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Original Article

Effective Risk Management in Construction Projects

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Abstract *- The construction industry is one of the most dynamic, risky, and challenging businesses. Due to the construction project's complexity and uniqueness, the number of risks present invariably goes behind those found in other industries. This project aims to investigate the risk management process in construction projects and aims to make a basis for future studies for developing a risk management framework to be adopted by prospective investors, developers, and contractors. A questionnaire was designed and circulated to collect responses about various risks occurring on construction sites. As a result, the people working on the projects face various risks such as operational requirements, cost overruns, and various types of accidents during a project. The risks were analyzed using the risk matrix method with the help of assessment forms, and further solutions were given to minimize the risks in a construction project.*

Keywords *- Risk Management, Risk assessment, Risk monitoring, Risk mitigation.*

1. Introduction

Risk management is a branch of construction management. Risk management in the construction project includes identifying, analyzing, and responding to various risks to achieve the project objective. Hence, the risk is considered a negative term in construction projects.

In theory, the risk is usually defined as a positive or negative deviation of a variable from its expected value. In general, the risk is understood only as a loss. The definition of risk, in the meantime, not least, takes into account the chances. The business owner must first know their risk sufficiently well to turn risks into chances. Risk management constitutes a strategy to avoid losses and use available chances or risks potentially arising from risks. The strategy demands from the person taking action a precise "consideration" and "assessment" of the situation and the scenarios probably occurring in the future. On this basis, decisions are made in the hope of having eliminated all risks and used all chances. This means recognizing potential risks and circumventing a threat by averting, evading, or reducing their negative effects.

This project aims to investigate the risk management process in construction project

1.1. Objective

- To identify various risks associated with the project viz construction, labor, material, machine, and financial risks.
- To study the parameters of various risks.
- To collect data via Google forms from various contractors and builders
- To rate risks by matrix method using the assessment form

1.2. Methodology

To investigate the perception and knowledge management of contractors regarding risk and the implementation of risk management within the construction sector, an application of a comprehensive method is essential. The methodology consists of a thorough literature review on the subject and an empirical data collection comprising two sources, survey research in a questionnaire and semi-structured interviews. The risk management process is carried out in four stages named risk monitoring, risk identification, risk assessment, and risk response. The process of tracking and evaluating the levels of risk in an organization is known as risk monitoring. The discipline tracks and analyses the success of risk management measures and monitors the risk itself. Identifying hazards that could hinder a program, organization, or investment from attaining its goals is known as risk identification. It entails recording and communicating the problem. A risk assessment is a method of identifying prospective dangers and determining what might happen if they occur. The response or activity of a leader in response to the presence of a risk. Various approaches are available, including Avoidance entails removing the circumstances that allow the danger to exist. Minimize the risk's probability and/or likelihood of occurrence by reduction/mitigation. Risk identification in this thesis is done by circulating Google forms and collecting their responses. Risk assessment is done by matrix method, and then solutions are provided.

2. Conclusion of Literature Review

Risk management should be viewed as a positive process even if the risk is termed as a negative term. Construction companies should include risk as an integral part of their project management. We understood that there are various methods of risk identification and analysis. Construction companies should adopt risk management for greater productivity and improved success. Professionals in the

construction industry use techniques described in the literature concerning risk management but are not aware of it. By adopting a simple method, it is possible to identify potential risks easily. Moreover, it can detect which of the identified risks has the biggest impact on time, cost, and quality. Those risks should be eliminated or mitigated by taking appropriate action.

3. Case Study

This chapter presents the main theoretical framework for the research. The nature of construction projects is discussed, and the project risk and risk management process concepts are explored. An overview of the various procurement options, i.e., preparing Questioner via Google form, Collecting Responses, Risk Identification, Site Visit, analyzed by risk matrix method. Finally, the theories of joint risk management and relational contracting that significantly influence the effectiveness of project risk management are described**.**

3.1. Risk

Risk is the statement of what may arise from that lack of knowledge. Risks are gaps in knowledge that we think constitute a threat to the project.

3.2. Risk Management

Risk management identifies, assesses, and controls threats to an organization's capital and earnings. These risks stem from various sources, including financial uncertainties, legal liabilities, technology issues, strategic management errors, accidents, and natural disasters. A typical risk management process includes the following key steps.

- Risk identification
- Risk assessment
- Risk mitigation
- Risk monitoring.

3.3. Categorization of risk

Risk categorization, in project management, is the organization of risks based on their sources, areas of the affected project, and other useful categories to determine the areas of the project that is the most exposed to the effects of risks or uncertainties. Risk categorization can also be done by using the common root causes. The main goal of categorizing risk is to avoid any unpleasant surprises. It also provides a systemic and structured approach to identifying the risks consistently. Another benefit is that it provides better management focus in identifying a wide range of risks.

- Construction Risk
- Financial Risk
- Labour Risk
- Technical Risk Material Risk

3.4. Experimental Work

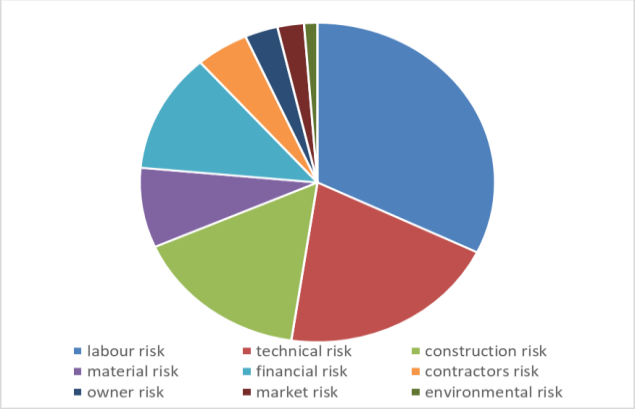
This chapter contains the experimental work, i.e., the questionnaire made for risk identification, responses collected through a google form, responses collected by paperwork, and the risk analysis was done using a risk assessment form. Risk assessment can be done by using 2 methods qualitative and quantitative analysis.

Fig 1. Safety Instructions

Questionnaire for Risk survey

1. How do you manage rate change in the market after estimating the budget
2. What if work is not done in the scheduled time?
3. What if workers don't listen to their supervisors?
4. Do you work better independently or as a part of a team?
5. How do you handle the conditions of working on construction sites?
6. How do you handle the technical risk?
7. What impacts the technical risk most?
8. What are the causes of technical risk?
9. What unique challenge do you have in reaching and engaging with the client?
10. How do you deal with customers? What happen if the material doesn't arrive?
11. How would you mitigate the technical risk in a construction project?
12. How would you ensure your labor's safety?
13. Are you providing safety shoes and other required things to them?
14. Have you faced any risks? If yes, then which?
15. Has any accident taking place on your site?
16. What strategies do you use for controlling risk?

4. Result



4.1. Risk Rating Method

4.1.1. Step 1: Risk Prioritization

The risk assessment matrix shows how project risks are prioritized at different levels. Project risk assessment is a continuous process that needs to change concurrently with modifications in your organization or consumer trends. If the matrix is reviewed only once a year, developing risks may be overlooked, leading to issues.

Consequences	Likelihood → Low 1	Med 2	High 3
Low 1	1	2	3
Med 2	2	4	6
High 3	3	6	9

- 1-2 = Acceptable
- 3-4 = Tolerable for little work
- 6-9 = Unacceptable (take immediate action)

4.1.2. Step 2: Risk Likelihood

This is the possibility of the occurrence of risk in your projects. Risk likelihood is split into four ranges of percentages:

0 to 25 % Less likely to occur
51 to 75% Likely to occur
26 to 75% Occasional
76-100% Cause the serious problem

4.1.3. Step 3: Risk Zones

Apart from these divisions, there are three major zones inside the matrix. After the calculations are done, the quantified risk falls into these three zones:

Yellow indicates an acceptable low-risk zone Green indicates a moderate risk zone that may not be acceptable Red indicates a critical zone that is high risk and unacceptable.

These zones make the result of a risk matrix more transparent by giving out a clear-cut division regarding the future steps that need to be taken.

Formula Risk: Likelihood x Consequence (it is a chance to happen accident) x (it is a result of the accident)

Risk	Large Scale		Small Scale	
	Before	After	Before	After
Labour Risk	65%	25%	35%	16%
Construction Risk	70%	30%	40%	12%
Technical Risk	63%	42%	45%	13%
Financial Risk	50%	20%	35%	14%
Material Risk	60%	17%	32%	10%

5. Conclusion

Questionnaires and interviews were chosen as data collection methods, and five main categories of risk involved in construction projects were chosen as participants.

Out of 20 projects selected, 8 were small scale, and 12 were large scale projects.

After circulating google form to various contractors, the site engineers, builders, we got an overall view that top five risk that possibly occur on construction sites are technical risk, construction risk, labor risk, financial risk, and material risk.

Further risk analysis is done using the assessment form and the risks are rated according to their likelihood and consequences by the risk matrix method.

Then solutions are provided, and again the risk is rated. The possibility of risk on construction sites can be decreased if the solutions are followed properly.

References

[1] Nini Xia et al., "Towards Integrating Construction Risk Management and Stakeholder Management: A Systematic Literature Review and Future Research Agendas," *International Journal of Project Management*, vol. 36, no. 5, pp. 701-715, 2018. *Crossref*, https://doi.org/10.1016/j.ijproman.2018.03.006

[2] Mr.Shubham.A. Simant rt al.," Literature Review Based on Risk Management in Building Construction," *International Journal of Advance Research in Science and Engineering*, vol. 6, no. 3, 2017.

[3] RA Bahamid, and SI Doh., "A Review of Risk Management Process in Construction Projects of Developing Countries," *IOP Conference Series: Materials Science and Engineering*, vol. 271, no. 1, 2017. *Crossref*, 10.1088/1757-899X/271/1/012042

[4] Pawel Szymanski, "Risk Management in Construction Project," *Procedia Engineering*, vol. 208, pp. 174-182, 2017. *Crossref*, https://doi.org/10.1016/j.proeng.2017.11.036

[5] Krantikumar Mhetre, BA Konnour, and Amarsinh B Langde, "Risk Management in the Construction Industry," *International Journal of Engineering Research*, vol. 5, no. 1, pp. 153-155, 2016. *Crossref*, http://dx.doi.org/10.17950/ijer/v5i1/035

[6] Alfredo Federico Serpella, et al., "Risk Management in Construction Projects: A Knowledge-Based Approach," *Procedia- Social and Behavioral Sciences*, vol. 119, pp. 653-662, 2014. *Crossref*, https://doi.org/10.1016/j.sbspro.2014.03.073

[7] Nerija Banaitine, Audrius Banaitis, *Risk Management- Current Issues and Challenges*, in Banaitiene Ed., pp. 429-448, 2012.

[8] Ekaterina Osipova, and Per Erik Erickson, "How Procurement Options Influence Risk Management in Construction Project," *Construction Management and Economics*, vol. 29, no. 11, pp. 1149-1158, 2011. *Crossref*, https://doi.org/10.1080/01446193.2011.639379

[9] Martin Schieg, "Risk Management in Construction Project Management," *Journal of Business Economics and Management*, vol. 7, no. 2, pp. 77-83, 2006. *Crossref*, http://dx.doi.org/10.3846/16111699.2006.9636126

[10] Anthony Mills, "A Systematic Approach to Risk Management for Construction," *Structural Survey*, vol. 19, no. 5, pp. 245-252, 2001. *Crossref*, https://doi.org/10.1108/02630800110412615

[11] Peter J Edwards, Paul A Bowen, "Risk and Risk Management in Construction: A Review and Future Directions for Research," *Engineering Construction and Architectural Management*, vol. 5, no. 4, pp. 339-349, 1998. *Crossref*, https://doi.org/10.1108/eb021087

[12] Huang Hongwei, "State of the Art of the Research on Risk Management in Constructing the Tunnel and Underground Works," *Chinese Journal of Underground Space and Engineering*, vol. 2, no. 1, pp. 13-20, 2006.

[13] Shahid Iqbal, et al., "Risk Management in Construction Projects," *Technological and Economic Development of Economy*, vol. 21, no. 1, pp. 65-78, 2015.

[14] Berenger Y. Renault and Justus N. Agumba, "Risk Management in the Construction Industry: A New Literature Review," *The 4th International Building Control Conference 2016 (IBCC 2016), University of Johannesburg, Johannesburg, South Africa*, vol. 66, 2016. *Crossref*, https://doi.org/10.1051/matecconf/20166600008

[15] Abdulmaten Taroun, "Towards Better Modeling and Assessment of Construction Risk: Insights from a Literature Review," *International Journal of Project Management*, vol. 32, no. 1, pp. 101-115, 2014. *Crossref*, https://doi.org/10.1016/j.ijproman.2013.03.004

[16] Ali Rostami, James Sommerville, Liang Wong, Cynthia Lee, "Engineering, Construction and Architectural Management," 2015.

[17] Maryam Alavi and Dorothy E. Leidner, "Review: Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues," *MIS Quarterly*, vol. 25, no. 1, pp. 107-136, 2001. *Crossref*, https://doi.org/10.2307/3250961

[18] Yeo K, and Ren Y, "Risk Management Capability Maturity Model for Complex Product Systems (Cops) Projects," *International Engineering Management Conference*, pp. 807-811, 2004. *Crossref*, https://doi.org/10.1109/IEMC.2004.1407492

[19] TerryLyons and Martin Skitmore, "Project Risk Management in the Queensland Engineering Construction Industry: A Survey," *International Journal of Project Management*, vol. 22, no. 1, pp. 51-61, 2004. *Crossref*, https://doi.org/10.1016/S0263-7863(03)00005-X

[20] Mills A, "A Systematic Approach to Risk Management for Construction," *Structural Survey*, vol. 19, no. 5, pp. 245-252, 2001. *Crossref*, https://doi.org/10.1108/02630800110412615

[21] Søren Degn Eskesen et al., "Guidelines for Tunneling Risk Management," *International Tunnelling Association*, Working Group No. 2-1, Tunn Undergr Sp Tech, vol. 19, no. 3, pp. 217-237, 2004. *Crossref*, http://dx.doi.org/10.1016/j.tust.2004.01.001

[22] Prasanta Kumar Dey and Stephen O. Ogunlana, "Risk-Based Decision Support System for Effective Implementation of Projects," *International Journal of Risk Assessment and Management*, vol. 3, no. 2/3/4, pp. 189-204, 2002. *Crossref*, https://doi.org/10.1504/IJRAM.2002.002552

[23] Ammar Ahmed et al., "A Review of Techniques for Risk Management in Projects," *Benchmarking: An International Journal*, vol. 14, no. 1, pp. 22-36, 2007. *Crossref*, http://dx.doi.org/10.1108/14635770710730919

[24] Tzvi Raz, Aaron Shenhar and Dov Dvir, "Risk Management, Project Success, and Technological Uncertainty," *R & D Management*, vol. 32, no. 2, pp. 101-109, 2002. *Crossref*, http://dx.doi.org/10.1111/1467-9310.00243

[25] Cf. Romeike, Frank, "Lexikon Risk Management," *Wiley-VCH Verlag*, pp. 113, 2004.