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# Review on Risk Management Tools & Techniques for Project Management

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**Abstract:** Construction industry is very risk prone, with advanced and dynamic project environments that produce an environment of high uncertainty and risk. The business is prone to varied technical, socio-political and business risks. The memoir to address these risks has not been superb in industry. As a result, the folks operating within the business bear varied failures, like failure of permanent by quality and operational needs, value overruns and unsure delays in project completion. Risk management could be a method that consists of identification of risks, assessment with qualitatively and quantitatively, responses with an appropriate technique for handling risks, then controls the risks by watching. This paper covers the ideas of risk management and varied risk analysis techniques to be used for the one stop answer for every type of hazards possibly to occur throughout any construction project

**Keywords:** Risk Management, Construction Projects, Risk, project management, Questionnaire survey.

## I. INTRODUCTION

The development of infrastructure is one in every of the foremost necessary activities which will accelerate the business of varied industries, thereby increasing the gross domestic product of the country. Construction comes area unit invariably distinctive and risks raises from variety of various sources. Risk is outlined as any action or prevalence which is able to have an effect on the accomplishment of project objectives. Risk management may be a technique that is employed in several alternative industries from, information technology associated with business, automobile, pharmaceutical business, to the development sector. Risks and uncertainties inherent within the housing industry area unit over the other industries. Several industries became a lot of proactive concerning victimisation risk management techniques in project. However, with relation to the development business, an equivalent isn't used normally. Risk is associate in nursing integral part of any project. Risk is gift altogether comes regardless of their size or sector. No project is completely free from risks. If risks don't seem to be properly analyzed and techniques don't seem to be trained to upset them, the project is probably going to guide to failures.

### A. Concept of Risk Analysis and management

Risk management could be a method that identifies the project risks, analyze them, and verify the actions to avert the threats on any project. All steps within the risk management method ought to be enclosed to handle risks, so as to implement the method of the project. Because of the character of construction comes, risk management could be a important method. Risk related to building industry is generally categorised into:

- 1) Technical Risks: The risks associated with the incomplete design, inadequate specification, inadequate site investigation, Change in scope, Construction procedures and insufficient resource availability etc. are termed as technical risks.
- 2) Construction Risks: These risks include Labor productivity, Labor disputes, Site condition, Equipment failures, Design changes, too high quality standard and new technology.
- 3) Physical Risks: The risks arising from the Damage to structure, Damage to equipment, Labor injuries, Equipment & material fire and theft etc. are known as physical risks.
- 4) Organizational Risks: The organizational risks consist of Contractual relations, Contractor's experience, Attitudes of participants, inexperienced work force and Communication.
- 5) Financial Risks: Increased material cost, Low market demand, Exchange rate fluctuation, Payment delays and improper estimation taxes etc. are related to financial risks.
- 6) Socio-Political Risks: Changes in laws and regulations, Pollution and safety rules, Bribery/Corruption, Language/Cultural barrier, Law & order, War and civil disorder and Requirement for permits and their approval.
- 7) Environmental Risks: Natural Disasters and Weather Implications.

## II. OBJECTIVES AND NEED OF STUDY

The risk management technique is employed terribly less thanks to less data and awareness among the folks. The chronicle is additionally terribly poor in terms of brick up with risks in comes, leading to the love of project objectives. Risk management is adopted to contain the attainable future risks proactively instead of being reactive. It applies to any project to guage the foremost, major, and customary risks that cause unhealthy impact on the development project to realize its objectives. The danger management construct is incredibly less well-liked technique within the industry, then it's necessary to unfold awareness of a similar.

## III. METHODOLOGY

In this paper, general focus has been made on the general concepts of risk management. Risk identification has been done with the study of literature. A questionnaire was developed after the identified factors affecting risk. A risk management can be done with the aid of qualitative and quantitative analysis.

## IV. CONCEPT OF RISK ANALYSIS AND MANAGEMENT

Risk management is a process which identifies the project risks, analyse them, and determine the actions to avert the threats on any project. All steps in the risk management process should be included to deal with risks, in order to implement the process of the project. Due to the nature of construction projects, risk management is a very important process.

### A. Risk Management Process

Risk management is the process which consists of identification, assessment, response and review.

**Risk Identification:** Risk identification can be done by the following methods-

- 1) *Brainstorming:* this can be one amongst the foremost in style techniques typically, it's used for plan generation; it's additionally terribly helpful for risk identification. All relevant persons related to project gather at one place. there's one assistant United Nations agency is making known concerning varied aspects with the participants then when author the factors. Before closing it the assistant review the factors eliminate the spare ones.
- 2) *Delphi Technique:* This method is analogous to group action however the participants during this don't recognize one another and that they don't seem to be at a similar place. The assistant like in group action sums up the known factors.
- 3) *Interview/Expert Opinion:* consultants or personnel with ample expertise during a project may be an excellent facilitate in avoiding/solving similar issues over and all over again. All the participants or the relevant persons within the project may be interviewed for the identification of things touching risk.
- 4) *Past Experience:* Past expertise from a similar quite project, the analogy may be shaped for identification of the factors. once scrutiny the characteristics of comes can offer insight concerning the common factors.
- 5) *Checklists:* These square measure straightforward however terribly helpful planned lists of things that square measure potential for the project. The check list that contains a listing of the risks known in comes undertaken within the past and also the response to those risks provides a vantage in risk identification.

### B. Risk Assessment

Quantitative methods

- 1) *Sensitivity Analysis:* this will be distributed to identify the unsure project components which might have most impact on the top results of the project. once a risk model is created a sensitivity analysis is distributed to ascertain the sensitivity of varied parts of the model on project outcome. to undertake and do these the values of one variable at a time is changed and conjointly the impact of these changes is then seen on the project.
- 2) *State of affairs Analysis:* situation analysis offers the impact of varied state of affairs of the project or impact of varied risk if that happens at identical time. an honest decision is also created once this analysis, risk the selection which might supply lesser loss or hazards that choice is also opted.
- 3) *Probabilistic Analysis (Monte Carlo Simulation):* A project simulation is finished using a model to suggests the potential impact of varied level of uncertainties on project objectives. Monte Carlo Simulation is sometimes used for this analysis. it'll quantify the results of uncertainties and risks on project budget and schedule. It simulates the entire system repeatedly, once randomly choosing a price for each issue from its probability distribution. It uses three purpose estimates like presumably, worst case and best case amount for each task in time management.
- 4) *Decision Trees:* This analysis is distributed by decision figure. call trees live|area unit|unit of measurement|unit} really helpful to every formulate the matter and measure selections throughout this analysis .



- 5) **Risk Probability And Impact Assessment:** By applying the method called risk probability and impact assessment, the likelihood of a specific risk to occur is evaluated. Furthermore, risk impact on a project's objectives is assessed regarding its positive effects for opportunities, as well as negative effects which result from threats. For the purpose of this assessment, probability and impact should be defined and tailored to a particular project. This means that clear definitions of scale should be drawn up and its scope depends on the project's nature, criteria and objectives. PMI (Project Management Institute) identifies exemplary range of probability from 'very unlikely' to 'almost certain'; however, corresponding numerical assessment is admissible. The impact scale varies from 'very low' to 'very high'.
- 6) **Probability/Impact Risk Rating Matrix:** Probability and impact, which were assessed in the previous step, are used as a basis for quantitative analysis. For this reason findings from the assessment are prioritized by using various methods of calculation which can be found in the literature. Westland computes the priority score as the average of the probability and impact. The range of priority score, the rating and color are assigned to indicate the importance of each risk. Threats with high impact and likelihood are identified as high-risk and may require immediate response, while low priority score threats can be monitored with action being taken only if, or when, needed.
- 7) **Risk Categorization And Risk Assessment:** Risk categorization is a way of systematizing project threats According to their sources, in order to identify areas of the project that are most exposed to those risks.

Risk associated with construction industry can be broadly categorized into

TYPES OF RISKS		
A	TECHNICAL RISKS	E. FINANCIAL RISKS
	Incomplete Design	Increased material cost
	Inadequate specification	Low market demand
	Unknown site conditions	Exchange rate fluctuation
	Investigation Change in scope	Payment delays
	Construction procedures	Improper estimation Taxes
	Labor shortages	Change in bank formalities and lenders
	Errors in design drawing	Insurances risks
	Material shortage	Taxes and Burden
	Industrial disputes	Inexperience when pricing tender
	Incompetence of transportation facilities	Loss due to fluctuation of interest rate
B	CONSTRUCTION RISKS	F. SOCIO-POLITICAL RISKS
	Labour productivity	Changes in laws and regulations
	Labour disputes	Pollution and safety rules
	Site condition	Bribery/Corruption
	Equipment failures	Language/Cultural barrier
	Design changes	Law and order
	Too high quality Standard	War and civil disorder
	New technology	Requirement for permits and their approval
C	PHYSICAL RISKS:	G. ENVIRONMENTAL RISKS
	Damage to structure	Weather implications
	Damage to equipment	Natural Disasters
	Labour injuries	Any adverse impact on project due to climatic conditions
	Equipment and material fire and theft	Any impact on the environment due to the project
D	ORGANISATIONAL RISKS	Inclement Weather
	Contractual relations	Collapse and Land slide
	Contractor's experience	Local people support for the project
	Attitudes of participants	Any impact on the environment due to the project
	Inexperienced work force	Fire
	Communication	

Table No .1A

## V. RESEARCH METHODOLOGY

For this research, a questionnaire survey method has been adopted to find the impact of critical factors that leads to delay on resource related in the Indian construction sector drawing from various international researchers mentioned above in particular (Sambasivan and Soon 2007). A questionnaire survey was conducted of construction professionals representing various stakeholders involved in construction projects in India.

### A. Questionnaire Design

The questionnaire was designed based on critical factors were identified that contributed to the causes of delays. A questionnaire survey was developed to assess the perceptions of various construction professional of the relative importance of causes and the effects of construction delays. The questionnaire was designed into two sections: Section A; section B. Section A is to obtain the requested background information about the respondents. Section B is to obtain the information on factors that contribute to the causes of delays in construction projects from the perspective of construction professionals. A total twenty eight resource related factors were identified under three broad categories namely manpower related, material related and equipment related issues. The critical factors are listed in Table 1. 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 particular factors on delay in one of their selected projects.

### B. Data Analysis

The data analysis will be done by relative importance index technique used to determine the relative importance of the various cause of factors. The same method is going to be adopted in this study. The five-point scale ranged from 1(very low important) to 5 (very high important) will be adopted and will be transformed to relative importance indices (RII) for each factors as follows:

$$RII = \sum W/A * N$$

Where, W is the weighting given to each factor by the respondents (ranging from 1 to 5), A is the highest weight (i.e. 5 in this case), and N is the total number of respondents. The RII value had a range from 0 to 4 (0 not inclusive), higher the value of the RII, more important was the causes of delays. The RII was used to rank the different uncertainty factors that cause delay. These ranking made it possible to cross-compare the relative importance of the uncertainty factors as perceived by the respondents. After obtaining index score for each factor, standard deviation and coefficient of variation of each factor is also determined. Subsequently, ranking of factors is done based on Index score.

## VI. CONCLUSION

Risk is perceived as a negative term, even though in theory It can have two dimensions. Professionals in the construction industries are using techniques described in the literature concerning RM, but are not aware of it. Risks are being managed every day in the industry, but not in such a structured way as the literature describes. As also other researchers confirmed, the knowledge of RM and RMP is close to zero, even though the concept of risk management is becoming more popular in the construction sector. Risk management is a technique that should be applied within an industry to achieve the goals of the industry. Hence, it is necessary to spread awareness and create interest amongst people to use risk management techniques in the industries.

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