



THE IMPACT OF CONSTRUCTION RISKS ON PROJECT DELIVERY AMONG CONTRACTORS IN NASARAWA STATE, NIGERIA

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ABSTRACT

In Nigeria, construction industry is important in the country's economy growth. Construction industry has been contributing immensely towards the Gross Domestic Product, and employment. Despite this acclaim, studies in recent years have shown poor performance of construction projects. This has among other things provoked increased

Introduction

The construction industry in Nigeria state is continuously booming and subsidized by the government in line with the provisions of the Constitution (1995) and the divesture policy, with the aim of achieving full and effective participation of the private sector for the sustainable development of the country's physical infrastructure. Amid 2010-2015, the industry comprising construction, manufacturing, mining, and others grew on average 9.3% annually, outperforming the overall economy at 7%. The building and infrastructure construction sectors accounted for majority of the industry growth, reporting 12.8% average annual growth in 2010-2015 sector (Ministry of Infrastructure, 2009). Thus, the construction industry plays a major role in the economic and social development of the country and substantially contributes to 51% of the total of industrial Gross Domestic Product (GDP) (The Swedish Trade & Invest Council, 2017)



interest in the nature and mechanism of risk analysis and management. The main objective of this study was to determine the extent to which construction risk affects project delivery among contractors in Nasarawa. The study assessed the likelihood of occurrence of construction risks and their impact on project namely cost, time, quality, environment and health and safety. Risks were ranked thus determining the key risks influencing project delivery. This study was conducted through a review of literature and a self-administered structured questionnaire to the contractors. Contractors registered by the National Construction Authority in category NCA 5 and above were targeted. A sample of 190 respondents were selected through stratified random sampling to participate in this study. Senior managers, project managers, technical managers, architects, quantity surveyors and engineers were the respondents in this study; one professional was selected from every contractor included in the sample. Data analysis involved cleaning, sorting and coding of raw data collected from the field and processing for purposes of interpretation by use of statistical package for social science (SPSS) and Microsoft Office Excel. The study recommends that Professionals in the construction field should be educated in risk management and thus both formal and informal system of risk management training needs to be developed. In the graduate level of education in construction project management, formal education on risk management should be provided. In the training curricula for building professionals i.e. Architecture, Quantity Surveying and Engineering students should be exposed to risk management concepts and practices. Informal education on construction risk management can be provided by career development programmes, trainings through workshops and seminars on risk-awareness, risk assessments, safety and legislative requirement. Such trainings can be organized by academic institutions or professional organizations such as Architectural Association of Nigeria (AAN); Institute of Quantity Surveyors of Nigeria (IQSN); The study also recommends that the Ministry of works should ensure full implementation of its training policy by objectively identifying the training needs for project supervisors. tools and should be done regularly

Key words: Contractions risk, construction projects, project delivery, contractors, construction industries.



because it serves as the central delivery mechanism in generation and quality of all economic and social development activities in the country. Due to this role that the industry plays, the government of Nigeria developed supporting policies to encourage and facilitate the development of the sector (Ministry of Infrastructure, 2009).

Nigeria is a country with limited resources and to ensure its development, it is essential for the countrymen to invest in appropriate technologies. Communication and documentation within the industry need to be improved. In order to achieve this improvement, it is better to institute an appropriate process of adopting new technologies such as Building Information Modelling (BIM), an intelligent 3D model-based process that gives the Architecture Engineering & Construction (AEC) professionals the insight and tools to more efficiently plan, design, construct, and manage buildings and infrastructure for the purpose of visualization, engineering analysis, conflict analysis, code criteria checking, cost engineering, as-built product, budgeting and many other purposes (Autodesk, 2018).

During construction activities, consultants and contractors set up together teams of professionals and technicians and who often work for quite a short period of time on site by using different platforms during the preparation of necessary documents needed for any construction project implementation with aim of designing and planning of what is to be constructed. CAD, the traditional technology used by AEC in past years, does not promote a true collaborative approach (Teicholz, 2004). Architects and engineers process CAD documents to hand on their designs to owners and contractors. The drawings produced are not integrated and usually pose conflicts of information which result in inefficiency in labor productivity hence estimators need to count and generate their own quantity take offs based on the produced CAD documents (Masood, Kharal, & Nasir, 2013). In addition, the 2D CAD approach does not promote the integration of the drawings with schedule and cost (Hergunsel, 2011). In order to get more insights about BIM adoption process and practices, it was crucial to explore and understand how other countries have implemented them through review of literatures as detailed..



Statement of the Problem

Contractors are faced with several risks in their construction business and fail to meet the principal project objectives of budget, time, quality, environmental conservation and health and safety. This has been attributed to lack of knowledge of key risks influencing each of the objectives and how best to manage them. Hergunsel (2011) emphasized that construction firms do not have as much of an incentive or the resources to invest money in research and development of new technologies because of the high risks and costs of such investment. When the new methods and technologies are used, they are applied per project basis and are not adapted quickly in the construction industry as a whole. Globally, the construction industry must undergo a model shift from its old approach to the new project delivery approach, and this is the case for Nigeria particularly in the Nasarawa state.

Due to the contemporary sophistication in construction contracts, building design and the resulting demand for the construction of quality infrastructure, the constructability challenges that many construction companies face are very sophisticated and cannot be addressed and solved easily without the help and application of technology. According to GenieBelt (2017), one technology that has emerged over the last decade and a half is BIM. This technology has enabled designs to become more sophisticated as the technologies supporting BIM have evolved. Currently, the modeling industry in developed countries can support not only 3D models but the construction management areas of scheduling, cost control, estimating, safety training, and sustainability. Recent advances in technology have allowed the AEC industry to keep up with the multi-dimensional real world and the tool that has allowed them to do this is Building Information Modelling (Christoph & Bjørn, 2012). The future of the construction industry is BIM. As it is becoming more popular, it introduces many opportunities for the improvement of business information transfer through the construction process. Perceived and actual benefits have been investigated throughout many studies. However, a framework for adoption of BIM in the AEC industry in Nigeria has not yet been formulated. BIM can only be of full benefits to the AEC industry adopters once it has been more widely adopted



through the industry. It is hard for a company to fully achieve the benefits of BIM while other partners are not using it. BIM provides a much better means of communication and distribution of information between clients, construction and architecture firms and legal authorities involved in project.

Research Objective;

To determine the impact of construction risks on project delivery among contractors in Nasarawa state, Nigeria

Research Hypothesis

The following hypotheses was tested and formulated in a null form.

H₀₁, construction risks has no significant influence on project delivery among contractors in Nasarawa state, Nigeria

Justification of the study

The findings of this research would inform the contractors, Government and other Public and private sector bodies on key construction risks which affect project delivery in Nasarawa state and Nigeria. Construction risks affects all industry players both client and contractors and cause cost overrun and delays in project.

The state, corporations, contractors and other stakeholders in the construction industry would benefit from this study because it highlights key construction risks which when mitigated would augment project delivery. When the recommended risk management measures and strategies are realized, there should be improved contractor risk management capacity consequently performance is guaranteed. The information gathered and presented in this study will serve as a guideline in the decision making for the parties concerned. .For researchers and academicians, this study would add to the existing body of knowledge thereby acting as a source of reference. In addition, this study has provided areas for further research where future scholars could explore to widen the knowledgebase on construction management.



LITERATURE REVIEW

Concept of Construction risks

Construction industry is associated with a high degree of risk due to the complex nature of the of the construction process. The occurrence of risk event has a positive ornegative effect on at least one project objective i.e. time, cost, scope or quality, (PMI,2004). Gwaya et al. (2014) noted that projects have an element of risk and tasks leading to their completion may not be described with accuracy in advance. Risk management is an important aspect construction project management in that it involves identifying major risks that influence contractor performance in terms of meeting project objectives (Wanyona, 2005) , that is, time, quality, safety and environmental sustainability (Zou et al., 2006). The difficult in achieving the main project objectives results to most of the problems militating against the achievement of desired effect on the construction industry of any country (Gwaya, et al., 2014). This ultimately results to dissatisfied clients. Risk management has been identified as one of the most important tools in determining any project success yet very few studies investigate the nature of this relationship (Fewings, 2005). Also Wanyona (2005) also notes that very few studies have been done in Kenya on risk management. Where the nature of risks is understood less is known about likelihood of occurrence and the potential impact (Chileshe & Yirenkyi-Fianko, 2011). According to Deviprasadh (2009) managing risk should be an integral part of a good management and fundamental to achieving business and project outcomes and effective procurement of goods and services. Therefore, there is a clear need for a strong risk management processes from the outset of a project and to be applied and continuously developed throughout the life of the project.

The function of project management is therefore to predict as many risks, problems as possible, and plan, organize and control activities so that the project is completed successfully (Gwaya et al., 2014). Most research has focused on some aspects of construction risk management rather than using a systematic and holistic approach to identify risks and analyze their likelihood of occurrence and impact of these risks on project objectives (Zou et al., 2006). A study by Mousa (2005) in Palestine



has shown that contractors and owners suffer from lack of innovative methods to prevent and mitigate risks. They fail to utilize risk analysis techniques but depend widely on direct judgment in estimating time and cost. Assessment of risk of cost overruns and delivery of project within budget is also a major challenge in Nigerian construction industry (Tipili & Ilyasu, 2014). This has an increased project cost, time delays and lack of quality of projects. Studies done in Kenya have shown that 73 percent of project assessed experienced time overruns and 38 percent suffered cost overruns (Mbatha, 1986). Another study by Gichunge (2000) showed that the most serious source of cost and time related risks in building projects during construction period is extra work (variations). According to him, this occurs in 73 per cent of building projects in the population whereas defective materials accounted for 38.2 percent for observed unacceptable quality work cases. Construction performance in Kenya is inadequate. Despite the fact that projects are supervised by very qualified human resources, they end up failing (Gwaya et al. 2014). There is the need to look into construction project performance with a view of identifying the right success measures for appropriate application. Risk management is one of the important measures to undertake to ensure improved construction performance. Al-Shibly, Lousi and Hiassat (2013), states that it is one of the performances that can positively affect working effectively inside the firm if it was practiced in the proper way. Dawood (2001) and Wanyona (2005) have observed that in the current practices in the construction industry there is lack of structured methodologies and systematic cost escalation approach to achieve an appropriate cost analysis at the onset of construction process. Many projects fail because of choices made in the early stages of development. An inappropriately designed project-delivery approach or the wrong procurement method can lead to delays, higher costs, and administrative returns (Beckers et al., 2013). Assessing risk indicators associated with cost prior to the start of project enables better prediction of risk levels. Effective use of project management techniques such as risk and value management is considered as key supporting processes and to add to them quality, cost, time and change control (Fewings, 2005) all together generate an integrated approach to the project success.



Important risk factors affecting construction

Aibinu and Jagboro (2002) surveyed major delays facing Nigerian construction industry. He defines delay as a situation when the contractor and project owner jointly or severally contribute to the non-completion of projects within the original or the situated period. The major client related delays were: variation orders; slow decision making process and cash flow. The contractor related risk factors were: financial difficulties; material management problems; planning and scheduling problems; inadequate site inspection; equipment shortage problems; and shortage of manpower. Extraneous problems, identified were ranked as: increment weather; acts of God; labour disputes and strikes. He concluded that cost overruns and time overrun were the two most frequent effects of delay in the Nigerian construction industry. A similar study was carried out by Shebob, Dawood, and Xu (2011) in Libya. The survey showed that: low skills workers; rise in material prices; delay in material delivery; changes in scope of project were critical delay factors in the Libyan construction industry on contractor point of view. On owner's point of view the most critical delay factors were low skills of manpower; delay in delivery of site to contractor, modification (replacement or addition of new works); changes in material specification. On the consultant point of view: delay in making decision; slow supervision; poor planning; slowness in giving instructions; poor qualification of consultant engineer staff and waiting time for approval of drawing and tests samples of materials. Tipili and Ilyasu (2014) observed that risk of cost overruns and delivery of project within budget as major challenges in Nigerian construction industry. Factors affecting projects costs were ranked in order of significance as: design variation; variations by clients; price inflation; incomplete or inaccurate cost estimate; and inaccurate program scheduling. Risk factors related to time in order of significance were: Bureaucracy of government; design variations; quality performance; tight project schedule and variation of construction programme. Risk factors related to quality in order of significance were: Tight project schedule; design variation; lack of coordination between project participates; unsuitable contract programme planning and lack of skilled labour. Risks related to cost in



order of significance were: incomplete or inaccurate cost estimate; inadequate program planning; variation by the client; design variation and price inflation. Chileshe and Yirenkyi-Fianko (2012) identified 25 major risk factors associated with construction projects and have major impacts on issues related to project performance and delivery in relation to cost, time and quality. The five most likely risk factors agreed by clients, consultants and contractors in Ghana were: price fluctuations; delay in payment; inflation; quality and performance and poor financial markets. The important risks in terms of impact on construction objectives were: delay in payment; inflation; financial failure; price fluctuation and quality performance control

Construction Risk in Nigeria

Nigeria has had several initiatives to identify potential sources of Construction Innovation. One such effort is the promotion of appropriate technologies in order to lower the pressure on Conventional Construction Materials (R.o.K, 2013). In 2006, the Ministry of Housing rolled out the Appropriate Building Materials and Technology (ABMT) Programme; which refers to building processes, materials and tools that are cost-effective, safe, innovative, environmentally friendly as well as acceptable to the climate, socio-economic conditions, and natural resources of an area. (R.o.K., 2013). These included Stabilized Soil Blocks (SSBs), Micro-Concrete Roofing (MCR) Tiles and Pozzolana/Rice Husks Cement. The Ministry has utilized local and global research findings through networking to continue running the ABMT Programme and has been able to establish the Regional ABMT Centre at Mavoko in Nairobi, 9 county ABMT Centres and 63 Constituency ABMT Centres. Training workshops have been conducted throughout the country to transfer skills and empower community groups to construct affordable houses, social facilities and other utilities. (R.o.K., 2013). To facilitate the use of new and viable ABMT, the Ministry has spearheaded the revision of the current Building Code to enable their acceptance in designated areas within the local authorities.

With these efforts and with collaboration with private sector, there is a range of local and adapted innovative construction technologies



available in Kenya. This include Plastics, Stabilized soil blocks, Rammed earth walling, Bamboo, Wood wool slabs, Micro-Concrete Roofing Tile, Light Steel Frame, Expanded Polystyrene (EPS) technology, Solar water heating and lighting, Waffle slabs, Fibre mesh, and recycling of grey water.

Theoretical Framework

This study anchors on contingency theory of construction risk because the theory is relevant to this study. There are a number of theories that can be drawn upon developing risk management strategies. Among all these theories related to management and risk management, contingency theory was found to be the best suited for this study. This is in reference to the nature of construction projects and the concept of risk. Each construction project is unique and with its own complexities therefore should be managed according to its specific characteristics and environment in the particular period of time. Contingency thinking recognizes the uniqueness and complexities of construction projects and attempts to identify practices that best fit with the unique demands of different situations. This therefore highlights the complexity involved on managing of risks in construction projects.

The application of various management tools and techniques must be appropriate to the particular situation because each situation presents unique problems. This theory rejects the idea that there is one best way to manage because of the varying management situations (Ghahramanzadeh, 2013). According to Mutema (2013), contingency theory takes into account the interaction and interrelation between the organization and its environment. This includes the recognition and accommodation of those elements that cannot be controlled. He articulates that contingency theory involves recognizing that those elements that can be controlled and influenced must be addressed in ways that vary depending on prevailing situations. In applying this theory it is emphasized that each project is unique and has got its own specifications which therefore requires suitable management practice according to its situation and specifications. Contingency theory recognizes that there are a range of contextual variables (risk factors),



each influencing the projects objectives differently. Examples of these variables are: External environment, technology, organizational structure and size, cost, culture, people involved, strategy. The theory focuses on the relationship between these contextual variables and the organization. These variables (risks factors) influence the organization and therefore the projects they are implementing. As a result, to manage any project the specific variables associated with it should be considered and evaluated (Gong & Tse, 2009).Zeithaml et al. (1988) conceptualizes contingency theory-building as involving three types of variables: contingency variables, response variables and performance variables. Contingency variables represent situational characteristics which are exogenous to the project manager or organization. Response variables are the managerial or organizational actions taken in response to the current or probable contingency factors.

Performance variables are the dependent measures and present specific aspects of effectiveness that are suitable to evaluate the fit between contingency variables and response variables for the situation under consideration. This study thus employed the contingency theory by establishing the various risks that influence the different performance objectives and determining appropriate response measures to improve performance of contractors. Despite the fact that contingency thinking rejects the existence of “one best way” for managing risks it proposes “one most appropriate” approach for each specific situation (Ghahramanzadeh, 2013). Smith et al. (2006) asserts that projects are heavily influenced by external factors and they influence the world outside them. These external factors are termed as the project environment. The interactions and interrelations between the organization and its environment make it prone to several external risks. According to Zeithaml et al. (1988) effectiveness in any organization can be achieved in more than one way. For example responding to risk with an aim of reducing their impact on project. However, she claims that each way is not equally effective under all conditions and situations. The contingency approach suggests we can employ various response strategies to varying situations to achieve effectiveness. Therefore, “one best way” to manage all the construction project risks cannot be defined



and for this study the most appropriate way depends on the nature of environments in which projects are taking place. In our case we are considering the Nigeria construction environment. So, contingency theory is used in this study in order to describe an approach in managing of risks of construction projects that best suits the current Nigeria situation. Construction risks have varying influence on particular project objectives and hence the contingency theory is

Empirical Review

Prior studies reveal that construction risk offers numerous advantages and the potential benefits to Nigerian development. Aibinu and Jagboro (2002) surveyed major delays facing Nigerian construction industry. He defines delay as a situation when the contractor and project owner jointly or severally contribute to the non-completion of projects within the original or the situated period. The major client related delays were: variation orders; slow decision making process and cash flow. The contractor related risk factors were: financial difficulties; material management problems; planning and scheduling problems; inadequate site inspection; equipment shortage problems; and shortage of manpower. Extraneous problems, identified were ranked as: increment weather; acts of God; labour disputes and strikes. He concluded that cost overruns and time overrun were the two most frequent effects of delay in the Nigerian construction industry.

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quantities; lack of consistency between Bill of Quantities, drawing and specifications; working at hot (dangerous) areas; financial failure of the contractors; closures and high competition bids.

Zou et al. (2006) in his paper identified and analyzed the risks associated with the development of construction projects from stakeholders and life cycle perceptions in China. Twenty major risks factors were identified and were mainly related contractors, clients and designer with few related to Government bodies, subcontractors/suppliers and external issues. Among them, in ranking, were: Tight project schedules; design variation; excessive approval procedure in administrative government departments; high performance; unsuitable contractors programme planning; variation of construction programme; low management competency of sub-contractors; variations by the client; incompleteness of approval and other documents; and incomplete and inaccurate estimates. Wang, Dulaimi and Agura (2004) also carried a research in China on risk management on construction in developing countries. These included:- Approval and permit; change of law; justice reinforcement; local partner's credit worthless; political instability; cost overrun; corruption; inflation and interest rates; government policies and government influence on disputes.

Tang, Qiang, Duffield and Lu (2007) carried out a research on risk management in the Chinese construction industry. He compared criticality of the risks and evaluated the methods and risk responses used by project parties in construction industry. They ranked the five most important risks as poor quality of work, premature failure of the facility, safety, inadequate or incorrect design, and financial risk.

Project Drawings

Construction drawings are vital tools that contractors and supervisors need to complete a building project. Construction drawings are necessary for every project and have multiple users as well as multiple uses. Construction projects come in all shapes, sizes, and complexity. Larger projects have more drawings while small projects have fewer drawings. Construction drawings must be detailed, accurate, neat, and



complete The purpose of preparing a complete set of construction drawings are:

- Help the client to envision the entire project.
- Assist in planning and estimating the cost and time for the project.
- Prevent unpleasant surprises and last minute changes.
- Provide all parties involved (clients, contractors, inspectors, plan reviewers, etc.) with clear instructions regarding layout, materials, and the expected finished product.
- Expedite the plan review process.

METHODOLOGY

Research Design: The study adopted a descriptive research design. Descriptive research design was employed because is an efficient way of gathering data to help address a research questions and one can collect unbiased data and develop sensible decision based on analyzed results (Van de van, 2007).

Sampling. A sample of 190 respondents were selected through stratified random sampling to participate in this study. Senior managers, project managers, technical managers, architects, quantity surveyors and engineers were the respondents in this study; one professional was selected from every contractor included in the sample.

Data Collection Instruments: A structured questionnaire was used to collect relevant information from the study's participants.

Data processing and analysis

Data analysis is the process of data to make meaningful information (Saunders, Lewis & Thornhill, 2009) defined data as mechanism for reducing and organizing data to produce findings that require interpretation by researcher. According to Hyndman (2008) data processing involves translating the answers on a questionnaire into a form that can be manipulated to produce statistics. This involves coding, editing, data entry, and monitoring the whole data processing procedure. Data collected was analysed by editing, coding and categorizing through the use



of statistical package for social sciences (SPSS) version 20.0 computer software.

Validity and Reliability of Research Instruments: The instruments used in this study were submitted to a panel of experts for validation. The panel carried out a content analysis of each of the questionnaires and eliminated items found to be irrelevant to the research problem. After necessary modifications, the panel of experts recommended the use of the instruments for the study. The scales were subjected to further item analysis as to determine their psychometric soundness as indicated in Table1 below:

Table 1: Summary of Results of the Measurement Instruments Validation

Scale	No of Items	Meaning Bartlett	KMO	Eigenvalue of the principal Component	% of the Variance	α of Cronbach
Constructions Risk Questionnaires Q	7	$p = .000$ (significant)	0.259	2.743	97.44%	0.58

Source: Field Report, 2022

From Table 1 above, factor loads of all the indicators are higher than 0.5 which shows that the questions highly explain the variance of their variables so we can say that the measurement model has high factor validity.

Method of Data Analysis: Regression Analysis was used to test the hypotheses.

Regression Model

$$OP = \alpha + \beta_1 X_1 + \mu$$

Where the variables are express as

OP- Project Delivery

X_1 – Construction Risk

μ - Error term.



Results and Discussion

Table 2.2: Construction Risk and Project Delivery

		Construction Risk	Project Delivery
Construction Risk	Pearson Correlation	1	.287**
	Sig. (2-tailed)		.000
	N	170	170
Project Delivery	Pearson Correlation	.287**	1
	Sig. (2-tailed)	.000	
	N	170	170
Correlation is significant at the 0.01 level (2-tailed).			

The results in table 4.7 showed that improvisation had a Pearson correlation value of 0.287 and significance value of 0.000. The finding implied that construction risk had a significant association with project delivery in Nasarawai state. The results implied that when construction risk goes up, project delivery is likely to increase. The findings implied that when construction risk is positive then mindset development will also be positive showing significant association.

Therefore, null hypothesis that stated no significant relationship between construction risk and project delivery is rejected. This means that there is significant but weak relationship between construction risk and project delivery.

CONCLUSION AND RECOMMENDATIONS

This study examines the impact of construction risk on project delivery. The study established that there is a strong positive correlation between construction risk on project delivery in Nasarawa state, Nigeria. The study reveals that construction risk is one of the major factor in project delivery. Therefore, the study recommends that construction risk is one of the tools used in attainment of organizational goals and objectives. The study also recommends that Nasarawa state should adopt construction risk strategies through taking calculated risk in their operations as well as carefully analyzing the available options so as to



increase the chances of landing into the best option. In general, therefore, the study recommends that Nasarawa state government should have a template in dealing with construction risk this will give them leverage in dealing with project delivery.

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