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A Review on Risk and Risk Management Technique in Construction Projects

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Abstract

Construction projects are complex in nature and thus entail multiple threats and uncertainties that can adversely affect the project. The industry has witnessed many studies focused on a similar idea that identified the types of risk and the risk management method to handle these risks. Aim of this paper, to gather reviews on Risk and Risk management. So, the literature analysis of the referred articles emphasized the value of risk management in building projects to infer the relevant risks. Some of the authors have already suggested fundamental aspects, including contractual accountability, regular risk assessments, updated risk strategies and joint risk management. These filtered recommendations for productive outcomes from the study of the data must be taken into account and integrated into risk management procedures.

Index Terms*— Risk, Risk management, Construction projects, Uncertainty, Risk management process*

1 INTRODUCTION

Construction projects are high-risk, unpredictable, dynamic and change-prone, frequently struggling to achieve their goals **(Denicol et al., 2020)** [(1)]. While these projects have highly defined standards, budget, time, regulations and project staff who are capable of achieving their goals, they often vary and go beyond time and budget and are difficult to implement. This is an important issue for the construction industry as large investments are made around the world in construction projects in order to meet current and future community needs **(Rickaby, et al. 2018)** [(2)] and for the growth of the country, but these projects are poorly carried out and are causing the problems.

A variety of risks are related to construction projects which are defined as "undesired events that may cause delays, excessive spending, unsatisfactory project results, safety or environmental hazards, or even total failure" **(Raz, et al., 2002)** [(3)]. Risks are generally categorized as financial risks, environmental risks, socio-economic risks and operational risks. To manage such risks, Risk Management procedure is followed which refers to the process for deciding how risk incidents for the respective programs can be handled and coordinated. Risk management in the initial project development phase should be applied; risk management will be very useful to develop an understanding of project uncertainty.

Risk Management is generally carried out in four steps: Risk Identification, Risk Analysis, Risk Mitigations and Risk Controlling and Monitoring. For days now, risk analysis, identification and management are still a major element of Project management in the attempt to deal effectively with uncertainty and unexpected events to achieve project success. In view of the complexity and size and budget of construction projects, small risks can have a greater impact on the project. Risks also cause delays that can lead to delayed completion of projects and monetary losses. It is worth studying how a construction project is organized and how it works in practice to understand the concept of risks in

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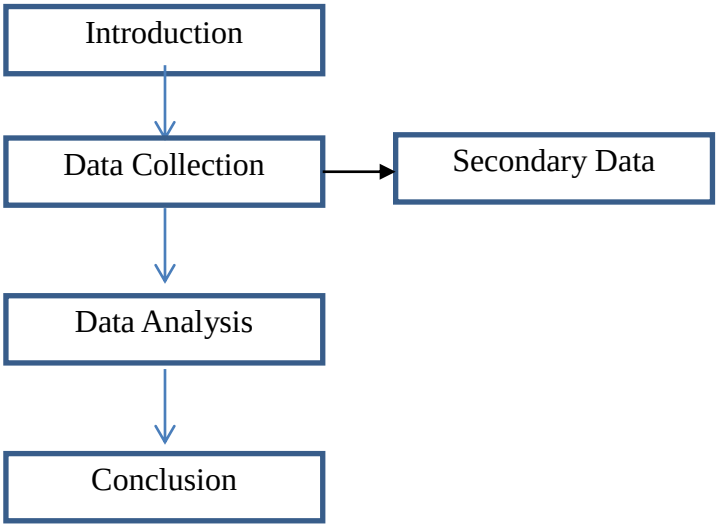
construction projects. Thus the objective of this paper is to understand and identify the construction project risks, using previous studies.

2 METHODOLOGY

The research methodology is the way to resolve the research problem systematically and scientifically. It is a blueprint of the manner in which work is carried out. Start with the introduction and conclude with it. Data collection is carried out by only secondary data. For secondary data, search engines like Google Scholar, Microsoft Academic, and Scopus have been used to download papers using the appropriate keyword. All this process obtains number of papers. After scrutinizing and bifurcation of these papers I got 10 papers. Then I obtained 5 papers related to Risk management perfectly and with proper conclusion.



3 DATA COLLECTION

Risk and Uncertainty, generally used interchangeably are differentiated and defined by **Gajewska et al. (2011)** [4] in their thesis according to previous studies which are mentioned bellows:

Author	Risk Definition	Uncertainty definition
Winch (2002)	A stage in which there is a lack of information but it is easier to predict the future and to solve it by looking at past experience. Events where the findings are known and expected.	Uncertainty is part of the information necessary for a decision to be taken. The information needed consists of the amount of knowledge and uncertainty available. The level of uncertainty would diminish further over the entire life cycle of a project.
Cleden (2009)	Risk is an interpretation of what could result from this lack of information. Risks are knowledge gaps that we believe pose a challenge to the project.	The intangible indicator of what we don't know is uncertainty. Uncertainty is what remains after all threats are defined. Uncertainty is gaps that we may not even be

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		aware of in our information.
Smith et al. (2006)	Risks arise where knowledge of the incident occurs.	There may not be enough information about an event, but we know it can happen.
Webb (2003)	Risk is the condition in which he lacks no reliable knowledge about the result. Risk exposure can be assessed positive or negative.	Uncertainty is a circumstance where an individual has no idea of the outcome.
Darnall and Preston (2010)	Risk is a loss or injury possibility.	
Cooper et al. (2005)	The risk is vulnerability to uncertainty consequences.	

Harland et al. (2003) [5] divided risks as following:

- Operations Risk: It affects the internal ability of a company to manufacture and supply goods / services.
- Strategic risk: It affects the execution of the business strategy.
- Client risk: This affects client's probability of offering work grouped with factors such as quality obsolescence in output risk.
- Supply risk: Adverse effects on the inward flow of any resource to enable operations to be carried out.
- Asset impairment risk: Reduces the use of an asset which can occur if the income generating capacity of the asset is reduced.
- Competitive risk: affects the ability of a company to distinguish its services from competitors.
- Reputation risk: Erodes the value of the entire business by loss of trust.
- Financial risk: Caused by exposure a company to future risk by shifts in capital markets may also be triggered by defaults by individual debtors.
- Fiscal risk: The alterations in taxation arise.
- Regulatory risk: Exposes the company to changes in the company's regulations, for example environmental standards.
- Legal risk: Subjects the company to dispute with the actions of customers, suppliers, shareholders or employees.

The above mentioned types of risks can have detrimental effects on the project; hence it needs to be managed using an effective risk management procedure. **Ennouri W. (2013)** [6] discussed that the risk management process is executed in four steps:

- Risk identification: Considered the main phase to identify unpredictable events which could interrupt the good working order in the supply chain.
- Risk Assessment: The selection of appropriate risk corrective actions established is a required step, refers to the assignment of the probability of event occurrence. At the end of this stage, risks may be categorized as very unlikely, unlikely, possible, probable, and very likely.
- Risk Management: refers to the selection and execution of the defined optimal risk corrective strategy.

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- Risk Monitoring: This is the last part of the risk management process, which will enhance the risk management system if it is supervised to measure the effectiveness of corrective actions and detect potential risks not identified in previous steps.

Other papers which were studied for the literature review of Risk Management have been briefed below:
Raz et al. (2002) [3] discussed that risk management is still at its infancy and there is still a long way to go. More sensitivity, application, improved training, additional tools and studies are required to further promote the understanding, use and usefulness of risk management in projects. Different risk management techniques must be adapted for different types of projects in risk management and better and specific tools for managing risks in different project types must be developed. It is necessary to learn to differentiate between project risk management tools for simple and complex and large projects. As companies continue to take project management as part of their daily business processes, greater recognition and better understanding of risk management will continue to be at the forefront of project management discipline.
Purohit et al. (2018) [7] mentioned that the first step in emergency preparedness and safe workplace maintenance is hazard definition and analysis. Although all hazards should be tackled, resource limitations do not normally permit this at once. Risk identification and risk assessment may also be used for prioritization to tackle the most risky conditions first, those which are less severe and less likely to cause significant problems later. The study also showed that formal approaches and risk analyses were used through brainstorming, checklists and health and safety legislation. High work and manual management were the most critical dangers in the Indian industry. Based on methods for communication of risk at constructions, toolbox meetings, site meetings, posters and informal verbal communication were revealed to communicate the risk. In addition, safety boards and gang managers have been shown to play a major role in managing health and safety threats. The problem of power relations and disputes was identified where a strong distinction existed between communication on health and safety and efficiency and productivity. Daily checks, fines and certificates of approval issued by regulatory bodies have a further effect on risk management. In fact, the workplace safety culture affects risk management. It is found that construction companies with a safety culture take the site manager, safety supervisor and security officer into consideration in terms of health and security. Awareness of health and safety is an important criterion.
T Williams (1995) [8] concluded that Project participation success depends on who bears the risk, and the main role of risk analysis is discussed in informing contractual risk allocation.
Pawar et al. (2015) [9] discussed that the major risks to the construction project are systematically investigated. To execute any construction project successfully, all aspects of the project referred to in contract contracts must be investigated. Project success depends on tracking significant project risks and key factors responsible for costs and time intervals. The contract agreements are used by various organizations as a tool for managing risk through allocating risks into different contracts. In order to mitigate project failure or poor performance, risk management strategies must be enforced and reviewed on a regular basis.
K Spang (2011) [10] conferred that Cooperative managing risk between the client and the contractor is an essential factor for effective project risk management in the implementation process. It begins in the tendering process with transparency. Risk control is a key responsibility for the owner of the project, assisted by other partners, to be continually undertaken in all project phases. He also concluded that we can never create traffic lines without any risk. one should routinely assess the rising threats, risky behaviors and risky techniques. The need for standards, a systematic risk management obligation and holistic risk treatment is obvious. The solution proposed would be an important first step. In order to ensure the accountability he suggested improvements in organizational culture in company and contracting organizations and Cooperative customer-contractor relationships for joint risk management.
Wang et al. (2004) [11] identified twenty-eight critical risks and categorized into three levels of hierarchy for international construction projects in developing countries (country, market and project). Of which 22 were evaluated as critical or highly critical on the basis of a rating system of 7 degrees. The top 11 critical

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risks are: approval and authorization change in law, strengthening justice, local creditworthiness of partners, political instability, overrun costs, corruption, inflation and rates of interest, government policies, and government influence on disputes and the end of JV. Risks are more critical at the country level than at market level, and the latter is more critical than at project level. Practical mitigation measures were given and assessed for each of the identified risks. They suggested that measures with greater efficiency should be given higher priority when mitigating a serious risk. Further they proposed a risk model, called the Alien Eyes Risk Model which showed the three levels of risk hierarchy and the risk-related influence. This proposed model should allow better risk categorization and reflect the impact of risks at different levels of hierarchy as well as the mitigating sequence / priority of risks.

Pawar et al. (2015) [12] concluded Contract documents are used as a risk management tool by allocating risks through various contracts to different agencies. Risk reduction strategies must be enforced and reviewed periodically in the project to reduce the likelihood of a failure or underperformance. It is concluded that customers, designers, firms and government agencies must cooperate from the feasibility stage to address potential risks in due time. Such awareness is of great importance in the introduction of more successful steps to provide construction professionals with the right path for future growth.

4 DATA ANALYSIS

Above mentioned literature were scrutinized to highlight the important concepts of Risk and Risk Management procedures.

Author	Title of Paper	Finding
Raz et al. (2002)	"Risk management, project success, and technological uncertainty"	There are various risk management approaches to be adapted for various types of risk management projects and improved more relevant risk management methods must be built for different types of projects.
T Williams (1995)	"A classified bibliography of recent research relating to project risk management"	The quality of project participation depends on who bears a risk, and the main role of risk analysis in informing contract allocation is addressed.
Pawar et al. (2015)	"management of risks implied by conditions of contract and specifications"	Different companies use the contract arrangements as a method for managing risk by allocating risks to different contracts. Risk reduction techniques must be applied and checked on a regular basis in order to minimize project failure or poor results.
K Spang (2011)	"Integrated Risk Management in Infrastructure Projects"	The improvisation of organization culture is required for effective risk management.

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Wang et al. (2004)	"Risk management framework for construction projects in developing countries"	The outstanding proposal of Alien Eyes Risk Model for better risk categorization and reflection of impact of risk at different levels of organizations.
Pawar et al. (2015)	"Risk Management in Infrastructure Projects in India"	Risk management should be initiated from the beginning of the project and holistically for an effective risk management.

4 CONCLUSION

Construction projects are dynamic in nature and hence carry various risks and uncertainties which can have unfavourable impacts on the project. To manage such risks, the industry has witnessed several studies formed around a similar idea, describing the types of risk and the risk management process. To conclude the important points of risks in construction, the literature review of referred papers highlighted the importance of Risk Management in Construction Projects. Some of the authors are previously suggested essential aspects such as contractual responsibility, regular risk assessments, updated risk strategies and joint risk management. These filtered suggestions from the data analysis must be considered and incorporated with risk management procedures for effective results.

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