

Assessment of Risk Factors in Construction Project Using PI Method

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Abstract - Construction industry is considered as one of the most complex industrial sector. It is because of the reason that construction projects involve a variety of complex processes working simultaneously. Proper management of all these processes is quite challenging for the management team. Risk is nothing but the threats that occur during the project life cycle. Risk may be of various kinds. There are various factors which affects the occurrence of these risks. All these risk occur during the project life cycle will results in financial loss and even in the stoppage of a particular project. Hence in order to prevent this, proper risk management is very important. Risk management can be done only by assessing the chances of occurrence of risks. This thesis is conducting to find out various risks factors that occur in construction projects using PI method and to rank them according to their priority. For that a questionnaire of five point scale was prepared. Eight major risks were considered for the questionnaire survey. SPSS software is used for risk assessment and is done with the help of Important Index equation.

Key Words: Risk, Risk identification, Risk Assessment, Risk Management, PI Method, Importance Index.

1. INTRODUCTION

A risk is considered as the combination of probability of an event and its impacts on project objectives. Risk is a sure factor for every business organisation. Construction projects carry lot of risks because of the involvement of a large number of parties such as owners, designers, supervision consultants, contractors, subcontractors, suppliers, manufacturers, governments etc. The construction industry is subject to more risks compared with many other industries due to the unique features of construction activities, such as long period, complicated processes, abominable environment, financial intensity and dynamic organization structures.

Hence it is important to implement proper risk management in every construction project. Risk management is not a simple process. It involves various complex steps. The most important steps in risk management are risk identification and risk assessment. Various methods can be used for risk assessment. This study deals with Probability Impact (PI) method for risk

assessment and Importance Index equation for ranking of risks.

1.1 Objectives of the Study

The objectives of the study are

- The risks in construction project are identified through questionnaire surveys.
- Identified risks are assessed by SPSS software.
- Risks factors then ranked according to their priority, which will help to know about the severity of each risk.
- To suggest effective management techniques for preventing the risk during construction.

1.2 Scope of the Study

This study aims to assess and rank various risks in construction projects. This will help to conduct various researches to reduce the impact of construction risks in future.

2. LITERATURE REVIEW

From an extensive literature survey it is revealed that a large number of researchers have shown a remarkable contribution towards risk identification and assessment. Shahabas. S, Sivaprakash. G [1] conducted a study on regression techniques on the risk modelling in highway projects using fault tree analysis & recommendations for rectification. Shankar neeraj and Balasubramanian [2] conducted a study on assessment of risk in construction industry. A. Suchith Reddy [3] conducted a study on risk management in construction industry -a case study. Anandhababu S, Vinoth M et.al [4] conducted a study on risk assessment in construction project of an educational institution. Ibrahim Alrashed, Abdulmohsen Alrashed et.al [5] conducted a study on risk assessments for construction projects in saudi arabia. Seyed Hossein Abedian Kalkhoran, Gholamali Liravi et.al [6] conducted a study on risk management in construction projects. S. M. Renuka, C. Umarani et.al [7] conducted a review on critical risk factors in the life cycle of construction projects.

3. CONCEPT OF RISK ASSESSMENT

Risk assessment is defined as the process of estimating the chance of occurrence of risk in construction industries. By conducting a risk assessment it is easy to make a judgment about the intensity of risk that may involve within the workplace or an industry. The methods adopted for risk assessment basically depends on the type of risk and the environment in which the study is carrying out. The most important step involved in the risk assessment procedure is the risk identification process. Once the risks of a project have been identified, risk we can start risk assessment procedure. Risk assessment is a time consuming activity. Risk assessment requires high degree of accuracy in order to avoid the chances of occurrence of error.

3.1 Types of Risks

Risks considered for this study are as follows.

- Financial Risk
- Design Risk
- Management Risk
- Construction Risk
- Environmental Risk
- Procurement Risk
- Sub-Contractors Risk
- Technology Risk

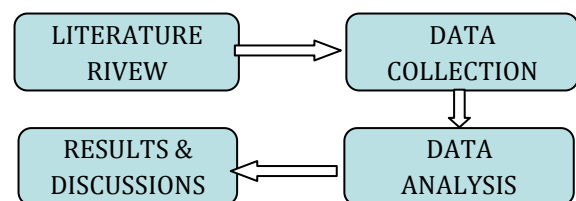
Each of these risks are sub-divided into various sub factors.

3.2 Various Risk Factors

- Financial Risk
 - Delay from clients.
 - Unprecedented price in raw materials.
 - Fluctuations in estimated finance than expected.
- Design Risk
 - Late changes of design from client side.
 - Improper specifications.
 - Inadequate and incomplete design.
- Management Risk
 - Changes of top management.
 - No past experience in similar project.
 - Short tender.
 - Internal management problem.
 - Improper project feasibility study.
 - Poor relation and disputes with partner.
 - Team work.
 - Time constraint.
 - Project delay.

- Construction Risk
 - Disputes between labours.
 - Non availability of resources.
 - Availability of camp for labours.
 - Safety of workers.
 - Stoppage of work due to medical outbreak.
- Environmental Risk
 - Impact of weather condition on completion of project.
 - Pollution by construction waste.
 - Procedure to facilitate construction waste cleanup or disposal.
- Procurement Risk
 - Temporary demand of increase in price of material.
 - Specialized labour for fixation/ installation.
- Sub-Contractors Risk
 - Chances of sub-contractor walk out.
 - Delay in work execution of sub- contractor.
 - Revision of price.
- Technology Risk
 - Knowledge on equipment's.
 - Service for damaged equipment's
 - Loss of data/software/hardware of computer.

6. METHODOLOGY



5. DATA COLLECTION

Data collection is done through questionnaire survey. A five point scale questionnaire is used for data collection. Both probability of risk occurrence and impact of risk are included in questionnaire.

6. DATA ANALYSIS

Data analysis is done by using SPSS software. SPSS is a Windows based program that can be used to perform data entry and analysis. The data collected through questionnaire survey are fed in to SPSS software. Frequency analysis is done for the collected data.

3.1 Results of Frequency Analysis

Data analysis was done with the help of SPSS software. Frequency analysis was done for collected data. With the help of frequency analysis we can obtain the frequency of occurrence of each risk factor. Tables below show the result of frequency analysis for delay from client which is a sub factor of financial risk.

Table-1: Frequency Analysis for Probability of Risk Occurrence

FINANCIAL RISK Delay From Client				
	Frequency	Percent	Valid Percent	Cumulative Percent
Normal	4	5.3	5.3	5.3
Large	71	94.7	94.7	100.0
Total	75	100.0	100.0	

Table-2: Frequency Analysis for Impact of Risk

FINANCIAL RISK Delay From Client				
	Frequency	Percent	Valid Percent	Cumulative Percent
small	57	76.0	76.0	76.0
Normal	4	5.3	5.3	81.3
Large	14	18.7	18.7	100.0
Total	75	100.0	100.0	

7. RESULTS AND DISCUSSION

From the results obtained from frequency analysis we can find the value of each risk using the equations given below;

$$\text{Importance Index} = \frac{n_1 + 2n_2 + 3n_3 + 4n_4 + 5n_5}{5 \times (n_1 + n_2 + n_3 + n_4 + n_5)}$$

Where,

n_1 = sum of responses corresponding to very small value

n_2 = sum of responses corresponding to small value

n_3 = sum of responses corresponding to normal value

n_4 = sum of responses corresponding to large value

n_5 = sum of responses corresponding to very large value

Using the values obtained from importance index equation we can plot the graphs shown below.

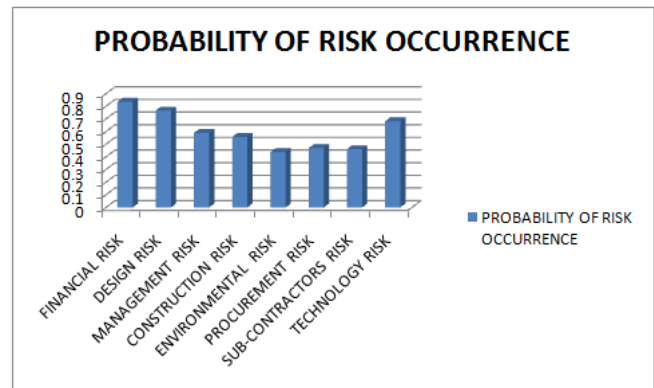


Chart 1. Risk Vs Probability of Risk Occurrence

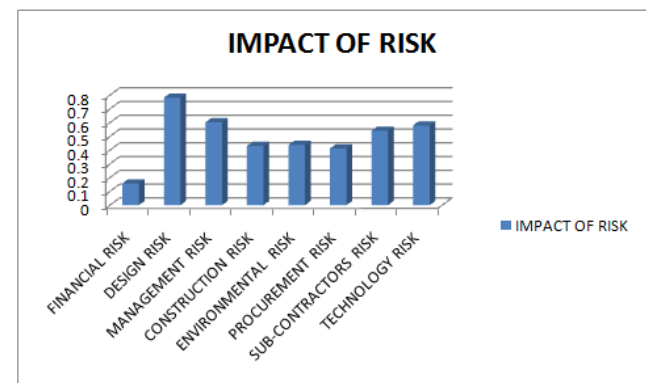


Chart 2. Risk Vs Impact of Risk

By analyzing the graphs we can rank the risks according to their priority. Ranking helps to identify the most probable risk and most potential risk. This will help a lot for effective management.

Table-3: Ranking of Risks.

RISK	RANKS	
	PROBABILITY OF RISK OCCURRENCE	IMPACT OF RISK
FINANCIAL RISK	1	8
DESIGN RISK	2	1
MANAGEMENT RISK	4	2
CONSTRUCTION RISK	5	6
ENVIRONMENTAL RISK	8	5
SUB-CONTRACTOR RISK	7	4
PROCUREMENT RISK	6	7
TECHNOLOGY RISK	3	3

A comparison between the probability of risk occurrence and impact of risk are also possible from this. This comparison will help to predict the importance of each risk according to their probability and impact.

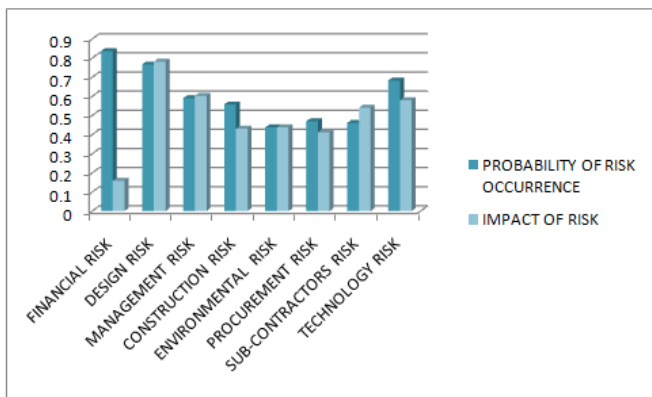


Chart 3. Risk Vs Probability of Risk Occurrence & Impact

From this it is clear that the financial risk have first rank in probability of occurrence, where as it have the last rank for its impact. Hence we can say that the probability and impact do not depend each other.

7.1 Suggestions for Risk Management

There are various methods of risk management can be adopted. Some of them are,

- Risk Transfer
- Risk Selling
- Risk Mitigation Through Insurance Policies etc.

Among them risk transfer is find to be the most suitable method of risk management technique. This is because of the reason that risk selling and risk mitigation through insurance policies require time for risk mitigation. This may cause delays in construction.

8. CONCLUSION

Construction industry is considered to be one of the most risky business sectors. Since construction process involves a large number of activities the chance for the occurrence of risks are very high in construction industry. Risk may results in serious financial loss, disputes, delays, and even in the stoppage of work. Risks are of various types. Depending up on the type of risks, its impact also varies. Hence it is important manage the risk during construction. Through this study it found that the financial risk has the high probability of risk occurrence. But its degree of impact is very low. And also it is found that the risk with high impact is the design risk. Hence we can conclude that the probability of risk occurrence do not depend on the impact of risk. And it is found that in order to reduce the impact of risk proper management should be implemented. There are various management techniques to reduce the impact of risk. Among them the most suitable

suggestion is the risk management through risk transfer technique.

REFERENCES

- [1] Shahabas. S, Sivaprakash. G et.al, "Study of Regression Techniques on the Risk Modelling In Highway Projects Using Fault Tree Analysis & Recommendations for Rectification", International Journal for Innovative Research In Science, Engineering and Technology, 2016, Vol 5, PP 2474-2482.
- [2] Shankar Neeraj and Balasubramanian, Assessment of risk in construction industry, "International Research Journal of Engineering and Technology (IRJET)", 2015, Vol-2, PP 68-72.
- [3] Suchith Reddy, "Risk Management in Construction Industry -A Case Study", International Journal of Innovative Research in Science, Engineering and Technology, 2015, Vol 4, PP 10058-10067.
- [4] Anandhababu S, Vinoth M. et.al, "A Study On Risk Assessment In Construction Project of An Educational Institution", International Journal of Research in Engineering and Technology, 2014, Vol 3, PP 296-298.
- [5] Ibrahim Alrashed, Abdulmohsen Alrashed, "Risk Assessments for Construction projects in Saudi Arabia", Research Journal of Management Sciences, 2014, Vol 3, PP 1-6.
- [6] Seyed Hossein Abedian Kalkhoran, Gholamali Liravi et.al, "Risk Management in Construction Projects", International Journal of Engineering Trends and Technology (IJETT), 2014, Vol 10, PP 133-139.
- [7] S. M. Renuka, C. Umarani et.al, A Review on Critical "Risk Factors in the Life Cycle of Construction Projects", Journal for Civil Engineering Research, 2014, Vol-4, PP 31-36.
- [8] Mr. Satish K. Kamane and Mr. Sandip A. Mahadik, "Risk Management in Construction Industry", IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE), 2014, Vol 2, PP 59-65.
- [9] Kinnaresh Patel, "A study on risk assessment and its management in India", American Journal of Civil Engineering, 2013, Vol 1, PP 64-69.
- [10] Prof. Shakil S. Malek, Nazneen I.Pathan, "Risk Management in Construction Industry", Indian Journal for Applied Research, 2013, Vol 3, PP 377-379.
- [11] Dr. R. K. Kansal and Manoj Sharma, "Risk Assessment Methods and Application in the Construction Projects", International Journal of Modern Engineering Research (IJMER), 2012, Vol-2, PP 1081-1085.