



IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 7 Issue: XI Month of publication: November 2019 DOI: http://doi.org/10.22214/ijraset.2019.11101

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Literature Review: Risks Mitigation in Construction Projects

ManojSharma¹, Dr. A. S. Trivedi², Neha Madhan³

¹Associate Professor, Civil IPS CTM Gwalior, RGPV University, Bhopal (M.P) / India ²Professor, Civil IPS CTM Gwalior, RGPV University, Bhopal (M.P) / India ³Research Scholar, M. Tech Civil IPS CTM Gwalior, RGPV University, Bhopal (M.P) / India

Abstract: The construction industries are wide related to a high risk and uncertainty because of the character of its operational surroundings. This study aims to spot and value key risk factors and their frequency and severity than their impact in several styles of construction. A survey was conducted and a complete of sixty five important factors were known and categorised into eight teams. These are: Financial risk, Legal risk, Management risk, Market risk, Political and Technical risk, Environmental risk, and Social risk.

Keywords: Risks, Risk Management, Construction Projects, Relative important index, Statistical analysis

I. INTRODUCTION

The Construction project is exposed to a high degree of risk from the beginning of the project till the top of the project. Risk is outlined as any event or prevalence which could have an effect on the action of project goals. Risk management in construction comes is to deal effectively with uncertainty and sudden events that would have an effect on palmy and timely completion of the project. If risks don't seem to be known early throughout a project, it creates heaps of exposure and uncertainties to the project life cycle, thereby touching such aspects as value, schedule and quality of the project. Additionally, it might additionally produce exposures within the space of Health, safety and surroundings. Hence, risk management permits project managers to spot, analyze, respond and manage the risks of the project. This can be the rationale why risk management is extremely necessary for the palmy action for a project. In drafting the contract, the gating strategy ought to clearly outline the responsibilities of the shopper and the contractor and such ought to be specific and graspable. This can be to form positive that the chance is evident for each the contractor and shopper thereby avoid future dispute. The importance of risk management in construction comes are reportable by many authors. It had been completed that risk management is crucial to construction activities in minimizing losses and enhancing profitableness. It had been explicit that risk management could be a technique that ought to be applied in associate degree trade to attain the goals of the trade, thus it's necessary to unfold awareness and build interest amongst individuals to use risk management techniques within the trade. The chance could be a measurable a part of uncertainty and is assumed as a deviation from the required level, thus the chance analysis is thus necessary for project choice and coordination of construction work. It had been explicit that risk management won't take away all risks from the construction, its main objective is to make sure that risks are managed most effectively.





ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177 Volume 7 Issue XI, Nov 2019- Available at www.ijraset.com

II. OBJECTIVES

The main objectives of this study include the following:

- A. To identify the causes of risks in construction projects.
- B. To identify the approaches for solving the problems regarding risks.
- C. To minimize the effect of risks in construction project.
- D. Identify risk for construction projects in India and categorize them.
- E. Ranking of the risk factors in accordance of their frequency, severity and importance.

III. LITERATURE REVIEW

Year	Title of Research		
2010	Yasser Abdelghany, A.Samer Ezeidin - This paper focuses on the analysis of the different ICJV risk environments.		
	The related risks are analyzed into country, operating, sociopolitical and financial risks and then identified and		
	grouped into internal, project specific, schedules, and major contract clause risks.		
2011 Hong-bo Zhou, S.e. M.ASCE and Hui Zhang - Risk assessment and risk management for deep foundation			
	are essential for quality and safety in civil engineering owing to the needs of urban construction projects		
2012 Hariharan Subramanyan, Priyadarshi H. Sawant and Vandana Bhatt- Student's t-test, a significance test, h			
	know the significance of test findings on the general construction industry.		
2013	Patel AnkitMahendra, Jayeshkumar R. Pitroda, J. J. Bhavsar This study proposes to apply the risk management technique		
	which includes well - documented procedures for the one stop solution all types of hazards most likely to occur during any		
	construction project Lifecycle		
2015	Shankar Neeraj, Balasubramanian.M -Risk assessment is a tool to identify those risks in a project and manage it		
	accordingly with proper treatment. Risk assessment is defined in this study as a technique that aims to identify and estimate		
	risks to personnel and property impacted upon by a project.		
2016	Krantikumar Mhetre, B.A.Konnur, Amarsinh B. Landage - This paper covers the concepts of risk management and various		
	risk analysis techniques to be used for the one stop solution for all types of hazards most likely to occur during any		
	construction project lifecycle.		
2017	Paweł Szymańskia et.al -The basic problem of this option, however, is its senselessness economic, because what is		
	potentially profitable, it is by definition risky and something that does not pose a risk, it is interesting from an economic		
	point of view, and thus, does not bring tangible benefits.		
2018	Mohammad Numan Aloko et.al (2018) - To overcome these problems, nowadays, implementing risk management in		
1	construction field has shown improvements in the mitigation of risks which have adverse impacts on project objects		
1	such as time, cost and quality.		

IV. METHODOLOGY

A questionnaire survey was conducted by construction professionals representing various stakeholders involved in construction projects in India

A. Questionnaire Design

The questionnaire was designed based on critical factors were identified that contributed to the causes of risks. A questionnaire survey was developed to assess the perceptions of various construction professionals of the relative importance of causes and the effects of construction risks. The questionnaire was designed into two sections: Section A; section B. Section A is to obtain the requested background information about the respondents. Section B is to obtain information on the factors that contribute to the causes of risks in construction projects from the perspective of construction professionals. A five point Likert scale (1 very low, 2 low, 3 moderate, 4 high, 5 very high) was adopted where respondents were asked to rank the importance and impact of a particular factor on risks in one of their selected projects. Descriptive statistical techniques, namely Relative Importance Index (RII) has been used to highlight the relative importance of critical factors as perceived by the respondents (Assaf et. al, 1995; Faridi and El-Sayegh, 2006; Iyer and Jha, 2005; kmaraswamy and Chan, 1998).



ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177 Volume 7 Issue XI, Nov 2019- Available at www.ijraset.com

Questionnaire Table -1

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	Local protectionism		
Unfairness in tendering	Unfairness in tendering		



ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177 Volume 7 Issue XI, Nov 2019- Available at www.ijraset.com

Political Risk	
Cost increase due to changes of Govt policies	
Loss incurred due to political changes	
Loss due to bureaucracy for late approvals	
War and Civil disorders	
Problems with Licenses	
Technical Risk	
Accidents on site	
Equipment failure	
Errors in design drawings	
High degree of difficulty in construction	
Incompetence of transportation facilities	
poor quality of procured materials	
Unknown site physical conditions	
Following government standards and codes	
Wastage of materials by workers	
Site distance from urban area	
Surplus materials handling	
Shortage of skillful workers	
Insufficient Detailing	
Environmental Risk & Natural Risk	
Any adverse impact on project due to climatic	
conditions	
Any impact on the environment due to the project	
Earthquake	
Fire	
Collapse and Land Slide	
Inclement Weather	
Floods	
Social Risk	
Resettlement and rehabilitation of people	
Problems due to adjacent or nearby projects Local people ,support for the project	
Local people, support for the project	

V. METHODOLOGY

A. Data Collection Through Field Survey

Field survey is done to study the prevalent environment in the building construction industry. The objective of doing field survey is to obtain the opinion of field personnel with respect to various types of risks associated with building construction industry. For the survey, based on literature review a questionnaire is developed to obtain the opinion of respondent. The questionnaire is designed probability level of the risk occurrence and degree of impact or the level of loss if the risk occurs. Survey was carried out among the various project participants. For the purpose of survey, leading builders, real estate developers, project managers, contractors and senior engineers in various construction organizations both in government as well as private sector were approached.



ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177 Volume 7 Issue XI, Nov 2019- Available at www.ijraset.com

B. Risk Rating

Likert scale of 1-5 was used in the questionnaire. A Likert scale is a kind of psychometric response scale often used in questionnaire and is the most widely used scale in survey research. When responding to a Likert questionnaire item, respondent specify their level of agreement to a statement. The scale is named after RensisLikert. Who published a report describing its use (Likeret, 1932). Likert scale is a widely use instrument in measuring opinions, beliefs and attitudes (Davellis, 1991). The respondents were requested to judge the significance or expected loss of each risk. There are many criteria that respondents may need to consider. One alternative approach adopted by previous researchers is to consider two attributes for each risk: the probability level of risk occurrence denoted by a, and the degree of impact or the level of loss if the risk occurs, denoted by b. The same type of approach is followed in this study. Therefore risk significance denoted as RS, can be described as the function of the two attributes RS = f(a,b). Applying this approach, the respondents were asked to respond to the two attributes for each risk. Considering a , the respondents were required to judge the probability level of risk occurrence by selecting one from among five levels namely , very small , small , normal , large and very large . Considering b, the respondents were required to judge the degree of impact if the risk concerned occurs, by selecting one from among five grades, very low, low, medium, high and very high.

C. Analysis of Data

The data obtained was analyses to determine the relative importance of the various factors that contribute to causes of construction risks.

D. Relative Importance Index (RII)

Assess the relative significance among risks, previous literature work study suggests establishing a risk significance index by calculating a significance score for each risk. For Calculating the significance score, multiply the probability of occurrence by the degree of Impact. The significance score for each risk assessed by each respondent can be obtained through the model

$$\mathbf{S}_{j}^{i} = \mathbf{A}_{j}^{i} * \mathbf{B}_{j}^{i}$$

Where Sij = Significance score assessed by respondent j for risk i

Aij = Occurrence of risk i, assessed by respondent j

Bij= degree of impact of risk I, assessed by respondent j.

By averaging scores from every one of the reactions, it is conceivable to get a normal importance score for each hazard, and this normal score is known as the hazard record score and is utilized for positioning the dangers. The model for the figuring of hazard list score can be characterized as

$$R_{s}^{i} = \sum_{j}^{T} = 1 S_{j}^{i} / T$$

Where R_s^i = index score for risk i

 S_{j}^{i} = Significance score assessed by respondent j for risk i

T= total number of responses

	a , b	
Ratting Attributes	Numerical Conversion	
0	0.0	
1	0.2	
2	0.4	
3	0.6	
4	0.8	
5	1.0	

Numerical conversion for the rating attributes Table-2

After obtaining index score for each risk factor, standard deviation and coefficient of variation of each risk factor is also determined. Subsequently, ranking of risk factors is done based on Index score.



ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177 Volume 7 Issue XI, Nov 2019- Available at www.ijraset.com

E. Applicability of Test Results to Construction Industry

To test for statistical analysis techniques was used to determine the significance of the level of importance attached to factors causing risk in building construction project. Descriptive and frequency statistical analysis techniques were used to analyze the data collected in the survey. However, an advanced and accurate method is necessary to analyze the data in a systematic, fast and reliable way. For this purpose, MS Excel was selected. The data collected from the survey were analyzed using the frequency and severity index method (Assaf and Al-Hejji, 2006) [5]. Details of both frequency and severity index analysis are explained below. According to Assaf and Al-Hejji (2006), a formula as shown in equation (1) was used to rank risk factors based on frequency of occurrence as identified by the participants, which is called the Frequency Index (F.I).

 $\sum_{n \in \mathbb{N}} \sum_{i=1}^{n} \sum_{j=1}^{n} \sum_{i=1}^{n} \sum_{$

Where (a) is the constant expressing weighting given to each response (ranges from 1 for very small up to 5 for very high occurrence), n is the frequency of the responses, and N is the total number of responses. Similarly, a formula as shown in equation (2) used to rank risk factors based on severity index as indicated by the participants, which is called Severity Index (S.I).

$$\sum_{a(n/N)}$$
Severity Index (S. I.)(%)= 5×100 (2)

Where (a) is the constant expressing weighting given to each response (range from 1 for very low to 5 for very high effect), n is the frequency of the response, and N is the total number of responses. Importance Index: The importance index of each risk factor is calculated as a function of both frequency and severity indices, as follows:

Importance Index (I.I) (%) =
$$F.I.(\%) \times S.I.(\%)$$
 (3)
100

VI. CONCLUSION

In this study, identifying the risk factors faced by the construction industry is based on collecting information about construction risks, their consequences and corrective actions that may be done to prevent or mitigate the risk effects. The main point which was considered this research is to explore the key risk factors and identify these factors that could be faced in construction projects in India.

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ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177

Volume 7 Issue XI, Nov 2019- Available at www.ijraset.com

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