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Literature Review: Risks Mitigation in Construction Projects

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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.

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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 pit engineering 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, has been applied to 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 construction field has shown improvements in the mitigation of risks which have adverse impacts on project objects 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).

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Questionnaire Table -1

Types of risk	Probability level of the risk occurrence (a)	Degree of impact or the level of loss if the risk occurs (b)
Financial Risk		
Loss due to Fluctuation of interest rate		
Low credibility of shareholder and lender		
Change in bank formalities and lenders		
Loss due to rise in fuel prices		
Insurances risk		
Default by subcontractors		
Inadequate Cash Flow		
Inflation, Availability of foreign currency & Exchange Rate change		
Taxes and burdens		
Inexperience when pricing tenders		
Legal Risk		
Breach of contract by project partner		
Lack of enforcement of legal judgment		
Improper verification of contract document		
Uncertainty and unfairness of court justice		
Management Risk		
Change of top management		
No past experience in similar project		
Short tender time		
Internal management problem		
Improper project feasibility study		
Poor relation and disputes with partner		
Team work		
Time constraint		
Project delay		
Market Risk		
Competition from other similar projects		
Fall short of expected income from project		
Increase of resettlement costs		
Increase of labour costs		
Increase of materials price		
Inadequate forecast about market demand		
Local protectionism		
Unfairness in tendering		

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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		

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.

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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

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

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

$$R_s^i = \sum_j^T = 1\ S^i_j / T$$

Where R_s^i = index score for risk i

S^i_j = Significance score assessed by respondent j for risk i

T= total number of responses

Numerical conversion for the rating attributes Table-2

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

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.

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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).

$$\text{Frequency Index (F. I.)}(\%) = \frac{\sum a(n/N)}{5} \times 100 \qquad (1)$$

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).

$$\text{Severity Index (S. I.)}(\%) = \frac{\sum a(n/N)}{5} \times 100 \qquad (2)$$

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:

$$\text{Importance Index (I.I)}(\%) = \frac{\text{F.I (\%) X S.I (\%)}}{100} \qquad (3)$$

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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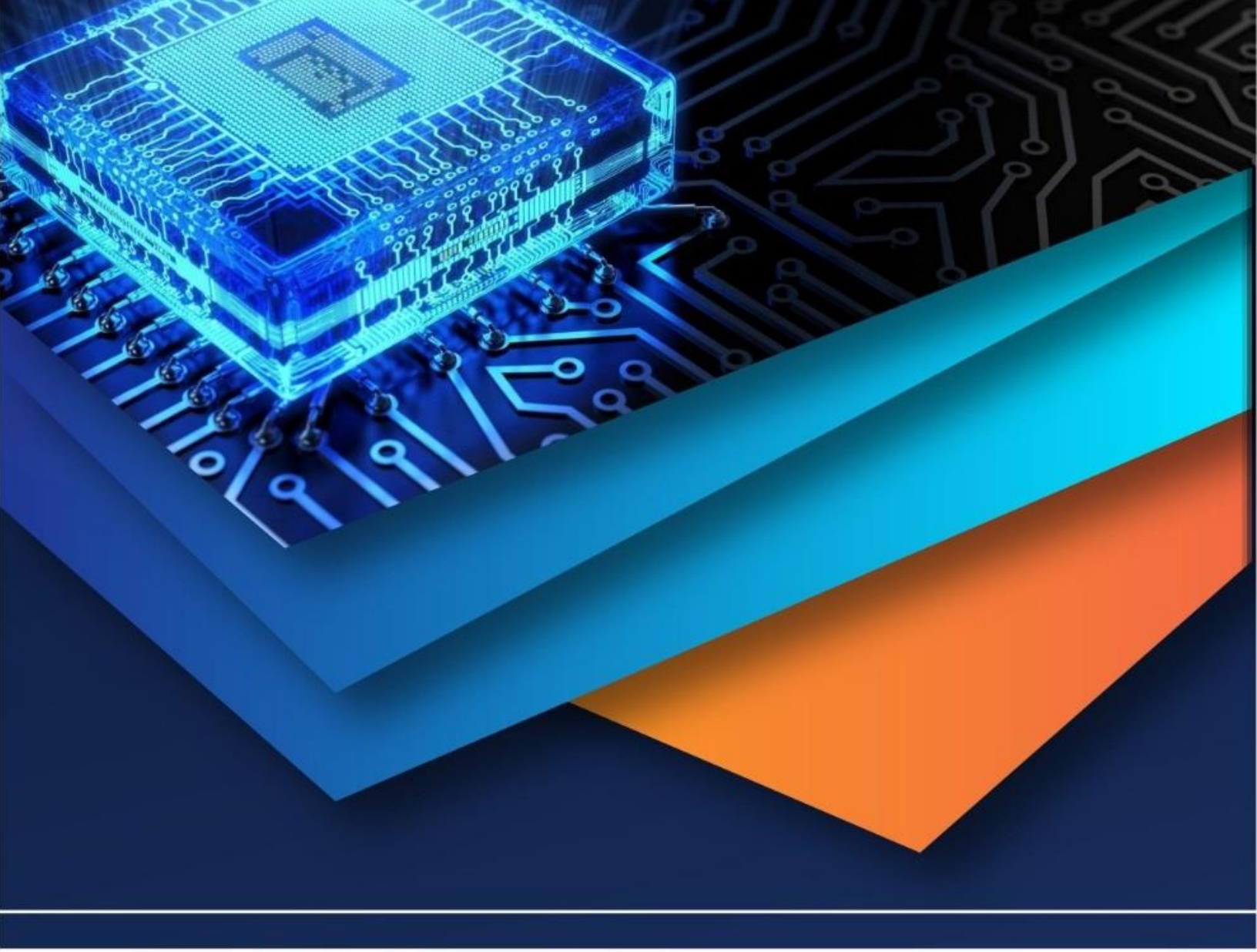

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