

# Qualitative Risk Analysis for Construction Projects

Jameelahammad Nadaf<sup>1</sup>, Mahaboobali Nadaf<sup>2</sup>, Balasaheb Jamadar<sup>3</sup>, K. P. Thejaswi<sup>4</sup>

<sup>1</sup> Student, Final year, M.Tech in Construction Technology, Civil Dept., Jain College of Engg., Belagavi-PIN-590014

<sup>2,3</sup> Assistant Professor, Civil Dept., Jain College of Engg, Machee, Belagavi, Karnataka-PIN-590014

<sup>4</sup> Assistant Professor, Civil Dept., KLS Gogte Institute of technology, Belagavi, Karnataka-PIN-590001

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**Abstract** - Risk is present everywhere, every area of life. In construction industry risk is always present. The purpose of current work is to study of various risks in construction projects, their importance and impact on the project goals and plan for the risk analysis. Here, effort is made to recognize and identification of risk in construction projects. In this study, the qualitative risk analysis methods are used to collect data, analyze data and reporting on outcomes. The methodology selected for risk management is, distributing questionnaire survey to the various contractors and clients, consultants of the project. Qualitative risk analysis is used for data analysis and matrix for probability-impact, impact-urgency, probability-urgency and priority-urgency are plotted and high risks were marked, and graphs are plotted for high risks.

**Key Words:** Qualitative risk analysis, Matrix, construction risks.

## 1. INTRODUCTION

### 1.1 BACKGROUND

Risk management is an idea which is been utilized in every industries, it might be IT related enormous business, pharmaceutical business or automobile industry to the construction division. For each organization there will be fixed fundamentals set for risk tackling as per which they work. This shows a solid connection between project success and managing risk. Risk management can be quickly characterized as a field of hierarchical goings-on and professional practice. Risk management is taken as one of the toughest part of the construction process and its application must be empowered in every one of the project to avoid negative results in the project.

In the era of progressive globalization it is hard to avoid risk, which has become an indispensable part of everyday life. Effective risk management does not mean the removal of risk, which would be the seemingly be the cheapest option. From economic point of view this is pointless because what is potentially profitable is by definition risky and activity that does not pose a risk economically interesting, and thus, doesn't bring tangible benefits.

### 1.2 SIGNIFICANCE AND PURPOSE OF THE RESEARCH

The enormity of construction sector has associated possibility of various environmental, socio-political, and other unanticipated problems which will cause huge loss to the industry. Therefore, well-organized management of project is required by using all the methods of project

management which involves project risk management as an important constituent, through the several stages of the project, in order to manage the risks and reduce the cost overruns, time overruns, and quality and safety issues. It provide practical tools for handling and also reducing the risk identified, before and during the project, in a planned or organized way, so that any possible threat to the liberation of outputs i.e. resources, cost, time, quality, and realization of benefits or profits by owner, is suitably managed, to enable that the project is finished successfully.

### 1.3 OBJECTIVE OF THE STUDY

By investigating the real circumstances in construction business the following objectives of the study are listed.

- 1 To identify various risks those are uncertain to occur in the construction project.
- 2 Categorizing the risks depending on the probability, impact, urgency, priority and then categorize the risk as high, moderate, and low.
- 3 Qualitative risk analysis carried for the identification of high risks.

### 1.4 SCOPE AND LIMITATION OF THE RESEARCH

The risks can be recognized by questionnaire survey. The risks are identified and then it is evaluated by various technique like qualitative analysis to know the probability of occurrence of risk and impact of these risk on project goals.

## 2. LITRATURE REWIEW

### 2.1 GENERAL

The following are the past research survey based on the identification of construction risks at every stage.

Pawel szymanski [1]. This paper helps in identification and classification of the risks. The author concluded, risk is present everywhere and every area of life in one such is construction industry where the risk always present. The author did the analysis on part or in detail, including escorts and even stake holders by doing this we can effectively manage the risk coming in future and can be translated into clear benefits to project. The author first is identify the risk in the very main stage and determining which type of risk, how it is affecting to the project, and characteristics of risk and estimating possibility of its incidence to project. This

paper reviews different type of risks present in stages of construction.

Agnieszka Dziadoz, Mariusz Rejment [2]. This paper defines, the risk cannot be measured and it is measurable part of uncertainty, which we are able to identify some of occurrences of probability and size of injury or loss. This paper presents three types of risk analysis. They are methods, and advantages, disadvantages, others and selection of project (pre-estimation). These methods are different from each other. The author started using some qualitative variables. This method depends on decision maker and also it is simple and easy to use. The regions of use and logical limit of the recorded strategies are shown with the short cases, at the same time illustrating their attributes from the examination. The assessment issues, which are the canvas of operation of the examined techniques are not commonly interrelated. They author display various parts of variations of the investment procedure.

### 3. RESEARCH METHODOLOGY

#### 3.1 GENERAL

The purpose of current work is to study various risk in construction projects, their importance and impact on the project goals and identification of high risks using qualitative risk analysis. Here, an effort is made to recognize and evaluate risk in construction projects.

#### 3.2 RESEARCH STAGES

The methodology selected for risk management is distributing questionnaire survey to the various contractors and clients, consultant of the project. Qualitative risk analysis is used for data analysis.

This investigate, passed through the following stages in figure:



Fig. 3.1 Methodology adopted for project

#### 3.2.1 Objective and scope of project

The study is carried with the following objectives:

- Classify the risks and get ratings for probability and impact and urgency for each risk.
- Make risk matrices to find high, moderate, and low risks.

#### 3.2.3 Review of literature/Risk identification

Risk identification is a repetitive process because as the project progresses new risk develop through the project life cycle. The risk valuation format should be continuous to allow the comparison between the effects of one risk even on the other. The identification process in the organization includes the project team members. For the purpose, the several risk arising in the construction process from the formulation, mobilization and construction stage are categorized and listed.

#### 3.2.4 Design of questionnaire

The information collection process utilized in this investigate, had the choice of two essential strategies: questionnaires and individual discussions. As the result of pilot overview, there are types of risks which influence the risk occurs in construction, types are listed below:

1. Technical risks
2. Financial risks
3. Logistics and construction risks
4. Management risks
5. Socio political risk
6. Environmental risks

#### 3.2.5 Survey and data collection

To successfully accomplish the objective of the study, one of the best vital stage is collection of accurate information. Data collection is a method of collecting important information records for a certain test or populace of observations. About seventeen questionnaires were sent to the construction industry by mail and interviews were conducted among construction personnel specifically consultant, client, engineer, contractor, architect and labor.

#### 3.2.6 Qualitative Risk Analysis

Qualitative risk analysis involves evaluating the probability and impact of the various risks and listing the risks so as to improve the performance of the project by making the risks with high priority. The valuation of the priority identified risks is done on basis of likelihood or probability of

occurrence of risks, the corresponding impact of the risks if it happens and as well as urgency of risk response.

The qualitative risk analysis is carried out by making

SL.No.	RISKS		P	I	U	PR
1	Type of contract	T1	2	2	2	3
2	Project preliminary plan	T2	3	4	4	4
3	Delays occurs in design and drawings than expected	T3	3	4	4	4
4	Managing resources	T4	4	4	4	4
5	Inadequate investigation on site	T5	3	4	4	3
6	Unknown productivity of resources	T6	3	4	4	4
7	Changes in project scope and requirement	T7	2	3	3	3
8	Design errors and faults	T8	3	4	4	4
9	Subcontractors	T9	2	2	2	2
10	Insufficient contractor experience	T10	2	2	2	3
11	Failure to carry work as per planning, scheduling	T11	2	3	3	3
12	Improper scheduling and delay of contractor	T12	3	4	4	3
13	Controlling and monitoring and execution	T13	2	3	3	3

following matrices:

i) **Probability – Impact matrix:** It helps in the assessment of each risk’s priority for consideration and importance.

The ratings for probability and impact are given below:

**Probability 1-5**

- High - From 4-5 occurrence of probability
- Medium - 3 occurrence of probability
- Low - Between 1-2 occurrences of probability

**Impact 1-5**

High - Risk occurrence that has the possible to greatly impact on the project schedule, performance, time and cost. The work of an activity cannot be continued and it will stopped. The progress of the work is delayed due to this risk.

Medium - The occurrence of risk that will slightly impact on project goals. The work will be continued at this stage.

Low - occurrence of risk will have a low impact on the goals of the project.

ii) **Impact – urgency matrix:** It lists the risks, which require a near-term response or the risk that have to be addressed instantly.

**Urgency 1-5**

High - occurrence of risk that has to be addressed immediately/quickly.

Medium - occurrence of risk that has time to proceed the actions.

Low - occurrence of risk has low urgency.

**3.2.7 Conclusions**

After positioning, conclusions can be made about risks which influence most and impact on project goals.

**4. RESULTS AND DISCUSSIONS**

The questionnaire survey done on fourteen construction companies and their average results are shown below:  
In the table,

- P - Probability
- I - Impact
- U - Urgency
- PR - Priority

**TECHNICAL RISKS**

**FINANCIAL RISKS**

SL.No.	RISKS		P	I	U	PR
1	Investment on projects	F1	2	2	3	3
2	Availability and undulation in foreign exchange	F2				
3	Delays in worker wages	F3	3	4	4	4
4	Increase in cost of materials	F4	3	4	3	4
5	Releasing of funds	F5	2	2	3	3
6	Import procedures	F6	2	2	2	3

**LOGISTICS AND CONSTRUCTION RISKS**

SL.No	RISKS		P	I	U	PR
1	Non availability of transportation services	L1	2	3	2	2
2	Difficulties in disposing plant and equipment's	L2	2	2	2	2
3	Unfamiliarity with local bodies	C1	2	2	3	2
4	Demands on use of local firms and agents	C2	2	2	2	2
5	Technologies	C3	2	3	3	3
6	Absence of protection on construction site	C4	3	4	4	3

**MANAGEMENT RISKS**

SL.No	RISKS		P	I	U	PR
1	Company relation problems	M1	1	1	2	2
2	Inadequate assigning works	M2	2	2	2	3
3	Unsatisfactory skilled staff	M3	2	2	2	3
4	Uncertainty about relationship between project employees	M4	2	2	2	2
5	Clashes between project group	M5	1	2	2	2
6	Resource allocation	M6	2	2	3	3

**SOCIO POLITICAL RISKS**

SL.NO.	RISKS		P	I	U	PR
1	Before tendering	P1	2	2	2	2
2	Acceptance of contract	P2	1	2	2	2
3	Public complaints	P3	2	2	2	2
4	Finalization of contract	P4	1	1	1	2
5	Resident tolls	P5	1	2	2	2
6	Permissions, clearance, approvals	P6	3	4	4	3

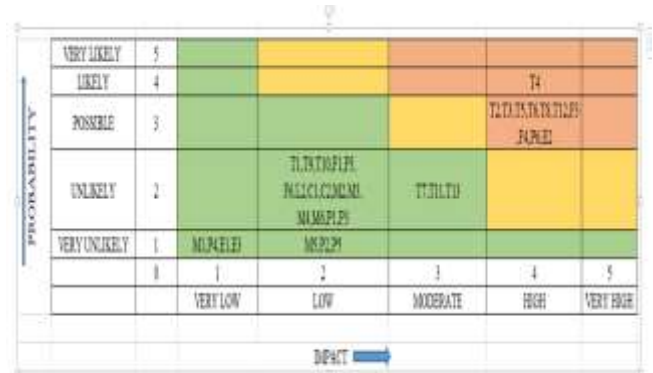
**ENVIRONMENTAL RISKS**

SL.No	RISKS		P	I	U	PR
1	Natural disasters	E1				
2	Weather and seasonal variations	E2	3	4	3	3
3	EIA reports	E3				

**Fig.4.1: Questionnaire format and ratings.**

**Qualitative Risk Analysis:** The qualitative risk analysis is done for identified risks and it is done by taking average values of Probability, Impact, Urgency and priority, obtained by the questionnaire survey. The following matrix consist three main regions High, moderate/medium and Low which are identified through color codes. The blocks covered with orange color represents high risks and blocks covered with yellow represents moderate risks and the block covered with green represents low risks.

**Probability - impact matrix:**



The above matrix shows probability occurrence and impact of the risks. from the above matrix it found that the following risks have High Probability and Impact T2,T3,T4,T5,T6,T8,T12,F3,F4,C4,P6,E2.

**Impact-Urgency matrix**



The above matrix it's found that T2,T3,T4,T5,T6,T8,T12,F4,F3,C4,P6 and E2 which have high Impact and Urgency.

**Probability - Urgency matrix:**

PROBABILITY	VERY LIKELY	5				
	LIKELY	4				T4
	POSSIBLE	3			F4E2	T2,T3,T5,T6,T8,T12,F4,C4,P6
	UNLIKELY	2		T2,T3,T4,T5,T6,T8,T12,F3,C4,P6	T2,T3,T4,T5,T6,T8,T12,F3,C4,P6	
	VERY UNLIKELY	1	F4E2	M,M,P,P,P,P		
	0	1	2	3	4	5
		VERY LOW	LOW	MODERATE	HIGH	VERY HIGH
		URGENCY				

The risks T2,T3,T4,T5,T6,T8,T12,F3,C4,P6 which have high occurrence of Probability and Urgency .

**Priority - Urgency Matrix:**

PRIORITY	VERY LIKELY	5				
	LIKELY	4			F4	T2,T3,T4,T5,T6,T8,T12
	POSSIBLE	3		T2,T3	T2,T3,T4,T5,T6,T8,T12,F3,C4,P6	T2,T3,T4,T5,T6,T8,T12,F3,C4,P6
	UNLIKELY	2	M,M,P	T2,T3,T4,T5,T6,T8,T12,F3,C4,P6	F4,C4,P6	
	VERY UNLIKELY	1	E2			
	0	1	2	3	4	5
		VERY LOW	LOW	MODERATE	HIGH	VERY HIGH
		URGENCY				

The above priority urgency matrix which shows that risks T2,T3,T4,T6,T8,F3,F4,C4,P6 which needs immediate response.

**5. Conclusion:**

The methods to classify project risks, that have been particularized for construction projects, have been presented from various point of view(from contractors, consultants, and government contractors) and construction companies and firms that may be helping the development of dealing with project in the planning and construction stages.

Matrix for probability-impact, impact-urgency, probability-urgency and priority-urgency plotted and high risks were marked. A brief mitigation plans for avoiding and resolving of the risks are prepared. The project has studied various

factors related to risks and some of outcomes are listed below:

- The risks management process starts prior to project itself.
- Record of all the risk occurred and occurring, occurs in future should be maintained.
- Every organization big or small should be adopt risk management practices to reduce effect of risks arising in the project and its impact to reach the project goals.
- There must be proper coordination between every distinct involved with project to implement better risk management practices.
- Every organization big or small should be adopt risk management practices to reduce effect of risks arising in the project and its impact to reach the project goals.
- Clear understanding of the project scope explaining of the complete outcome of project.

From the results, it is safe to say that majority of the construction projects have no systematic procedure in place to deal with risks. Risk management is done in a very informal mode.

All the risks were recorded and ratings were given for their probability of occurrence, its impact on the project and urgency of resolving particular risk.

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**BIOGRAPHIES**



**Jameelahammad Nadaf**  
Student, Final year, M.Tech in Construction Technology, Civil Dept., Jain College of Engg., Belagavi-PIN-590014

**Mahaboobali Nadaf**

Assistant Professor, Civil Dept.,  
Jain College of Engg., Machee,  
Belagavi, Karnataka-PIN-590014

**Balasaheb Jamadar**

Assistant Professor, Civil Dept.,  
Jain College of Engg., Machee,  
Belagavi, Karnataka-PIN-590014

**K. P. Thejaswi**

Assistant Professor, Civil Dept.,  
KLS Gogte Institute of technology  
Belagavi, Karnataka - PIN-590001