



# Identification and Assessment of Risks in Construction Projects: A Case of Pune City

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## Abstract:

India has seen a very large growth in the infrastructure and construction sector in the recent times. With the increasing size of the construction projects and the finances related to it we also need to consider the risks related. Hence the risk management module of project management comes into the scenario. These risks can cause losses that lead to increase in costs, time delays and lack of quality of projects. Risk management deals with identification and mitigation of risks in construction projects and helps in timely and in budget completion of projects.

## 1. INTRODUCTION

Construction industry has a lot of risks and uncertainties associated with it as the working process is complex and involves different departments altogether. Construction projects in general have faced problems like delays in project completion, cost overruns, poor quality of finished work etc. Due the increasing demand there has been a rise in number as well as the size of construction projects. With the increasing size and complexity of the projects the problems have started to affect them a lot. This can be avoided if the project risks are taken care of in the process planning itself. Therefore, managing project risk of any construction projects leads to successful project completion. Occurrence of risks and uncertainties in the construction industry are more than any other industries. The process of planning, scheduling, executing and monitoring all construction activities is complex and time-consuming hence the amount of risk involved in all such construction activities varies from one activity to another. The process of risk management requires experience and a constant supervision from the top management. The track record of construction industry is very poor in terms of managing with risks, resulting in the failure of many projects to meet time schedules, targets of budget and sometimes even the scope of work. As a result, in general conflicts arise between clients and contractors. Also with the realty bill being in discussion by the Government there has arisen a need of completing projects in given time as one the clause stated. Therefore, an attempt is made in this study to identify risk factors which effect the smooth completion of the project. On the basis of literature review and inputs from various project experts risk factors have been identified and grouped under various categories.

## 2. BACKGROUND & OBJECTIVE

The construction industry has gained enormous amount of importance in the recent times because of the opening up opportunities in both international and private sector (Subramanyan, Sawant & Bhatt, 2012). With the increasing size and expanse of infrastructural projects there has arisen a need of incorporating use of modern technology as well as equipment. In this scenario, Risk management is one such

important measure which needs more attention during planning and execution phase of the project. The objective of this study is to identify risk factors which influence the smooth completion of any project.

## 3. LITERATURE REVIEW

### 3.1 Definition of Risk & Risk Management

PMBOK defines "risk" as an uncertain event or condition that, if it occurs has a positive or negative effect on at least one or more project objective, such as time delays, cost overruns, project scope or quality issues. A risk will have one or more impacts if it occurs and may have one or more causes. Al-Bahar (1990) and Crandall defined risk as uncertainty of any events that which occurs has a negative or positive affecton the project objective. Risk management is a stepwise procedure involving risk identification, classification, analysis and assessment.



Figure.1.A general description of risk management process

### 3.2. Construction Risk Factors Identified in the past

A detailed study of literature shows a number of risk factors which were identified in the past by researchers. Ehsan, Alam, Mirza and Ishaquehavelisted a number of risk factors like Changes in project scope and requirements, Design errors and omissions, Inadequately defined roles and responsibilities, Insufficiently skilled staff, Subcontractors, Inadequate contractor experience, Uncertainty about the fundamental relationships between project participants, New technology, Unfamiliarity with local conditions & Force majeure in Pakistan construction Industry. Tang, Qiang, Duffield, Young and Youmei Lu (2007) identified 32 risk factors which affects Chi-nese construction industry. A study on Palestine building project, a study on contractor perspective (Mohamed & Mosa, 2008) shows a total of 44 risk factors which were grouped under Physical, Environmental, Design, Logistics, Financial, Legal, Construction, Political and Management. Similarly, a study on Indian construction industry by Subramanyan, Sawant and Vandana Bhatt, 2012 have identified 93 risk factors and grouped under various sub-groups like Owner specific, Project

Specific, Consultant Specific, Resource Specific, Project Manager specific, finance Specific, Contract Clause Specific, Contractor Specific & external environment Specific which have a significant influence on smooth completion of the project.

**4. OVERVIEW OF THE RESEARCH**

It has been clear from literature that many researchers have tried to list out risk factors under various sub-groups. Therefore, we decided to include previously studied risk factors along with the additional risk factors which were brought up in the discussions with industry experts. The study area is considered is Pune Region. Likert scale of 1 to 5 is used for rating the level of risk and the probability of occurrence of risk factor, scale 1 corresponds to "least level of risk" & "least probability of occurrence", scale 2 corresponds to "low level of risk" & "low probability of occurrence", scale 3 corresponds to "medium level of risk" & "medium probability of occurrence", scale 4 corresponds to "high level of risk" & "high probability of occurrence and scale 5 corresponds to "very high level of risk" & "very high probability of occurrence". Factor weights are combined to get overall project weight, which indicates that distribution of each factors and level of each risk to which project exposed. Microsoft Excel is used for Relative Importance index (RII).

**5. IDENTIFICATION OF RISK FACTORS**

The list of risk factors identified in the present research is based on literature review and it was further revised on the basis of interaction with the different project members. The factors under the following sub-groups are listed from the Table 1-8 which used questionnaire

1. Financial Risk
2. Legal Risk
3. Management Risk
4. Market Risk
5. Political Risks
6. Technical Risk
7. Environmental Risk
8. Social Risk

**6. METHODOLOGY**

This paper is based on the quantitative approach which is used to identify the overall risk factor. The following is the stepwise methodology adopted in this study:

**Step1:** A list of risk factors were identified and prepared and grouped under 9 sub-groups shown in Table 1-8.

**Step2:** The list of risk factors are distributed to various project experts to get the qualitative opinion about level of risk and probability of occurrence and the same is marked in questionnaire quantitatively.

**Step3:** The weight scale 1-5 for "Probability of occurrence" is reduced to 0.2-1 scale.

**Step4:** Function of product of level of risk and probability of occurrence is calculated for obtaining individual factor risk

**Step5:** Relative Importance Index (RII) for level of risk is calculated and top 10 risk factors are listed.

**7. RESULTS&CONCLUSIONS**

**7.1. Relative Importance Index (RII)**

The result of Relative Important Index (RII) analysis is shown in Table 9. The table concludes top ten risk factors which

affects the project among 69 risk factors from the analysis. The respondents have ranked "Project delay" which is related to Management risks sub-group as the first prime factor with RII 0.8571, as the most of the experts agree to the fact that delaying the project leads to increase in the indirect costs. "Shortage of skillful workers" followed on second place with RII of 0.8000. It was noticed that top third ranking with RII 0.7429 is the "Wastage of materials by workers" which is again a major factor for any construction projects.

**Table.1. Financial Risks**

Financial Risks	Bankruptcy of project partner
	Loss due to fluctuation of inflation rate
	Loss due to fluctuation of interest rate
	Loss due to fluctuation of exchange rate
	Loss due to rise in fuel prices
	Low credibility of shareholders and lenders
	Changes in Bank formalities and regulations
	Insurance risk
	Bankruptcy of project partner
	Loss due to fluctuation of inflation rate
	Loss due to fluctuation of interest rate
	Loss due to fluctuation of exchange rate
	Loss due to rise in fuel prices
	Low credibility of shareholders and lenders
Changes in Bank formalities and regulations	

**Table.2. Legal Risks**

Legal risk	Breach of contract by project partner
	Lack of enforcement of legal judgment
	Improper verification of contract documents
	Lack of knowledge of arbitration
	Uncertainty and unfairness of court justice

**Table.3. Market Risks**

Market Risk	Competition from other companies
	Fall short of expected income from project
	Increase of accessory facilities price
	Increase of labour costs
	Increase of materials price
	Increase of resettlement costs
	Inadequate forecast about market demand
	Local protectionism
	Unfairness in tendering

**Table.4. Management Risks**

Management Risks	Change of Top management
	No past experience in similar projects
	Short tendering time
	Sub-contractor related problems
	Improper project feasibility study
	Improper project planning and budgeting
	Inadequate choice of project partner
	Improper project organization structure
	Poor relation and disputes with partner
	Poor communication between clients
	Team work
	Poor relation with government dept
	Time constraint
	Project delay

**Table .5. Policy & Political Risks**

Policy &Political Risk	Cost increase due to changes of Govt policies
	Loss incurred due to corruption and bribery
	Loss incurred due to political changes
	Loss due to bureaucracy for late approvals
	Cost increase due to changes of Govt policies

**Table.6. Environmental Risk**

Environmental Risk	Any adverse impact on project due to climatic conditions
	Any impact on the environment due to the project
	Healthy working environment for the workers

**Table .7. Social Risk**

Social Risk	Resettlement and rehabilitation of people
	Problems due to adjacent or nearby projects
	Local people support for the project

**Table.8. Technical Risk**

Technical Risk	Accidents on site
	Design changes
	Equipment failure
	Errors in design drawings
	High degree of difficulty in construction
	Stiff environmental regulations
	Incompetence of transportation facilities
	Industrial disputes
	Materials shortage
	Obsolescence of building equipment
	Poor quality of procured materials
	Problems due to partner's different practice
	Shortage in supply of water
	Shortage in supply fuel
	Shortage in supply electricity
	Unknown site physical conditions
	Following government standards and codes
	Wastage of materials by workers
	Theft of materials at site
	Site distance from urban area
Surplus materials handling	
Architect vs Structural Engineer dispute	
Shortage of skillful workers	

**Table.9. Results, Top 10 risk based on Relative Importance Index.**

Sr. No.	Risk	Relative Importance Index
1.	Project delay	0.8571
2.	Shortage of skillful workers	0.8000
3.	Wastage of materials by workers	0.7429
4.	Improper project planning and budgeting	0.7429
5.	Errors in design drawings	0.7143
6.	Time constraints set by PMCs	0.6857
7.	Architect Vs Structural Engineer dispute	0.6857
8.	Materials shortage	0.6571
9.	Unknown site physical conditions	0.6571
10.	Improper project feasibility study	0.6571

**8. CONCLUSION**

From the above study we can conclude that there is strong need of awareness in the field of risk management in actual infrastructural projects. The risk management process is very informally carried out and there are no mitigation plans ready

to be executed when the event of risk occurs. The risks with greater Relative Importance Index need to be specially kept under supervision as the occurrence of them are very common. If these risks are mitigated well the project indeed will be cost effect, better quality and timely completion will also be possible in such cases.

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