Literature Review: Identify Critical Factors in Construction Projects

Dharmendra[1] Manoj Sharma[2] B. P. Mudgal[3]
[1]M. Tech Research Scholar [2,3]Associate Professor
[1,2,3]Department of Civil Engineering
[1,2.3]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 fifty important factors were known and categorized into eight teams. These are: Owner, Consultant, Contractor, Design, Labor, Materials, Equipment, Project and External 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 very best of the project. Risk is printed as any event or prevalence which could have an impact on the action of project goals. Risk management in construction comes is to deal effectively with uncertainty and sudden events that might have an impact on palmy and timely completion of the project. If risks don't seem to be known early throughout a project, it creates tons of exposure and uncertainties to the project life cycle, thereby touching such aspects as value, schedule and quality of the project. Additionally, it'd additionally produce exposures within the space of Health, safety and surroundings. Hence, risk management permits project managers to identify, analyze, respond and manage the risks of the project. this will be the rationale why risk management is extremely necessary for the palmy action for a project. In drafting the contract, the gating strategy need to clearly outline the responsibilities of the consumer and therefore the contractor and such need to be specific and graspable. this will be to make positive that the prospect is clear for every 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 might be a way that need to be applied in associate trade to achieve the goals of the trade, thus it is necessary to unfold awareness and build interest amongst individuals to use risk management techniques within the trade. the prospect might be a measurable a neighborhood of uncertainty and is assumed as a deviation from the specified level, thus the prospect analysis is thus necessary for project choice and coordination of construction work. It had been explicit that risk management won't deduct all risks from the construction; its main objective is to form sure that risks are managed most effectively.

A. Objectives

The main objectives of this study include the following:

- Identify risk for construction projects in India and categorize them.
- To identify the approaches for solving the problems regarding risks.
- Ranking of the risk factors in accordance of their frequency, severity and importance.

II. LITERATURE REVIEW

Yasser Abdelghany, A.Samer Ezeidin - This paper focuses on the analysis of the different ICJV risk environments. The related risks are analysed into country, operating, socio political and financial risks and then identified and grouped into internal, project specific, schedules, and major contract clause risks (2010)

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 (2011)

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.(2012)

Patel Ankit Mahendra, 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.(2013)

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.(2015)

Krantikumar Mhetre, B.A.Konnur, Amarsinh B. Landage - This paper covers the concepts of risk management and various risk analysis techniques to be used

All rights reserved by www.ijsrd.com

for the one stop solution for all types of hazards most likely to occur during any construction project lifecycle.(2016)
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.(2017)

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.(2018)

Ahsan Nawaz et al.- Risk management is a comparatively new field and there is no core system of risk management in the construction industries of developing countries.(2019)

III. 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 supported critical factors were identified that contributed to the causes of risks. A questionnaire survey was developed to assess the perceptions of varied construction professionals of the relative importance of causes and therefore the effects of construction risks. The questionnaire was designed into two sections: Section A; section B. Section A is to get the requested background information about the respondents. Section B is to get information on the factors that contribute to the causes of risks in construction projects from the attitude 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 specific factor on risks in one among their selected projects. Descriptive statistical techniques, namely Relative Importance Index (RII) has been wont 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).

Types of risk	Probability level of the risk occurrence(a)	Degree of impact or the level of loss if the risk occurs (b)
Owner		
Inadequate project planning by owner		
Selecting inappropriate contractors		
Delays in site delivery to contractor		
Delays in reviewing and approving design documents		
Change orders by owner		
Slow decision-making process by owner		
Delays in progress payments by owner		
Suspension of work by owner		
Poor coordination by owner between consultant and contractor		
Conflicts between joint ownership of the project		
Consultant		
Delays in reviewing and approving design documents		
Delays in performing inspection and testing		
Delays in approving major changes in scope of work by consultant		
Inadequate consultant experience		
Poor consultant communication with contractor and owner		
Conflicts between consultant and design engineer		
Contractor		
Ineffective project planning by contractor		
Difficulties in financing project by contractor		
Incompetence or inexperience of contractor		
Inadequate site investigation		
Slow site mobilization		
Poor site management and supervision		
Delays due to unreliable subcontractors' work		
Frequent change of subcontractors		
Rework due to errors during construction		
Poor contractor communication with consultant and owner		
Design		
Inadequate design team experience		
Misunderstanding of owner's requirements by design engineeer		
Delays in producing design documents		
Design errors/incomplete		

All rights reserved by *www.ijsrd.com*

or unclear design drawings		
Labor		
Shortage of labor		
Unqualified or inadequate workforce		
Low productivity of labor		
Personal conflicts among labor		
Materials		
Shortage of construction materials in market		
Delays in delivery of materials		
Inadequate quality of materials		
Changes in material types and specifications during construction		
Equipment		
Shortage of equipment		
Slow mobilization of equipment		
Low productivity and efficiency of equipment		
Frequent equipment breakdowns		
Improper equipment or lack of high-tech equipment		
Project		
Unsuitable type of project bidding and award		
Mistakes or discrepancies in contract documents		
Original contract duration is too short		
Ineffective delay penalties		
Lack of communication between project parties		
Legal disputes between project participants		
External		
Delays in obtaining permits from municipality		
Changes in government regulations and laws		
Delays in providing services from utilities		
Unexpected surface and subsurface		
Problems with neighbours		
Unfavourable weather conditions		

Questionnaire Table 1:

B. 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.

1) 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. Data Analysis

1) Important Index Method (IMPI)

For each case important index is calculated as a function of both frequency and severity index as follows:

Important Index % = [F.I% X S.I %] /100

2) Relative Importance Index (RII)

Assess the relative significance among risks, previous literature work study suggest 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 $S^i j$ = Significance score assessed by respondent j for risk i

$A^i j$ = Occurrence of risk i, assessed by respondent j

All rights reserved by *www.ijsrd.com*

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 risks. 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.

IV. 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) . 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:

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

V. Conclusion

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

References

[1] Akintoye, A.S. and MacLeod, M.J.; "Risk analysis and management in construction"; International Journal of Project Management (1997)
[2] Amiruddin Ismail, abbas M. Abd et.al (2007) "Modeling of Risk Assessment for Integrated Project Management System in Construction" APRN journal of Engineering and applied Science, Vol.2, No.6, pp. 37-43
[3] Al-Bahar, J. F. and Crandall, K. C. (1990) Systematic risk management approach for construction project. Journal of Construction Engineering and Management, Vol.116,Issue (3), pp. 533–546.
[4] Aleshin,(2001) A. Risk management of international projects in Russia. International Journal of Project Management, Vol.19, 20, pp. 207–222.
[5] Assaf, S. and Al-Hejji.(2006) Causes of delay in large construction projects. International Journal of Project Management,Vol. 21,Issue (4), pp. 349–357.
[6] Bing, L., Tiong, R. L. K., Wong, W. F. and Chow, D.(1999) Risk management of international construction joint ventures. Journal of Construction Engineering and Management, ASCE, 25(4),pp. 277–284.
[7] Dey, P.K., 2002. Project Risk Management: A Combined Analytic Hierarchy Process and Decision Tree Approach. Cost Engineering, Vol. 44, No. 3, pp. 1326.
[8] El-Diraby, T. A. and Gill, S. M.(2006) A taxonomy for construction terms in privatized infrastructure finance: supporting semantic exchange of project risk information. Construction Management and Economics, 24(3), pp. 271–285.
[9] Hastak, M. and Shaked, K.(2000) ICRAM-1: Model for international construction risk assessment. Journal of management in Engineering, Vol.16,Issue(1), pp. 59–67.
[10] Kartam, N. and Kartam,(2001) S. Risk and its management in the Kuwaiti construction industry: a contractors' perspective. International Journal of Project Management,Vol. 19,Issue(2), pp. 325–335.
[11] Miller, K.(1992) A framework for integrated risk management in international business. Journal of

All rights reserved by *www.ijsrd.com*

International Business Studies, Vol.23,Issue (2), pp. 311–331.
[12] Mulholland, B. and Christian, J. (1999) Risk assessment in construction schedules. Journal of Construction Engineering and Management, Vol.125,Issue (1), pp. 8–15.
[13] Bing, L., Akintoye, A., Edwards, P. J. and Hardcastle, C.(2005) The allocation of risk in PPP/PFI construction projects in the UK. International Journal of Project Management,Vol.23 ,Issue (3), pp.25–35.
[14] Lyons, N. S. and Skitmore, M(2004). Project risk management in the Queensland engineering construction industry: a survey. International Journal of Project Management, Vol.22,Issue (1),pp. 51–61.
[15] Daud Nasir, Brenda McCabe and Loesie Hartono,2003. "Evaluating Risk in Construction-Construction Schedule Risk Model", ASCE Journal of Construction Engineering and Management, Volume 129, Issue 5, pp. 518-527
[16] Elkingtin P. and Sallman C.,2002. Managing project risks: a case study from the utilities sector. International Journal of Project Management. Vol. 20, No. 1, pp. 49-57
[17] Lyons T. and Skitmore M. 2004. Project risk management in the Queensland engineering construction industry: a survey. International Journal of Project Management. Vol. 22, pp. 51- 61.
[18] Pinto J.K. and Prescott J.E., Variations in Critical Success Factors Over the Stages in the Project Life Cycle, Journal of Management,1988, Vol.14, pp. 5-18
[19] Ward S. C. and Chapman C.B ,"Risk management perspective on the project life cycle", International journal of Project Management, Vol.13, Issue 3, pp. 145-149.

All rights reserved by *www.ijsrd.com*