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A Study on Risk Management in Construction Industry and To Propose an Effective Model for Incorporating Precautionary Measures

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Abstract- **Construction Industry is prone with lot of risks and uncertainties especially during the execution of the project at the dynamic environments. This industry is vulnerable to numerous risks such as Financial risk, Legal risk, Management risk, Market risk, Policy & Political risk, Technical risk, Construction risk, Environmental risk and Social risk. These risks lead to the time and cost overrun of project. To overcome this time and cost overrun Risk Management is needed. Risk management is defined in this study as a tool to identify potential risks, Assess the probability and impact of each risk and to Identify alternative actions that may prevent the risk from happening (avoidance), or if it does happen deteriorate the impact (reduction), or provide a strategy for dealing with the accepted consequences (acceptance). A literature review is initially conducted to identify the risk factors that affect the performance of construction industry as a whole. The survey questionnaire is designed to probe the cross-sectional behavioral pattern of construction risks construction industry. The questionnaire prepared for the pilot survey was formulated by seeing the relevant literatures in the area of construction risk management. The questionnaire was given to forty companies, out of which thirty gave an effective rely. Thus the response rate is of 75%. An effective model incorporating precautionary measures is proposed for adoption from the data's obtained through questionnaire survey.**

Keywords: Risk Management, Risk Analysis, Risk Identification, Relative Importance Index.

1. INTRODUCTION

Construction projects are always unique and risks raise from a number of the different sources. Construction projects are inherently complex and dynamic, and involving multiple feedback processes. A lot of participants – individuals and organisations are actively involved in the construction project, and they interests may be positively or negatively affected as a result of the project execution or project completion. Different participants with different experience and skills usually have different expectations and interests. This naturally creates problems and confusion for even the most experienced project managers and contractors.

The research paper focuses on the major risk factors that affect the construction project. Construction Management is defined as the management activities that are over and above the normal architectural and engineering services conducted during the pre-design, design and construction phases of a project that contribute to the control of cost and time.

Any issue that is caused due to risk management affects the cost and time of the project. A questionnaire survey is conducted to assess and rank the risk factors affecting the cost and time of the project, and to propose an effective module incorporating precautionary measures for adoption.

Risk Management

Risk management in a project encompasses identifying factors that could potentially negatively impact a project's cost schedule or quality baselines; quantifying the associated potential impact of the identified risk; and implementing measures to manage and mitigate the potential impact. The riskier the activity is, the costlier the consequences if wrong decision is made. Businesses would like to quantify risk for many reasons. Knowing how much risk is involved will help decide if costly measures to reduce the level of risk are justifiable. It can also help to decide if sharing the risk with an insurance company is justified. Some risks, such as natural disasters, are virtually unavoidable and affect many people. All choices in life involve risk. Risks cannot be totally avoided, but the choice cans be made so that risk is minimized.

2. CONCEPTS OF RISK MANAGEMENT

Risk

A measure of potential economic loss or human injury in terms of the probability of the loss or injury occurring and the magnitude of the loss or injury if it occurs.

Factors affecting risk

Several factors can expose projects to higher than normal risk.

- Team size
- History
- Staff expertise and experience
- Complexity
- Management stability
- Time compression
- Resource availability

Risk identification

Risk identification is the process of identifying all potential sources of project risks and their likely consequences, besides finding out the causes of those risks. Some of the methods used for risk identification are

- Brainstorming
- Delphi technique
- Interviews
- Risk Questionnaires and Risk Surveys
- Checklists
- Working Groups
- Experiential Knowledge
- Documented Knowledge

Risk Analysis and Evaluation Process

Risk analysis is the systematic use of available information to characterise the risks, determine how often the specified events could occur, and judge the magnitude of their likely sequence (BS 31100:2008). On the other hand, risk evaluation is the process to decide risk management priorities by evaluating and comparing the level of risk against predetermined standards, target risk levels, or other criteria. Types of risk analysis are

- Qualitative Risk Analysis
- Quantitative Risk Analysis

Response to Risk

There are basically five categories of classic risk response strategies:

- Accepting
- Avoiding
- Monitoring
- Transferring
- Mitigating

3. RESEARCH OBJECTIVE

This research paper has aimed to (1) To identify and synthesize the factors affecting the key aspects. (2)To quantify relative importance of the factors and to demonstrate the ranking of factors and categories according to their importance level on issues. (3)To categorize the factors into major categories and to address the major factors and make recommendations in order to overcome the key aspect issues.

4. METHODOLOGY

Method of Surveying

The general methodology of this study relies largely on the survey questionnaire which will be collected from the local building contractors of different sizes by mail or by personnel meeting. A through literature review was initially conducted to identify the risk factors that affect the performance of construction industry as a whole.**Risk Rating**

A Likert scale is a type of psychometric response scale often used in questionnaires, and is the most widely used scale in survey research. When responding to a Likert questionnaire item, respondent specify their level of agreement to a statement.

Questionnaire Survey

The questionnaire was designed based on the review of the related literatures. The questionnaire is divided into four sections.

SECTION A: Technical Risk issues

SECTION B: Market Risk issues

SECTION C: Management Risk issues

SECTION D: Financial Risk issues

SECTION E: Political Risk issues

SECTION F: Legal Risk issues

SECTION G: Environmental Risk issues

Collection of Data

The questionnaire is to be distributed to various categories of respondents (Owners, Consultants, Managers, Engineers, and Contractors). The data is to be collected in person as an interview basis.

Processing of the Collected Data's

The data's from the questionnaire survey is to be ranked using Risk Significance Index method to rank the key factors affecting the Risk management in construction industry.

$$RS = \alpha_{ij} \times \beta_{ij}$$

Where,

α_{ij} is probability of occurrence of risk i assessed by respondent j

β_{ij} is degree of impact of risk i, assessed by respondent j

5. RESULT

I. Financial Risk related 5 major factors

In case of Financial Risk the mean value of Loss due to fluctuation of inflation rate is high than other factors. Rising fuel prices have also been behind rising inflation. Ranking of financial risks related 5 major factors are given in the table 5.1 and the corresponding bar chart is shown in figure 5.1.

Table 5.1

S.No	Factors	Mean	Rank
2	Loss due to fluctuation of inflation rate	7.83	1
3	Loss due to fluctuation of interest rate	7.22	2
8	Insurance risk	6.91	3
5	Loss due to rise in fuel price	6.72	4
7	Changes in Bank formalities and regulations	6.13	5

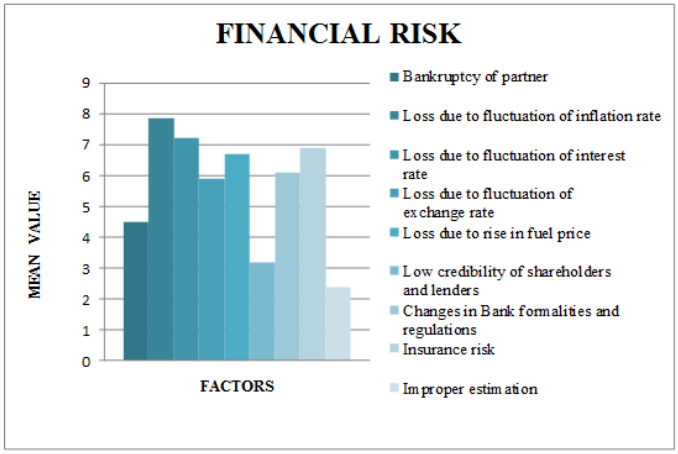


Figure 5.1.

II. Political Risk related major factors

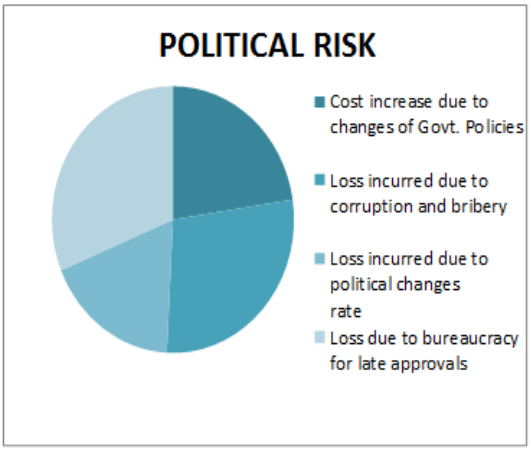
In case of Political Risk the mean value of Cost increase due to changes of Govt. Policies is high than other factors. Common approval for the new projects is present, which causes delays and even financial loss for the companies. Ranking of Political risks related major factors are given in the table 5.2 and the corresponding bar chart is shown in figure 5.2.

Figure 5.2.

Table 5.2

S.No	Factors	Mean	Rank
4	Cost increase due to changes of Govt. Policies	7.50	1

2	Loss incurred due to corruption and bribery	6.78	2
1	Loss incurred due to political changes	5.43	3
3	Loss due to bureaucracy for late approvals	4.36	4

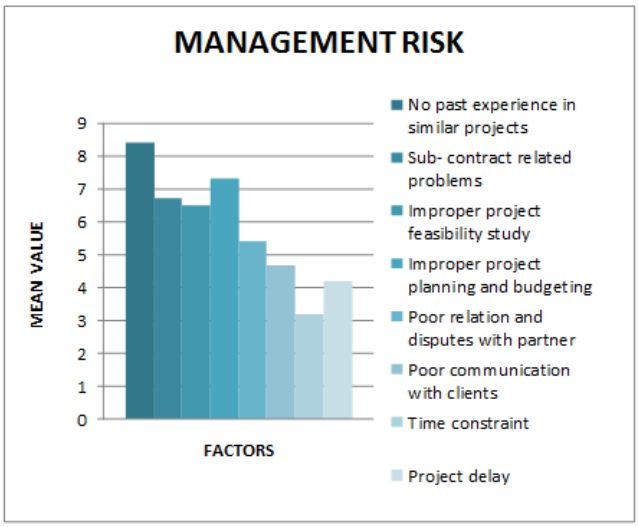


III. Management Risk related 5 major factors

In case of Management Risk the mean value of No past experience in similar projects is high than other factors. Improper planning and budgeting, improper feasibility studies, no past experience in similar projects are some technical risk faced by the companies. To overcome these companies are making joint ventures. Ranking of Management risks related 5 major factors are given in the table 5.3 and the corresponding bar chart is shown in figure 5.3**.**

Table 5.3 **Figure 5.3**

S.No	Factors	Mean	Rank
2	No past experience in similar projects	8.43	1
6	Improper project planning and budgeting	6.91	2
4	Sub- contract related problems	6.74	3
5	Improper project feasibility study	6.52	4
9	Poor relation and disputes with partner	5.43	5



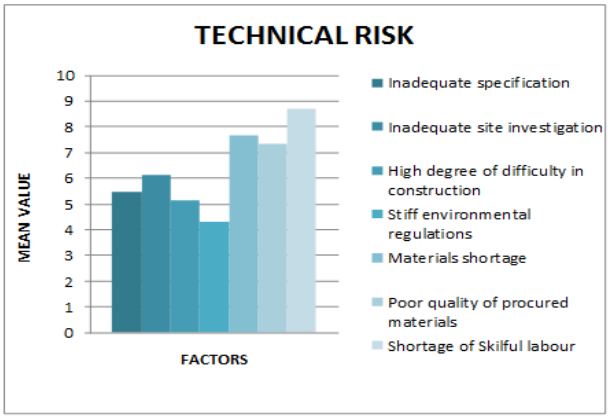
IV. Technical Risk related 5 major factors

In case of Technical Risk the mean value of Shortage of Skillful labour is high than other factors. As of now compared with other industries the construction sector suffers a chronic shortage of skilled workers, though unskilled workers are available in large amount from different part of the country. Ranking of Technical risks related 5 major factors are given in the table 5.4 and the corresponding bar chart is shown in figure 5.4.

Table 5.4

S.No	Factors	Mean	Rank
24	Shortage of Skillful labour	8.72	1
10	Materials shortage	7.65	2
12	Poor quality of procured materials	7.32	3
5	Inadequate site investigation	6.14	4
4	Inadequate specification	5.48	5

Figure 5.4



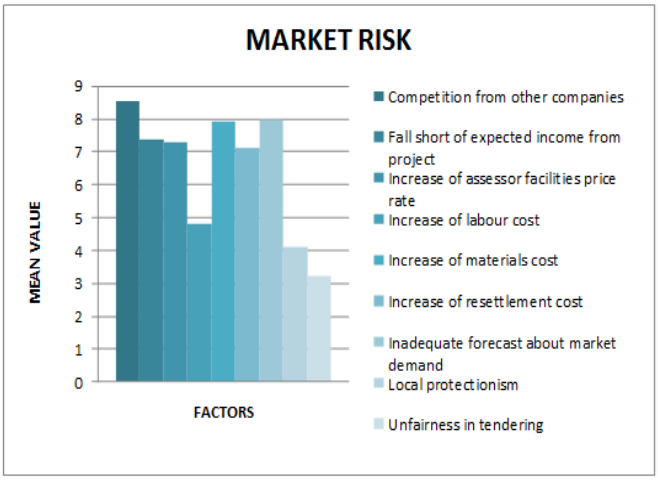
V. Market Risk related 5 major factors

In case of Market Risk the mean value of Competition from other companies is high than other factors. Material shortage & steep increase in its price have also affected the construction industry. Ranking of Market risks related 5 major factors are given in the table 5.5 and the corresponding bar chart is shown in figure 5.5.

Table 5.5

S.No	Factors	Mean	Rank
1	Competition from other companies	8.54	1
7	Inadequate forecast about market demand	7.95	2
5	Increase of materials cost	7.91	3
2	Fall short of expected income from project	7.38	4
3	Increase of assessor facilities price	7.31	5

Figure 5.5



VI. Legal Risk related 5 major factors

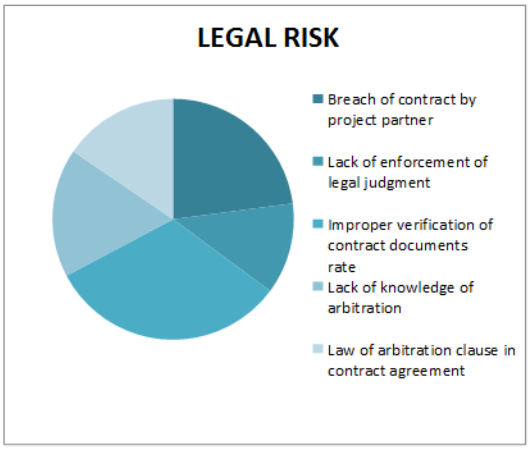
In case of Legal Risk the mean value of Improper verification of contract documents is high than other factors. Legal risk is not much, but if the contract legal problem arises then settlement dispute takes time & money. Nowadays arbitration clause has made in most of the big projects, but small projects don't involve this clause in the agreement itself. Ranking of Legal risks related 5 major factors are given in the table 5.6 and the corresponding bar chart is shown in figure 5.6.

Table 5.6

Figure 5.6

S.No	Factors	Mean	Rank

3	Improper verification of contract documents	3.94	1
1	Breach of contract by project partner	2.81	2
4	Lack of knowledge of arbitration	2.12	3
6	Law of arbitration clause in contract agreement	1.90	4
2	Lack of enforcement of legal judgment	1.50	5



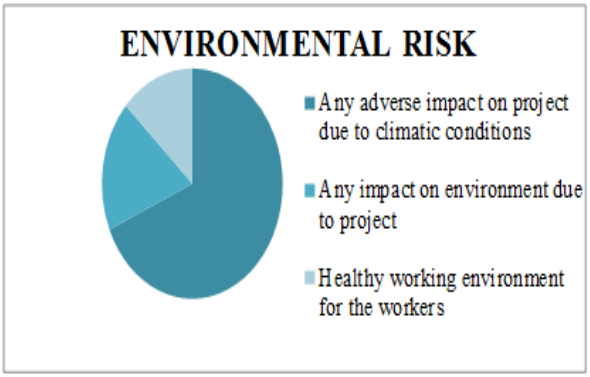
VII. Environmental Risk related major factors

In case of Environmental Risk the mean value of impact due to climatic conditions is high than other factors. During rainy season inundation of water in foundation in the starting stage of the project is a great disadvantage for the construction companies. For the workers working under the direct sunlight is difficult, so safety helmets are provided in some companies. Ranking of Market risks related 5 major factors are given in the table 5.7 and the corresponding bar chart is shown in figure 5.7.

Table 5.7

S.No	Factors	Mean	Rank
1	Any adverse impact on project due to climatic conditions	2.91	1
2	Any impact on environment due to project	0.78	2
3	Healthy working environment for the workers	0.56	3

Figure 5.7



6. CONCLUSION

Formal risk analysis and management techniques are rarely employed in construction industry. This technique is not employed because of less knowledge and awareness among the construction industry. The following are the conclusions from this thesis work

- In financial risk factor the Relative Importance Index of 'Loss due to fluctuation of interest rate' was higher than other factors.
- In Management risk factor the Relative Importance Index of 'No past experience in similar projects' was higher than other factors

- In Technical risk factor the Relative Importance Index of 'Shortage of Skillful labour' was higher than other factors
- In Market risk factor the Relative Importance Index of 'Competition from other companies' was higher than other factors
- In Political risk factor the Mean value Risk Significance Index of 'Cost increase due to changes of Govt. Policies' was higher than other factors
- In Legal risk factor the Mean value Risk Significance Index of 'Improper verification of contract documents' was higher than other factors
- In Environmental risk factor the Mean value Risk Significance Index of 'Any adverse impact on project due to climatic conditions' was higher than other factors
- Overall market, management and financial risks are high when compared to other risk

The recommended model to avoid the risk factor issues for adoption in the construction industry.

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