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Critical Issues in Reforming the Nigerian Construction Industry

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Authors' contributions

This work was carried out in collaboration between all authors. Author ANA designed the study, performed the analysis, wrote the protocol, and wrote the first draft of the manuscript. Authors CIA and OMK managed the statistical analyses and literature searches of the study. All authors read and approved the final manuscript.

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ABSTRACT

It is the consensus of scholars that the productivity of the construction industry in Nigeria is very low compared with other industries. This situation has been attributed to the fragmented approach commonly adopted in the delivery of construction projects and does not effectively encourage the integration, coordination and communication between participants in the construction industry [1]. Many studies have enunciated this fact and suggested various ways to improve the performance, including the adoption of new construction delivery concepts from other more successful industries. This work therefore seeks to identify the critical elements that will be influential in diffusing these new delivery concepts into the Nigerian construction industry in order to improve their productivity. A detailed literature search and preliminary questionnaire survey were conducted and identified 63 variables that will influence the adoption of new construction delivery concepts in the Nigerian construction industry. The Kendall coefficient of concordance was applied to the responses from 25 experienced construction professionals who ranked the variables in their order of importance and

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also compute the degree of agreement among these respondents to improve the reliability of the results. A coefficient of concordance (W=0.56) was obtained indicating a good level of agreement. The 46 topmost variables out of 63 were selected and used to design a wieldy 5-step ordinal scale Likert type questionnaire, which was distributed to 459 professionals in the construction industry with a 57% response rate. Principal Component Analysis (PCA), based on a 260 x 46 data matrix, was conducted on the survey responses. PCA was chosen over other models due to the fact that it identifies patterns in data, and expresses the data in a way that highlights their similarities and differences. It also reduces the number of dimensions, without much loss of information. Further analysis using StatistiXL and SPSS software packages using PCA output as input. A correlation matrix of 46 dimensions was obtained from which communalities and Kaiser-Olkin-Mayer (KMO) of the variables was developed.

The construction life cycle variable had the highest communalities of 0.752 and a meritorious KMO value of 0.840 for the entire variables, thus justifying the adequacy of the sample. The eigen-values obtained for the variables ranged between + or- 0.001 and + or – 0.499, indicating that the variables had more characteristics of relating with others and were clearly correlated. The Varimax rotation grouped the 46 variables into 10 clusters based on their similarities. Cluster 7 which was creatively labeled Regulatory Environment housed the highest number of variables with above average factor loading between 0.09 to 0.0.657. The severity index (SI) analysis of the data matrix presented Delayed Remuneration, a variable under Regulatory Environment, as the most influential variable with SI of 4.396. The work identified that the focus of any ameliorative measures should be on Regulatory environment, which should aim at building credible Institutions and Infrastructure. A policy framework for diffusing innovations and new construction delivery systems will be a good extension to this work.

Keywords: Coefficient of concordance; correlation matrix; communalities; new construction delivery concept; eigen-values; variable clusters; regulatory environment.

1. INTRODUCTION

Most National development plans usually emphasize those sectors of an economy that constitute special problems or offer special opportunities. The construction industry is usually not considered, at least explicitly, as either constituting a special problems or offering a special opportunity within the development process of the economy. Yet with all fixed investments requiring some construction, this industry has ramifications within the entire system which markedly influence and directly affects the successful implementation of every project in all the economic sectors [2]. Global construction market is worth an estimated $7.5 trillion with an expenditure of $4.6 trillion in 2011. By 2020, the global construction market will be worth an estimated $12.7 trillion;– 70% growth and will grow by more than 70% to $15 trillion worldwide by 2025 [3]. With this size of expenditure profile, the construction industry has in the recent past acquired special prominence as an economic as well as strategic asset for most nations.

With more than half of the global population living in cities which all together make up less than 2% of the planet's landmass, the pressure now being placed on urban infrastructure is unprecedented. In the markets of the global north, rapidly aging infrastructure poses very significant challenges. Whether the solution will be to rehabilitate existing assets or develop new infrastructure, cities and states are now facing significant investment challenges. In the developing world, the urban population is expected to jump by more than 1.3 billion over the next two decades, with each new entrant seeking better employment opportunities and a higher quality of living that can only be delivered through efficient and effective urban infrastructure. The infrastructure gap in these regions provides great investment opportunities in public services such as roads, transport, power, water, health, Information and communications technology (ICT), and ports, which will have to be built up and offer huge potentials for the construction industry [4].

This research was motivated by a number of factors including the fact that developing Countries more than any other are in need of new approaches to project delivery to enhance the capacity of their industries to deliver their national goals. The research will aid significantly to:

- Improve the performance of the local construction industry and her ability to deliver the National Construction objectives through the adoption of new construction delivery systems.
- Improve the performance level of local contractors so they can more effectively compete in the $4.6 trillion global construction market.
- Take advantage of the trickle down effects of construction by gaining the value-added in construction, as well as the value-added by local industries supplying construction inputs
- More effectively harness the strategic importance of the construction industry and position the Nigerian construction industry as an export commodity.

The construction industry generally has been faced with continuously increasing and sophisticated clientele and demands, which calls for the most efficient use of the available resources. The industry has in turn evolved through many stages and delivery systems in order to cope. Many of the services and parts of the structure of the modern facilities are now so technically specialized that they have to be designed, produced and managed by many specialists. Hence a feature of the construction industry is the fragmentation of the production process into discrete sub-processes, in its structures and procedures, in its proliferation of actors and activities, in the diversity of the resources employed, their sources and their mobilization amongst many participants who belong to different organizations with different policies, objectives and practices [5]. This increases the channels of communication necessary in the production processes and the larger volume of work required for some of the mega-sized and public-oriented projects today increases the time required for delivery, whereas time has become more of a premium. The atmosphere created under this circumstance is one of bureaucracy, rivalry, distrust, suspicion, misunderstanding, buck passing, and the like as the experts seek to grapple with the numerous imponderables associated with construction.

This fragmented nature of the construction process and the industry, evident in the large number of firms operating within it, and the distinct separation of the professions, poor communication, a lack of concurrency, institutional barriers, ad-hoc problem solving approach, lack of trust and collaborative spirit within the client/design/construction team amongst other factors have led to consistently low levels of performance. This has affected the effectiveness inasmuch as current procurement practices do not effectively encourage the integration, coordination and communication between participants.

In addition, there is an ephemeral shifting coalition of participants from which divergent goals and objectives often emanate. This inhibits the scope for creativity and innovation as functional disciplines often operate independently, making design decisions without considering their impact on the other disciplines [6]. Consequently, this has led to the creation of walls between disciplines over which the project is figuratively thrown once one functional discipline has completed its respective tasks As tasks move downstream, and information is gathered, each discipline may notice that information provided by the preceding task is inappropriate. In otablerder to ascertain the information required, members must move upstream against the natural flow process to be able to complete their task. This is exercabated by the so-called procurement gap", that is, the separation of the design and construction processes (Fig. 1). Consequently, this has led to the creation of walls between disciplines over which the project is figuratively thrown once one functional discipline has completed its respective tasks. This wall has affected each discipline's ability to effectively communicate and has contributed to major behavioural and organizational differences between project individuals and groups and perhaps, the communication process.

1.1 New Construction Delivery Concepts

Attempts have been made to integrate the fragmented sub-processes of construction production expertise into the design process through the use of various procurement strategies such as design and build, project management etc. These strategies have been used to stimulate team formation, team working and team retention in an attempt to secure consequent benefits which to date have been elusive [7]. The use of fast-tracking methods such as management contracting and construction management as an alternative to the traditional sequential approach was considered by many practitioners and researchers as the panacea for delivering clients projects on time and within budget. However, the

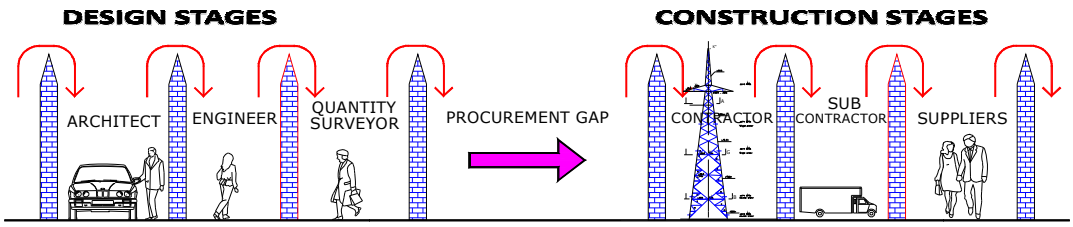

Fig. 1. Communication walls between disciplines

common failures associated with this approach are attributable to the lack of team work between the contractor and the designer, which invariably results in sub-optimal design solutions [8]. As a result, improvements in quality, productivity and innovation can be hindered. Thus there is an increasing need for a procurement strategy that can effectively coordinate and integrate individuals and groups so that inter-organizational communication and team building can thrive and become the norm.

To reduce the difficulties encountered with procuring projects, industry practitioners and researchers have turned to the manufacturing industry as a point of reference and a potential source of innovation. Accordingly, new concepts have become the focal point for research. These new concepts all advocate the use of a multi-disciplinary project team whereby participants are brought together during the design stage to determine how downstream issues may be affected by design decisions. The portability of some of these concepts makes them possible to be relatively adaptable to other industries.

The construction industries in developing countries lack the capacity to implement their national construction objectives. The poor performance of the indigenous contractors in Nigeria has been the subject of many studies [9,10,11,12,13]. Thus although construction accounts for a substantial percentage of the Gross National Product (GNP) in Nigeria and constitute almost half of the total public spending, the indigenous construction industry is slow to benefit from this trend [14,15]. Clearly, developing countries like Nigeria are in a greater need for New construction delivery systems that will enhance the productivity of their construction industry. However, most of the on-going research efforts assume that the basic infrastructure for information technology and the construction supply chain are adequate to support the new and more sophisticated construction delivery initiatives. This premise does not hold true for the developing countries, thus the application of these new concepts in these areas will require much more work than are currently accommodated in on-going research efforts.

2. METHODOLOGY

Through detailed literature search and preliminary survey, this work identified sixty-three (63) variables that will be influential in the adoption of new construction delivery concept into the Nigerian construction industry. The veracity and appropriateness of the identified variables were confirmed with the use of Kendall coefficient of concordance, which assessed the level of agreement on this amongst 25 judges, who are professional stakeholders in the Nigerian Construction Industry. Where the object *i* is given the rank $r_{i,j}$ by judge number *j*, and there are total *n* objects and *m* judges, then the total rank given to object *i* is given as;

$$R_i = \sum_{j=1}^{m} r_{i,j}, \tag{1}$$

and the mean value of these total ranks is given as;

$$\bar{R}=\frac{\sum_i^n R_i}{n} \tag{2}$$

The sum of squared deviations *S*, is defined as

$$S = \sum_{i=1}^{n} (R_i - \bar{R})^2, \tag{3}$$

and then Kendalll's *W* is defined as

$$W = \frac{12S}{m^2(n^3 - n)}. \tag{4}$$

The judges were also required to rank the variables by their order of importance from 1 - 63. The severity of each variable as agreed by the judges were determined using the frequency

of occurrence for each of the variables. This was used for the Pearson moment product correlation and the severity index is computed using the expression in equation (5).

$$\text{Severity index} = \frac{\sum a_i x_i}{5} x100 \quad (5)$$

Where a_i = constant expressing the weight given to each response, ranging from 5 to 1.

The variables were ranked and the topmost 46 variables were used to develop a 5-point ordinal scale Likert type questionnaire, which was distributed to 459 respondents, who are stakeholders in the Construction Industry (Table 1).

In all 260 responded to the enquiry representing an average response rate of 57% (Table 2). The population for this survey were selected from Delta, Edo, Lagos, Rivers States and Abuja. They all fall within the Southern States of Nigeria.

The Principal Component Analysis (PCA) model, used for taking high-dimensional data and using the dependencies between the variables to represent it in a more tractable, lower-dimensional form, without losing information, was used to analyze the 260 responses. The PCA analysis allowed us to perform the severity indices analysis which enabled us to determine the level of influence exerted by each of the variables on the adoption of concurrent engineering in the Nigerian construction industry. This was implemented on the computer software StatistiX. The results were used to obtain;

i. Confirmation of the adequacy of the sample size by using the Kaiser-Meyer-Olkin;
ii. Factor loadings after maximum variable (Varimax) rotation with which we are able to extract the relevant factors, ie, scree plot, eigen-values, factor loading, etc.
iii. Reduce the variables to a few manageable factors (Clusters) without losing valuable data;
iv. Severity indices of the variables with which we can rank their levels of influence.

A data matrix 46 x260 was developed using the inputs from the returned questionnaires in the form below and fed into the Principal component analytical software, thus (equation 6).

$$M = \begin{matrix} a_{11} & a_{12} & a_{13} & . . & a_{1n} \\ a_{12} & a_{22} & a_{23} & & a_{2n} \\ a_{31} & a_{32} & a_{33} & & a_{3n} \\ \vdots & \vdots & & & \\ \vdots & \vdots & \vdots & & \\ a_{m1} & am_2 & a_{m3} & . . & a_{mn} \end{matrix} \quad (6)$$

The data matrix was then decomposed into scores (for the subjects) or components and loadings for the variables (the loadings are, in general, correlations between the original variables and the components extracted by the analysis). Principal component analysis (PCA) is a statistical procedure that uses orthogonal transformation to convert a set of observations of possibly correlated variables into a set of values of linearly uncorrelated variables called principal components. The number of principal components is less than or equal to the number of original variables. This transformation is defined in such a way that the first principal component has the largest possible variance, and each succeeding component in turn has the highest variance possible under the constraint that it be orthogonal to (i.e., uncorrelated with) the preceding components. Principal components are guaranteed to be independent, if the data set is jointly normally distributed. The first loading vector $\mathbf{w}_{(1)}$ thus has to satisfy;

$$\mathbf{w}_{(1)} = \arg\max_{\|\mathbf{w}\|=1} \{\sum_i (t_1)^2_{(i)}\} = \arg\max_{\|\mathbf{w}\|=1} \sum_i \left(\mathbf{x}_{(i)} \cdot \mathbf{w}\right)^2 \quad (7)$$

Equivalently, writing this in matrix form gives

$$\mathbf{w}_{(1)} = \arg\max_{\|\mathbf{w}\|=1} \{\|\mathbf{X}\mathbf{w}\|^2\} = \arg\max_{\|\mathbf{w}\|=1} \{\mathbf{w}^T \mathbf{X}^T \mathbf{X}\mathbf{w}\} \quad (8)$$

Since $\mathbf{w}_{(1)}$ has been defined to be a unit vector, it equivalently also satisfies

$$\mathbf{w}_{(1)} = \arg\max_{\|\mathbf{w}\|=1} \left\{ \frac{\mathbf{w}^T \mathbf{X}^T \mathbf{X} \mathbf{w}}{\mathbf{w}^T \mathbf{w}} \right\} \quad (9)$$

A standard result for a symmetric matrix such as $\mathbf{X}^T\mathbf{X}$ is that the quotient's maximum possible value is the largest eigen-value of the matrix, which occurs when $\boldsymbol{w}$ is the corresponding eigenvector. With $\mathbf{w}_{(1)}$ found, the first component of a data vector $\mathbf{x}_{(i)}$ can then be given as a score $t_{1(i)} = \mathbf{x}_{(i)} \cdot \mathbf{w}_{(1)}$ in the transformed co-ordinates, or as the corresponding vector in the original variables, $\{\mathbf{x}_{(i)} \cdot \mathbf{w}_{(1)}\} \mathbf{w}_{(1)}$ [16].

3. PRESENTATION AND ANALYSIS OF RESULTS

The analytical procedure employed was aimed at reducing the variables to a few manageable factors without losing valuable data, which will be more portable for policy formulation.

The Kendall coefficient of concordance was computed to ascertain the degree of agreement on the identified variables, amongst the stakeholders and a value of (W=0.56) obtained indicated a good level of agreement. The forty six (46) topmost variables out of the sixty three (63) were selected and used to design a 5-step ordinal scale Likert type questionnaire, which was distributed to 459 professionals in the construction industry (Table 2). 260 respondents returned their questionnaire indicating a response rate of 57% which is adequate for such a study. The responses were used as research scale items for the Principal Components Analysis (PCA) which was based on a 260 x 46 data matrix, that served as input data for the, StatistiXL and SPSS software packages employed. A correlation matrix of 46 dimensions was obtained from which communalities, Kaiser-Olkin-Mayer (KMO) of the variables were developed.

The *Construction Life Cycle* (Variable no 22) had the highest communalities of 0.752, and a KMO value of 0.840 for the entire variables justified the adequacy of the sample. The eigen-values obtained for the variables ranged between ±0.001 and ±0.499 which indicated that the variables had more characteristics of relating with others and were clearly correlated. The Varimax rotation grouped the 46 variables into 10 clusters based on their similarities (Table 3). Cluster 7 creatively labeled *Regulatory Environment* houses the highest number of variables with above average factor loading between 0.509 - 0.657. The severity index (S.I) analysis of the data matrix presented *Delayed Remuneration,* a variable under *Regulatory Environment*, as the most severe with S.I. = 4.396 on the 5-point Likert scale.

Table 1. Number of questionnaires distributed and collected from various stakeholders

Profession	Number distributed	Number returned	% Response	% Of total number of respondent
Clients	59	22	37	08
Consultants	122	67	55	26
Contractors	150	114	76	44
Suppliers	34	14	41	05
Manufacturers	29	15	52	06
Developers	65	28	43	11
Total	459	260	57	100%

Table 2. Number of questionnaires distributed and collected at various locations

Location	Number distributed	Number of respondents	% Of number distributed	% Of total number of respondent
Edo	66	49	74	**19**
Abuja	30	12	40	**5**
Lagos	31	11	35	**4**
Enugu	46	20	43	**33**
Ondo	45	26	58	**10**
Delta	121	88	73	**34**
Rivers	120	55	46	**21**
Total	459	260	57%	100%

4. DISCUSSION

The principal component analysis of the variables threw up 10 factors based on an eigen value of >1 and whose factor loading was more than 0.500. The factors or clusters which were creatively labeled, were rigorously discussed in other to expose all facets of the problems they pose and to understand the challenges they present with a view to proffering solutions. The cluster which has been labeled Regulatory environment, composed of 6-variables is considered a principal factor, because it houses the highest number of variables of all factors under its cluster. All the variables loaded under this factor wield positive signs of factor loadings which implies that the factors are very sturdy. The variables recorded an above average factor loading of between 0.509 – 0.657, which implies a more than significant level of input. The severity indices which assessed the level of criticality of influence each of the variables exert on the subject matter as perceived by the respondents were also very high. With the severity index of all the variables in this cluster higher than 4.008, it implies that these variables are considered very serious, very difficult to manage and their effects are felt most of the time. Only the different variables that make up this factor are discussed due to lack of space. This factor can be used as policy formulation instrument that will be fundamental in any initiatives at improving the Nigerian construction industry through new construction delivery systems and include;

- Unfavourable Contract Conditions;
- Concurrent Construction Operations;
- Corruption;
- Government Regulation;
- Due Diligence and
- Delayed Remuneration.

Unfavourable contract conditions trumps as the most offensive variable with a factor loading of 0.657 and a severity index of 4.046, which is indicative of very significant level of influence. In the global North where contractual systems and frameworks are private sector initiatives, whereas in the developing context, the government is both the regulator and the largest client to the Construction Industry with the attendant implications.

Construction work all over the world is often of a complex nature involving many parties and carried out over a long period of time. Thus, the details of the works and responsibilities, rights and obligations of all the parties, including the mode and channels of communication between them are defined by statutes as contained in the various standard forms of contracts used in the construction industry in order to avoid confusion and disagreement. It is to meet these requirements that various contractual systems have evolved.

Nigeria has no nationally recognized standard form of contract, thus a variety of forms are in use in the Nigerian construction industry, all of which are foreign. They include the Joint Contract Tribunal (JCT) standard forms of contract, 1963 and 1980 editions published for the British construction industry [17,18]. Also in use are the Institute of Civil engineers (ICE) conditions of contract for civil engineering works [19] and the general conditions of government contract (GC/Works) 1st and 2nd editions for building and civil engineering works also published for the British construction industry [20]. The Federation International Des Ingenuers Conseils (FIDIC) form of contract, 1977, 1987 and 1988 editions for works of civil engineering construction, prepared for most of Europe and U.S.A [21] are also in use.

All of these forms of contract are foreign and are not addressed to the business environment of the Nigerian construction industry. They are consequently not very adequate for dealing with conditions in the Nigerian construction industry. Even in Britain from where most of the forms of contract were adopted and to whose construction industry their provisions are addressed, there was the feeling that the systems may not necessarily be the most suitable for the present day requirements of the British construction industry resulting in the development of many hybrid forms today [21]. The effectiveness of any system can only be suitably assessed by the productive efficiency of that system. The contractual systems and procedures operational in the Nigerian construction industry are not conducive for the growth of the industry. The ease with which provisions of the systems and procedures are flouted suggest that they do not contain any safeguards/sanctions to ensure compliance or that whatever safeguards they contain cannot ensure compliance in the Nigerian business environment.

Table 3. Summary of results with the clusters and their creative labels

Creative label	Factor code	Category	Variable	Factor loading	Variable rank	Severity index
Infrastructure	D1	Infrastructural environment	Unfavourable lending terms	0.667	30	4.12
		Infrastructural environment	Materials testing facilities	0.643	28	4.138
		Infrastructural environment	Power supply	0.582	7	4.377
Operational conditions	D2	Security environment	Site security	0.765	46	2.862
		Security environment	Construction process fragmentation	0.739	45	2.988
		Country readiness	Educational system	0.547	41	3.542
Institutional support	D3	Regulatory environment	Contract documentation	0.704	37	3.769
		Infrastructural environment	Equipment leasing/buying options	0.671	43	3.396
Market environment	D4	Infrastructural environment	Inadequate transportation	0.658	19	4.219
		Market environment	Unforcastable workload	0.634	23	4.165
		Corporate culture	Political influence	0.521	26	4.146
Capacity	D5	Security environment	Effective policing	0.671	33	3.919
		Corporate readiness	Concurrent engineering awareness	0.653	2	4.481
		Infrastructural environment	Materials supplies logistics	0.638	12	4.265
Readiness	D6	National readiness	Ineffective communication	0.635	21	4.212
		National readiness	availability of professionals	0.584	6	4.385
Regulatory environment	D7	Regulatory environment	Unfavourable contract conditions	0.657	31	4.046
		Market environment	concurrent construct. Operations	0.564	9	4.277
		Regulatory environment	Corruption	0.556	10	4.277
		Regulatory environment	Government regulation	0.534	32	4.008
		Regulatory environment	Due diligence.	0.527	17	4.234
		Regulatory environment	Delayed remuneration	0.509	4	4.396
Supply chain	D8	Market environment	Construction material scarcity	0.578	29	4.135
		Individual culture	Inter-personal relationship	-0.628	8	4.327
Market environment	D9	Market environment	Financial market sophistication	0.650	40	3.550
		Market environment	Lack of standardization	0.573	11	4.265
Culture	D10	Individual culture	Religious influence	0.649	42	3.515
		Individual culture	Family influence	0.516	44	3.158

The single most important means of promoting the development of the domestic construction industry is through the adoption of efficient and equitable contracting systems and procedures. The contractor should have full responsibility for the labour, materials, workmanship, programming, management and all logistic of construction operation. He should be paid promptly on portions of work done and measured according to specifications and terms of contract and should have access to mechanisms which allow for prompt and fair settlement of disputes. In short the contractor should be a full partners in the contract, with clearly defined obligations, responsibilities and rights. Unless this basic requirement is met, efforts to develop domestic industry will not be effective [12]. The present contractual systems and procedures in use in Nigeria places an impossible burden on the local contractor, which often results in complication and adversely affects the contractor's ability to perform. Whereas the provisions may not be faulty on their own, when applied to conditions different from those for which they were designed, they are likely to become inadequate.

Concurrent Construction Operations has the second highest factor loading in this cluster with a factor loading of 0.564 and a severity index of 4.277, which indicate very significant levels of influence. The PCA throws up the factor loading as a middling, suggesting a certain level of acceptability and acquiescence, whereas the severity index identifies the variable as a serious issue. The PCA model firmly confirms the lack of this practice and emphasizes the role of concurrent operations even though the traditional system still dominates. This is inherent in most new concept which negates the sequential, traditional system of construction delivery.

Corruption as a variable has a factor loading of 0.556 and a severity index of 4.277, which indicate a very high level of influence. Speaking at a workshop on Project Anti-Corruption Systems held in Dar es Salaam in May 2007, Catherine Stansbury from the Transparency International of UK, said that “the construction sector was generally perceived as the most corrupt industry in the world”. Corruption has an edge to penetrate into the construction industry system as it can occur at any phase of a project, such as project identification, financing, designing, tendering and execution. This trend of corruption could involve project owners, funding agencies, consultants, contractors, sub-contractors, joint-venture partners and agents.

Corruption has been identified as a bane of the urgently–needed Nigerian National development. It remains the greatest threat to the attainment of the Millennium Development Goals (MDG) and even to the continued existence of the state [22]. The 1996 study of corruption by Transparency International and Goettrigen University, ranked Nigeria as the most corrupt nation among 54 nations listed for the study, with Pakistan as the second [22]. Another study was carried out in 1978 by Transparency International Corruption Perception Index (C.P.I) ranked Nigeria 81 out of 85 nations [23]. In 2001 Corruption Perception Index (C.P.I.) Nigeria ranked 90 out of 91 nations, pooled, with second position as most corrupt nation with Bangladesh coming first. Similarly the 2007 Transparency International Corruption Perception Index rated Nigeria 147 out of 179 countries under review [21].

Studies indicate that Corruption in the Nigerian construction industry is caused by poverty, greed, god-fatherism in contract award, unethical behaviour of professionals, profit maximization by contractors, quackery and fall-out of endemic societal corruption [24]. The inability to police the conduct of construction stakeholders in the light of the principal ethical guidelines and codes breeds a fertile ground for corruption. Since the government is the largest client to the construction industry, her actions or inactions directly affects the perpetration of corruption. Also it is within the purview of government as the primary regulator in the construction industry to establish and maintain the relevant institutions to manage corruption.

Government Regulation. The burdensomeneess of businesses to comply with governmental administrative requirements are the issues addressed in this variable. The factor loading is 0.534 with a severity index of 4.008, indicate a fairly high level of significance. It assesses the extent to which the national legal framework facilitates innovation and new technologies uptake, taking into account the general features of the regulatory environment (including the protection afforded to property rights, the independence of the judiciary, and the efficiency of the law-making process) as well as more construction industry-specific dimensions (the development of construction industry development agencies).

The problems arising from this variable does not arise from a lack of adequate legal provisions, but rather from a lack of the ability to enforce

their compliance. It would seem that most laws in Nigeria, including construction laws, which were mostly received from the colonial government, do not command the minimum support required to make them meaningful and place people under obligation to accept them. This is as against the existing situation where people are made to obey. While the latter stance could be forced on the society by a dictatorial leadership, the former is voluntary, an acceptance based on the people's conviction only of the justness of the cause [25].

4.1 Due Diligence

The inability to conduct proper due diligence especially on clients has been identified as having a very high significance in the new construction delivery concepts being considered for the Nigerian Construction Industry. The variable has a factor loading of 0.527 and a severity index of 4.234. This implies that the variable exerts very serious influence. It is very difficult to manage and its effects are felt most of the time. The contractual arrangement is based on the underlying premise that a client has enough financial considerations or arrangement to undertake the project and that a contractor has the necessary expertise to execute the project. This premise does not hold true in Nigeria.

Due diligence is the process of evaluating a prospective business opportunity by getting information about the financial, legal, and other material (important) state of the other party. Generally, due diligence refers to the care a reasonable person should take before entering into an agreement or a transaction with another party. As such, it involves investigation into all relevant aspects of the past, present, and predictable future of the business of a target company. Usually in construction the contracting parties are the Client, the consultants, contractors and subcontractors. In order to select the appropriate professionals for the various operations, the tendering process is structured to use due diligence and other known techniques of decision making to prequalify and select the parties prior to signing a contract.

The objective of an owner or client in initiating a construction project is to acquire a sound, finished work at a minimum price and time. Most clients do not have the skill or the desire to undertake this task on their own, thus they delegate the responsibility of execution to an expert with the appropriate competence for a certain consideration. Thus a contract is entered into between the client and the contractor, because the client wishes to transfer the responsibility for the construction of the said project to the contractor. Along with this transfer is also the transfer of certain financial incentives and risks arising there-from. All tendering procedures and contractual arrangements are normally aimed at selecting the most suitable contractor for the project and securing from him a most suitable offer and acceptance and using that as a basis for an agreement for the execution of the project. Hence the processes of tendering, negotiations and other such arrangement are mere tools for selecting the contractor and defining the terms of the transfer of responsibilities. In a business environment where fraud and corruption are rampant, it is prudent to investigate all information relating to the transaction, including the credibility of the client.

4.2 Delayed Remuneration

There is a general consensus that the delays by clients to make payments as and at when due is a very serious problem in the Nigerian construction industry with a factor loading of .509 and a severity index of 4.396 which the variable in question wields. Furthermore this variable is related to the ease with which terms of the conditions of contract entered into by the client and the contractor are flouted and payments due to the contractors for services rendered as stipulated in the terms of agreement with the employers are with-held.

The government of Nigeria accounts for 60% of all building engineering works and 95% of all civil engineering works in the construction industry and consequently the biggest and most important client of the construction industry [12]. It is also observed that payments on government contracts are at best abnormally slow and certificates are not honoured as stipulated in the contract. The government also as a matter of deliberate policy does not pay advances for mobilization and purchase of equipment except in very special cases. Thus contractors often borrow to finance on-going projects and to mobilize on new ones. The high interest payable on such borrowed money is not catered for in the conditions of contract. Although the contractual arrangement provides for some measure of remedies in cases of wrongful delays in payment of due certificates and in cases of price escalation which result from no cause of the

contractor. It is not always expedient for the contractor to invoke such remedies since he is dependent on the goodwill of the client for his subsequent jobs. The contractor is therefore helpless in this situation because of the business environment of the Nigerian construction industry, which does not provide for any system of equitable adjudication in such matters. Delaying payments is one act of the employer that drives the contractors to desperation, ruins their profitability, cripples their professional integrity and inhibits their zeal for doing a good job on time. Yet most employers in Nigeria especially the government delays payment with impunity. This is a structural problem that pervades the whole Nigeria society [25].

5. CONCLUSION

This paper identified and reviewed the most important elements that are critical in an attempt to reform the Nigerian Construction Industry through the adoption and adaptation of new construction delivery systems. The factor creatively labeled Regulatory environment appeared as the most influential factor with a set of six (6) variables. Severity indices which assessed the level of criticality of influence each of the variables exert on the subject matter as perceived by the respondents were very high. With the severity index of all the variables higher than 4.008, it implies that these variables are considered very serious, very difficult to manage and their effects are felt most of the time. Only the different variables that make up the critical factors are discussed due to lack of space. These factor which houses the different variables can be used as policy formulation instrument that will be fundamental in any initiatives at reforming the Nigerian construction industry. Thus, the focus of any ameliorative measures should be on this factor and its component variables. The factors identified can mostly be resolved through the development of strong institutions and a much improved infrastructural environment. The analysis exposes the tangible and intangible systems that make up the construction business environment, both of which will need to be addressed. While Infrastructure addresses most of the tangible requirements, Institutional support addresses the intangible aspect through policies were highlighted.

Also, there is need to create a more business friendly environment, especially through the building of appropriate Institutions. As the American President, Barack Obama said to the Ghanaian parliament during his maiden African visit to Ghana, on July 11, 2009, that "Africa does not need strongmen, it needs strong institutions,"

A similar attention given to the Power and the Telecommunications sector of the economy by the Federal Government of Nigeria is also needed to be given to the transportation infrastructure. However there is a need to bring such focus on the transportation infrastructure by reworking and extending the Public Private Partnership initiative for greater effectiveness and perhaps establish a specialized company that would identify, develop and manage transportation infrastructure projects to enhance planning and financing of such projects in the Country.

COMPETING INTERESTS

Authors declare that there are no competing interests.

REFERENCES

1. Latham, Sir M. Constructing the Team. Her Majesty's Stationery Service (HMSO), London; 1994.
2. Global Construction Perspectives and Oxford Economics: A global forecast for the Construction Industry over the next decade to 2025. Global Economic Outlook 2025. Global Construction Perspectives. Broadwall House, 21 Broadwall, LONDON SE1 9PL; 2013.
3. O'Brien, David. Infrastructure 100: World cities edition. KPMG International Cooperative ("KPMG International"); 2012.
4. Aniekwu AN, Nwachukwu JC. Understanding the Nigerian Construction Industry, Mindex Publishing Co. Ltd; 2002.
5. Love PED, Gunasekaran A. Concurrent Engineering in the Construction Industry, Concurrent Engineering: Research and Applications. 1997;5(2):155–162.
6. Fellows R, Langford D, Newcombe R, Urry S. Construction Management in Practice, Construction Press: London; 1983.
7. Huovila P, Koskela L, Lautanala M. 'Fast or Concurrent: The Art of Getting Construction Improved', in Alarcon, L. (ed.), Lean Construction, A. A. Balkema, Rotterdam. 1997;143–159.
8. Wahab KA. Improving efficiency in the building sector. West African Technical Review. 1977;81-89.

9. Edmunds G, Miles D. Foundations for change: Aspects of the Construction Industry in Developing Countries, IT Publications, London; 1984.
10. Okpala DC, Aniekwu AN. Causes of high costs of construction in Nigeria. Journal of Engineering and Management (ASCE Journal). 1988;114(2):223–244.
11. Aniekwu AN, Okpala DC. Contractual arrangements and the performance of the Nigerian construction industry (the structural component). Journal of Construction Management and Economics, UK. 1987;5:3–11.
12. Aniekwu AN, Okpala DC. A survey of the problems of the construction industry in Nigeria: A research report commissioned by the World Bank, Washington D. C. Project No. AF4IN. 1989;1 and 2.
13. Aniekwu AN, Okpala DC. The effects of systemic factors on contract services in Nigeria. Journal of Construction Management and Economics, U.K. 1988;6:171–182.
14. Kirmani S. The Construction Industry in Development: Issues and Options. Discussion paper Infrastructure and Urban Developing Department. The World Bank, Report No. INU 10, Feb; 1988.
15. Adeyemi A.Y. (2000): "Multinational Construction Contractors in a cyclical Economic environment". Nigeria Journal of Engineering Management, Vol. 1, No. 2 April - June 2000, pg 46-53.
16. Jolliffe IT. Principal Component Analysis, Series: Springer Series in Statistics, 2nd ed., Springer, NY. 2002;29(487):28 illus. ISBN 978-0-387-95442-4.
17. Joint Contract Tribunal Guide. Standard Form of Building Contract, RIBA Publication; 1963.
18. Joint Contract Tribunal Guide. Standard Form of Building contract, RIBA Publication; 1980.
19. I.C.E . Conditions of contract and forms of tender, Agreement and Bond for works of civil engineering construction. Institute of Civil engineers (ICE) Press. London; 1973.
20. F.I.D.I.C. Conditions of contract for works of civil engineering construction 1977. Part II and I. Federation International Des Ingenuers Conseils (FIDIC). 3rd edition, 1977.
21. Arowolo D. "International Economic Order" in Arowolo, D. ed. Contemporary Issues in International Relations. Lagos. Princeway-Gbade Ent. (Nig.) Ltd; 2008.
22. Moore DS. Response," International Statistical Review. 1997;65:162-165.
23. Lipset SM, Lenz GS. Corruption, culture and markets, in culture matters: How values change human progress ed. Lawrence J. Harrison and Samuel P. Huntington. New York: Basic Books. 2000;112-114.
24. Ayodele Elijah Olusegun, Ogunbode Akintoye Benson, Ariyo Ibironke Esther, Alabi Olumuyiwa Michael. Corruption in the construction industry of Nigeria: Causes and solutions. Journal of Emerging Trends in Economics and Management Sciences (JETEMS). 2011;2 (3):156-159.
25. Aniekwu AN. The business environment of the construction industry in Nigeria. Journal of Construction Management and Economics. 1995;13:445–455.

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