

MANAGEMENT OF RISKS IMPLIED BY CONDITIONS OF CONTRACT AND SPECIFICATIONS

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Abstract- The study of various risks and their management is becoming pre-requisite for many construction projects and can significantly benefit most all parties. The construction activity involves a number of agencies like owner, consultant and contractor may have conflicting interests. In order to establish the duties, obligations, rights, responsibilities amongst the agencies, a contract is required to be made between them which will establish a mutual relationship to do a work. The contracts may be used as a risk managing tool to by allocating risks to the various agencies through the various contracts between them and client, contractors and investors. This paper proposes study of risk arises in the condition of contracts and specifications. The qualitative risk analysis is used to analysis helps to predict severity of risks. Risk management includes identification of risks in contract documents, risk classification, risk analysis and then risk control. It has been found that severities of important risks have been calculated considering the suitable control measures from client and contractors point of view. The findings of paper may be used as reference to similar construction projects in India i.e. for local clients, contractors, investors and also for Government.

Keywords: Construction project, Contract documents, Risks, Qualitative risk analysis, Risk management.

1. INTRODUCTION

A variety of unexpected events may occur in construction projects and many of them can cause losses to the parties involved. Such uncertain events or set of circumstances that have an effect on achievement of one or more of project's objectives, are commonly called risks. The most

of civil engineering work is performed under contract. A contract provides a "self-contained statement of obligations as between its own parties". The analysis has also identified several factors responsible for time and cost overruns some within the control of the enterprises and some beyond their control. The contracts are vital to the success of a project is important difficult, costly and lengthy proceedings. The contract documents can be used as a tool to manage risk by allocating risks to the various agencies through the various contracts between them. It is very important for all the agencies that they are aware at all times of the extent of risk exposure or the risks that they have to manage. If this awareness is lacking then it may lead to a number of disputes, disagreements and disruptions. One of the major reasons of disagreement and conflict is inadequate and defective contract documentation and also inappropriate contract arrangements and an unreasonable burden of risk being allocated to one of the parties by the contract [4].

The present study aims to identify the key problems in certain critical areas of a construction contract, which if not attended properly have the potential to become major roadblocks in the progress of the project In the present work, two case studies of infrastructure projects in Mumbai and Pune city of Maharashtra state, India, have been referred. The study includes identification, classification of various risks in a given set of contract documents and on basis of qualitative risk analysis find out severity of these risks, suggests methods to mitigate risks in construction projects from the client's and contractor's view point

2. BACKGROUND RESEARCH

There are various research papers on the risks management in construction projects in various countries and various strategies for managing risk. During literature study, S.Q. Wang [1] proposes Risk management framework for construction projects in developing

countries, D. W. Stam [6] proposes Project risk Management by suggesting an essential tool for managing is exposed so that a conscious decision can be taken on **how to manage the risks.** It also include; various risks; agencies involved, their roles; exposure of projects to risk; effects of project phase on risk. Contracting in Construction is also discussed and the contract documents essential are enlisted and their significance is spelt. The bridge between the two topics of Contracting and Risk is **then discussed and the qualities of a “good” construction contract** are enlisted. There are various techniques are available for assessment of risks as per purpose of study.

2. METHODOLOGY

The research methodology is used in order to collect data, analysis of data and report on findings and discussions. The research methodology selected for this risk management project consists of comprehensive literature reviews, data collection followed by open interviews and distributing checklists to the various agencies including client, contractors, and consultants of the projects. The collected data has been analyzed using statistical techniques to study variation between responses of contractors and owners. Fig-1 shows the research methodology flow chart used for present study.

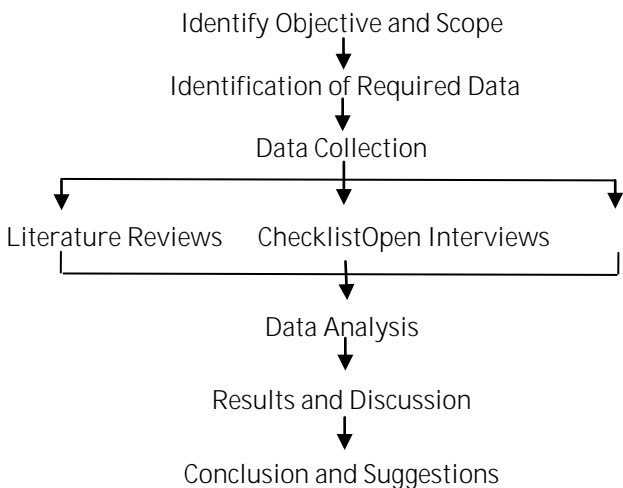


Fig -1:Flow Chart of Research Methodology

3. DATA COLLECTION

For the purpose of this study, two sets of contract documents of the infrastructure projects in Mumbai and Pune city of India have been referred. Table 1 shows the referred contract documents between client and contractor.

and controlling projects, and L. Y. Shen [5], proposed a risk management is explained as “a system which

Table -1: Referred Contract Documents

Sr. No.	Content
1	Tenderer Notice
2	Detailed tender notice
3	Instructions to Tenderers
4	Declaration of the contractor
5	General Conditions of contract
6	Special Conditions of contract
7	Technical Specifications
8	Bill of Quantity

4. RESULTS AND DISCUSSIONS

Here the various risk related to the contract document of project are identified, studied, classified and analyzed. From the study of contract document, it found that there are various clauses mentioned, as General conditions, Technical specifications and special conditions. With the help of the checklist given by L.Y. Shen risks are identified and grouped in eight different categories which are physical risk, financial risk, legal risk, construction risk, political risk, design risk, environmental risk & contractual risk. Table 2 shows the matrix of risks and types of risks for condition of contract. The risk assessment matrix is formed according to the impact of risks on client & contractor. Because every clause of contract is may be converted into the risk and it may effects on different perspectives of the project i.e. time, cost, scope, quality.

Table -2: Risk Matrix of Types of Risks in Contract Documents

Conditions of Contract	Risks Classification							
	Physical	Financial	Legal	Construction	Political	Design	Environmental	Contractual
General conditions								
Suspension of work		*			*			
Changes in design		*		*		*		
Extension of time		*						*
Penalty for delay		*						*
Insurance and Indemnity		*						*
Labour regulations	*				*		*	
Extra works		*		*				
Accidents	*							
Quality assurance plan		*		*		*	*	
Technical Specification								
General and Supplementary tech. spec.				*		*		

Prevention of property				*		*		
Tests List with frequency				*		*		
Special conditions								
Advance		*						
Dispute and Arbitration			*					*
Arrangement of traffic during construction	*			*				
Completion certificate				*				*
Environmental safeguard	*						*	
Price variation clause		*						*
Opposition from social Bodies					*	*		

3.1 Qualitative Risk Analysis (QRA)

Qualitative risk analysis determines the importance of addressing specific risks and guides risk responses. It helps to determine the likelihood and potential effect of the risks on the project objectives. It provides a quick and clear picture of risks and is easy to understand. To do this analysis QRA Sheet as shown in table-5 was used which consists of identified risks classified into various types requiring a subjective response on the probability of its occurrence on a 5 point scale of: very low, low, medium, high, very high and on the impact of these risks again on a 5 point scale of, very low, low, medium, high, very high. The responses on QRA sheet were analyzed using median as a measurement of central tendency.

Table -3: Sample of QRA Sheet

Types of risk	Probability					Impact				
	Very low	Low	medium	High	Very high	Very low	Low	medium	High	Very high
Physical										
Risk 1		*						*		
Risk 2			*					*		
Financial										
Risk 1		*						*		
Risk 2				*					*	
Construction										
Risk 1	*							*		
Risk 2		*							*	

From above mentioned risk classification in contract documents, these risks have given rating on the basis of their probability of occurrences & impact related to clients & contractors point of view. Table-4 shows rating for risks identified in Contract Documents of projects in Pune and Table-5 shows rating for risks identified in Contract Documents of projects in Mumbai.

Table -4: Rating for Risks Identified in Contract Documents of Projects in Pune

Risks	Owner		Contractor	
	Probability	Impact	Probability	Impact
Change in Design	High	High	High	High
Opposition from Social Bodies	Medium	High	High	very high
Suspension of Work	High	High	High	High
Extra Works	Medium	High	Medium	Medium
Accidents and safety	Low	Low	Medium	High
Penalty or compensation for delay	Medium	medium	Medium	Medium
Dispute and Arbitration	Low	Low	Low	Medium
Extension of time	Medium	medium	Medium	High
Insurance and Indemnity	Low	Low	Low	Medium
Prevention of property	Medium	medium	Low	Medium
Price variation	Medium	High	Medium	High
Quality assurance	Low	medium	Medium	Medium
Labour regulations	Low	medium	Medium	Medium
Excessive approval by government	Medium	medium	Medium	High
Material management	Low	medium	Medium	Medium
Traffic diversion	Low	medium	Medium	Medium

Table -5: Rating for risks identified in Contract Documents of projects in Mumbai city

Risks	Owner		Contractor	
	Probability	Impact	Probability	Impact
Suspension	Medium	Low	Medium	Medium
Expanses of political force majeure events occur	Medium	High	Very Low	Low
Termination.	Low	Medium	Low	High
No permit from Govt. Bodies / Organization/Mini stries	Medium	High	Medium	High
Expense as damages	Medium	Medium	Low	Medium
Losses due to breach	Low	Low	Low	High

Cash flow being affected	High	Medium	Low	Low
Expense towards taxes	Medium	Medium	Medium	Low
Accidents	Low	Medium	Medium	Medium
Reduction in time for completion	Medium	Medium	Very Low	High
Delay	Medium	High	Medium	Medium
Direct liability	Medium	Medium	Low	Medium
Non- extension of completion date	Medium	Medium	Low	Medium
Encroachment	Medium	High	Low	Very Low
Forfeiture of assets	Medium	Medium	Medium	Medium
Expense towards taxes	Medium	Medium	Medium	Low

From the study of contract documents various risks in contract are related to client and contractor are summarized. This help to understand the risks associated with the conditions of contract document.

In this paper qualitative risk analysis technique provides an effective insight and clear picture of the risks involved in infrastructure construction in Mumbai and Pune city. This analysis helps to take necessary risk mitigation action for project team of client & contractor.

Finally, methods available to reduce or mitigate construction project risks are identified which are the stable currency of project funding, obtaining more geotechnical data, conducting constructability reviews, set a realistic contract performance times, work and rework cost information, introducing phased pricing, pre-plan for permits, utilities and zoning, pre-define rates, equations and procedures, use of experienced project personnel, proper material management and last but not least use the contracting process as a risk avoidance measure.

Taking an enlightened, proactive approach to construction risk allocation and contracting practices will produce short term and long term benefits for all construction project participants.

5. CONCLUSIONS

The major risks affecting the infrastructure project are systematically examined. For successful completion of any infrastructure construction project, it is necessary to study all aspects of project mentioned in contract documents. The performance of project depends upon control over major risks involved in project and critical factors responsible for cost and time overruns.

Based on present study the following conclusions are drawn

- The contract documents are used as a tool to manage risk by allocating risks to various agencies through various contracts.
- To minimize the chances of failure or under-performance of project, risk management policy must be implements and evaluate regularly into the construction project.

This study may be used as guidelines for researchers and any infrastructure construction projects in India.

ACKNOWLEDGEMENT

This research study was supported by clients, contractors and consultants of projects. The authors would like to thanks all the interviewees and respondents of the survey for their precious comments, opinions, responses, and ideas that have provided me with very useful background data. The word sincere gratitude will not be adequate to express the feelings; I have for my honored guide Prof. Dr. J. R. Patil, Asso. Prof. S. S. Jain and Asst. Prof. A. M. Gaikwad. In addition, I am also thankful to my parents and friends who helped me directly and indirectly to bring this research study in reality.

REFERENCES

- [1] S.Q. Wang, M.F. Dulaim & M.Y. Aguria “*Risk management framework for construction projects in developing countries.*” Construction Management and Economics, March 2004, vol.22, pp.237-252
- [2] Misbah Jamil, N. H. mufti, A.H. Khan, “*Risk Identification For Construction Projects.*” Advancing & Integrating Construction Education, Research & Practice, Karachi, Pakistan, August 20008, pp.4-5.
- [3] Lionel Galway, “*Quantitative Risk Analysis for Project Management*”, Working Paper, Rand Publication, Feb 2004,
- [4] N.J. Smith, “*Managing Risk in construction projects*”, Blackwell Science, Oxford, Feb 2000.
- [5] L. Y. Shen, George W. C. Wu & Catherine S. K., “*Risk management*”, Journal of Construction Engineering & Management, Jan 2001.
- [6] Dvan Well- Stam, “*Project risk Management- An essential tool for managing and controlling projects*”, Kogan Page Limited, Dutch, 2005.
- [7] Hamimah Adnan, “*An Assessment of Risk Management in Projects*”, Asian Social Science, CCSE, June 2008, Vol-4, No-6.
- [8] Mark H. McCallum, “*A Quick Primer on Construction Risks and Contracting Practices*”, American Corporate Counsel Association Annual Meeting, October 2000.

- [9] Gary Smith and Caryn M. Bohn, "*Small to Medium Contractor Contingency and Assumption of Risk*", Journal of Construction Engineering and Management, American Society of Civil Engineers (ASCE), 1999, vol. 125 No. 2, p. 101.
- [10] BayuAdityaFirmansyah, AlinVeronika and BambangTrigunarsyah, "*Risk Analysis in Feasibility Study of Building Construction Project*", The Tenth East Asia-Pacific Conference on Structural Engineering and Construction, Bangkok, Thailand, August 2006, pp. 3-5.
- [11] Richard Clough, "*Construction Contracting*", Wiley-Interscience, New Mexico, 1972.
- [12] Roger Flanagan & George Norman, "*Risk management and construction*", Blackwell Scientific Publications, London, 1993.
- [13] Roger Graves, "*Qualitative Risk Assessment*", PM Network- The Professional Magazine of the Project Management Institute, October 2000, p.80
- [14] "*A guide to the Project Management Body of Knowledge*"; Project Management Institute, Edition-2004.

BIOGRAPHIES



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