

PROJECT RISK MANAGEMENT – STRATEGY AND ANALYSIS FOR PROPOSED AHMEDABAD- GANDHINAGAR METRO

Aalap Nayak¹, Rinni Shah², Krupa Dave³

1 PG Student, M.E. Civil (Infrastructure Engineering), L.D.R.P. Institute of Technology & Research, Gandhinagar, Gujarat, India

2 Faculty, Civil Engineering Department, L.D.R.P. Institute of Technology and Research, Gujarat, India

3 Faculty, Civil Engineering Department, L.D.R.P. Institute of Technology and Research, Gujarat, India

ABSTRACT

Project Risk Management primarily comprises of cost and schedule uncertainties and risks. These risks can be assessed or measured in terms of likelihood, impact and consequences. Depending upon the severity of each of the risks obtained, specific risk mitigation measures are proposed. The responsible entity/authority of the project should take appropriate decision/action pertaining to the adoption of the mitigation measures for reducing the likelihood of occurrence of the identified risks involved in the project. In this report, Construction of Proposed Metro between Ahmedabad-Gandhinagar has been considered for formulation of Project Risk Management.

Keyword : *Project Management, Project Risk Management, Risk Identification, Risk Analysis, Risk Register*

1. INTRODUCTION

Risk Management is a mechanism to help to predict and deal with events that might prevent project outcomes being delivered on time. It can be carried out effectively by investigating and identifying the risks associated with each activity of the project. These risks can be assessed or measured in terms of likelihood and impact. For an infrastructure project there is always a chance that things would not turn out exactly as planned. Thus project risk pertains to the probability of uncertainties of the technical, schedule and cost outcomes.

The major activities in Construction of Metro Rail Project facility between Ahmedabad and Gandhinagar, consist of Feasibility Study, Geo—Technical Investigations, Siesmic Survey, EIA, SIA, Route Alignment, Design Features, Traffic Diverson, Utility Shifting, Excavation, Structure/Tunnel works, Support Wall, Drainage, Pile Work, Superstructure & Substructure work, Construction of Stations, Restoration work etc.

1.1 Objective of Study

- To identify, assess, monitor and manage risks (Risk Identification)
- To assess impact of risk (Risk Identification)
- To identify mitigative action (Risk Analysis)
- To control uncertain aspect of project (Control Risk Environment)
- To eliminate/transfer/reduce risks (Risks Response Planning)
- Risk severity and categorization.

1.2 Scope of Work

Finding risks, that are associated with the project and take mitigative measures through the use of risk management methods. Currently, a vast number of risk management methods exist, but none of them pertain to a situation where multiple actors are required to work together on one project. So it is important to identify the risks, then to prepare plan to mitigate the risk using Qualitative analysis for the successfully outcome of the project.

2. BACKGROUND AND LITERATURE REVIEW

In today's post-crisis economy effective risk management is a critical component of any winning management strategy.

Risk management process combines two defined forms namely qualitative and quantitative analysis. Qualitative risk analysis mainly focuses on prioritizing the risks for which action needs to be taken. It is also a pre-requisite for quantitative risk analysis.

Risk identification is the first and perhaps the most important step in the risk management process, as it attempts to identify the source and type of risks. It includes the recognition of potential risk event conditions in the construction project and the clarification of risk responsibilities. Risk identification develops the basis for the next steps: analysis and control of risk management. Corrects risk identification ensures risk management effectiveness.

Debasis Sarkar, Goutam Dutta [2011] "A Framework of Project Risk Management for the Underground Corridor Construction of Metro Rail". In this paper, a method of measurement of project risk, based on the expected value method (EVM). They have identified the major risk sources and quantified the risks in terms of likelihood, impact and severity in a complex infrastructure project for the construction of an underground corridor for metro railways. For his research work he has taken an underground metro corridor in the capital city of an emerging economic nation of South Asia. The methodology for this work was the response from the experts associated and involved in this and other similar projects in metro rail. The risk analysis for the determination of risk cost, risk time, expected cost and expected time of the project has been carried out by the expected value method. Based on this study they found that the project cost overrun and time overrun can be about 22.5 % and 23.4 % respectively.

3. STUDY AREA

Ahmedabad - Gandhinagar Metro rail project is being promoted with the objective of providing safe, fast and eco-friendly transportation services to the public at affordable rates while simultaneously reducing the congestion on the roads. The metro rail project will promote integration with AMTS, BRTS, Railways and other modes of public transit system. The route connecting Ahmedabad and Gandhinagar will cover areas from AEC junction to Akshardham temple in Gandhinagar. Starting from AEC the route will cover Sabarmati, Visat petrol pump, IIT Gandhinagar, Tapovan circle, Koba circle, crossing the State Highway-71 and going parallel to Kasturbhai campus, Koba village, PDPU, Raysan village, Dholakuva and finally entering Gandhinagar via Ch road. In Gandhinagar the route will cover Ch-2, Ch-3, Chh road, Police Bhavan, Sachivalaya to Akshardham, while for Mahatma Mandir there will be a separate route from Ch-3 to Pathikashram, reaching to Mahatma Mandir via Kh-3. This entire route will be of around 32 km.

4.1 Risk Identification

It is a process to acknowledge risk events and to identify characteristics of risk events for the selected project based on the risk-related information.

The risks identified subsequent to the activities of the project are classified as follows:

- Delay in approval and permissions
- ROW Acquisition
- Traffic Diversion
- Utility shifting
- Excavation
- Testing Commissioning of materials
- Technical uncertainties
- Major / Minor Accident during Execution
- Site Communication
- Force Majeure Risks like Flood, Rain, Earthquake etc.
- Labour Agitation and Strikes
- Political

4.2 Risk Analysis

Qualitative risk analysis for projects assigns a Risk Rating to each risk in the risk register. The risk ratings determine where the greatest effort should be focused in responding to the risks. They facilitate structured risk response action and resource allocation.

The three ratings for projects are:

- “High” – First priority for risk response.
- “Medium” – Risk response as time and resources permit.
- “Low” – No risk response required at this time.

The concept of risk can include positive and negative impacts. This means that the word “risk” can be used to describe uncertainties that, if they occurred, would have a negative or harmful effect. The same word can also describe uncertainties that, if they occurred, would be helpful. In short, there are two sides to risk: threats and opportunities.

Projects in design have the greatest potential for opportunities because the project is still open to changes. Risk reduction and avoidance are opportunities, as are value analyses, construct ability reviews, and innovations in design, construction methods, and materials.

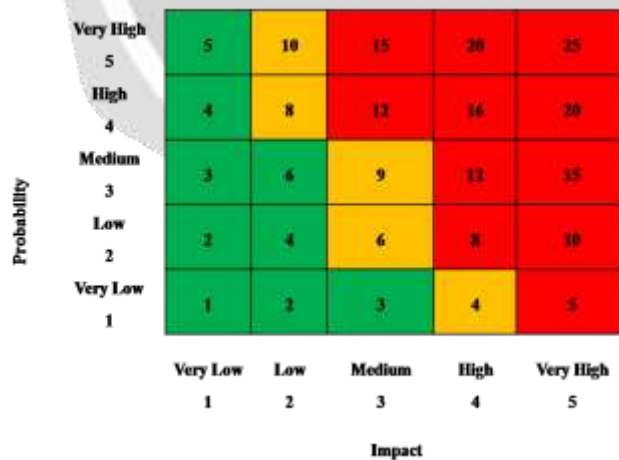
Risk Analysis is the determination of value of risk related to a concrete situation and a recognized threat. In project management, risk analysis is an integral part of the risk management plan, studying the probability, the impact, and the effect of every known risk on the project.

The ratings for the project serve as a consistent frame of reference for the PRMT in assessing the risks during

the life of the project.

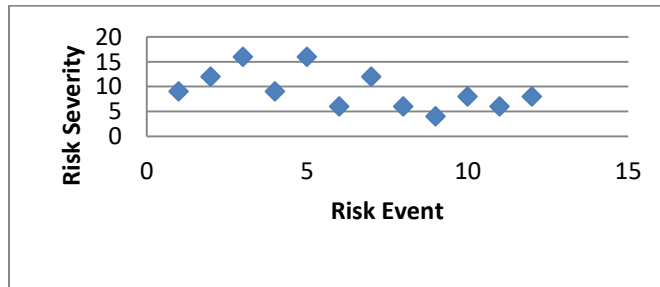
Risk ID	Risk Event	Probability	Impact	Risk Value	Score	Probability Ranking
01	Delay in approval and permission	Medium	Medium	Medium	9	Medium
02	ROW Acquisition	Medium	High	Medium	12	Medium
03	Traffic Diversion	High	High	High	16	High
04	Utility shifting	Medium	Medium	Medium	9	Medium
05	Excavation	High	High	High	16	Medium
06	Testing/Commissioning of materials	Low	Medium	Low	6	Medium
07	Technical uncertainties	Medium	High	Medium	12	Medium
08	Major / Minor Accidents during Execution	Low	Medium	Medium	6	Medium
09	Site Communication	Low	Low	Low	4	Low
10	Force Majeure Risks like Flood, Rain, Earthquake	Low	High	Medium	8	Medium
11	Labour Agitation and Strikes	Low	Medium	Medium	6	Medium
12	Political	Low	Medium/High	Medium	8	Medium

4.3 Risk Matrix



Risk	Score
Low	1-5
Medium	6-14
High	15++

These results were then put on a graph and severity graph is generated as below :



Risk Severity Graph

4.4 Risk Management Register

Risk Management Register																																				
Risk Identification				Qualitative Risk Assessment				Risk Response Plan		Monitoring and Control																										
#	Risk Event	Effect	Threat or Opportunity	Primary Objective	Probability	Impact	Risk Matrix				Response Strategy	Response Actions	Responsible Entity	Interval or Milestone Check																						
1	Delay in approval and permission	Delay in time	Threat	Time	Medium	Medium	<table border="1"> <tr><td>Very High</td><td>High</td><td>Medium</td><td>Low</td><td>Very Low</td></tr> <tr><td>High</td><td>Medium</td><td>Low</td><td>Very Low</td><td>Very Low</td></tr> <tr><td>Medium</td><td>Low</td><td>Very Low</td><td>Very Low</td><td>Very Low</td></tr> <tr><td>Low</td><td>Very Low</td><td>Very Low</td><td>Very Low</td><td>Very Low</td></tr> <tr><td>Very Low</td><td>Very Low</td><td>Very Low</td><td>Very Low</td><td>Very Low</td></tr> </table>	Very High	High	Medium	Low	Very Low	High	Medium	Low	Very Low	Very Low	Medium	Low	Very Low	Very Low	Very Low	Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Mitigate	Efficiently communicate with authorities	Government	Real time
Very High	High	Medium	Low	Very Low																																
High	Medium	Low	Very Low	Very Low																																
Medium	Low	Very Low	Very Low	Very Low																																
Low	Very Low	Very Low	Very Low	Very Low																																
Very Low	Very Low	Very Low	Very Low	Very Low																																
2	Weak implementation plan	Delay in time	Threat	Time	Medium	High	<table border="1"> <tr><td>Very High</td><td>High</td><td>Medium</td><td>Low</td><td>Very Low</td></tr> <tr><td>High</td><td>Medium</td><td>Low</td><td>Very Low</td><td>Very Low</td></tr> <tr><td>Medium</td><td>Low</td><td>Very Low</td><td>Very Low</td><td>Very Low</td></tr> <tr><td>Low</td><td>Very Low</td><td>Very Low</td><td>Very Low</td><td>Very Low</td></tr> <tr><td>Very Low</td><td>Very Low</td><td>Very Low</td><td>Very Low</td><td>Very Low</td></tr> </table>	Very High	High	Medium	Low	Very Low	High	Medium	Low	Very Low	Very Low	Medium	Low	Very Low	Very Low	Very Low	Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Mitigate	Legal advice consultation	Government	Quarterly
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3	Quality deviation	Delay in time	Threat	Time	High	High	<table border="1"> <tr><td>Very High</td><td>High</td><td>Medium</td><td>Low</td><td>Very Low</td></tr> <tr><td>High</td><td>Medium</td><td>Low</td><td>Very Low</td><td>Very Low</td></tr> <tr><td>Medium</td><td>Low</td><td>Very Low</td><td>Very Low</td><td>Very Low</td></tr> <tr><td>Low</td><td>Very Low</td><td>Very Low</td><td>Very Low</td><td>Very Low</td></tr> <tr><td>Very Low</td><td>Very Low</td><td>Very Low</td><td>Very Low</td><td>Very Low</td></tr> </table>	Very High	High	Medium	Low	Very Low	High	Medium	Low	Very Low	Very Low	Medium	Low	Very Low	Very Low	Very Low	Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Mitigate	Quality management procedure	Government	Regularly
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4	Unavailability	Cost increase	Threat	Cost	Medium	Medium	<table border="1"> <tr><td>Very High</td><td>High</td><td>Medium</td><td>Low</td><td>Very Low</td></tr> <tr><td>High</td><td>Medium</td><td>Low</td><td>Very Low</td><td>Very Low</td></tr> <tr><td>Medium</td><td>Low</td><td>Very Low</td><td>Very Low</td><td>Very Low</td></tr> <tr><td>Low</td><td>Very Low</td><td>Very Low</td><td>Very Low</td><td>Very Low</td></tr> <tr><td>Very Low</td><td>Very Low</td><td>Very Low</td><td>Very Low</td><td>Very Low</td></tr> </table>	Very High	High	Medium	Low	Very Low	High	Medium	Low	Very Low	Very Low	Medium	Low	Very Low	Very Low	Very Low	Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Mitigate	Reading of the Safety Culture Compendium and EOP and EOPG system identification	Government	Real time
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Very Low	Very Low	Very Low	Very Low	Very Low																																
5	Resource work	Cost increase/Quality decline	Threat	Time	High	High	<table border="1"> <tr><td>Very High</td><td>High</td><td>Medium</td><td>Low</td><td>Very Low</td></tr> <tr><td>High</td><td>Medium</td><td>Low</td><td>Very Low</td><td>Very Low</td></tr> <tr><td>Medium</td><td>Low</td><td>Very Low</td><td>Very Low</td><td>Very Low</td></tr> <tr><td>Low</td><td>Very Low</td><td>Very Low</td><td>Very Low</td><td>Very Low</td></tr> <tr><td>Very Low</td><td>Very Low</td><td>Very Low</td><td>Very Low</td><td>Very Low</td></tr> </table>	Very High	High	Medium	Low	Very Low	High	Medium	Low	Very Low	Very Low	Medium	Low	Very Low	Very Low	Very Low	Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Acceptability is good to some extent but need further response	Government	Contractor	After work & programme
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Medium	Low	Very Low	Very Low	Very Low																																
Low	Very Low	Very Low	Very Low	Very Low																																
Very Low	Very Low	Very Low	Very Low	Very Low																																
6	Timing (contingency of resources)	Cost increase	Threat	Quality	Low	Medium	<table border="1"> <tr><td>Very High</td><td>High</td><td>Medium</td><td>Low</td><td>Very Low</td></tr> <tr><td>High</td><td>Medium</td><td>Low</td><td>Very Low</td><td>Very Low</td></tr> <tr><td>Medium</td><td>Low</td><td>Very Low</td><td>Very Low</td><td>Very Low</td></tr> <tr><td>Low</td><td>Very Low</td><td>Very Low</td><td>Very Low</td><td>Very Low</td></tr> <tr><td>Very Low</td><td>Very Low</td><td>Very Low</td><td>Very Low</td><td>Very Low</td></tr> </table>	Very High	High	Medium	Low	Very Low	High	Medium	Low	Very Low	Very Low	Medium	Low	Very Low	Very Low	Very Low	Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Mitigate	Quality Control	Contractor	After work
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7	Terminal CONTRACTORS	Delay in time	Threat	Time	Medium	High	<table border="1"> <tr><td>Probability</td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> <tr><td>Impact</td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> <tr><td></td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> <tr><td></td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> <tr><td></td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> <tr><td></td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> </table>	Probability	VH	H	M	L	VL	Impact	VH	H	M	L	VL		VH	H	M	L	VL		VH	H	M	L	VL		VH	H	M	L	VL		VH	H	M	L	VL	Mitigate	Project Management/ Planning for each activity/ Resource requirement	Contractor/Project Manager	Day to day
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8	Major/Minor Accidents during Activities	Negative	Threat	Cost	Low	Medium	<table border="1"> <tr><td>Probability</td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> <tr><td>Impact</td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> <tr><td></td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> <tr><td></td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> <tr><td></td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> <tr><td></td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> </table>	Probability	VH	H	M	L	VL	Impact	VH	H	M	L	VL		VH	H	M	L	VL		VH	H	M	L	VL		VH	H	M	L	VL		VH	H	M	L	VL	Mitigate	CRISIS Emergency Response	Contractor	-
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9	Site Communication	Negative	Threat	Cost	Low	Low	<table border="1"> <tr><td>Probability</td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> <tr><td>Impact</td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> <tr><td></td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> <tr><td></td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> <tr><td></td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> <tr><td></td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> </table>	Probability	VH	H	M	L	VL	Impact	VH	H	M	L	VL		VH	H	M	L	VL		VH	H	M	L	VL		VH	H	M	L	VL		VH	H	M	L	VL	Mitigate	Proper coordination and information sharing	Contractor/Project Manager	Day to day
Probability	VH	H	M	L	VL																																										
Impact	VH	H	M	L	VL																																										
	VH	H	M	L	VL																																										
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#	Risk Event	Effect	Threat or Opportunity	Primary Objective	Probability	Impact	Risk Matrix					Response Strategy	Response Actions	Responsible Entity	Interval or Milestone Check																																
10	Cost Matters, Risk to the Road, Risk to the people etc.	Cost/Time	Threat	Fast	Low	High	<table border="1"> <tr><td>Probability</td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> <tr><td>Impact</td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> <tr><td></td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> <tr><td></td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> <tr><td></td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> <tr><td></td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> </table>	Probability	VH	H	M	L	VL	Impact	VH	H	M	L	VL		VH	H	M	L	VL		VH	H	M	L	VL		VH	H	M	L	VL		VH	H	M	L	VL	Accept	Cost/estimate reduction	Contractor	-
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11	Labour Agitation and Strikes	Time	Threat	Time	Low	Medium	<table border="1"> <tr><td>Probability</td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> <tr><td>Impact</td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> <tr><td></td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> <tr><td></td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> <tr><td></td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> <tr><td></td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> </table>	Probability	VH	H	M	L	VL	Impact	VH	H	M	L	VL		VH	H	M	L	VL		VH	H	M	L	VL		VH	H	M	L	VL		VH	H	M	L	VL	Mitigate	Relative approach/ Good communication	Contractor/Project Manager	Day to Day
Probability	VH	H	M	L	VL																																										
Impact	VH	H	M	L	VL																																										
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12	Political Risk	Cost/Increase	Threat	Scope	Low	Medium/High	<table border="1"> <tr><td>Probability</td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> <tr><td>Impact</td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> <tr><td></td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> <tr><td></td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> <tr><td></td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> <tr><td></td><td>VH</td><td>H</td><td>M</td><td>L</td><td>VL</td></tr> </table>	Probability	VH	H	M	L	VL	Impact	VH	H	M	L	VL		VH	H	M	L	VL		VH	H	M	L	VL		VH	H	M	L	VL		VH	H	M	L	VL	Mitigate	Provision/Reduce	Government	-
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Impact	VH	H	M	L	VL																																										
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5. CONCLUSIONS

The risks involved during the construction of the project if not treated or mitigated properly, the probability of successful completion of the project within the stipulated time and cost frame will reduce. This will have a direct impact on project.

A major limitation for analysis is that the entire process being probabilistic, the outcome of the analysis is largely dependent on the opinion of the likelihood and impact of the identified risks. Also any sort of misinformation will result in inexact results.

If risks are to be properly managed, it is also self-evident that the risk management process must be present, transparent and activated within each phase. A shift from project-oriented to process-oriented risk management is required in order to manage project risks successfully.

ACKNOWLEDGEMENT

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