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Risk Identification and Applying Risk Management Technique in Construction Project

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Abstract – Construction is a risky industry and there is no other industry that requires proper application of business practices much as construction industry. Risks have a major impact on a construction project's performance in terms of cost, time and quality. The aim of study to identify risk factor to most effect the construction project and generate model for their mitigation of risks. This research is based on a questionnaire survey to collect the primary data. In questionnaire, question generate on evaluated six risk factors. Questionnaire was conducted with the project manager, senior engineers having experience above 5-15 years. The results are based on analyzing 82 questionnaires that were directed respondents and concluded that the most effect risk factors are: Construction risk, Environmental risk, financial risk, Management risk, Contact risk and Political risk. Data from respondents by rating on a 5 point Likert scale were analyzed through tools like MS Excel. Survey has been carried out from some area of Ahmedabad. Finally, the conclusion was made regarding results of the research.

Key words: Risk Management, Risk, Risk factors, Risk Model, Risk Mitigation plan

I. INTRODUCTION

In recent years, construction industry has developed rapidly in big cities of India. Construction industry 40% to 50% of India's capital expenditure on projects in various sectors such as highways, roads, railways, energy, airports, irrigation, etc. and is the second largest industry in India after agriculture. It accounts for about 11% of India's GDP. [1] Construction industry has a vital role in the competitive delivery of goods and services by the rest of economy. Also construction sector is a major employment driver, next only to agriculture. It is provide large number of opportunities in the field of building, civil engineering, offshore structure and the process plant industry. 250+ ancillary industries such as cement, steel, brick, and timber and building material are dependent on the construction industry.

The construction industry has a long history. Housing has been built ever since humans left caves and the construction project as a business branch has probably been around since before the pyramids. There have always been considerations about uncertainties and risk. [3] Risk is the probability that an unfavorable outcome will occur. The process of measuring risk by risk management and then manages the risk by developing various strategies.

Risk management used in all industries like IT related business, automobile or pharmaceutical industry, construction industry, etc. each and every industries have their own risk management standards, but the general concept of risk management remain same. Risk management is most important factor for successful project. Risk management is not hard to apply in construction industry.

A. Need for Study

Construction project require high value and huge resource of men, material, machinery. In major project involves heavy investment, require higher level of technology need of effective management of resource.

Constructions conditions vary from region to region, project to project, time to time. Due to certain obstacles and problems project can face serious issue such as quality requirements, cost overruns and uncertain delays in project. Due to such unseen hurdles project face a lots, which in turns required to address through some techniques and or some management skills? Here author as takes a charge to identity and resolution such risk factor by identify them by risk management techniques.

B. Objective

- 1) To study risk and risk management process and its importance in construction industry.
- 2) To identify various risk related with construction projects.
- 3) Improving the performance and reduce risk effect on construction project by using risk management model.

II. IDENTIFICATION OF RISK FACTORS AFFECTING CONSTRUCTION PROJECT

The literature articles have shown that different type of risk arises in construction project so project gets failure. Various literature reviews shows that some of risks are mostly common each and every construction project.

By Analyzing of literature articles I have carried out 97 sub-factors. Then 97 sub-factors have been categorized in 11 derived factors. From 11 derived factors I have listed top six risk factors based on 10 time repeat criteria. Hence, below figure shows six risk factors are taken as a further instigation.

Table 1 : Details of Number of Factors

Total number of sub-factor	97
Derived main factors	11
Top ranked factors	6

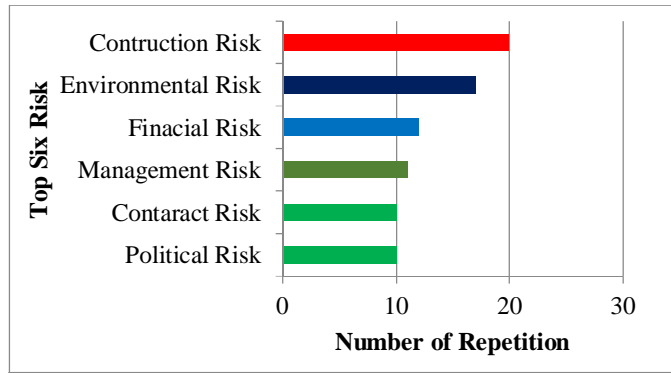


Figure 1: List of Top Ranked 6 Factors

III. RESEARCH METHODOLOGY

A. Introduction

It is decision about the data collection technique to be used. Data collection is a process of collecting information from all the relevant sources to find answers to the research problem. Data collection methods can be divided into two categories: secondary methods of data collection and primary methods of data collection. Secondary method is a type of data that has already been published in books, newspapers, magazines, journals, online portals etc. Primary method is a data collection by questionnaire and interviews.

Data collection process

Data collect by using Questionnaire and face to face interview with the respondents.

And respondent are:-

Project manager

Planning manager

Senior engineer with 4-5 year experience

B. Research Design

The first phase of the research is to identify the aim of this study and establishment of clear objective. The second phase of the research included a summary of the literature review. The third phase of the research is determined sample size. Also in this phase questionnaire has been designed. In the fourth phase data is collecting by using questionnaire. 90 questionnaires were distributed targeting commercial and residential project in Ahmedabad. It is also includes results analysis and generating risk management model. Fifth phase includes the conclusion and recommendations based on the result of the analysis.

IV. DATA COLLECTION

A. Study Area

To carry out the research work, the various risk factors which can be affect the performance of the project. So the analysis will carried out in big city of Gujarat which is Ahmedabad. My study area in Ahmedabad is Gota, science city, vaishno devi circle. There are different types of project in Ahmedabad city like residential, commercial, hospital, roads, education, etc. Hence the target population for the research work is commercial and residential project.

B. Questionnaire Design



From the literature review all the information that could help in achieving the study objectives were collected, reviewed and formalized to be suitable for the study survey and after many stages of brain storming and opinion from the expert & amending the questionnaire has been developed with close ended questions .

The questionnaire contains three parts to accomplish of the research, as follow:

Part 1: Background information.

This part is related to general information about the companies and respondents. General information like name and age of respondents, name of companies, experience of respondents, education , type of project, duration of project, etc.

Part 2: Question related to risk management.

In this part questions are related to risk management.

Part 3: various risk factors affecting project.

This part includes the list of the various risk factors affecting the projects derived from the analysis of the literature review which contains six main factors. The degree of impact is based on five-point likert scale. These five points are Very low, Low, Neutral, High and Very high. Desired answer for the particular question needs to answer by ticking form very low to very high.

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Following formula where the Relative Importance Index (RII) ranges from 0 to 1[18]

$$\text{Relative Importance Index} = \frac{\sum w}{AN} = \frac{5n1+4n2+3n3+2n4+1n5}{5N}$$

Where,

W is the weighting given to each factor by the respondent, ranging from 1 to 5

n1 = Number of responses for very low

n2 = Number of responses for low

n3 = Number of responses for neutral

n4 = Number of responses for high

n5 = Number of responses for very high

A = Highest weight.

N = Total number of samples.

C. Issue Arise Collection Data

- 1) Before the collection of data from the respondents, they were fully informed about the overall aims and objectives of the study and verbal consent will be taken from them.
- 2) Project managers and site contractor's privacy and confidentiality were maintained in the process of the data collection.
- 3) Respondents were not forced to participate in the study without their interest.
- 4) Data was collected at the convenient times of the respondents when they are available for Best results.

V. DATA ANALYSIS

A. Introduction

This chapter shows the analysis and results of the data collected data. Derived top six factors from the literature review and a discussion with professionals has been analyzed separately and their analysis detail has been summarized in this chapter.

Questionnaire listed a number of statements to evaluate risk. For each of these statements, respondents indicate their preference by rating it on a 5 point likert scale, where 1 indicates "very low" and 5 indicates "very high".

When the completed questionnaires had been collected by hard copy of questionnaire, the data was entered into excel sheet. All questions and sub-questions were converted into variables. In data analysis is used as an analytical tool in the form of different charts and tables.

B. Relative Importance Index (RII)

Relative importance index (RII) can be used to analysis the ranking of the various answer derived from the questionnaires. The calculation has been done to obtain the RII of the various factors. The various risk factors has various RII are mentioned in below table.

NO	Main Risk	Risk factors	RII
1	Construction risk	Change in work	0.4926
		Improper Quality in work	0.5731
		Permit work system	0.6609
		Change in methodology	0.7024
		Incorrect survey	0.6365
		Unidentified hazardous waste	0.6170
		Sub-contractors delay & resourcing problem	0.4707
		Lack of material	0.4609
2	Environmental risk	Acts of gods	0.8634
		Difficulty of access to the site	0.7585
		Adverse whether condition	0.5634
		Differing site conditions	0.6268
		Noise pollution	0.5731
		Air pollution	0.5536
3	Financial risk	Delayed payment on contract	0.4585
		Penalty for activity delay	0.4951
		Taxation, vat etc.	0.7512
		Due to Theft	0.7243
		Change in design or variation in design	0.3512
4	Management risk	Project complexity	0.6658
		Organization or change management	0.4585
		Coordination with sub-contractors	0.7024
		Lack of Communication	0.7243
		Inexperienced staff assigned	0.3951
5	Contract risk	Improper quality	0.5439
		Delay in time	0.4878
		Cost overruns	0.4682
		Inconsistent supplier pricing	0.6073
6	Political risk	Government acts	0.4731
		Legislation	0.4121
		War threats	0.8146
		Blockade	0.8731

This table of contents shows top six derived risk factor and their average relative importance index respectively. Environmental risk is the highest Average Relative Importance Index.

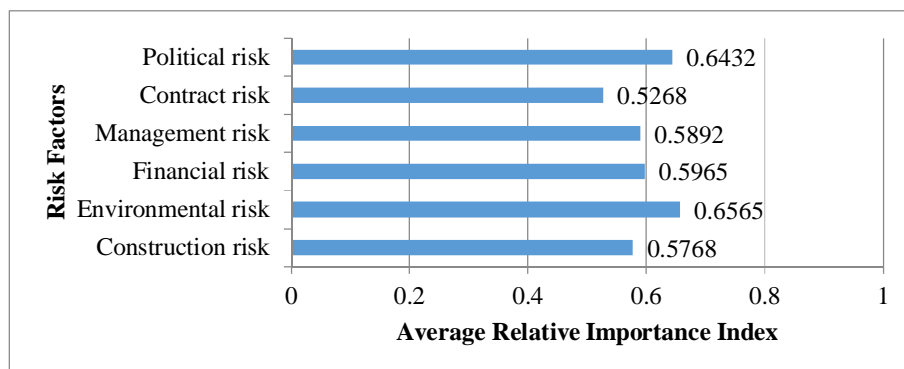


Figure 2: Average RII Results of Six Risk Factors

C. Proposed Risk Management Model

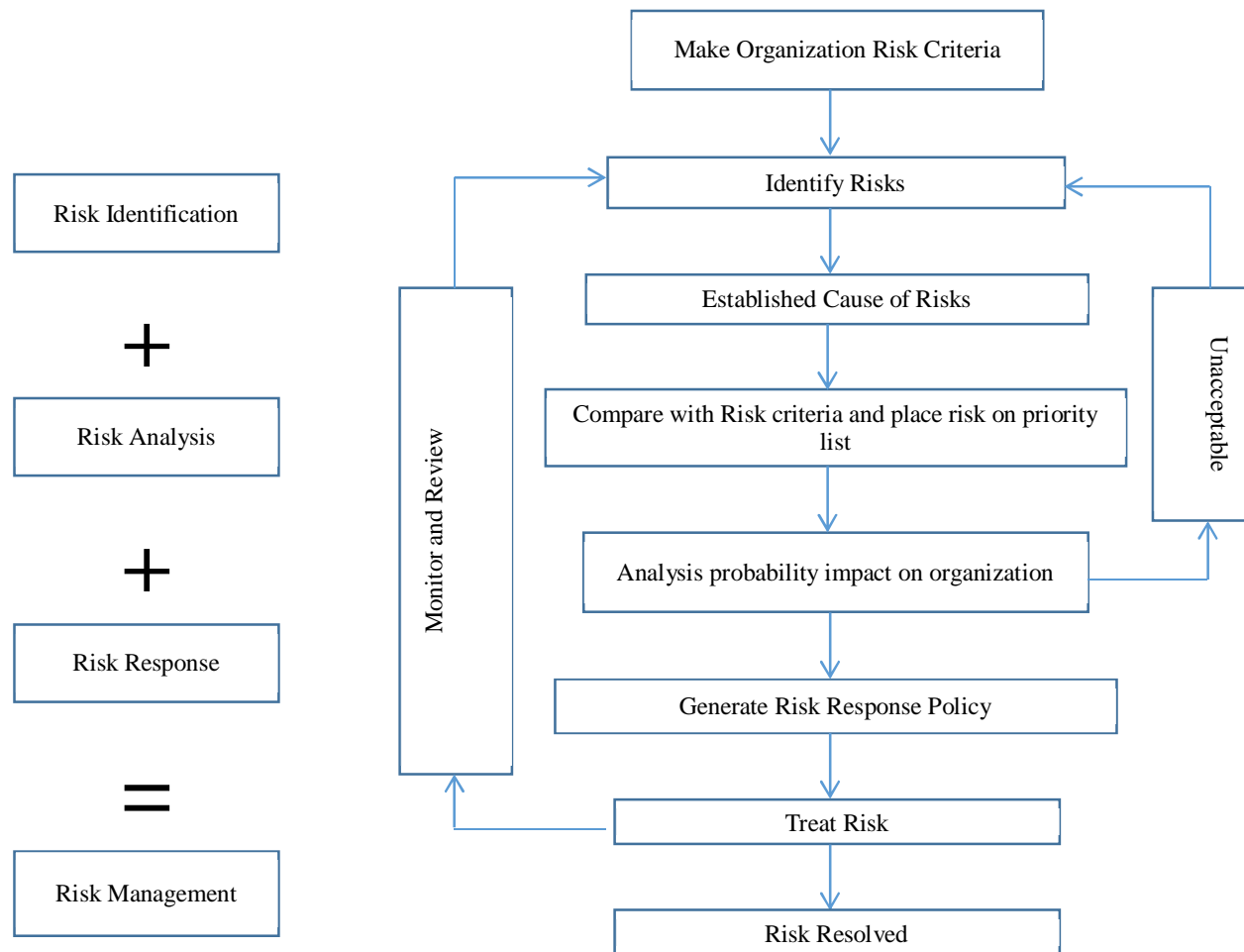


Figure 3: Risk Management Model

VI. CONCLUSION

Construction project is unique; complex also takes a lot of investment so basically it is sensitive and risky business. The aim of this paper has been to identify the Risk factors to reduce project complexity. This has been achieved by questionnaire survey with industry experts and analyzing the results accordingly. Secondary data collected from literature article. In summary of literature article, Sub-factors are divided into the 11 derived factors. Top six risk factors from 11 derived factors that arise in each and every construction project.

Top six risk factors are as under below,

- Construction risk
- Environmental risk
- Financial risk
- Management risk
- Contract risk
- Political risk

Questionnaire has been generated on top six risk factors to carry out primary data collection. The results of the analysis of the data collection have been done by using relative important index formula. This research is for residential and commercial project which aims to develop a model that can be used to evaluate and reduce the risks effects on project and improve project planning.



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