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SIGNIFICANT RISK FACTORS IN CONSTRUCTION PROJECTS FROM CONTRACTOR'S PERSPECTIVE

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ABSTRACT

Construction projects are associated with various risks which must be properly managed to achieve project success. Despite extensive research on managing risks in the construction industry, there are many significant risk factors which still hinder the achievement of project goals. Identification of these risk factors is critical to delivering successful projects. This study, therefore, seeks to investigate risk factors inhibiting success from contractors' perspective considering the key role contractors play in the success of a project. The scope of this study was limited to selected projects handled by renown contractors in Abuja, Nigeria's capital city. Data was collected using structured questionnaire survey distributed to these contractors. The respondents aligned themselves to the 25 common risk factors identified from literature and classified into five broad categories. Statistical approach was used for data analysis. The study found that the five most significant factors in construction projects are: shortage of materials, late delivery of materials, shortage of equipment, poor quality workmanship and cash flow difficulties. All five significant risk factors fall under two broad categories of 'construction' and 'finance'. The findings of this study enhance better understanding of risks and assist contractors deal with various risks encountered in construction projects.

Keywords: Risks, risk factors, projects, construction industry, contractors, critical, significant, respondents, study, research.

INTRODUCTION

Compared to other business concerns, the construction industry and its clients are more widely exposed to high degree of risk owing to the complexity associated with coordinating the various activities and processes in the built environment. Furthermore, each project is unique and requires unique techniques and procedures for handling it. In reality, many projects fail to meet datelines, cost, quality and targets. This is no surprise when we consider that there is no perfect quantity surveyor (QS), no perfect engineer, no perfect designer, no perfect contractor, or perfect environment, for that matter. The core element of a project success is to meet the objectives of time, cost and quality, which are made difficult to achieve because of frequent changes and risk factors. In reality, changes cannot be eliminated in a project, but the risks can be managed (Ng & Loose more, 2007). In general terms, risk is directly linked to danger or harm that should be avoided. However, in project management, risk has two sides to it; as it portends danger (negative event) and opportunity (positive event). This position is strengthened by the objective of project management which is to increase the probability and impact of positive events and decrease the probability of and impact of negative events (PMI, 2008). Thus, risk is defined simply as the effect of uncertainty on a project's objectives. To manage a project successfully, risk management must be deployed as an essential part of project management. The purpose of risk management is to add value to project delivery and improve project efficiency in practice (Wood & Ellis, 2003). Consequently, risk management could be described as a coordinated set of activities and procedures used to control risks. To achieve project objectives, a proper risk management is necessary. The theory of risk management provides a systematic approach towards managing risks in general and risk identification in particular. Project management book of knowledge (PMBOK) uses the risk breakdown structure (RBS) framework where risks are showcased in categories and sub-categories that identify the main causes of risky events in a project (PMI, 2008). Information related to risks is gathered through a number of techniques such as brainstorming, checklists and Delphi performed by a team of experts and key stakeholders in order to produce consensus views on potential risks (Ghazali & Kabir, 2009; PMI 2008). To guarantee success of the process, risk identification should be an iterative process that takes place over the project lifecycle. Since contractors play a major role in the construction process, as they are directly involved in the physical activities of the projects, they should be directly involved in the risk control process during the construction works to ensure the overall success of project delivery (Tang, Qiang & Duffield, 2007). This study is focused on investigating the risk factors from the contractors' perspectives, with projects in Abuja, as case study.

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LITERATURE REVIEW

Construction industry is a key contributor to Nigeria's economic growth with activities ranging from construction of buildings, roads, power or energy infrastructure, water supply infrastructure, to other specific heavy engineering projects such as dams and reservoirs, gas and oil refineries, and air and seaports, amongst others. Every one of these activities involves risks in varying degrees. This makes risks one of the major considerations in managing projects, and a major contributor to a project's success. Unfortunately, risk management is not well practiced in the Nigerian construction industry due largely to insufficient knowledge of risk management. It is, therefore, important for construction practitioners to understand risk management, and what it entails, in order for them to embrace it as an asset in the handling of their projects (Zaini *et al.,* 2011). The risk management procedure is a systematic approach that involves nine steps which must be followed to ensure effective management of risk, namely; making risk management strategy, Identify the risk, Assess the risk, Apply risk Matrix, Negotiate the risk, Update risk assessment, Allocate the risk, Treat the risk, and Monitor and report. The first step in the risk management process is "making the risk management strategy", which must be adopted at the project planning stage of the project and implemented throughout the project lifecycle. The second step is to "identify the risk" associated with project. The process of identifying risks is achieved using several methods such as

brainstorming, prompt list, checklist, work breakdown structure (WBS), Delphi technique, or by asking expert (Lester, 2007). The third step is "assess the risk" to evaluate the effects of each risk on the project. A "risk Matrix" is then developed by checking the possibility of risk occurrence and the severity of its impact. The fifth step involves "negotiating each risk" amongst the parties involved in the risk management process. This step takes place after the contract has been signed, and is a very important step since it is closely tied to the next which reflects the risk management "Assessment updates" continuously. Next is to allocate the risk to the party that is more competent and has the expertise to handle the risk. This is followed by treating the risk in one of several ways such as: avoid, defer, accept, reduce, share, transfer, mitigate or insure the risk. The final step is to "monitor and control" the risk using a risk register, where the details i.e. type of risk, probability of occurrence, impact on the project, possible treatment, etc. are listed, monitored and amended. Several researchers have identified many risk factors in construction projects, and classified and prioritized them in different ways, depending on the thrust of their research. While some researchers classified them as internal risk factors, project risk factors and external risk factors; others classified them as construction risks, political risks, legal risks, economic risks, and operation risks. Some of the major risk factors identified include employer delay, lack of information from employer, conflict of interest and variation to changes, and difficulty following instructions. Risks associated to construction projects are attributed to five key factors, namely: financial, technical, politics, force majeure and social risks which impact project success and profit. This study has identified a total of 25 risk factors from literature and categorized them into the following five groups: construction, politics & contract provision, financial, design and environmental. Risk factors under construction group include those occurring due to faulty construction techniques, managerial issues, cost escalation and delay in construction. Under politics & contract provision are risk factors occurring due to legal changes and unsupportive government policies. Finance-related risk factors are those occurring due to inadequate hedging of revenue streams and financing costs. Design-related risk factors are those caused by faulty designs which impede constructability and are amended late. Environmental risk factors are those occurring due to lack of enforcement of laws and regulations, pollution, and ecological factors.

Table 1. Risk Factors identified from Literature

Risk Category	Risk Factor
	Land acquisition
	Shortage of equipment
	Shortage of material
	Late deliveries of materials
Construction	Poor quality of workmanship
	Site safety
	Insolvency of subcontractors
	Inadequate planning
	Weather
	Insolvency of suppliers
	Change in law and regulation
	Delay in project approval and permit
Politics & Contract	Inconsistencies in government policies
Provision	Excessive contract variation
	Poor supervision
	Bureaucracy
	Compliance with government
	Delay in payment for claim
Finance	Cash flow difficulties
	Lack of financial resources
Design	Improper design
	Change of scope
	Pollution
Environmental	Ecological damage
	Compliance with law and regulation for environmental issue

METHODOLGY

The research used the questionnaire survey for data collection which provided insights into the perception of construction practitioners, especially contractors, on the different risk factors identified, and their impact in construction projects. The target respondents were contractors registered and operating in Abuja, Nigeria's federal capital - which is also home to a sizeable number of construction projects. A total of 75 questionnaires were dispatched to a selected list of contractors registered in Abuja. The questionnaire was structured in two segments with the first part comprising detailed information about the respondent. The second part comprised questions requiring each respondent to respond to the questions asked as they relate to the risk factors listed therein. Five-point Liker scale was used to identify the significance of risk factors as follows: 1 = Not Significant, 2 = Slightly Significant, 3 = Moderately Significant, 4 = Very Significant, and 5 = Extremely Significant. Data collected from the survey was analyzed statistically using Relative Importance Index (RII) to establish the relative significance and ranking of the risk factors. RII was calculated using the formula:

$$\text{Relative Importance Index (RII)} = \frac{\Sigma (a1 * n1)}{A*N} \quad \text{.....Equation 1}$$

Where, a = constant expressing weight assigned to response
n = frequency of each response
N = total number of responses
A = the highest weight (5)

RESULTS AND DISCUSSION

Out of a total of 75 questionnaires dispatched, 55 were returned duly completed, giving a rate of return of 73.33%. The respondents were contractors registered in different categories with the government agency in Abuja, as summarized in Table 2. Majority of respondents were Category A, D and F contractors constituting 63.6% of the total, i.e. 21.8%, 20.0% and 21.8% respectively. That aside, 18.2% were registered as category E contractors. While category B and C contractors constituted 9.1% each. As shown in Table 2, 49.1% of the respondents had a working experience of 5 - 10years in construction projects, while 27.3% of the respondents had a working experience of 11 - 15years, and the remainder of 23.6% of the respondents had more than 15years of working experience. Reliability Test was carried out using Cronbach's Alpha Test, where alpha (α) coefficient of reliability test was used to establish the consistency of the data obtained. SPSS was calculated using the formula:

Chronbach's Alpha Test Formula

$$\alpha = \frac{N*c}{v+(N-1)*c} \quad \text{.....Equation 2}$$

Where, N = number of samples
c = average inter-item covariance among items
v = the average variance

The result obtained was 0.896, which indicates that the data obtained are highly reliable compared to the cut-off value of 0.7 given by George and Mallery (2003), Wong and Cheung (2005), and Ou and Yang (2008). The research found that the five (5) most important risk factors in construction projects are: shortage of material, late delivery of material, shortage of equipment, poor quality of workmanship, and cash flow difficulties. These top five factors are from two groups, namely; construction and finance. Amongst these, shortage of material, late delivery of material, and shortage of equipment/poor quality of workmanship, emerged as the top three (3) most significant risk factors in construction projects.

Table 2. Demographic characteristics of respondents

	Frequency	Percentage (%)	Cumulative %
Category of Contractors			
A	12	21.8	21.8
B	5	9.1	30.9
C	5	9.1	40.0
D	11	20.0	60.0
E	10	18.2	78.2
F	12	21.8	100.0
Working Experience			
5 - 10 years	27	49.1	49.1
11 - 15 years	15	27.3	76.4
Over 15 years	13	23.6	100.0

Table II. Ranking of Risk Factors

Risk Factor	RII	Rank	Group
Shortage of material	0.824	1	Construction
Late delivery of material	0.821	2	Construction
Shortage of equipment	0.810	3	Construction
Poor quality of workmanship	0.810	3	Construction
Cash flow difficulties	0.791	5	Finance
Inadequate planning	0.788	6	Construction
Insolvency of contractors	0.788	6	Construction
Bureaucracy	0.776	8	Politics & Contract provision
Insolvency of suppliers	0.773	9	Construction
Change in law and regulations	0.772	10	Politics & Contract provision
Lack of financial resource	0.770	11	Finance
Delay in payment of claim	0.751	12	Finance
Site safety	0.747	13	Construction
Change of scope	0.743	14	Design
Poor supervision	0.735	15	Politics & Contract provision
Weather	0.721	16	Construction
Delay in project approval and permits	0.683	17	Politics & Contract provision
Compliance with government	0.676	18	Politics & Contract provision
Land acquisition	0.634	19	Construction
Inconsistencies in government policies	0.596	20	Politics & Contract provision
Pollution	0.585	21	Environmental
Improper design	0.578	22	Design
Excessive contract variation	0.491	23	Politics & Contract provision
Ecological damage	0.467	24	Environmental
Compliance with law and regulation for environment issue	0.454	25	Environmental

Accordingly, they are ranked 1,2 and 3, in Table 3. These results are credible considering that material is a very important component in construction project and constitutes about 70% of the total value of a project (Enshassi *et al.,* 2003). Thus, any problem related to construction materials would have a significant effect on the project. Therefore, contractors and suppliers are to take necessary steps to ensure adequate availability of materials on site. This means, making sure that critical materials are delivered ahead of tasks requiring them, or on schedule, as the case may be. Timely delivery of materials to site will eliminate shortage of materials on the project. Equipment and personnel are major risk factors that should not be in short supply. In the rating of respondents, shortage of equipment and poor quality of workmanship, carry same weight and are tied in ranking in third position. This suggests that both impact project productivity equally and should be carefully factored into the project planning schedule to avoid disruption of progress. Contractors who handle more than one project at a time (as is often the case) are known to alternate the use of their equipment and personnel. They must take care to avoid clash in planning their projects. This is where a contractor's field experience comes into play. Inexperienced contractors may have a serious challenge maintaining a balance as they alternate the use of their equipment and personnel between sites. If not properly handled, shortage of equipment will occur, and poor workmanship cannot be ruled out either. Cash flow is a critical risk factor and places fifth in the ranking. This is no surprise because cash flow difficulties can hamper the procurement of materials and/or equipment and thus impede timely completion of the project. To avoid this, contractors must plan enough cash for the project to avoid financial problems.

CONCLUSION AND RECOMMENDATION

The findings of this research have shown that risk factors are components critical to achieving project objectives. Among other things, the research found that the most significant risk-contributing factors are shortage of material, late deliveries of material, shortage of equipment, poor quality of workmanship, and cash flow difficulties. All five emerged from two major categories, namely, construction and finance; with the top four risk factors belonging to the construction category, and the fifth from finance category.

This implies that to minimize the chances of project failure, the significant factors revealed by this research should be properly handled in the risk management process of the project. Considering the importance of materials in construction projects, material procurement and delivery should be properly planned and handled, factoring all associated risk factors into the mix, to ensure timely delivery to the project site. This is the surest way of meeting the project objectives. Equipment are key components in construction projects, without which little or no task can be successfully accomplished. Contractors must procure and properly plan the use of equipment in line with the project plan and schedule. Furthermore, since personnel are the operators of equipment and implementers of project tasks from start to finish, it is incumbent on the contractor to engage workmen with the right skill-sets and commitment to deliver high quality workmanship. And since cash drives all aspects of the project activity, a good cash-flow is necessary to facilitate the achievement of project success.

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