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EVALUATION OF RISK FACTORS IMPACTING ON CONSTRUCTION PROJECT PERFORMANCE IN ABUJA

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ABSTRACT
Nigerian construction industry plays an important role in terms of meeting the country's infrastructure and economic development. Construction is been considered to be also a risky business due to its complexity and position to national growth domestic product of any country- especially developing countries. Risk in construction industry is perceived to be an occurrence that has impacts on major objectives of any project with respect to cost, time and quality. This has led to an investigation to discover the risks factors impacting on construction project performance with a view of suggesting strategies for mitigating the risk factors. The study employed quantitative research technique and relies on questionnaires survey to understand the perception of stakeholders and their mitigating strategies of each risks factors as an instrument for data collection. A statistical tools (means items scores and standard deviation) were used to identified and ranked the most critical risk factors that has effect on construction project performance. The top major risk factors that impact on cost are finance, credit facilities and economy policy. While those that top the time are: Finance, Security and design; Design, political and economic are for quality. For each of the identified risks, practical mitigation measures were provided and evaluated. It is been suggested that when mitigating a specific risk, the measures with higher effectiveness should be given a higher priority. Taking into account the higher criticalities of higher risk hierarchy levels, the mitigation measures should also be prioritized by the higher risk hierarchy level.

Keywords: *Construction Industry, Construction Project Performance, Risk factor, and Risk management process*

1 INTRODUCTION

Construction project has to do with process that consists of tangibly assembling an infrastructure or building. Construction projects incorporate numerous activities, such as fabrication, plumbing, masonry, carpentry and joinery (Ghaffari, 2013). According to Sharma and Swain, (2011) a construction project is not a single activity. Construction starts with planning, designing, costing and financing. It continues until project is completed and ready for use. Furthermore Ghaffari,(2013) stated that construction projects performance is affected by many complex and dynamic factors such as political, economic, social, and cultural risks, term as external as well as internal risks from within the project. A project is term to be successful when it achieves its objectives, (time, cost and specification) as expected without overrun (Sharma and Swain, 2011). Abd El-Karim, *et al*. (2015) is of the view that the basic objectives of any construction project is to complete it within the cost target, agreed time and the required quality, safety and environmental limits. Hence, construction projects are characterized a poor performance which leads to small profit margin (Ghaffari-2013).

Construction is been considered to be highly risky business due to its complexity and position to national growth domestic product of any country- especially developing countries (Renuka, *et al*,2014). Risk is defined as the likelihood of a determinant event occurring to the project Therefore, risk can be seen as a measurable uncertainty positive or negative event that can occurred as result of certain decision or event on project performance (Baloi and Price, 2003). It is pertinent to understand that there is the need to evaluate risk factors that impact on the construction projects performance with a view of suggesting strategy for mitigating the risk factors.

Construction industry as a whole faces a lot of challenges and suffers costing risk ends up or bulk sum called the contingency sum which sadly has been arbitrary misconstrued by many construction professional to be 10% (Alabo, 2015). The level of project risk contingency in estimates has a major impact in their financial outcomes for clients. If a contingency is too high, it might encourage poor cost management and subsequently caused the project to be uneconomical and aborted. On the other hand, if the contingency is too low, it may be too rigid and set unrealistic financial environment, resulting in unsatisfactory performance. Yet identification, analysis and response of risk factors by various researchers need further study on the strategy for dealing with these risk factors.

Given the above scenario and observations, the aim of this study is to evaluate risks factors impacting on construction project performance in Abuja with a view of suggesting strategies for mitigating risk factors.

Furthermore in order to achieve the above aim, the following objectives were formulated;

(i) To identify and examine the risk factors that has effect on construction project performance in terms of cost, time and quality.
(ii) To suggest strategies for mitigating risk factors of Construction projects.

1.1 Risk and Construction Industry in Nigeria

According to Dantata & Tenaga, (2008), the Nigerian construction industry plays an important role in terms of meeting the country's infrastructure and economic development. About 70% of nation's capital goes to construction industry. But its contribution to gross domestic product (GDP) has been dropped in recent years. The industry also has potential for generating activity and employment in other sectors of the economy such as mining, manufacturing, and transportation). The average growth of the Nigerian construction industry was 18% in 2010 – 2012. Its contribution to the gross domestic product (GDP) in 2010 was 2.78% (Bandupe, 2015). It can be concluded that construction industry in Nigeria generates growth and development by providing public facilities which then avail the citizenry and thereby increase productivity and in turn generate county's GDP. (NBS, 2017).

However, construction industry in Nigeria is facing chronic problems including poor performance of time, cost, construction waste and poor productivity. Many constructions companies especially some indigenous contractors; were successful for some years, unfortunately, it was confronted with many operational challenges, including under estimation of projects and their inability to meet performance target. (Chileshel and Yirenlayi – Fianko, (2012) observed that, despite the use of common form of contract, called JCT form of contract includes Liquidated and Ascertained damages (LAD) clause which guarantee that a predetermined amount will be paid to the client in the event of project delays for which contractor is responsible, traditionally, the contractor bears the risk of completing the work based on agree cost and quality

. Risk in construction industry is perceived to be an occurrence that has impacts on major objectives of any project; namely cost, time and quality. Risk can be seen from two angles; that is – the external risk (the environmental) and the other internal risks which exists in projects itself (Ismail, 2014). Compared to other industries, construction is subject to more risk due to its unique features of the construction activities such as completed procedures, financial intensity, environment long dedication and dynamic organization structure. Studies have revealed that construction industry has a poor track record of risk analysis as compared to other business (Mishra and Mishra, 2016).

1.3 Risk Management Process

Risk management process (RMP) involves the drawing up of plans on how to combat risk. The overall goal of the risk management process is to maximise the opportunities and minimize the consequences of a risk event. This includes Risk identification, assessment/ analysis, register and monitoring. .The risk management process aims to identify and assess risk in order to enable the risk to be understood clearly and managed effectively

1.3.1Identification of Risk Factors Causing Cost Overruns Time Overruns and Quality Problems in Construction Projects.

Risk identification relies mostly on past experience on projects executed to be used for proposed projects. risk identification has to do with obtaining a list of potential risk to be managed in construction project (Gajewaska and Ropel, 2011). Risk identification involves the following techniques; Brainstorming, Industrial checklist., Interview with key projects participant, Examination of historical data from previous similar projects., experts' evaluation, Delphic technique. Risk factors can occur in any kind of construction project. Construction project risks include business, contract relationship, cost, funding, management, political and schedule risk.

Various risk factors that impact on construction projects performance are identified by various researches and are categorized, amongst are; Ghaffari (2013) identified forty six (46) risk factors impacting on construction projects. According to Soyingbe *et al* (2014) identified thirty three (33) risk factors that affects cost and time performance of construction projects..Alabo (2015) identified thirty (30) risk factors. Tipili and Yakubu (2016) have identified nineteen (19) risk factors. Ajator (2017) listed twenty one (21) likelihood or risk in a construction projects.

1.4 Project Performance Scope

Chan and Chan (2004) defined project success as "the set of principles or standards by which favorable outcomes can be accomplished within a set specification". Project success means different things to different people. Therefore, in this research, the following variables are used to determine project performance: (i) Cost, (ii) Time, and (ii) Quality. These variables form a system that must remain in balance for a building construction project to be achieved. Because they are so important to the success or failure of the project. Each of these variables is discussed individually in the subsequent sub section.

Cost is a major consideration throughout the project management life cycle. According to Wysocki (2009), the first consideration occurs at an early and informal phase in the life of the construction project

Time frame or deadline date is being specified by the client within a construction project (Wysocki, 2009). To an extent, time and cost are inversely related to one another. For example, the time a construction project takes to be completed can be reduced but cost increases as a result,

According to oxford English dictionary, defined quality as the standard of something when measured against the

thing of similar kind, the degree of excellence of something. Quality is a comprehensive concept and its definition differs from different people. According to Wysocki (2009), a project is said to be of a good quality if the output; meets the specification, meets the customer's requirements and satisfies the customer

2 METHODOLOGY

In order to meet the research objectives, two research approaches was adopted; First, the research work started with extensive literature scan for past researchers concerning risk management, risk factors and construction project performance containing some thesis, construction and engineering journals, and academic published papers. The literature review was used to assist in developing the initial risk factors list and mitigating measure. Similar to this step, a pilot survey was considered to validate these identified risk factors and further add to existing one.

The second approach is the used of questionnaire. Data collection was carried out using questionnaire survey to understand the perception of the stakeholders, to the risk factors and mitigation strategies. The questionnaire was designed based on knowledge obtained through the reviewed of literature and content validity. A questionnaire survey was conducted between June and August, 2018, and the target respondents were the Architects, Builders, Quantity Surveyors, Electrical Engineers, and Mechanical Engineers, that formed the population for the study.

Stratified sampling technique was used to determine the number of the responses. This is a form of probability sampling that classified people into groups according to their characteristics. For each risk factor, expert was asked to assign an impact based on scale as it relate to cost, time and quality. Furthermore, percentage was used to assess the sharing of risk between the client, consultant, and contractor. The survey was distributed to 30 Experts within the Federal Capital Territory - Abuja (30 valid responses were received out of the 32 distributed questionnaires)

The data gathered from the survey were analyzed statistically using two of the techniques of Statistical Package for Social Sciences (SPSS) they are Means Item Score (MIS) and Standard Deviation (SD)i.e equation (1) and (2) respectively to determine most significant and ranking of risk factors that impact on construction project performance. The same approached was adopted by many researchers to analyze their data collected from survey. The mean item score and standard deviation are calculated with the following formulae

. $MISi = \frac{\Sigma(f \times s)}{N}$ (1)

where;

S= score given to each risk factor by the despondence,

f= Frequency of response to each score for each risk factor

N= Total number of response in the respective groups for the respective risk factor, and

i= Respective risk factor

While for standard deviation (SD) is as follows;

$$SD = \sqrt{\frac{\sum(x - \hat{x})^2}{n-1}} \quad (2)$$

Standard deviation σ = √variance; and variance is

$$Variance = \frac{(n-mean)+\cdots\ldots(n-mean)}{N-1}$$

3 RESULTS AND DISCUSSION

3.1 Demographic result

A total of 32 questionnaires were distributed; A response rate was 100% but, the valid questionnaire were 30 out of 32, means 93% valid questionnaire were analyzed.

Table II: RESPONSE RATE

S/No	Description	No. of Questionnaires Distributed	No. of Valid Responses	No. of Invalid Responses	Percentage of Valid Responses
1	Respondents	32	30	4	93%

Source; Authors' Field Survey(2018)

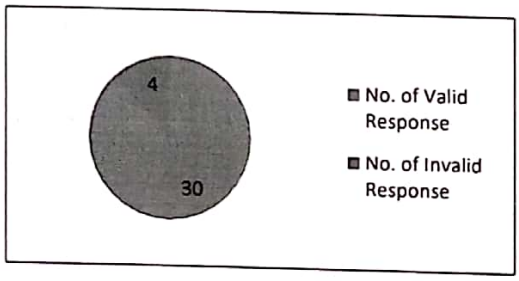

FIGURE I : RATE OF RESPONSES

To validate the study, the sample size adopted for this study was thirty (32), selectively distributed based on stratified sampling. The chosen number was based on recommendation of Abd Karim (2012), that a sample size larger than 30 and less than 500 are appropriate and efficient for most research. Thirty two (32) questionnaires were given and all returned making 100% return rate; 30 were properly completed. Abd Karim (2012), stated that a respondents range between 25-100 is appropriate for a study test. The response rate are categorized based on their educational and professional qualifications and area of specialization; year of experience in the construction industry.

From the analysis 14 out of 30 had first degree or Higher National Diploma (HND), 5 with Post Graduate Diploma (PGD) and 11 with Master's degree. On professional qualifications, 90% of them are registered with their professional bodies. On years of experience; 12 of the respondents are 1-15 years of experience, 6 are those between 16-25 years , 12 are those 25yaers and above.

On the Response rate 23% response are Architects, Builders, Electrical Engineers and Mechanical Engineers are all 17% each, while Quantity Surveyors 26% response. Table 2 and Figure 2 show the categorized response rate.

Table III: CATEGORIES BY AREA OF SPECIALIZATION

S/No	Status	No. of Responses	Percentage	Cumulative Percentage
1	Architect	7	23	23
2	Builders	5	17	40
3	Electrical Engineer	5	17	57
4	Mechanical Engineer	5	17	74
5	Quantity surveyors	8	26	100
	Total	**30**	**100**	

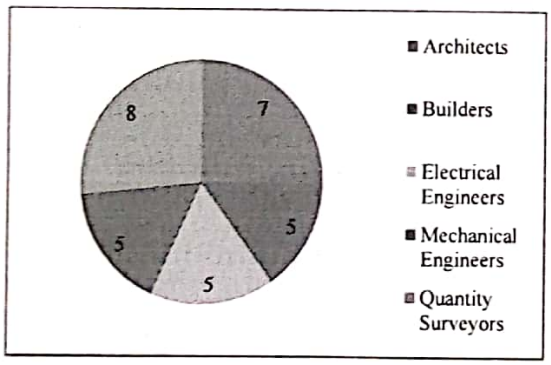

FIGURE II: CATEGORIES BY AREA OF SPECIALIZATION

Identified and categorized risk factors impacting on Construction projects

The identified risk factors from literature scan and response from the questionnaires are hereby categorized. Ninety four (94) risk factors have been identified and categorized into eighteen (18); Viz a) Design risks, b) Planning & Delay Schedule, c) Technology risk, d)Financial risk e) Procurement-contractual risk, f) Political risk, ,g) Environmental risk, h) Social risk, i) Economic risk:, j) Credit risk:, k) Standards and regulation risk ,l) Physical Factor, m) Legal Risk ,,n) Construction (Project execution), o) Project Management , p) Political, q) Resources (*Material, Labour,Plants& Machinery, r)* Contractual (*Technical Procedure & procurement).*

Ranking study of risk factors

The five most important risk factors that impact on construction project Cost from table 2 are; Finance, Credit facilities, Economic policy Contract/procurement system and Planning & delay Schedule, they are ranked as 1st, 2nd, 3rd, 4th, and 5th respectively.. While those risk factors that impact on Time are; Finance, Security, Design, Contract/procurement and Project management 1st, 2nd , 3rd , 4th , and 5th respectively. Those that affect quality are; Design, Political, Economic, Resources and Finance

In attempt to rank them, Mean Item Score and Standard deviation was used. The MIS with highest value is considered, but where MIS value are sane with a different independent variable, the lowest value of SD is used to rank the most effective

TABLE IV: RANKING Of RISK FACTORS

S/No	Risk Factors	Cost			Time			Quality		
		MIS	SD	Rank	MIS	SD	Rank	MIS	SD	Rank
1	Design	3.9643	0.9222	6th	3.9643	1.8852	3rd	4.2857	0.8668	1st
2	Environment	3.5357	0.8599	14th	3.3929	0.9940	15th	3.2143	0.7868	9th
3	Physical Factor	3.5000	0.3848	15th	3.3571	1.1616	18th	3.1071	1.2573	15th
4	Finance	4.2500	0.5853	1st	4.1428	0.5909	1st	3.4285	1.2301	5th
5	Economic	4.1785	0.6118	3rd	3.8214	0.8630	8th	3.5714	1.1362	3rd
6	Contract/Procurement	4.1428	0.5909	4th	3.9228	0.6627	4th	3.2142	1.1975	11th
7	Resources	3.7857	0.8759	10th	3.8571	1.4584	6th	3.4286	0.8789	4th
8	Construction	3.6428	0.8698	13th	3.5000	1.7533	17th	3.2142	0.5443	10th
9	Safety	3.4286	1.7305	17thh	3.6429	2.0224	13th	3.1071	1.1001	14th
10	Legal	3.7143	0.7629	12th	3.6786	0.6696	11th	2.9286	0.9786	17th
11	Planning & Delay schedule	3.9643	0.7444	5th	3.6786	2.0558	12th	3.3214	1.3486	7th
12	Standard & Regulation	3.7500	0.9280	11th	3.8214	0.6118	7th	3.1785	0.8181	13th
13	Security	3.9285	1.2745	7th	4.0000	0.5443	2nd	3.1786	0.9833	12th
14	Credit	4.2142	0.7382	2nd	3.7142	0.7228	10th	3.0714	1.0338	16th
15	Social	3.4642	0.8381	16th	3.3928	0.7859	16th	2.9285	1.0157	18th
16	Technology	3.8214	1.0203	9th	3.6428	1.0261	14th	3.4285	1.5494	6th
17	Political	3.8928	0.6853	8th	3.7500	0.7005	9th	4.000	0.8165	2nd
18	Project management	3.1071	1.6631	18th	3.8571	0.6506	5th	3.2500	0.7515	8th

Source; Authors" Field Survey

Risk Mitigation Measure

Based on the outcome of preliminary investigations and a review of relevant literature, a generic model of the payment risk sources and the response measures was developed to provide a holistic insight into the key constructs underlying the internal and external sources of risks and their associated mitigation measures The model helps to put the scope of the study in the context of the wider facets of the subject matter. The proposed strategies for responding to risks that may have negative impacts on expected outcomes are risk avoidance/elimination, risk minimization/mitigation, risk retention and contingency, and risk transfer-and an improvement on the three strategies provided in the Project Management Body of Knowledge (PMBOK) (Project Management Institute, 2004); the key point of difference is the inclusion of the risk retention and contingency on Table 4 shows the details of response strategies.

Table IV: RISK RESPONSE STRATEGIES- MITIGATING MEASURES

S/No	Risk factors	Mitigating measures
1	Design	- Ensure the design are done properly - All design before commencement must be stamped - Proper coordinates of drawings (Structure Mechanical and Electrical) - Adopt design & built option
2	Site safety	- Ensure that construction and operation are as per examination - Get third party insurance for compensation - Study and implement the local accident regulations
3	Construction	- Adopt proper quality control procedures - Undertake probability analysis
4	Legal	- Maintain good relation with development control unit of government higher official - Obtain good guarantee to adjust tariff or extend concession period (for BOT) - Obtain support of in termination monitory institution like world bank, ADB against discrimination and harassment
5	Political instability	- Develop over contingency plan for possibly instability - Seek incorporation of termination or delay clause in contract - Obtain insurance for political risk from international finance
6	Social	- Undertake comprehensive negotiations & agreement with local government & partners - Provide dispute settlement clauses in the contract - Have an understanding with the host community
7	Resources	- Sign formal employment contract with every staff - Offer better enumeration/incentives packages to staff - Office training to new and existing staff - Ensure good material are chosen
8	Contract/procurement	- Examine the target company's financial viability, technical and management competence - Insist on having trustworthy people on key places - Have a clear contractual terms and conditions agree on one accounting standard - Pay careful attention to contract translation - Conduct market survey
9	Environment	- Insure all of the insurable force majeure risk - Include delay clause for contingency plan in contract
10	Technology	- Limit the deviation of technology transfer - Negotiate on amount and speed of technology transfer - Intellectual property right's training of all key employees
11	Standard and regulation	- Ensure compliance with both local and intermediate laws
12	Project management	- Hire competent project management team - Clear definition of staff duties and responsibilities - Employ local staff with bilingual ability because of communication gap
13	Physical factor	- Ensure an archeological survey is done before commencement of project - Visit the site and study the environment before commencement
14	Credit/Economic	- Get letter of credit form government - Obtain payment & performance bond - Adopt alternative to contract payment e.g. land development rights, resources swap - Client to secure standby financing- (i.e. more 100% financing commitment when needed)
15	Finance	- Use dual-currency contract with portion to be paid in local currency & others in foreign currency - Obtain government guarantee of exchange rate and convertibility e.g. fixed rate for long period
16	Corruption	- Enter into contract with government authorities to prevent corruption - Set aside a budget for unavoidable spending - Try to work with the business connection, i.e. avoid hire broker or middle men - Obtain all necessary approval in time to minimize chance for corrupt individual to obstruct work.

Source; Authors' Field Survey (2018)

4 CONCLUSION

Ninety four (94) risks factors associated with construction projects in Abuja were identified and categorized into three hierarchy levels (Country, Market and Project). Of which some were evaluated as Critical or Very Much Critical based on a 5-degree rating system (using likert scale). This paper presents research results obtained through questionnaire surveys conducted in Abuja. It is pertinent to note that, key risk factors that have impact on cost, time, and quality performance of construction projects were based on comprehensive assessment of their index score comprising the likelihood of occurrence and magnitude of consequence (Impact). The top major risk factors that impact on cost are finance, credit facilities and government economy policy. Similarly, finance, security and design top the time, while design, political and economic were the top ranked risk factors against quality.

Apart from identifying the top major risk factors/and their effect, it also suggest the strategies for responses that suit each of the identified risk. For each of the identified risks, practical mitigation measures were provided and evaluated. Almost all of the mitigation measures were perceived by the respondents to the survey as effective

The findings of this study have a lot of contributions to the body of knowledge. Some of these contributions are: a) Risk factors can be avoided if not fully eliminated if the findings of this research work are adopted and implemented, b) The study can also serve as a basis for future work and sources of literature for other research work.

Recommendations

It is suggested that when mitigating a specific risk, the measures with higher effectiveness should be given a higher priority. Taking into account the higher criticalities of higher risk hierarchy levels, the mitigation measures should also be prioritized by the higher risk hierarchy level, i.e. the risks at higher hierarchy level should be mitigated first with higher priority with their respective more effective mitigation measures. This paper provides a number of recommendations for decision makers on construction industry in Abuja.

(i) The Federal ministry of finance, National Planning, Investment and Power, works and housing in conjunction with professional bodies registered board/council to provide early warning or broadcasting of risk factors facing different fields of projects

(ii) Nigerian universities and other institutes of higher learning be directed to includes risk knowledge into their curriculums of studies especially in field of construction and engineering.

(iii) Improve the role of insurance companies to help eliminating or minimizing a wide range of risk factors

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