

RISK MANAGEMENT PRACTICES AND MILITARY CONSTRUCTION PROJECTS IN NIGERIA

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ABSTRACT

The construction industry has inadequate approach for managing risk and is highly risk-inclined. Several construction projects in Nigeria and throughout the world are prone to risk, despite the best efforts of all parties involved, they still have a high probability of performing poorly due to huge overbudgets and delivery delays. Therefore, this study intends to evaluate the risk management practices applied to construction project in military system in Nigeria. For the study, a survey research design approach was used. Data were gathered through the use of a standardized questionnaire. The sample size of the project's stakeholder includes 87 end users as well as 75 military engineers was chosen using convenient, random and purposive sampling techniques. 70 usable questionnaire were returned. The construct and content of the questionnaire were both used to validate it. The reliability was measured using Cronbach's Alpha, with $\alpha = 0.86$. The data analysis employed was multiple regression analysis. The findings of the study show that risk identification, monitoring and response have significant relationship with the timely delivery of military construction projects ($R = 0.705$; $p < 0.05$; $R^2 = 0.645$). From the results of the findings, it can be explained that managing the risk does not primarily mean avoiding risk but identifying it correctly and determining all associated opportunities and hazards, which will promote adequate response and mitigate the effects of the risk. The study recommended among others that risk management should be included in the curriculum as an examinable subject for all military cadets undertaking construction-related studies.

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1.0 Introduction

The construction industry is notorious for its inadequate risk management practices and high-risk inclination (Shen, 2019). Risks are associated with the construction industry and its projects work activities (Wang, 2020). In the construction sector, project achievement is mostly determined by the effectiveness of risk management process (Kartam & Kartam, 2018). The degree of risk rises with the growing number of contracting parties involved, including suppliers, owners, designers, contractors, and subcontractors (Iqbal, 2019). In using risk management techniques, this degree of risk can be reduced to tolerance level (Iqbal, 2015; Aleshin, 2017).

Construction industry projects come in different sizes (small, medium and large) and with these, there are diverse levels of risk impact (Hwang et al. 2017). The industry frequently experiences low level of performance as a result of the risk not being handled adequately (Iqbal, 2015). Due to their sizes, many infrastructure projects have enormous budgets and which sometimes resulted in significant financial losses, which are brought on by the numerous risks associated with these megaprojects. It was necessary to recognize and minimize these kinds of losses. Risk management refers to the entire identification and mitigation process of risk (Project Management Institute, 2016). Iqbal (2015) established a framework for risk management to document the importance of various hazards and the efficiency of risk management strategies used in building projects. Aleshin (2017) used risk event identification, classification, and assessment in his framework proposal for useful risk management advice for collaborative projects in Russia.

In his research, Iqbal (2015) itemized and ranked distinctive perils, risk management strategies to mitigate those risks, the state of risk management system implementation in businesses at the moment, and hindrances to efficient risk management in the construction sector. Furthermore, a risk model known as the "Alien Eyes Model" was presented, illustrating the impacted link between the dangers as well as hierarchical risk levels. In order to identify substantial risks and offer a plan that mitigates them from the contractor's perspective, Bing and Tiong (2016) provided a comprehensive risk assessment model that is useful for identifying significant risk variables and offers a mechanism that evaluates the discovered risk more effectively in order to identify and analyze the risks in the joint venture project.

As per legal description, Military Construction (MILCON) refers to any kind of development, construction, transformation, or expansion related to a military installation. This may be land

acquisition and Defense Access Road (DAR) construction, as well as temporary or permanent requirements. On each particular military post, the demand for facilities and supporting infrastructure is determined by the military missions of the units and establishments. As a result, facilities and supporting infrastructure may need to be replaced or transformed as the military base is relocated to or moved away from an installation, their missions change, or their buildings age and become obsolete or dilapidated. While significant alterations or the building of new facilities may be financed by operation and maintenance (O&M) funds, smaller repairs and construction may not.

An average military construction project receives a multi-year authorization, meaning it takes at least five years to go from an idea to a finished building. However, low-priority construction might take several more years to finish. Not every project that is submitted is included in the President's annual request for funding. The submittal for the upcoming year will only include those that have the highest priority and fit within the OMB's budgetary guidelines. Projects with lesser importance are categorized under the Future Years Defense Program (FYDP), the defense spending urge amount of time in plan that spans five years. As a result, some building projects can make it through the screening phase only to be added to the budgeting queue for submission in a subsequent year. Even so, a project's priority may alter because funding levels vary and the building list as a whole is evaluated once a year (CRS, 2016).

Therefore, one of the most crucial aspects of military construction management's execution is risk management, which primarily addresses the project's three main constraints: time, money, and quality.

2.0 Statement of the Problem

Several construction projects in Nigeria and throughout the world are prone to risk, despite the best efforts of all parties involved, there are high probability of performing poorly due to huge overbudgets and delivery delays. One of the main obstacles to the execution of building projects in Nigeria is the absence of sufficient risk management. Contemporary construction projects face a number of issues that call for an adequate, efficient and modern approach to risk management. In a military construction project, this could make it possible to accurately identify the causes that could result in a decrease, potential elimination, and ensuing improvement in totality performance of project (Hammed, 2022).

The fundamental issue with Nigerian construction projects is that the industry functions with disjointed, unconnected, and frequently contradictory components rather than being perceived and planned as an integrated whole and also fail to identify project as systematic process. This

frequently led to waste, ineffectiveness, and an inability to plan for overall development. The evaluation of construction risk on the overall performance of military building projects has not been the subject of many thorough studies.

In order to control risk in construction projects, avert cost overruns and schedule delays, researchers established a novel framework. However, they were unable to pinpoint the specific risk variables that contributed to these outcomes in the projects they assessed. Norman and Flanagan (2016). The majority of these researchers' studies examined the availability of construction risk management strategies using frequency analysis and the relative relevance index, respectively, without elaborating on how much the risk detected affects the project's timely completion and delivery.

Since timely delivery was used to gauge the success of military construction projects, this study concentrated on evaluating risk management practices in Nigerian military construction projects. Risk management practices were determined by effective risk identification, monitoring, and responses.

2.0 Literature Review

2.1 Conceptual Review

According to Fadun and Saka (2018), a risk is an unanticipated circumstance that makes it impossible for a construction project to be completed within the budget and timeline specified. Numerous academics Scholars have defined risk, taking into account the elements of chance or probability of occurrences as well as the potential for harm to project goals or objectives. In mathematics, the mean, dispersion, confidence interval, and other statistical characteristics are used to quantitatively express the probability of an event. To do a statistical analysis, pertinent data must be accessible. When there is lack of evidence, the decision-maker's expertise and experience play a crucial role in determining the likelihood of a negative outcome. Risk has an adverse effect on the projected costs, project schedule, and job quality in construction projects. (Pavel, 2017)

2.1.2 Risk Management

The idea of risk management is now widely used in many different types of enterprises. A lot of companies create risk management plans for their projects in an effort to increase output and profit margins. Currently, risk management is an essential component of project management

(Olsson, 2007; del Caño and de la Cruz, 2012). Compared to other industries, the construction sector was more prone to risk because of the complexity of its activities (Belel & Mahmood, 2012). Most Project managers are aware that risk management as the foundational building block of project management, which makes this process critical to the field (Baloi & Price, 2003). According to (Hillson, 2000), there is an affiliation between vagueness and risks. Specifically, risk is defined as "the uncertainty that cannot be measured, while uncertainty is the risk that can be measured." Moreover, there is a chance that a disastrous event will occur in the project and undermine its goals (Baloi & Price, 2003 and Yu, 2013).

Risk management can be defined as the process of detecting, assessing, and being able to use methods and strategies to minimize risks to a manageable level (Tohidi, 2011). Consequently, it is well known that the goal of risk management is to identify, assess, and mitigate risks in order to ensure the success of projects (Lee et al., 2009). The applications of risk management are numerous and vary depending on the situation. Risk management is a comprehensive and rational approach to identifying, assessing, and addressing risks in the context of construction project management in order to meet project objectives (Project Management Institute, 2004). Project risk management is a methodical process that focuses on identifying, evaluating, and mitigating project risks. Agerberg (2012) noted that separating threats from opportunities during both the identification and analysis phases would improve risk management procedures.

2.1.3 Risk Identification

Arguably, the most important element in the risk management process is risk identification (Banaitene & Banaitis, 2012). The goal is not to anticipate every future occurrence with absolute accuracy, but to identify prospective sources of risk that, should they materialize, could have a significant influence on a given project. According to Nnadi, Enebe and Ugwu (2018), risk identification is the first stage of risk management, and its goal is to list every risk that could arise while the project is being worked on.

2.1.4 Risk Monitoring

When it comes to putting the risk management approach into practice, ongoing observation and evaluation of possible hazards are crucial. Risk monitoring ensures that emerging hazards are identified and controlled. A fundamental tool utilized in management meetings should be a list of the major hazards that have been identified for therapeutic action, which the project manager should keep an eye on (Cooper et al., 2005). As the last stage of the procedure, this

one is just as crucial as the others. When new information becomes available, the risks can be reevaluated for likelihood and impact, and if a possible risk event has passed, they can be taken off the risk register (Winch, 2010).

2.1.5 Risk Response

The third step in the process of risk management denotes what measures should be made towards the several risks and earlier recognized threats (Mhetre et al., 2016). According to Dosunmu (2018), risk response involves identification of risk management plan, considering limits to achieve risk management objectives, evaluate cost and benefits of identifying risks, finding out the effectiveness of available controls and risk management responses, prioritizing risks that cause great losses and identifying up to rate business continuity plan.

2.2 Prospect Theory

Decision-making methods should ideally be taken under conditions in which all factors that determine predictable outcomes are adequately met. However, decisions are often made under conditions of uncertainty and risk. A certainty or ideal conditions has never been seen in running construction projects. In most cases a project manager made a decision about a particular event by assessing rationally or intuitively, with a degree of certainty, using information about similar past events or his personal experience as a basis for his decision making (Lawrence, 2015).

2.3 Empirical Review

In 2008, Fadun and Saka examined risk management. Critical success factor (CSFS) in Nigeria's construction industry Data was gathered from construction companies that operating in Lagos, Port-Harcourt, Abuja, and Onitsha using a survey research design. Effective communication and stakeholder commitment are the primary success factors to be taken into consideration for effective risk management, according to the results of the exploratory factor analysis used to evaluate the data. Lawrence (2015) investigated how Rwandan construction projects were affected by risk management techniques used in the planning phase. A Mixed method was used with the aid of a structured questionnaire and interview for gathering from selected clients, regulators, and contractors. Pearson Moment Correlation was used to analyze the data collected. Cost, safety and environmental sustainability were variables identified for this study.

Ekatina (2008) evaluates the risk management procedures used in the Swedish construction industry's procurement process. Data were gathered from construction companies operating in Sweden's major and minor cities using a survey research design, and the data were then analyzed using descriptive analysis. The results show that the main limitation in this study is the procurement alternatives.

3.0 Material and Methods

For this study's objectives, a survey research design was chosen. Primary data was gathered from the 85 military engineers who worked on the Nigeria Army College of Logistics' construction headquarter as well as the 72 end users of the building respectfully through the use of a questionnaire. 70 usable questionnaire were returned for both the military engineers and end users. For the investigation, a multi-stage sampling approach was employed, among these are convenient, randomized, and purposeful sampling. The study instrument's validity was examined using both content and construct validity. Cronbach's coefficient was utilized to determine the instrument's reliability, and the result was $\alpha = 0.88$. Using the statistical package for social sciences (SPSS), Mean and standard deviation and multiple regression analysis were used to analyzed the data collected this study.

4.0 Data Presentation, Analysis and Interpretation

Table1: Risk Identification

	N	Mean	Std. Deviation
Check List	70	4.1286	.86680
Brainstorming	70	4.1429	.85611
site visit	70	3.8000	.97207
using risk data compiled from previous experience	70	3.7857	1.04802
Case-based approach	70	3.7143	1.02353
Valid N (listwise)	70		

Source: Authors' Fieldwork (2024)

The top attributes of the risk identification process when arranged in order of priority based on the mean value are 'brainstorming techniques (4.1429)', checklist (4.1286), site visit (3.8000),

using risk data compiled from previous experience (3.7857), case base approach (3.7143). The most important risk identification is using risk data compiled from previous experience with a standard deviation value of (1.04802) showing how close the respondents' responses on the attribute are to the mean. This implies that this attribute is a major factor to be considered for the successful implementation of risk identification.

The next most important risk identification attribute is case based approach with a standard deviation value of (1.02353) showing how close the respondents' responses on the attribute are to the mean. This suggests that a case-based approach will enhance risk identification. The next most important attribute of risk identification is site visits with a standard deviation of (.97207) showing how close the respondents' responses on the attribute are to the mean. This implies that effective site visit plays a very vital role in risk identification. The next most important attribute of risk identification is a checklist with a standard deviation value of (0.86680) and the least is brainstorming with the least rating on the priority order of (.85611). Although this attribute had the lowest means in order of priority, taking time to practice it too would more likely improve risk identification.

Table:2 Risk monitoring methods

	N	Mean	Std. Deviation
periodic document review	70	3.6000	.99855
effective budget control	70	3.8714	1.10232
periodic risk status report	70	3.6000	1.23241
periodic trend reporting	70	3.4857	1.20076
milestones are identified and written	70	3.6571	1.21447
Valid N (listwise)	70		

Source: Authors' Fieldwork (2024)

The top attributes of the risk monitoring methods process when arranged in order of priority based on the mean value are effective budget control (3.8714), milestones are identified and written (3.6571), periodic document review (3.6000), periodic risk status report (3.6000), periodic trend reporting (3.7143). The most important risk monitoring method is a periodic risk

status report with a standard deviation value of (1.23241) showing how close the respondents' responses on the attribute are to the mean. This implies that this attribute is a major factor to be considered for successful risk monitoring methods.

The next most important risk monitoring methods attribute is 'milestones are identified and written' with a standard deviation value of (1.21447) showing how close the respondents' responses on the attribute are to the mean. The next most important risk monitoring methods attribute is periodic trend reporting with standard deviation of (1.20076) showing how close the respondents' responses on the attribute are to the mean. This implies that periodic trend reporting plays a very vital role in the success of risk identification. The next most important attributes of risk monitoring methods are effective budget control with the standard deviation value of (1.10232) and least is periodic document review with the standard deviation of (.99855). Although this attribute had the lowest means in order of priority, taking time to practice it too would more likely improve risk monitoring methods.

Table:3 Risk Response methods

	N	Mean	Std. Deviation
avoid the risk	70	3.9143	3.87389
reduce the likelihood of occurrence	70	3.7286	1.29572
reduce the consequences	70	3.4571	1.24744
transfer the risk	70	3.2857	2.63281
Contingencies	70	3.7286	1.30685
Valid N (listwise)	70		

Source: Authors' Fieldwork (2024)

The top attributes of risk response were arranged in order of priority based on the mean value are 'avoid the risk' (3.9143), reduce the likelihood of occurrence (3.7286), contingencies (3.7286), reduce the consequences (3.4571), transfer the risk (3.2857). The most important risk response method attribute is to avoid the risk with the standard deviation value of (3.87389) showing how close the respondents' responses on the attribute are to the mean. This implies

that this attribute is a major factor to be considered for the successful implementation of a risk response method.

The next most important risk response method attribute is the transfer of the risk with a standard deviation value of (2.63281) showing how close the respondents’ responses on the attribute are to the mean. This suggests that transferring the risk will enhance risk response methods. The next most important risk response method is contingencies (1.30685) showing how close the respondents’ responses on the attribute are to the mean. This implies that contingencies among the project team play a very vital role in the success of the risk response method. The next most important attribute of the risk response method is reducing the likelihood of occurrence with the standard deviation value of (1.29572) and the least is reducing the consequences with the least rating on the priority order of (1.24744).

Table:4 Timely delivery

	N	Mean	Std. Deviation
the risk management practices used to enhance the accuracy of design calculation	70	3.9714	1.14172
completeness of final design deliverables is adequately promoted	70	3.8571	1.02555
prompt acceptance of design deliverables is enhanced	70	3.7143	1.15649
project is delivered according to the agreed timeframe	70	3.8143	1.19532
accuracy of pre-construction cost estimate is adequately enhanced	70	3.6714	1.21251
Valid N (listwise)	70		

Source: Authors’ Fieldwork (2024)

The top attributes of the timely delivery process when arranged in order of priority based on the mean value are ‘the risk management practices used to enhance the accuracy of design calculation (3.9714), completeness of final design deliverables are adequately promoted (3.8571), the project is delivered according to agreed timeframe accuracy of pre-construction (3.8143), prompt acceptance of design deliverables are enhanced (3.7143), cost estimate are

adequately enhanced (3.6714). The most important attribute in timely delivery is the completeness of final design deliverables are adequately prompted with the standard deviation value of (1.19532) showing how close the respondents' responses on the attribute are to the mean. This implies that this attribute is a major factor to be considered for the successful implementation of timely delivery.

The next most important timely delivery techniques attribute is 'prompt acceptance of design deliverables are enhanced with the standard deviation value of (1.15649) showing how close the respondents' responses on the attribute are to the mean. This suggests that prompt acceptance of design deliverables is enhanced, for timely delivery. The next most important timely delivery attribute is the risk management practices used to enhance the accuracy of design calculation with a standard deviation of (1.14172) showing how close the respondents' responses on the attribute are to the mean. This implies that risk management practices are used to enhance the accuracy of design calculation. The next most important attributes of timely delivery are 'cost estimates are adequately enhanced with the standard deviation value of (1.21251) and the least is 'completeness of final design deliverables are adequately promoted on the priority order of (1.02555). Although this attribute had the lowest means in order of priority, taking time to practice it too would more likely improve the timely delivery.

4.1 Research Hypothesis

Hypothesis

Risk identification, risk monitoring and risk response practices do not have any significant relationship with timely delivery of a project.

Table:5 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.705 ^a	.645	.543	.12594

a. Predictors: (Constant), Risk identification, Risk monitoring and Risk response

The model summary table (table 5) above shows that risk identification, risk monitoring and risk response have a strong positive relationship with the timely delivery of the project (R = 0.705). This implies that, when a holistic approach is made to risk management (i.e. making

efforts on risk identification, risk monitoring and risk response at the same time), the timely delivery of the project will be enhanced. The model further shows the extent to which risk identification, risk monitoring and risk response account for variation in the timely delivery of a project. The coefficient of multiple determination ($R^2 = 0.645$) shows that 64.5% of the change in the timely delivery is accounted for by risk identification, risk monitoring and risk response.

Table: 6 ANOVA^a

Model	Sum of Squares	Df	Mean Square	F	Sig.
1	.017	3	.006	.386	.036 ^b
Regression					
Residual	.675	42	.016		
Total	.692s	45			

a. Dependent Variable: Timely delivery

b. Predictors: (Constant), Risk identification, Risk response, and Risk response

Table 6 indicates whether the regression model predicts the dependent variable significantly well.

This indicates the statistical significance of the regression model that was run. Here, *p*-value (0.036) indicates that, overall, the regression model statistically significantly predicts the outcome variable (i.e., it is a good fit for the data).

Table: 7 Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.692	.377		12.450	.000
	Risk identification	.008	.072	.022	.120	.005
	Risk monitoring	.073	.085	.160	.877	.035
	Risk response	.017	.069	.039	.233	.017

a. Dependent Variable: Timely delivery

An evaluation of the unstandardized coefficients of risk identification, risk monitoring and risk response in the coefficient table (table 7) and their associated p-values show that risk identification ($\beta_{TC} = 4.532$, $p < 0.05$), risk monitoring ($\beta_{CC} = 4.532$, $p < 0.05$), and risk response ($\beta_{RC} = 4.532$, $p < 0.05$) are statistically significant and can be used in enhancing timely delivery of a project.

$$\text{Timely delivery} = 4.532 + 0.008 \text{ RI} + 0.073 \text{ RM} + 0.17 \text{ RR}$$

4.2 Discussion of Findings

The findings of this study reveal that risk identification, risk monitoring and risk response contribute significantly to the timely delivery of military construction projects ($R = 0.705$; $p < 0.05$), ($R^2 = 0.645$). Therefore, the null hypothesis was rejected and the alternative was accepted. This implies that appropriate risk identification, risk monitoring and risk response would promote the timely delivery of military construction projects. This is in agreement with the work of Saurabh, Vaidahi, Priyal, Pranita and Swati (2022) that affirmed that effective risk management will enhance operational requirements and prevent construction projects from being delivered with a cost overrun, which might eventually lead to project failure. This was further corroborated by the study of David (2017), which indicated that insufficient risk management implementation will lead to the biggest obstacle of project delay. The study of Pavel (2017) also affirmed that a construction project's risk identification and analysis play a vital role in project success of a construction project. The findings of this study shows that management of risk does not primarily mean avoiding risk but identifying it correctly and determining all associated opportunities and hazards, which would promote adequate response that will mitigate the effect of risk.

5.0 Summary

The main goal of this research was to assess the risk management techniques employed in Nigerian military construction projects. The risk management technique was measured using risk identification, risk assessment and risk response, while the success of the project was measured using timely delivery. The feasibility of the elimination of all the risks affiliated with a certain project is unlikely. The best that can be achieved is the regulation of the risk allocated to various groups along with the proper management of the risks. The choice decisions of the projects are fundamental to both stakeholder management, the management of the risks and

unpredictability. Therefore, an integrated mechanism can be established depending on a balanced inducement and risk-sharing technique to contracting alongside a better practice methodology to risk management in terms of the entire life cycle of a project in which contractors usually are aimed at obtaining an acceptable scope of excess margin.

5.1 Conclusion

Considering the effects that risk management has on a project's goals in the form of quality and time, it should be an open and conscious process through all phases of the project. The aim of the paper was to examine the effect of risk management employed in the military construction projects in Nigeria and the extent to which the actors involved in risk management through the different phases of the project. For this purpose, we conducted a questionnaire survey of military construction engineers and the end-user of the project. The overall conclusion is that risk management is strongly linked to the production phase. Most of the risk processes are performed in that phase and contractors tend to be the most active group with a large influence on the risk management process. These findings show that, if risks are to be properly managed, the risk management process must promote effective risk identification, risk monitoring and risk response within each phase. It is the lack of an iterative approach to risk management that is a weakness in current risk management practices and this aspect must be addressed if the risk management process is to serve projects and, thus, their clients. Implicit in this thinking is that the project's other actors will be better able to cope with circumstances that might threaten the time, cost or function of the project if they can be engaged in the risk management process from the outset. A shift from project-oriented to process-oriented risk management is required in order to manage project risks successfully.

5.2 Recommendations

This research project recommends a formal and structured risk management practice during project planning and with the involvement of construction professionals and end users. It also suggested that a risk management course should be included in the curriculum as an examinable subject for all military cadets undertaking construction-related studies. Continuous development seminars in risk management for all professionals in construction projects planning and procurement departments of Nigeria military should be vigorously pursued. Lastly, it was suggested that qualified project managers who are either architects or engineers be included in all construction projects' site selection, needs identification, and preliminary budget and schedule development.

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