

RISK MANAGEMENT IN PUBLIC SECTOR CONSTRUCTION PROJECTS

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Abstract

Every construction project requires risk management by default, even to comply with health and safety standards and regulatory requirements. Although there may be oodles of risks in a construction project, knowing what these risks are, and managing them effectively with professional skill could mean the difference between success and failure of the project. And public sector construction projects are not exception to this. This study investigates how risks are managed in public construction projects. To this end, research data were sourced from stakeholders of public construction projects using both structured and self-administered questionnaires. Field data analysis using simple statistical tools involving percentage, mean and measures of dispersion indicated that, public organizations neither possess any officially established teams nor any officially approved risk assessment approaches to manage risks in the execution of public construction projects. Suffice to say that, public organizations predominantly manage construction risks by 'rule of thumb'. The analysis further revealed that, most 'big name' construction firms that handle public construction projects are also in possession of neither risk management teams nor specific construction risk assessment approaches in handling construction risks. To accord 'construction risk management' the prominence it deserves in public bureaucracies, the study recommended among others, (i) The establishment of Risk Department/Units in those public organizations, Departments and Authorities that oversee public construction projects, (ii) That, Capabilities to manage 'construction risks' be accorded high priority in the appointment of contractors in public construction projects, and (iii) Statutory Risk Agency to be established at every level of the government to synchronize construction risk allocation, sharing and transfer between public organizations and their construction contractors.

1.0 INTRODUCTION

We often hear stories of public construction projects engulfed in poor quality of work, disputes, claims, variations, delays, reviews, re-awards, and even complete termination. All these are clear features of failure in construction projects. A project is only successful when it is completed on time, within budget, and in accordance with quality and performance standards specified in the contract documents. Unless this is achieved, the project is said to be at the mercy of construction risks and therefore, remains either a failure or subject to failure. In other words, the success or failure of a construction project depends entirely on 'management' of its risks. This study is aimed to investigate how 'risks' are managed in public sector construction projects so as to identify its inadequacies and proffer solutions to them. It is intended to bridge the gap between success and failure of public construction projects and therefore to serve as a foundation for enhanced institutional performance in public sector construction practice

2.0 LITERATURE REVIEW

2.1 RISK IN CONSTRUCTION

In simple terms, risk is any plausible occurrence with adverse outcome. Hence, construction risks are possible events that are bound to cause negative impacts in project execution. In contrast to activities in many sectors of human endeavor, construction is invariably a very risky adventure as it largely involves the use of hazardous materials; crews working under precarious situations; movement of automobiles; operation of heavy plant and equipment; complicated supply and logistic chains; interdisciplinary workforce; participation of many independent organizations; steep and sharp item lingering around; et cetera, all of which can sour into risks in the course of execution of the project. Another bane of risks in construction project execution is unexpected occurrences, which include natural disasters and unknown underground conditions such as buried debris, rocks, loose soil, waste materials, and explosives (Blunt, 2028).

2.2 SUSCEPTIBILITY TO RISK IN CONSTRUCTION

We often hear stories from the construction industry of projects being delayed, halted or even terminated completely; final cost of projects shooting far beyond budgeted figures; non-adherence to design specifications; lengthy legal battles between stakeholders; stakeholders experiencing bankruptcy before project completion; stakeholders rounding up with razor-thin profit margins or even losses; accidents; etc. These are all risks and their repercussions in construction projects (Netscher, 2022).

Therefore, it is not only the client who is susceptible to construction risks. The contractor, workers, subcontractors, suppliers, vendors, etc all do experience their own share of risks in construction project. While there are risks that are the same for a number of stakeholders, other risks are only specific to a particular stakeholder. For example, when the project is running behind scheduled completion time, it is not only the client who will exclusively endure the risk--- the contractor and his subcontractors are also at the receiving end. Whereas, it is only the contractor that will be affected when the project is completed at a loss. However, notwithstanding who bears it, a risk in construction is invariably detrimental to completion of the project on time, within budget, and to specifications (Gerardi, 2021).

2.3 RISK MANAGEMENT IN CONSTRUCTION PROJECTS

As indicated earlier, risk is detrimental to successful completion of construction project and this therefore implies that, the only key to hitch-free delivery of construction project is to reduce all elements of risk to the barest minimum (Jones, 2022). However, PlanRadar (2021) suggested that getting fully prepared for everything that could go wrong is the best way to minimize risk in construction project. Incidentally however, 'Risk Management' is all about this preparation for 'everything that could go wrong'. Accordingly, Malsam (2022) defined construction risk management as:

"The process of evaluating and implementing procedure to reduce the impact of risks in construction projects".

To further buttress the importance of risk management in construction undertakings, Netscher (2022) opined that, since risks are bound to threaten every project, having knowledge of these risks, and taking steps to lessen or mitigate them, could mean the difference success or failure of the project. In

essence, a combination of effective risk management plan and a team with the right skillset serves the foundations for successful accomplishment of construction projects. Nonetheless, to enhance team effectiveness, it is worthwhile for risk management team members to command proper and intimate knowledge of the types of risks inherent in construction projects.

2.3 TYPES OF RISK IN CONSTRUCTION PROJECTS

Some literatures were reviewed to understand the various challenges faced in construction project execution. However, it is understood in the course of the review that, there is a wide range of subjectivity in compilation and categorization of construction risks. This subjectivity is merely due to individual interpretation and presentation pattern of the subject matter. And, although there are some overlaps and nuances between them, there is no one compilation or categorization of construction risks which can be said to be inherently more important, or riskier, than any other. Every risk in construction is assessed and managed on its individual merit. The 20 construction risks compiled by Machina (2023) are presented below only to proffer an idea of the types of risk inherent in construction projects.

1. Errors, emissions & delays in designs/estimates.
2. Natural disasters
3. Poor weather conditions
4. Liquidated damages
5. Stop-work orders
6. Disputes
7. Poorly written contracts
8. Labour shortage and use of untrained workers
9. Poor definition of project scope
10. Unknown site conditions
11. Increase in cost of materials
12. Transportation facilities, plant and equipment
13. Poor project management
14. Change orders
15. Safety hazard
16. Site security
17. Unrealistic payment schedules
18. Socio-political issues
19. Non-availability of construction materials
20. Inflation, local taxes, Interest & foreign - exchange rates.

2.4 STEPS IN RISK MANAGEMENT OF CONSTRUCTION PROJECTS

There is no one-step-fit-all procedure for risk management in construction projects. This

notwithstanding, a project team with the desirable expertise, who can correctly and sincerely make use of the risk management procedure, is required as linchpin to deliver the project to the Promised Land. In reality however, a risk management procedure should be able to reduce both the occurrence and magnitude of adverse events in construction projects (Indeed, 2022).

The risk management steps to be used for this study are as follows;

- A. Identification
- B. Prioritization
- C. Avoidance
- D. Transfer
- E. Elimination and mitigation
- F. Acceptance
- G. Risk management plan
- H. Implementation, monitoring and control
- I. Reporting

A. Identification

Having known the various risks inherent in construction projects, the first step in risk management is to identify those risks that are unique to the project concerned. This is done preferably during the pre-contract stage of the project. The consequences of failure to identify risks early enough in project execution is explained by Jones (2020), thus:

“If you fail to identify and manage a potential project risk, you are basically

accepting the risk should it present itself during your project”.

Here, the expertise, experience and knowledge base of the risk management team will come into play. The team is expected to brainstorm with other stakeholders for collaborative insight into as many scenarios as possible that could derail the project. Historical data on past construction projects can gainfully be explored for information and references.

The brainstorming session between the risk management team and other stakeholders should be on regular basis throughout the construction, from inception to completion of the project. This is to identify any emerging adverse scenario over the course of the project (Church, 2022; Jones, 2020; Andony, 2022; BigRentz, 2022; and Malsam, 2022).

B. Prioritization

After identifying the risks unique to the project, we then prioritize them based on the following two factors:

- i. Probability of their occurrence
- ii. The impact they will have on the project if they occur.

We rank each of the two factors i.e. probability and impact, on every risk as high, medium or low. We can factor in the amount of time, money, and work each risk will require to guide our analysis. However, the 3 by 3 priority matrix in figure 1 could be of assistance in prioritization.

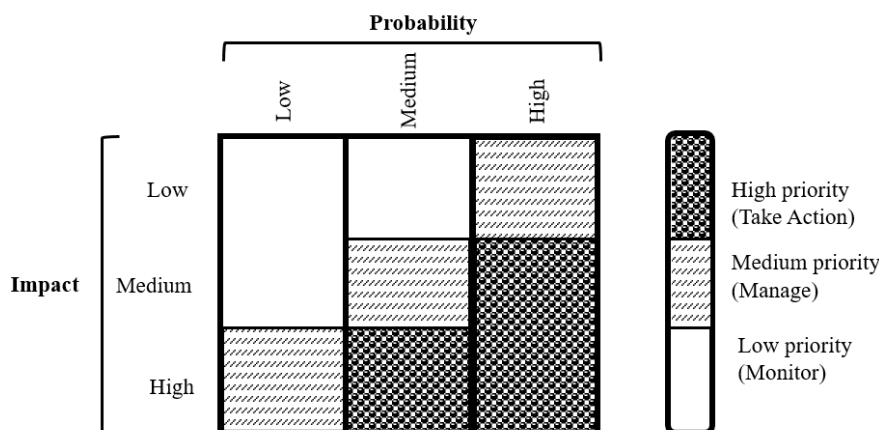


Figure 1: Priority Matrix

Source: Church (2022) & BigRentz (2022)

Each project risk falls into one of the nine grid fields of the priority matrix. In risks analysis, high probability risks with high impact are given high priority, and low probability risks with low impact are ranked under low priority (Church, 2022; Blunt, 2020; Jones, 2020;

Andony, 2022; BigRentz, 2022; Malsam, 2022; Strokes, 2018)

C. Avoidance

Stakeholders who lack the wherewithal to handle particular major risks should steer clear from (that is, avoid) such risks. Avoiding a risk could at times entails turning down the project

or negotiating the contract to remove the risk. For example, a contractor who is awarded a building contract in an area highly prone to natural disaster, like earthquake, should have no other choice than to turn down the project or re-negotiate the contract (Church, 2022; Jones, 2020; Andony, 2022; BigRentz, 2022; Indeed, 2022; Gerardi, 2021; Strokes, 2018). Jones (2020) said:

“There’s no shame in walking away from a project if the risks outweigh the potential rewards”.

D. Transfer

There are risks that cannot be avoided and that the stakeholder concerned is not fitted enough to manage the risk. When such situation prevails, the stakeholder should liaison with other stakeholders to iron out who among them can assume the risks. Contract documents should clearly define line of demarcation between client’s own risks and other stakeholders’ risks. There are certain risks in the construction process that can also be transferred to insurance providers (Church, 2022; Jones, 2020; Andony, 2022; BigRentz, 2022; Indeed, 2022; Gerardi, 2021; Strokes, 2018).

E. Elimination and Mitigation

Some risks that are unavoidable and untransferable can be addressed through elimination or mitigation. While elimination is getting rid of (or truncating) the occurrence of a risk, mitigation is reducing or lessening the likelihood and/or impact of the risk. For example, the risks associated with losing the only expert who handles a particular job in an organization can be eliminated by making contingency arrangement with similar expert outside the organization; or the risk involved in lifting construction materials manually to upper floors can be eliminated by hiring a mechanical crane to do the job. The option of providing proper safety training and insistence on the use of Personal Protective Equipment (PPE) on the other hand, can mitigate the occurrence of accidents on sites (Church, 2022; Jones, 2020; Andony, 2022; BigRentz, 2022; Indeed, 2022; Gerardi, 2021; Strokes, 2018).

F. Acceptance

Those risks which cannot be avoided, transferred, eliminated, and mitigated could be accepted. Jones (2020) said:

“Agreeing to accept a risk is a decision that shouldn’t be taken lightly. It might be fine to accept a few low probabilities, low impact risks. Agreeing to accept a high probability, high impact risk without

any type of management or mitigation could be detrimental to the project and your bottom line”.

The acceptance of any risk should be accompanied by a fallback plan and contingency arrangements for its likely occurrence in the course of the project. According to Church (2022), acceptance of risks in construction can be passive or active. Further claiming that, passive risk acceptance incorporates the risk into the fallback plan but requires no action on it except for review from time to time for fear of escalation. Whilst, active risk acceptance requires the risk to be included into the fallback plan with proactive contingency remedial measures for its occurrence in the future (also see Church, 2022; Jones, 2020; Andony, 2022; BigRentz, 2022; Indeed, 2022; Gerardi, 2021; Strokes, 2018).

G. Risk Management Plan

Risk management plan is a comprehensive document that details the entire risk management process including identification, assessment and evaluation, mitigation measures, and monitoring and control. The foregoing steps of risks management which started with Identification through Assessment, Avoidance, Transfer, Elimination and Mitigation to Acceptance are all part of the risk management plan. The risk management plan is drawn into full-blown scale as soon as decision becomes matured on those risks to be eliminated, mitigated and accepted (Church, 2022; BigRentz, 2022).

To expatiate on the content of a full-blown risk management plan, Big-Rents (2022) said:

“A risk plan optimizes your risk response strategy, detailing crucial information set of solutions to either mitigate, transfer, or accept the risks. In addition to stating priority, an effective plan should detail resources for each of your defined risks”.

Therefore, risk management plan can simply be said to a document that details risks and processes for addressing them.

H. Implementation, Monitoring and Control

Implementation of risk management plan is always an on-going process from identification of risks up to completion of the project. Similarly, monitoring and control of any implementable aspect of the plan also starts and ends alongside with its implementation. Implementation, monitoring and control of risk management plan requires a team with the

most-suited expertise, experience and knowledge base to effectively manage the execution of risk plans and monitor any triggering challenges over the course of the project (BigRentz, 2022; Indeed, 2022; Malsam, 2022; Strokes, 2018)

I. Reporting

A copy of the risks analysis document, which contains an analysis of the risk management plan, should be made available to every stakeholder. Risk report on the other hand, is another document that provides stakeholders with periodic feedback on risk management status of the project. It keeps stakeholders informed on the effectiveness (or otherwise) of implementation of the risk management plan. It also keeps them ‘in the know’ of any impending new risk and its associated implications on project objectives (BigRentz, 2022).

3.0 METHODOLOGY

3.1 DATA COLLECTION

Forty (40) organizations, comprising of twenty (20) government-owned and twenty (20) private, were randomly sampled for field data collection in the work. These organizations were sampled from the following two categories of organizations:

1. Those public organizations that are statutorily charged with responsibility of overseeing the design and construction of public construction projects. Specifically, these organizations are Ministries of Works/Housing, Works Departments in public establishments and Housing Authorities.
2. Those private organizations that undertake design and/or construction of public construction projects.

Both structured and unstructured instrument were utilized in sourcing field data for the study. Whilst the structured facilities were in the form of questionnaires, the unstructured tools were by means of self-administered questionnaires. The target respondents in both methods of field data collection were Chief Executives of the organizations sampled for the study. Field investigations were centered on the following two major areas of construction risk management:

1. Risk Management Team (RMT): Investigations were conducted as to the existence of any RMTs that are charged specifically with the responsibility of construction risk management in both the private and public organizations sampled for the study.
2. Construction Risk Assessment (CRA): The pattern and effectiveness of CRA approaches in each organization were also investigated.

3.2 DATA PRESENTATION

A total of thirty-two (32) Chief Executives of organizations, 17 public and 15 private, responded. This response represents 80% of the total number of Chief Executives contacted for field study. However, this response rate is considered adequate enough for research analysis in consideration of Moser and Kalton’s (1971) assertion that the result of a survey could be considered as biased and of little value if the return rate was lower than 30-40%.

The data obtained on the existence of RMTs are presented in table 1, whereas those obtained on the use of any specific CRA approaches are presented in table 2.

Table 1: Presentation of data on the existence of RMTs

Response	EXISTENCE OF RMTs		Total
	Public Orgs	Private Orgs	
No Response	3	5	8
No	17	12	29
Yes	0	3	3
TOTAL	20	20	40

Table 2: Presentation of Data on the existence of specific CRA approaches

Response	Existence of Specific CRAs		Total
	Public Orgs	Private Orgs	

No Response	3	5	8
No	17	10	27
Yes	0	5	5
TOTAL	20	20	40

3.3 DATA ANALYSIS

Data collected are analyzed using simple statistical tools involving percentages, measures of central tendency and measures of dispersion. Just as the field investigations were centered around two areas of risk management, analysis

of data obtained from the field also takes the same pattern. The two areas of concern are (1) Risk Management Team (RMT) and (2) Construction Risk Assessment (CRA) and analysis of field data obtained on them are given below in 3.3.1 and 3.3.2 respectively.

3.3.1 ANALYSIS OF DATA ON RISK MANAGEMENT TEAM (RMT)

The data obtained on Risk Management Team (RMT) are given on table 1 and they are analyzed as follows:

Response	Value(x)	Frequency (f)	Percentage	Valid Percentage	Cum Percentage
No Response	0	8	20	20	20
Yes	1	3	7.5	7.5	27.5
No	2	29	75.5	75.5	100

Mean = $\Sigma fx / \Sigma f = 61/40 = 1.525$ Standard Deviation = $\sqrt{\Sigma fd^2 / \Sigma f} = \sqrt{25.99/40} = 0.806$

3.3.2 ANALYSIS OF DATA ON CONSTRUCTION RISK ASSESSMENT (CRA)

The data obtained on Construction Risk Assessment (CRA) are given on table 2 and they are analyzed as follows:

Response	Value(x)	Frequency (f)	Percentage	Valid Percentage	Cum Percentage
No Response	0	8	20	20	20
Yes	1	5	12.5	12.5	32.5
No	2	27	67.5	67.5	100

Mean = $\Sigma Fx / \Sigma f = 59/40 = 1.475$ Standard Deviation = $\sqrt{\Sigma fd^2 / \Sigma f} = \sqrt{25.99/40} = 0.806$

4.0 RESULT AND DISCUSSION

Results on the existence of Risk Management Team (3.3.1) indicate that, even though 8 organizations (representing 20% of the organization contacted) did not respond, 75.5% of them confirmed the absence of RMT in their various organization. Only 7.5% of them were in possession of standing RMT. This revelation does not augur well to public sector construction practice and need to be reversed. Furthermore, the result on the availability of any Construction Risk Assessment (CRA) approaches in the various organization contacted, as shown in 3.3.2, is not encouraging as 67.5 % of the organizations contacted for data collection do not possess any standard CRA approach for risk management of public construction projects. This also signifies another huge setback in public sector construction practice.

Even though table 2 indicates that there are some private organizations with specific CRA approaches for conducting pre-contract assessment of construction risks, table 1 on the other hand, reveals that assessed risks in some of these organizations were not managed by

RMTs. However, all those category of private organizations that possess RTMs to manage construction risk were understood to be multinational construction companies who, by standard, are expected to command high level in-house risk management experts. This means, the other category of organizations, with specific CRA approaches and no RMTs, were not actually multinationals companies but they have the expertise to assess and prioritize project risks for the project manager to handle in the course of project execution.

It is also clear from both tables 1 and 2 that, there are neither any officially established (standard) RMTs nor specific CRA approaches for construction risks management in public organizations. Suffice to say that, construction risks are predominately managed by ‘rule of thumb’ in public bureaucracies. This therefore, suggests the need for corrective measures to salvage the situation.

5.0 RECOMMENDATIONS

The following recommendations are hereby made to enhance effective and timely delivery of public construction projects.

1. Establishment of Risk Departments

To give 'construction risk management' the rightful attention it deserves in public bureaucracies, it is hereby recommended that Risk Department/Unit be established in every public organization (or department) that oversee public construction projects. The overseer organizations/departments in reference are Ministries of Works/Housing, Works Departments in local government areas and other public establishments, and Housing Authorities.

2. Establishment of Risk Agencies

There should be a statutory Risk Agency at all levels of the government to synchronize risk management strategies of public organizations and their construction contractors. These Agencies are to be statutorily charged to oversee the allocation, sharing and transfer of construction risks between public organizations and their contractors. The Agencies are to be constituted mainly by skilled construction professionals with risk management background and knowledge base. Legal personnel from Ministries of Justice can be co-opted into the Agencies to assist in legal matters.

3. Appointment of Contractors

Capabilities should be given prominence in the appointment of contractors in public construction projects. In addition to managerial and financial capabilities, contractors should possess the wherewithal to effectively manage construction risks. Risk Agencies should conduct pre-contract scrutiny and evaluation of RMTs and CRAs before contractors are allowed to commence work on site.

4. Risk Allocation and Sharing

Risk Agencies should ensure that all risks are judiciously shared between stakeholders in public construction projects. Contract documents should state clearly and unambiguously as to 'who' among the stakeholders should assume 'what' risk. In addition, contract documents should make it possible for some construction risks that are caused by 'Acts of God', such as the risks incurred during the Covid-19 pandemic, to be borne by the government.

5. Preparation of Risk Management Documents

It should be made mandatory on all public organizations and contractors to forward their individual pre-contract construction risk

management documents before the commencement of every project. These documents are to contain risk identification, assessment, prioritization and management strategies on every intended public construction project, and should be submitted to the jurisdictional Risk Agency concerned for vetting. The Agencies are expected to conclude their vetting before the award of every contract.

6.0 CONCLUSION

Risks in construction should not always be seen as a negative phenomenon. When construction risks are properly managed, the completed project is invariably a source of pride not only to the stakeholders of the project but also to its end-users. However, for risks management to be successful, there must be high level of collaboration, understanding and communication between stakeholders. In addition, both the stakeholders and end-users must be brought to the same page if the desired goals of risk management are to be achieved. The recommended Risk Departments/Units and Agencies are expected to serve as catalysts in bringing all concerned together for the success of risk management in public construction projects.

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