International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 06 Issue: 05 | May 2019 www.irjet.net p-ISSN: 2395-0072

Risk Modelling in Highway Construction Project using Regression and Fault Tree Analysis

Mr. V. NIRANJAN1, SHABNA .K.V2

[1]*Assistant Professor, Department of Civil Engineering, RVS Technical Campus, Coimbatore-600025, India,*
[2]*PG student, Department of Civil Engineering, RVS Technical Campus, Coimbatore-600025, India,*

Abstract – *Construction industry is considered as one of the most complex industrial sector. It is because of the reasons that construction projects involve a variety of complex process working simultaneously. Proper management of all this processes is quite challenging for the management team. Risk is nothing but the threats occur during the project life cycle. Risk may be various kinds. There are various factors which affect the occurrence of these risks. All these risk occur during the project life cycle will results in financial loss and even in stoppage of particular project. Hence in order to prevent this, proper risk management is very important. Risk management can be done only by assessing the chance of occurrence of risks. This thesis is conducting to find out various risk factors that occur in construction project 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*: Project Management, Risk Management, Risk Factors, Risk assessment.**

1. INTRODUCTION

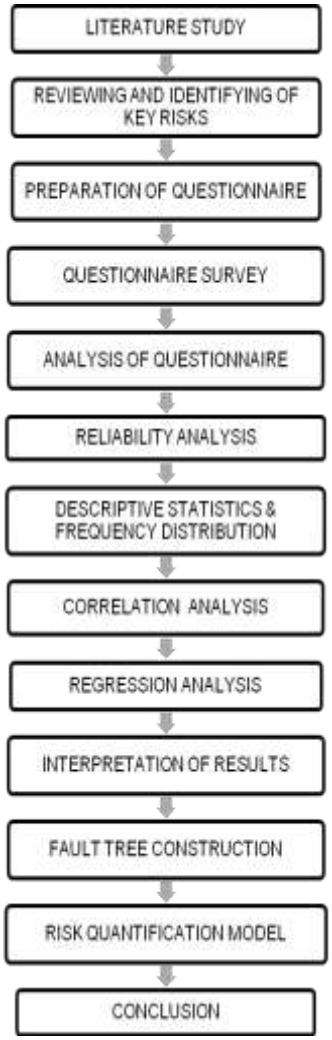
The construction industry is subject to more risks compared with many other industries due to the unique features of construction activities, such as long period, complicated processes, abominable environment, financial intensity and dynamic organization structures. Hence, taking effective risk management techniques to manage risks associated with variable construction activities is important for the successful delivery of a project. Risk management is the identification, assessment and prioritization of risk (defined in ISO 31000 as the effect of uncertainty on objectives, whether positive or negative) followed by coordinate and economical application of resources to minimize, monitor and control the probability and/ or impact of unfortunate event or to maximize the realization of opportunities. A systematic process of risk management has been divided into risk classification, risk identification, risk analysis and risk response, where risk response has been further divided into four actions, i.e. retention, reduction, transfer and avoidance.

2. LITERATURE REVIEW

Ming-The Wang et. al. (2003) "Risk Allocation and Risk Handling of Highway Projects in Taiwan" provides analytic procedures to recognize the risk allocation of construction projects and investigate the influence of risk allocation to contractor's risk handling decisions. This paper also investigates the effects of risk allocation and risk event conditions on contractors' risk handling decisions because owners and contractors usually have disagreements over risk responsibilities. Mohamed Sayed Bassionyet. al. (2015) "Identification and Assessment of Risk Factors Affecting Construction Projects" tried to identify, qualify, study, assess, and quantify the factors that affect budget and time contingency. This paper focused to identify and study the factors that affect cost overrun and schedule overrun, also to develop a probability distribution charts for likelihood, cost impact and schedule impact, and to quantify the Risk assessment impact on cost and schedule. Yanjun Zhao et. al. (2011) "Forecast for Construction Engineering Risk Based on Fuzzy Sets & System Theory" introduces the fuzzy system theory to build a construction engineering risk fuzzy forecast model. Osama Ahmed Jannadiet. al. (2003) "Risk Assessment in Construction" presents a risk assessor model (RAM) that was developed & that determines risk scores for various construction activities. The model also provides an acceptability level for the risks and determines a quantitative justification for the proposed remedy.Sadi A. Assafet. al. (2006) "Causes of delay in large construction projects "done survey on time performance of different types of construction projects in Saudi Arabia was conducted to determine the causes of delay and their importance according to each of the project participants. The most common cause of delay identified by all the three parties is ''change order''. Ana I. Irimia-Diéguezaet. al. (2014) "Risk Management in Megaprojects" focused on risk identification. Our purpose is to establishing the state of the art in risk management in megaprojects, systematizing the risks studied in the Literature, as well as to identify potential areas of further research. Dr. Patrick. X.W. Zouet. al. (2004) "Identifying Key Risks in Construction Projects: Life Cycle and Stakeholder Perspectives": This research endeavored to identify key risks associated with the achievement of all project objectives in terms of cost, time, quality, environment and safety. Irjet Template sample paragraph .Define abbreviations and acronyms the first time they are

used in the text, even after they have been defined in the abstract. Abbreviations such as IEEE, SI, MKS, CGS, sc, dc, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

3. METHODOLOGY



4. RISK IDENTIFICATION

In phase 1, as a part of risk identification and risk validation 60 risks were identified and listed out. The identified risks can be grouped or classified under cost risks, quality risks, environmental risks and safety risks. The risks were identified from various journals and publications. The risk validation was done through pilot survey. Risks identified from literature reviews: 1) Tight project schedule 2) Design variations 3) Variations by the client 4) Loss due to rise in fuel price 5) Insurance risks 6) Worker characteristics 7) Changes in climate, temperature 8) Unsuitable construction planning 9) Occurrence of dispute 10) Price inflation of construction materials 11) Diversity of work types 12) Incomplete approval and other documents 13) Inaccurate cost estimate 14) Inadequate program scheduling 15) Variations by the client 16) Variations of construction operations 17) High performance expectations 18) Inadequate program scheduling 19) Low management competency 20) Unavailability of sufficient amount of skilled labours 21) Lack of coordination 22) Noise pollution due to construction operations 23) Schedule pressure 24) Inadequate supervision 25) Supervisory violations 26) Poor quality material supply 27) Improper verification of contract document 28) Lack of enforcement of legal judgment 29) No past experience in similar projects 30) Short tender time 31) Internal management problem 32) Improper project feasibility study 33) Poor relation and disputes with partner 34) Project delay 35) Market risks 36) Changes in work 37) Subsurface geological an geotechnical conditions 38) Late drawings and instructions 39) Unavailability of resources 40) Changes in seismic criteria 41) Error in structural designs 42) Wrong selection of materials 43) Delayed deliveries and disruptions 44) Unsuitable equipment 45) Environmental analysis- incomplete/ wrong 46) Offsite and onsite wetlands 47) Land acquisition problems 48) New stakeholders 49) New information required for permits 50) Inconsistent cost, time, scope and quality 51) Political factors change (political interference) 52) Local communities pose objections 53) Water quality issues 54) Historic site, endangered species or wet land present 55) Inexperienced staff assigned 56) Insufficient time to plan 57) Too many projects 58) Consultant or contractor delays 59) Lack of coordination/ communication 60) Estimating/ scheduling error.

Based on risk validation, the 60 risks were validated and out of it 28 risks were classified under project approval delay, time overrun risks, cost overrun risks, site condition risks and safety risks.

4. CONCLUSION

Innovative procurement processes shall be introduced in the future in order to reduce the adversarial risk occurring in projects. Those concepts have been developed to involve all project participants. There are basically five categories of classic risk response strategies: accepting, avoiding, monitoring, transferring, and mitigating the risk Accepting the Risk: Accepting the risk means, understand the risk, its consequences, and probability, and choose to do nothing about it. If the risk occurs, the project team will react. This is a common strategy when the consequences or probability that a problem will occur are minimal. As long as the consequences are cheaper than the cure, thisstrategy makes sense. Avoid the Risk: Avoid a risk by choosing not to do part of the project. This deletion of part of the project could affect more than the project-the business risk could also be affected. Changing the scope of the project might change the business case as well, because a scaled-down product could have smaller revenue or cost-saving opportunities. Risk/return is a popular expression in finance-high return on an investment, probably more risk is involved. Avoiding risks on projects can

have the same effect-low risk, low return. Monitor the Risk and Prepare Contingency Plans: Monitor a risk by choosing some predictive indicator to watch as the project nears the risk point. The risk strategy in is to monitor the risk by being part of the test team. Contingency plans are alternative courses of action prepared before the risk event occurs. The most common contingency plan is to set aside extra money, a contingency fund, to draw on in the event of unforeseen cost overruns. It's important to make sure that this fund is used only for unforeseen cost overruns-not to make up for underestimating or substandard performance. Contingency plans can be looked on as a kind of insurance and, like insurance policies, they can be expensive.

REFERENCES

1) Aljassmi, H. and Han, S. (2013). "Analysis of Causes of Construction Defects Using Fault Trees and Risk Importance Measures." Journal of Construction Engineering and Management ASCE, 139, 870-880.

2) Ana I. Irimia-Diégueza et. al. (2014) "Risk Management in Megaprojects" Procedia - Social and Behavioral Sciences 119 (2014) 407 – 416.

3) Angeline Swarna et. al. (2014) "Fault Tree Analysis in Construction Industry for Risk Management" International Journal of Advanced Research in Civil, Structural, Environmental and Infrastructure Engineering and Developing Volume: 2 Issue: 1

4) Anil Kumar Gupta et. al. (2013) "Risk Variation Assessment of Indian Road PPP Projects" International Journal of Science, Environment and Technology, Vol. 2, No 5, 2013, 1017 –1026

5) Choudhry, R. M., Aslam, M. A., Hinze, J. W. and Arain, F. M. (2014). "Cost and Schedule Risk Analysis of Bridge Construction in Pakistan: Establishing Risk Guidelines." Journal of Construction Engineering And Management © ASCE, 140, 1-9.

6) Creedy, G. D., Skitmore, M. and Wong, J. K. W. (2010). "Evaluation of Risk Factors Leading to Cost Overrun in Delivery of Highway Construction Projects." Journal Of Construction Engineering And Management © ASCE, 136, 528-537.

7) Dione, S., Ruwanpura, J. Y. And Hettiaratchi, J. P. A. (2005). "Assessing and Managing the Potential Environmental Risks of Construction Projects." Journal of Construction Engineering and Management © ASCE, 10, 260-266.

8) Hallowell,M.R. and Gambatese, J. A. (2010). " Population and Initial Validation of a Formal Model for Construction Safety Risk Management." Journal of Construction Engineering And Management © ASCE, 136, 981-990.

9) Hariharan Subramanyan et. al. (2012) "Construction Project Risk Assessment: Development of Model Based on Investigation of Opinion of Construction Project Experts from India" Journal of Construction Engineering and Management ASCE, 138, 409-421.