDP. Estache (2006) finds that levels of private participation in the electricity, water and sanitation, telecoms and transportation sectors in Africa were at or above the levels in other LICs. Kamara (2006) uses data from African countries to estimate various dynamic panel effects of DFC in an aggregate

production function augmented with indicators of the quality of macroeconomic policy. Estache and Vagliasindi (2007) find that an insufficient power generation capacity restricts growth in Ghana. Ndulu (2007) finds insignificant private participation in African DFC. Dinkelman (2008) finds significant impact of household electrification on employment in South Africa's rural labour markets. Calderón (2009), using data on 39 African countries from 1960–2005 estimates the impact of DFC on per capita growth in three DFC areas (i.e. telecommunications, electricity & roads) based on econometrics. The study finds that volume and quality of DFC stocks significantly and positively impact on economic growth. Kingombe (2011) asserts that DFC formation and maintenance can be very expensive, especially in landlocked, rural and sparsely populated countries in Africa.

More recently, increasing attention has been paid to the impact of DFC formation on poverty and inequality. Empirical evidence shows that DFC in rural roads reduced poverty level in Peru (Escobal & Ponce, 2002) Georgia (Lokshin & Yemtsov, 2005) Bangladesh (Khandker et al., 2006) and Vietnam (Mu & van de Walle, 2007). Estache

et al., (2000, 2002); Estache, (2003); Calderón & Chong, (2004); Calderón & Servén, (2004); López, (2004); Galiani et al., (2005); Calderón & Servén, (2008a) assert that other things being equal, DFC may have a disproportionate effect on the income and welfare of the poor by raising the value of the assets they hold or by lowering the costs to access the markets. DFC plays a fundamental role in the promotion of growth and equity and helps to reduce poverty through both channels. However, for DFC to reduce income inequality, it must help expand access by the poor.

**Macroeconomics and Domestic Capital Formation (DFC)**

The process of DFC formation essentially comprises three steps; increase in real savings, mobilizing savings through financial institutions and investment of the savings. DFC formation therefore fluctuates during business cycles similar to the characteristic of the savings of individuals, firms and governments. DFC formation thus represents the real savings of a nation (Kuznets & Jenks, 1961; Umo, 1979). A socially optimal quantity of DFC formation depends on the demand for and supply of funds (Chiriniko & Morris, 1994). Thus, only high saving economies are able to achieve an optimal DFC formation level and prosperity (De Long & Lawrence, 1991). DFC thus remains a major challenge in Africa due to wide savings- investment gap and a declining savings rate (Aryeetey & Urdry, 2000). Restrictive monetary and credit policies tend to raise cost of capital by raising the real cost of bank credit, a major source of investment financing in LDCs and by increasing the opportunity cost of retained earnings, the other main source of investment financing in LDCs. Through both mechanisms, the result is a decline of investment (Servén & Solimano, 1993). However, some studies found no significant effect of interest rates on investment demand. This may be as result of the repressed financial markets that characterize many LDCs. Credit policy affects investment directly, through the credit available to firms with access to preferential interest rates, rather than indirect interest rate channel. The latter will also operate for the firms that borrow in the unofficial money market (van Wijnbergen, 1983). This direct role of credit availability is in empirical studies (Dailami, 1990). Fiscal deficits push up interest rates and/or reduce the availability of credit to the private sector and tend to crowd out private investment. Balassa (1988) reports a cross-section data (CSD) and estimates that public and private investments are negatively related. Hence, Khan and Reinhart (1990) suggest a reduction of deficit and that governments should aim at creating conditions favourable to private investment. However, empirical studies have reported complementarity between public and private investment (Greene & Villanueva, 1991). Reduced public investment, some of which tend to be complementary with private investment may result in the fall of private investment (Servén & Solimano, 1993). Public DFC formation can have a strong influence on the productivity, cost and return rate of private DFC (Munnell, 1992). Exchange rate depreciation may affect DFC through three main channels: the real cost of capital goods, the real interest rate and real output.

First, a real depreciation tends to raise the real cost of capital goods in terms of domestic goods. This is because DFC in most LDCs has a high import content whose relative price is increased by a real devaluation (Servén & Solimano, 1993). This tends to depress DFC formation in non-

tradable activities (Branson, 1986). In the traded goods sector however, the opposite happens: the real cost of DFC formation in terms of final goods falls and DFC formation rises. In the short run, a real devaluation has an adverse impact on DFC through this cost-of-capital-goods effect.

Second channel is the real interest rate. If devaluation is unanticipated and interest rates are determined in the money market, devaluation raises the price level through its impact on the cost of imported intermediate inputs and wages under indexation. On the one hand, if monetary policy does not fully accommodate the increase in the price level, real money balance falls, pushing up the real interest rate for a given rate of (anticipated) inflation. Hence, the user cost of capital rises and DFC formation falls. On the other, if devaluation is anticipated and it succeeds

in eliminating expectations, then it may result in an increase in DFC formation. The required return on capital would tend to fall reflecting a reduction in the anticipated devaluation. Third channel is the aggregate demand. In the short run, real devaluation adversely affects income and aggregate demand. If the net effect of currency devaluation is contractional, then DFC formation will fall. In the medium term, however, with a sufficiently strong impact of devaluation on net exports, an expansionary outcome for output and DFC formation may increase. This becomes more likely as time passes and substitution effects gradually come into play (Servén & Solimano, 1993).

**Nigerian Domestic Fixed Capital (DFC) Formation**

Prest and Stewart (1953) and Hawkins (1959) are the earliest studies of DFC in the Nigerian economy. These studies were limited and concentrated only on imported capital goods to the detriment of important indigenous components of DFC. These studies excluded African styled dwellings which were the most visible contribution of the citizens to DFC; this invariably means a gross underestimation of Nigerian DFC. Aboyade (1966) did the first objective DFC study tailored toward Nigerian environment as most of the concepts and measurement were modified to suite local realities. Hooley, (1967) asserts that estimates of the DFC are considered an integral part of national accounts statistics (NAS) and useful estimate of DFC in LDCs can only be achieved

where the method of estimation adopted are appropriate to the economic system they are purport to describe. Umo (1979) concludes that Nigeria must grow and optimally utilize DFC especially in critical areas of the economy. Akpokodje (2000) finds that exports earnings fluctuation in Nigeria adversely affects DFC formation in the short run and that changes in the official interest rate appear not to affect DFC formation. The study therefore suggests export stabilization schemes as likely stimulant to DFC formation. However, the impact of such stabilization schemes on DFC may not be very large. This implies that other fiscal policy instruments may have stronger impact on DFC under the assumption that they affect output directly. Ebajemito *et al.,* (2004) find that impediments to Nigerian DFC formation include capital income tax, government budget deficits and externalities. Capital income taxation distorts the savings and private DFC and cause the amount of DFC determined by the market to fall. Government deficits create a shortfall in private DFC formation by reducing the pool of savings available for private sector, thus crowding out private DFC formation. If the deficits are not used for DFC formation total DFC formation falls. This has been the case with Nigeria since the 1980s oil glut and the subsequent fiscal deficits. Servén and Solimano (1993) assert that most LDCs experienced investment slowdown following the outbreak of the debt crisis in 1982 and remained depressed for the rest of the decade. Faruqee (1994) finds that Nigeria particularly had difficult economic problems which led to adoption of Structural Adjustment Programmes (SAPs) in 1986 and a significant decline in both public and private DFC formation.

**The Nigerian Construction Sector (NCS)**

The Nigerian Construction Sector (NCS) is a major sector in the Nigerian economy; available statistics (though inadequate) reveals that the NCS have significantly contributed to the growth and development of the national economy. The NCS share of GDP has fluctuated between 4 percent and 10 percent since the 1960s. The contributions of the NCS to total employment have also been very significant fluctuating between 10 percent and 20 percent since the 1960s. The NCS decline in the 1980s is due to the fall in oil revenue, the implementation of SAPs and the forced suspension of many construction

projects (Faruqee, 1994). The NCS stands out as the most important single contributor to DFC in Nigeria. In the pre-independent era, the NCS accounted for about 40 percent of the DFC formation and in the post independent era the proportion increased to more than 50 percent. The NCS, has however not made commensurate

impact on growth and development, through backward and forward linkages to other economic sectors. One reason is that the NCS showed a residential building bias rather than other engineering DFC.

Additionally, the NCS is associated with misallocation and wastage of resources through corruption and inefficiency. Finally, there is a growing dependency on imported construction contents including technology and materials (Aboyade, 1966). Multinational Construction Contractors (MNCCs) dominate the NCS due to their superior technology and credibility in public DFC projects. This has adversely affected local content development of the NCS with the direct result that most Nigerian Indigenous Construction Contractors (NICCs) are stunted in growth and development. Other challenges of the NCS include the dominance of government, instability, time and cost overruns etc. However, the NCS is fairly large. The annual growth rate is among the highest in Nigeria. The NCS is projected to continue to grow as long as the international oil price remains high and the development of DFC remains a government priority. Nigeria has the potential to become one of the largest construction markets in Africa. The NCS is forecast to have one of the fastest growth rates in the world. There is also a growing participation of the private sector in the provision of important DFC (Dantata, 2008).

**RESEARCH METHOD**

The basic work horse of multivariate time series analysis (MTSA) is the Vector Autoregression (VAR) model. This is a direct generalization of the univariate Autoregression (AR) model to dynamic multivariate time series data (MTSD). The VAR model has proven to be especially useful for describing the dynamic behaviour of economic and financial time series data (TSD) and for forecasting. It is also used for structural inference and policy analysis (Hall, 1994; Patterson, 2000). Following the Granger representation theorem VAR can easily be transformed into the Vector Error Correction Model (VECM). When the I (1) variables are co-integrated, the approach of formulating the VAR model in first difference is inappropriate. The correct model is a co-integrated VAR in levels or a VECM i.e. a VAR in first differences together with the vector of co-integrating residuals (Robertson & Wickens, 1994). According to Engle and Granger (1987), when a set of variables I (1) are co-integrated then short run analysis of the system should incorporate an Error Correction Term (ECT) in order to model the adjustment for the deviation from its long run equilibrium. The VECM is therefore characterised by both differenced and long run equilibrium models thereby allowing for estimates of short run dynamics as well as long equilibrium adjustment process. The VECM is used for correcting disequilibrium in the co- integration relationship captured by the ECT, as well as to test for short and long run causality among co-integrated variables. The VECM is specified as follows:

$$\Delta LCNS_t = \emptyset_1 + \sum_{i=1}^{p-1}\beta_{11i}\Delta LCNS_{t-i} + \sum_{i=1}^{p-1}\beta_{12i}\Delta LGFCF_{t-i} + \sum_{i=1}^{p-1}\beta_{13}\Delta LGDP_{t-i} + \alpha_{11}ECT_{t-1} + \varepsilon_{1t} \quad (1)$$

$$\Delta LGFCF_t = \emptyset_2 + \sum_{i=1}^{p-1}\beta_{21i}\Delta LCNS_{t-i} + \sum_{i=1}^{p-1}\beta_{22i}\Delta LGFCF_{t-i} + \sum_{i=1}^{p-1}\beta_{23}\Delta LGDP_{t-i} + \alpha_{21}ECT_{t-1} + \varepsilon_{2t} \quad (2)$$

$$\Delta LGDP_t = \emptyset_3 + \sum_{i=1}^{p-1}\beta_{31i}\Delta LCNS_{t-i} + \sum_{i=1}^{p-1}\beta_{32i}\Delta LGFCF_{t-i} + \sum_{i=1}^{p-1}\beta_{33}\Delta LGDP_{t-i} + \alpha_{31}ECT_{t-1} + \varepsilon_{3t} \quad (3)$$

Where i=1…. N denotes the lag, t=1….T denotes the time period; εt is assumed to be serially uncorrelated error term; ECT is the lagged error term derived from the long term cointegrating relationship. According to Ang and McKibbin (2007) three types of Granger causality tests can be performed through the VECM framework: the short run Granger causality and the long run weak exogeneity test. The VECM is used to perform the Johansen co-integration tests.

Time Series Data (TSD)

The annualized TSD for the study was extracted from the United Nations Statistics Division (UNSD) available at http://unstats.un.org/unsd/economic. The data were based on GDP/breakdown at constant 2005 prices in US Dollars. The data covers a twenty-five year period

between 1970 and 2013. This includes the Gross Domestic Product (GDP), Gross Fixed Capital Formation (GFCF) and Construction Sector (CNS). Table 1 presents the descriptive statistics of the series.

**Definition of Terms**

**Gross Domestic Product (GDP):** This entry in the national account statistics (NAS) is the aggregate monetary value of final goods and services produced in a country within a given year (in 2005 USD)

**Gross Fixed Capital Formation (GFCF)**; This entry in the NAS includes current construction, flow of producers' durable equipment to users, net additions to inventories of business units and other agencies (but not households) and net changes in claims against foreign countries (Kuznets & Jenks, 1961).

**Construction Sector (CNS) Output:** This entry in the NAS is the total expenditure on new constructed facilities and on the maintenance of constructed facilities within the economy in a given year. This entry in the national account also includes money expended (Adamu, 1996).

**Causality and Exogeneity**

Causality concerns actual links between variables in the economy, whereas exogeneity is the property of being 'determined outside the model under analyses, so concerns the analysis of models conditional on putative exogenous variables without loss of relevant information. Concepts of weak, strong and super exogeneity relate contemporaneous explanatory variables to parameters of interest, to sustain valid conditional inference, forecasting and policy analysis respectively (Hendry, 1980). The various tests of exogeneity are important because weak exogeneity is needed for estimation purposes and for testing, strong exogeneity for forecasting and super-exogeneity is required for policy analysis (Caporale, 1996).

The Granger causality test is a statistical hypothesis test for determining whether one time series is useful in forecasting another (Granger, 1969). A time series X is said to Granger-cause Y if it can be shown, usually through a series of t- tests and F-tests on lagged values of X (and with lagged values of Y also included), that those X values provide statistically significant information about future values of Y. In practice, testing for Granger causality is carried out by testing for the significance of past values of the dependent variable in the marginal equation. However, conclusions drawn from granger test are affected by the number of lags, the sample period, choice of variables, and invalid weak exogeneity assumptions. Indeed, empirical findings of Granger causality, or its absence, need not entail an actual link (or its absence) in the DGP once non-stationarity is allowed (Hendry & Mizon, 1997).

The Weak exogeneity in a co-integrated system is a notion of long-run causality (Hall & Milne, 1994). However, the restrictions are meaningful if the adjustment coefficients or the loading factor which simply measures the speed of adjustment of variables is statistically significant and negatively signed (Wickens, 1996). Additionally a weak exogeneity is simply a variable in a co-integrated system that does not respond to discrepancy arising from long-run relationship. In other words, a variable is weakly exogenous if the coefficient of the speed of adjustment is zero i.e. $\alpha i=0$, and this indicates that there is no feedback response from the system (Enders, 2004).

Thus, a test of zero restriction (i.e. $\alpha=0$) is a test of weak exogeneity (Johansen, 1992; Johansen & Joselius, 1992). Hall and Wickens (1993) and Hall and Milne (1994) showed that the long-run causality is more efficient because it does not require two-steps procedure of estimating the co-integration relationship and the test of non-causality in ECM framework. Luintel and Khan (1999) suggest that long run causality is slightly different from the normal Granger causality as it does not take into account the short run dynamics. Strong exogeneity is the joint hypothesis of weak exogeneity and Granger's non causality. Strong exogeneity requires weak exogeneity plus the absence of Granger causality (Hunter, 1992; Cerqueira, 2009). The concept of super exogeneity combines weak and the invariance of conditional parameters to interventions changing marginal

parameters (Hendry, 1980). In the present study using eqn 2 to test short run causality from ΔCNS to ΔGFCF, the study use the null hypothesis Ho: the null hypothesis β21i=0, if this is rejected then it suggest that CNS causes GFCF. To test the long run causality i.e. the weak exogenous test, we use the null hypothesis Ho: α21=0 by using likelihood ratio test with $\chi 2$ distribution. The overall causality in the system is tested through the strong exogeneity test. To perform the strong

exogeneity test ΔLCNSt does not cause ΔLGFCFt, we use the null hypothesis Ho: β21i=0=α21=0, if the hypothesis is rejected it means LCNS significantly causes GFCF. The VECM procedure however involves modelling the series after stationarity and co-integration status of the series has been determined.

**Test for Stationarity and Co-integration**

Co-integration analysis necessitates that variables under consideration are integrated in the same order. Hence, it is necessary to undertake unit root tests before co-integration analysis (Ghirmay, 2004). The formal method to test the stationarity of a TSD is the unit root test. Augmented Dickey Fuller (ADF) test (Dickey & Fuller, 1979) and Philips-Perron (PP) tests (Phillips & Perron, 1988) are applied to test the time series data (TSD) for unit root. Yule (1926) suggests that regressions based on trending TSD could be spurious. The problem of spurious regression led to the concept of co-integration (Granger & Newbold, 1974; Granger, 1981). Two time series are said to be co-integrated, when both are non-stationary, but a linear combination of those time series is stationary (Engle & Granger, 1991). The stationary linear combination is called the co-integrating equation and may be interpreted as a long run equilibrium relationship between the variables. The co- integration analysis is performed with a VAR co- integration test, using the methodology developed by Johansen (1988 &1991) and Johansen and Juselius (1992).

**Forecast Error Variance Decomposition (FEVD)**

With ECM, it is possible to dictate a variable which is either endogenous or exogenous to the system but the relative degree of its endogeneity or exogeneity can only be effectively determined through the FEVD. The FEVD in essence shows the portion of the forecast error variance for each variable that is attributable to its own innovations and to innovations from the other variables in the system (Lütkepohl, 2007; Brooks, 2008; Olusegun, 2008). Therefore, if a variable is mainly explained by its own shocks and less by the other variables in the system, it can be said that such variable is exogenous (Masih *et al.,* 2009). This forecast error is a result of the variation in the current and future values of shocks. In line with what is expected, most of the forecast error variance of a variable is usually explained by its "own" innovations. The order of the variables is important while performing both IRFs and FEVD. The FEVD depends on the recursive causal ordering used to identify the structural shocks. Different causal orderings will produce different FEVD values. The VAR technique is used to estimate the FEVD.

**Impulse Response Functions (IRFS)**

The IRFs play an important role in describing the impact that shock has on economic variable and their propagation mechanism. The IRFs are used to analyse the response of current and future value of economic variables to a one-standard deviation increase in the current value of the VAR identified shocks. The IRFs describe the reaction of endogenous macroeconomic variables such as output, consumption, investment and employment at the time of the shock and over subsequent points in time (Lütkepohl, 2008). Shock is used to denote a change or an unexpected change in a variable or perhaps simply the value of the error term during a particular time period. A shock to the i-th variable not only directly affects the i-th variable but it is also transmitted to all other endogenous variables through the dynamic (lag) structure of the VAR (Brooks, 2008). Existing methods for constructing IRFs and their confidence intervals depends on auxiliary assumption on the order of integration of the variables. The estimate of the IRFs and their confidence interval are commonly based on Lutkepohl (1990) asymptotic normal approximations or bootstrap approximations to that distribution (Kilian, 1998).

**Empirical Estimation**

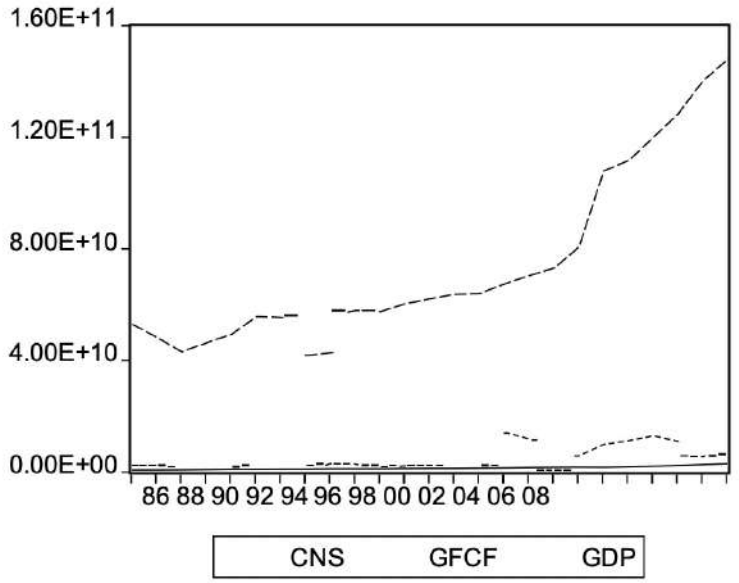


Figure 1 line graph of LCNS, LGDP and LGFCF

Fig. 1 shows the changing trends for each of the TSD for Nigeria. The line graph shows that the GDP had a downward growth between 1985 and 1987. From 1987 it begins an era of fast growth up to 1990; it then begins a moderate growth up to 2009. For the GFCF there was a downward growth between 1985 and 1987 and an upward growth between 1987 and 1993. The growth took a downward direction between 1993 and 1995.

Thereafter, a positive growth ensues from 1995 through 2000, then a downward growth in 2001. From 2002 begins another era of positive growth leading to 2006 and then downward growth up to 2008 and another positive growth up to 2009. For the CNS the line indicates a slow growth between 1985 and 2003 and then a downward growth to 2004 afterwards a fast growth began leading to 2009.

**Table 1 Descriptive Statistics of the Series**

| | CNS | GFCF | GDP |
|---|---|---|---|
| Mean | 1.25E+09 | 3.08E+09 | 7.56E+10 |
| Median | 1.08E+09 | 2.57E+09 | 6.24E+10 |
| Maximum | 2.66E+09 | 7.83E+09 | 1.49E+11 |
| Minimum | 6.35E+08 | 4.20E+08 | 4.37E+10 |
| Std. Dev. | 5.39E+08 | 1.91E+09 | 3.13E+10 |
| Skewness | 1.114692 | 0.965800 | 1.180091 |
| Kurtosis | 3.520245 | 3.085039 | 2.986884 |
| Jarque-Bera | 5.459175 | 3.894071 | 5.802740 |
| Probability | 0.065246 | 0.142696 | 0.054948 |
| Sum | 3.13E+10 | 7.71E+10 | 1.89E+12 |
| Sum Sq. Dev. | 6.98E+18 | 8.74E+19 | 2.35E+22 |
| Observations | 25 | 25 | 25 |

Table 1 presents the descriptive statistics of the three TSD CNS, GFCF and GDP. The statistics shows that the CNS has a mean of 1.25E+09 and a standard deviation of 5.39E+08, the Jacque-Bera value of 5.459175 with a p value <0.10 suggest a normal distribution. The statistics shows that the GFCF has a mean of 3.08E+09 and a standard deviation of 1.91E+09, the Jacque-Bera value of 3.894071 with a p>0.10 suggest not a normal distribution . Finally, the statistics shows that the GDP has a mean of 7.56E+10 and a standard deviation of 3.13E+10, the Jacque-Bera value of 5.802740 with a p<0.10 suggest a normal distribution.

**Unit Root Test Estimates**

Table 2 presents the result of the unit root showing that the null hypothesis of unit root for the series in level form with and without time trend is rejected at all conventional levels of significance when the calculated ADF and PP test statistics associated with the numerical coefficients of CNS, GDP and GFCF are compared with their critical values as given in Engle and Granger (1987). For this reason, it is assumed that all of the series are non-stationary based on the raw data series. The series were then transformed into natural logarithm and the unit root test rerun, the ADF and PP tests statistics then reject the hypothesis of a unit root at conventional levels of significance for all the series after first difference (i.e. I (1) series). The ADF and PP test statistics (p values) for log level of CNS (LCNS), GFCF (LGFCF) and GDP (LGDP) are reported in the table 2. It can be observed that the ADF and the PP tests lead to almost the same conclusion regarding the integration properties of the series. All the series are therefore taken as difference stationary i.e. I (1).

**Table 2: Result of Unit Root Tests for LCNS, LGDP and LGFCF**

| ADF | ADF 1st dif | PP | PP 1st dif | Conclusion | ADF | ADF 1st dif | PP | PP 1st dif | Conclusion |
|---|---|---|---|---|---|---|---|---|---|
| | No trend | With trend | No trend | With trend | No trend | With trend | No trend | With trend | |
| LCNS | 0.9650 | 0.9985 | 0.0265** | 0.0577* | 0.0095** | 0.0095** | 0.0208* | 0.0653* | I(1) |
| LGDP | 0.9988 | 0.9989 | 0.0053*** | 0.0057** | 0.9098 | 0.9098 | 0.0052*** | 0.0053** | I(1) |
| LGFC F | 0.3468 | 0.2685 | 0.0018*** | 0.0089** | 0.4764 | 0.4764 | 0.0018*** | 0.0092** | I(1) |

The asterisks *, ** or *** denotes rejection of the hypothesis at the10%, 5% or 1% level respectively p values are shown

**Co-Integration Test Estimates**

Table 3 reports the results of co-integration tests, the null hypothesis is that there is no co-integrating vector and the alternative is that there is one co-integrating vector. The results reveal that both the trace tests and the maximum Eigen value test reject the null hypothesis of zero co-integrating vectors in favour of one co-integrating vector at the conventional 5 per cent significance level. The establishment of co-integration confirms the existence of a long-term equilibrium contemporaneous relationship between the series and that they have a common trend. This rules out the possibility of a spurious relationship between the variables and suggests that a causal relationship must exist in at least one direction. However, although co-integration suggests the presence of Granger causality between the variables, it does not provide information on the direction of causal relationships. Therefore, the direction of causality is identified using the VECM derived from the long run co-integrating vectors.

**Table 3 Johansen Co-integration Tests: LCNS, LGFCF& LGDP**

| Null Hypothesis | Alternative Hypothesis | Trace λ | 0.05 critical values | Prob.** | Max λ | 0.05 critical values | Prob.** |
|---|---|---|---|---|---|---|---|
| R=0 | r≥1 | 42.8833** | 29.7971 | 0.0009 | 29.6016** | 21.1316 | 0.0025 |
| R≤1 | r≥2 | 13.2817 | 15.4947 | 0.1049 | 12.1064 | 14.2646 | 0.1067 |
| R≤2 | r≥3 | 1.1753 | 3.8415 | 0.2783 | 1.1753 | 3.8415 | 0.2783 |

r indicates the number of co-integrating vector. (**) and (*) indicate statistical significance at 1% and 5% levels of significance. Trace test indicates 1 co-integrating eqn (s) at the 0.05 level

**Co-Integrating Vectors Estimates**

The long run coefficient elasticities of the co-integration vectors are examined by the long run structural modelling of Pesaran and Shin (2002). Thus, the study imposes normalisation restriction only given that there is just one co-integrating vector from the Johansen co-integration test. Normalisation restriction is imposed on the LGFCF with respect to β22, since the main focus of this study is on the long-run causality between LCNS, LGFCF and LGDP. Table 4 presents the estimated coefficients associated with the identified co-integrating vector. The co-integrating vector shows that the co-integrating coefficient of LCNS is statistically significant at 1% level while the coefficient of the LGDP though significant carries a negative sign. An examination of the results of the loading factors indicate that the null hypothesis that the loading factor α21=0 is rejected at the 5 percent level of significance. It also carries the appropriate sign (i.e. negative). The adjustment speed is 43% which is quite good. This statistically indicates that DFC formation is significantly and positively caused by construction sector output and negatively by the GDP. In the overall, the results provide evidences of positive long-run causal effects from LCNS to the GFCF.

**Table 4: Long-Run Coefficient of the Co-Integrating Vector**

| s/no | Normalising on LGFCF | Loading factor (α) |
|---|---|---|
| 1 | LGFCF= 38.70909 +5.253459LCNS(-1) -6.806465LGDP(-1) | -0.432060 |
| | [8.62319] [-10.4504] | [-1.43344] |

(*) (**) and (***) show the rejection of null hypothesis at 10% 5% and 1% respectively and all figures in parentheses are t-statistics.

**Causality and Exogeneity Test Estimation**

The short-run causality estimates are presented in table 5. The result indicates significant short-run causality between LCNS and LGDP. The LCNS significantly causes LGDP χ (7.389716) p value (0.0249) while LGDP does not cause the LCNS significantly. Thus, a unidirectional cause and effect relationship exists between the LCNS and LGDP. There is no short-run Granger causality between LCNS and LGFCF or between LGDP and LGFCF.

**Table 5 Result of Causality and Exogeneity Tests**

| a. Granger Causality test | | | |
|---|---|---|---|
| Variables | Null Hypothesis | Chi-sq | Prob. |
| ΔLGDP → ΔLCNS | B13=0 | 0.626450 | 0.7311 |
| ΔLCNS →ΔLGDP | B31=0 | 7.389716 | 0.0249** |
| ΔLGFCF→ΔLCNS | B12=0 | 2.682067 | 0.2616 |
| ΔLCNS→ ΔLGFCF | B21=0 | 1.384921 | 0.5003 |
| ΔLGFCF→ ΔLGDP | B32=0 | 0.746227 | 0.6886 |

| | | | |
|---|---|---|---|
| ΔLGDP→ ΔLGFCF | B23=0 | 1.135604 | 0.5668 |
| b. Weak exogeneity test | | | |
| LCNS | Ho: α11=0 | 7.585692 | 0.005883*** |
| LGFCF | Ho: α21=0 | 2.340604 | 0.126041 |
| LGDP | Ho: α31=0 | 0.000376 | 0.984527 |
| c. Strong exogeneity test | | | |
| LCNS → LGFCF | B21=α21=0 | 24.63711 | 0.000004 |
| LGDP →LGFCF | B23=a21=0 | 24.65913 | 0.000004 |
| LGFCF → LCNS | B12=α11=0 | 29.50153 | 0.000000 |
| LGDP→ LCNS | B13=a11=0 | 22.29742 | 0.000014 |
| LCNS →LGDP | B31=a31=0 | 32.02034 | 0.000000 |
| LGFCF →LGDP | B32=a31=0 | 25.92069 | 0.000002 |

(*) (**) and (***) show the rejection of null hypothesis at 10% 5% and 1% respectively and all figures in parentheses are t-statistics.

The long run weak exogeneity estimate provides statistical evidence that the LCNS is significant in the system χ (0.704711) p value (0.191673). However, both the LGDP and LGFCF are insignificant in the system with χ=0.000376, p value=0.984527 and χ=2.340604, p value=0.126041 respectively. Thus, there exists a unidirectional causality starting from LCNS to the GFCF and LCNS to the LGDP in the system. It is observed that there is no feedback effect from LGFCF and LGDP (see table 5). The long run

**FEVD Estimates**

Table 6 present the result of the FEVD estimates. The forecast horizon is 10 years and the contribution of each variable own shocks and to the shocks of other variables in the system are explained. For the LCNS, the result indicates that between 92 and 100 percent of its FEVD is explained by its own shocks. The result also indicates that LCNS explains between 22 and 63 percent of the error variance in the LGDP through the 10 year time horizon, which suggest that the impact of LCNS on the LGDP is significant. Similarly the LCNS also explains between 58 and 76 percent of the variance in LGFCF. For the LGDP, the LGDP explains between 37 and 54 percent of its own variance with the strength of the explanation increasing along the time. The LGDP explains a relatively less significant proportion of error variance of between 1.5 and 3 percent in the LCNS, suggesting that the LGDP has lesser significant impact on the LCNS in long strong exogeneity tests estimates indicate that the all conceivable null hypotheses are rejected at 1% level of significance. This means that the CNS, GFCF and GDP are not strongly exogenous of each other. In this VECM, though series may be weakly exogenous, no two series are strongly exogenous (see table 5).

run. LGDP explains between 0 and 25 percent of the variance in LGFCF. Finally for the LGFCF, the LGFCF is responsible for between 13 and 41 percent of its own variances. However, the LGFCF is only able to account for an insignificant variance of LGDP of between 0 and 24 percent worse still it explains only between 0 and 5 percent of the error variance in the LCNS. The result also indicates that the contribution of each variable to its own shock in explaining the proportion of forecast error variance at the end of 10 years horizon are 96 percent for the LCNS , 54 percent for the LGDP, and 15 percent for the LGFCF . Furthermore, the result shows that at the end of year 10 the LCNS explains 22 percent and 60 percent of error variance in LGDP, and LGFCF respectively. These confirm LCNS as the most exogenous in the system contributing more to the error variance of LGDP and LGFCF while the LGFCF is the most endogenous in the system with the least explanation of variances in the system.

**Table 6 Forecast Error Variance Decomposition**

| **Variance Decomposition of LCNS:** | | | | |
|---|---|---|---|---|
| **Period** | **S.E.** | **LCNS** | **LGDP** | **LGFCF** |
| 1 | 0.082033 | 100.0000 | 0.000000 | 0.000000 |
| 2 | 0.137459 | 95.04058 | 1.736955 | 3.222467 |
| 3 | 0.179190 | 92.33178 | 2.688276 | 4.979946 |
| 4 | 0.205530 | 92.75977 | 2.494628 | 4.745603 |
| 5 | 0.223677 | 93.86261 | 2.106267 | 4.031121 |
| 6 | 0.239905 | 94.40427 | 1.979631 | 3.616099 |
| 7 | 0.256463 | 94.71871 | 1.935453 | 3.345837 |
| 8 | 0.273371 | 95.14971 | 1.817393 | 3.032902 |
| 9 | 0.290022 | 95.62637 | 1.658155 | 2.715477 |
| 10 | 0.305789 | 96.04052 | 1.512084 | 2.447399 |
| **Variance Decomposition of LGDP:** | | | | |
| 1 | 0.071204 | 62.89855 | 37.10145 | 0.000000 |
| 2 | 0.116597 | 57.03219 | 37.32939 | 5.638420 |
| 3 | 0.154053 | 43.49477 | 44.25529 | 12.24995 |
| 4 | 0.189201 | 35.71741 | 47.32424 | 16.95835 |
| 5 | 0.218827 | 30.88857 | 49.57500 | 19.53643 |
| 6 | 0.244124 | 27.82462 | 51.00657 | 21.16881 |
| 7 | 0.266419 | 25.70653 | 52.09721 | 22.19626 |
| 8 | 0.287090 | 24.19616 | 52.85112 | 22.95271 |
| 9 | 0.306759 | 23.03745 | 53.40948 | 23.55308 |
| 10 | 0.325625 | 22.11612 | 53.82235 | 24.06153 |
| **Variance Decomposition of LGFCF:** | | | | |
| 1 | 0.567891 | 58.43954 | 0.129527 | 41.43093 |
| 2 | 0.853738 | 79.55641 | 1.974763 | 18.46882 |
| 3 | 1.171484 | 75.52092 | 11.16986 | 13.30922 |
| 4 | 1.512097 | 68.33811 | 17.04435 | 14.61754 |
| 5 | 1.761863 | 63.52632 | 20.71672 | 15.75696 |
| 6 | 1.936622 | 61.36140 | 22.53945 | 16.09915 |
| 7 | 2.067117 | 60.55811 | 23.55973 | 15.88216 |
| 8 | 2.185354 | 60.35028 | 24.12262 | 15.52710 |
| 9 | 2.305101 | 60.21618 | 24.55324 | 15.23058 |
| 10 | 2.429001 | 59.96901 | 24.94935 | 15.08163 |
| Cholesky Ordering: LCNS LGDP LGFCF | | | | |

**Results of the IRFS**

Figure 2 shows that at the responses of LCNS, LGFCF and LGDP are largely due their own shocks , while the LCNS and LGDP remain positive, the LGFCF line crosses the horizon at period 2 from positive to negative. The response of LCNS to LGDP is negative but later positive, the response of LCNS to GFCF is positive up to period when it turns negative. The response of GFCF to LCNS indicates that it remains negative throughout, while LCNS response to LGDP indicates positive all the way. For the LGDP response to LCNS is negative throughout, the situation is replicated for the response of LGDP to LGFCF. These results of the IRFs are consistent with the earlier VECM, Granger Causality and FEVD results that the LCNS changes lead the LGFCF.

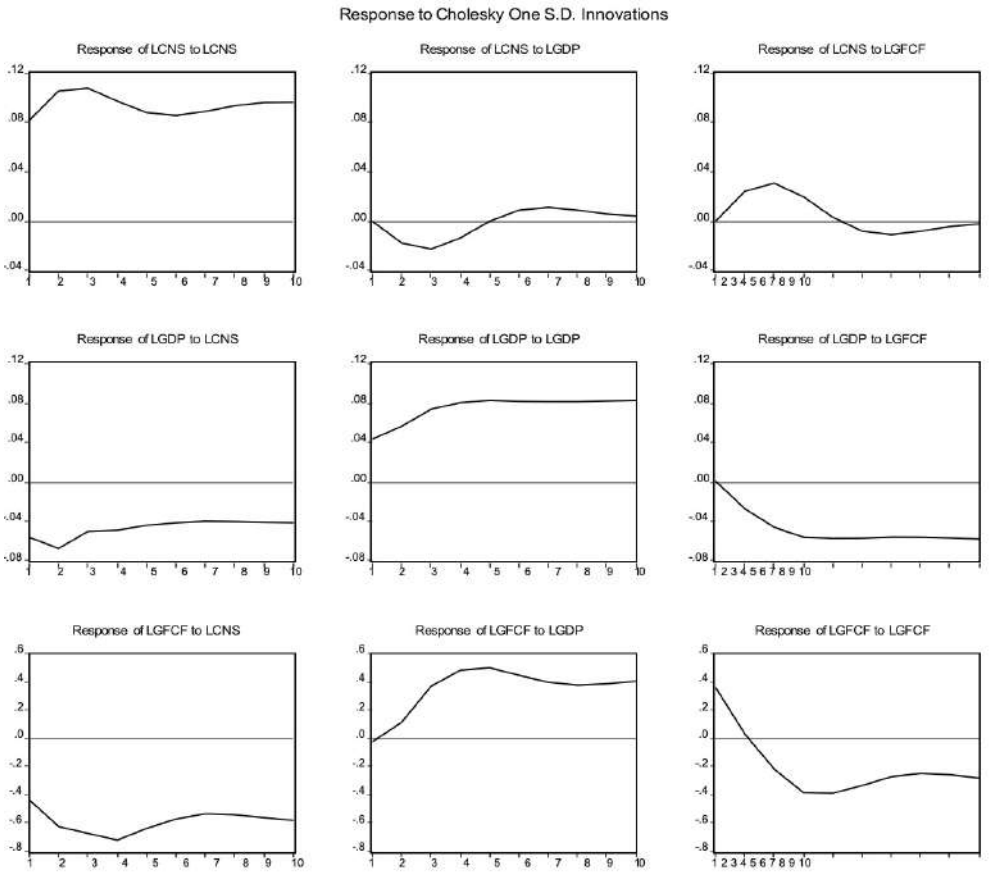


**Figure 2 Responses of the series to shocks at VEC level**

**DISCUSSION**

The study assessed the impact of construction sector on DFC formation and economic growth by using VECM framework. The model estimate indicates the following: (1) all TSD appear to be non-stationary in levels but stationary in the first differences for logarithmic form and The Johansen co-integration tests indicated significant contemporaneous co-integration between the series confirming the existence of causality among the series at least in one direction; (2) The GFCF appears to be CNS and LGDP elastic in the co-integrating vectors estimated. This elasticity suggests a high responsiveness of GFCF to construction sector output and national economic growth; (3) The result of short run Granger causality indicates the existence of a unidirectional short-run causality running from the LCNS to LGDP. (4) The result of the weak exogeneity test/long run causality indicates two unidirectional causality running from LCNS to the GFCF and from LCNS to the LGDP in the model there is no feedback effect from LGFCF and LGDP; (5) the result of the strong exogeneity test suggest no series is strongly exogenous, indicating all the series are important in the system. The results somewhat support the growth hypothesis, with CNS making significant impact on GFCF in agreement with Hillebrandt, (2000) on the one hand and the LCNS and LGFCF on the other, making significant impact on the national economic growth in agreement with Smith, (1776) Keynes, (1936) Harrod, (1939) Domar, (1946) Robinson, (1949) Solow, (1956) Romer, (1990) Estache, et al (2005) Kularatne, (2005) Perkins, et al (2005) and Boopen (2006). In spite of the findings, African, including Nigerian economy remains slow and underdeveloped due to slow rate of capital accumulation (Calderón

& Servén, 2008). To ensure fast growth and development, Nigeria must massively grow its DFC formation like China (Okonjo-Iweala, 2010).

**CONCLUSION AND FURTHER STUDIES**

The Nigerian Construction Sector is an important contributor to the DFC formation and GDP growth. This suggests that the construction sector is one of the vital sectors of the Nigerian economy. The cause and effect relationships between the series are unidirectional with the LCNS significantly having a long run causing effect on the GFCF and LGDP. The study recommends an aggressive public policy on the construction sector as a way of improving the DFC formation for sustained long run economic growth. In view of the deplorable state of public infrastructure in Nigeria, there is the need for an aggressive public policy on constructed infrastructure development. The complementarity theory should be adopted for infrastructure development with the government providing infrastructure that supports private investment. There is the need for a national construction and capital investment policy similar to the Chinese as well as the need for public DFC formation that is complementary to private investment. Kindly indicate areas for further studies.

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