

# Risk Management of Contracts in Construction Projects

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**Abstract - The construction sector in India is the second-largest economic segment in industry sector after agriculture, as it is one of the forces for driving the development of nations of the world. A contract agreement is mandatory in all construction projects, it sets forth the parties obligation to each other and determines how risks will be shared or divided on the project. In India most of the construction projects are delayed due to tendering and contractual issues. On an average around 26 percent of construction projects are failed or delayed due to risks in construction contracts. There is no proper framework for managing risks in contracts. The disputes between the owners and contractors due to contractual issues, can be solved through ADR(Alternate Dispute Resolutions)systems but it is noted that solutions given through the ADR systems are facing difficulty in courts and typically take many years to settle. The aim of this paper is to study and identify the major risk factors in construction contracts of Government projects, private projects and PPP projects and they are ranked according to their critical nature. These risks can be managed by the suitable risk management techniques.**

**Index Terms - contract agreement, delay, contractual risks, ADR systems, Framework, risk management techniques.**

## I. INTRODUCTION

The construction sector in India is the country's second-largest economic segment in industry sector. It accounts for about 7.74% of India as GDP. It makes major contribution to the national economy and provides employment to large number of people. The construction industry is subject to more risk and uncertainty than most other industries almost every construction projects carry with them enormous risks. Due to the risks and uncertainties involved in construction Industry a large number of projects in India undergoes time and cost overruns. The delays of these projects are due to various risks such as land acquisition challenges, contractual issues, change of scope, environmental clearance and so on. One of the major risks faced by construction industry is "contract risk". The risk factors involved in the construction contracts is one of the root causes for the delay and cost overruns of various construction projects in India.

The Indian Contracts Act 1872, creates rights and duties between the contracting parties. The parties are free to set the terms of contract. However, such rights and duties created must not be unlawful and must not infringe the legal principles. Promises which do not create legal obligation are not contracts. A construction contract is a mutual or legally binding agreement between two parties based on policies, terms and conditions in document form. The owner has full rights to decide what type of contract should be used for a specific development to be constructed and to set forth the legally-binding terms and conditions in a contractual agreement. Generally the construction contracts are made even for small scale residential buildings to very large infrastructure projects. There are different sectors in construction contracts like Government sector, private sector and PPP sector.

The Ministry of Statistics and Programme Implementation, Government of India has reported that out of 782 construction projects in India, a total of 215 projects are delayed with the time over-run ranging from 1 to 61 months(Source: MOSPI-2018). The primary causes which are noted are delay in tendering and contractual issues. On average around 26 percent of construction projects are failed or delayed due to the risks in construction contracts. Hence there is a need for risk management in construction contracts to reduce delay in the construction projects. Risk is inseparable in all construction projects and as such it can never be fully eliminated, although it can be managed effectively to limit and mitigate the impacts on expected project outcomes. In construction contract the risk is typically poorly understood by the chief acquiring parties and contractors.

The most common reason that causes the occurrence of risks in construction contracts is that the parties do not understand exactly what is expected of them. Specifically, the parties involved in contract agreement don't know the terms of the contract, their obligations or even their understanding of the other party's obligations, due to this several risks arises during the development and construction phases of the projects. Major risk bearers are owner and contractor. Usually the contractor always has the risks in the process of signing the contract. Clients more frequently apply the technique of "consulting experts" during both risk identification and risk analysis than contractors, indicating

clients rely on external expertise to assist with risk management more than contractors.

## II. LITERATURE REVIEW

K.V.Prasad, V.Vasugi *et al.* (2018)<sup>[7]</sup> briefly discussed that Projects in India continue to suffer excessive delays. To identify the major causes of delay specifically in different type of projects, the projects were categorized based on the type and causes for each project type viz., transportation, power, buildings, and water/irrigation sector were identified. A questionnaire survey was conducted among the major contractors, owners and consultants in India to determine the critical causes of delay. Sixty causes of delay identified from literature were selected for the study and ranked using the Importance Index (II). Financial related causes viz., delay in settlement of claims by owner, contractor's financial difficulties, delay in payment for extra work/ variations and late payment from contractor to subcontractors/suppliers were found to be the most critical causes of delay in all the type of projects. It also describes that an estimate as high as INR 700 Billion is tied up in arbitration and the average settlement time of these claims is more than seven years (Press Information Bureau (PIB), 2016). The claims submitted by contractors take significant time to finally fructify. Even the claims awarded by the arbitrators are challenged by the clients in courts and typically take about 6.5 years to settle (Construction Federation of India (CFI), 2015). It's also reported that nearly 84% of the claims raised by Indian contractors are still pending. This paper suggests some mitigation measures to control delay causes and improve project delivery not just in India but all developing countries. These measures of mitigation will need to be implemented in projects with equal support from all parties to the contract to ensure delays are minimized and projects are delivered faster.

Yunkai Yan, Yisheng Liu *et al.* (2016)<sup>[9]</sup> discussed that Risk is inherent in construction projects of all types and sizes. It has many causes and its effects clear themselves in various forms. The contract for construction projects refers to survey, design, construction, material supply and others for the completion of a certain construction project. It surely belongs to a kind of economic contract. Because it is the critical issue of the contractor to control of construction project, so the contract risk management is heavily necessary. According to the contract risk of the project, the contractor should recognize the situation, face the difficulties and actively put the unfavorable factors to reduce, and treat potential risk as a negative change. This paper discussed some of the issues faced by the contractor in the performance of the contract and also suggests some of the risk controlling strategies of the contractor some of the risk prevention strategies suggested are Carefully review the construction

drawings and tender documents, and carefully submit the tender documents, Determine construction period delay, Pay attention to the collection of engineering design change data, Improving the service quality of contract management staff, Pay attention to legal documents etc.,

Jasper Mbachu, Samuel Taylor (2014)<sup>[5]</sup> this study aimed to establish priority contractual risks in the NZ construction industry, and their mitigation measures. The research was based on a questionnaire survey of consultants and contractors. There are totally 21 risk factors are identified and 5 key mitigation measures are identified. A descriptive research method was adopted as observation technique (through opinion survey) was used as the primary data collection method. In the questionnaire survey, respondents were then asked to rate the relative levels of impact of the identified risk factors as well as relative levels of effectiveness of the identified risk mitigation measures. The most risky factors under the broad categories comprise, respectively, unforeseen site conditions, poor project management, inexperience or incompetent estimating team, work overload arising from taking on too many contracts at the same time, shortage of skilled labour, and clients' unreasonable expectations. This paper concludes that being cautious of the priority risk factors and implementation of the identified most effective risk mitigation measures could guide contractors and the project team to more appropriately budget for and respond to risk thereby ensuring more satisfactory project outcomes.

Nur Syaimasyaza Mansor *et al.* (2016)<sup>[6]</sup> discussed that this paper aims to present a review of incomplete contract focusing on its causes, implications, and strategies, with reference to PFI contracts, Past studies discussed the reason of incomplete contract include long-duration project, high risk or uncertainty, high transaction cost, bounded rationality, asymmetric information and signalling a trust. However, a complete contract is difficult to achieve because parties always face with uncertainties which consequently requires parties to renegotiate, breach or litigate. It seems that the parties prefer to resolve the matters through alternative dispute resolution. This paper focus that human factors play an important role in determining the completeness of a contract, it also presents the positive and negative implications of incomplete projects. This paper suggests some strategies to deal with incomplete projects. Finally this paper concludes that the importance of trust, ethic, and cooperation, information sharing, promote the spirit of partnership can be strategy deal with incomplete projects.

## III. METHODOLOGY

With reference to the literatures, the problem is identified and the risk factors in contract are identified from

the literatures and experts. With this identified factors a questionnaire was prepared and circulated to owners, contractors and engineers of Government, Private, and PPP organizations. The responses from those experts were collected and major risks factors were ranked according to their critical nature.. This is shown in Figure.1

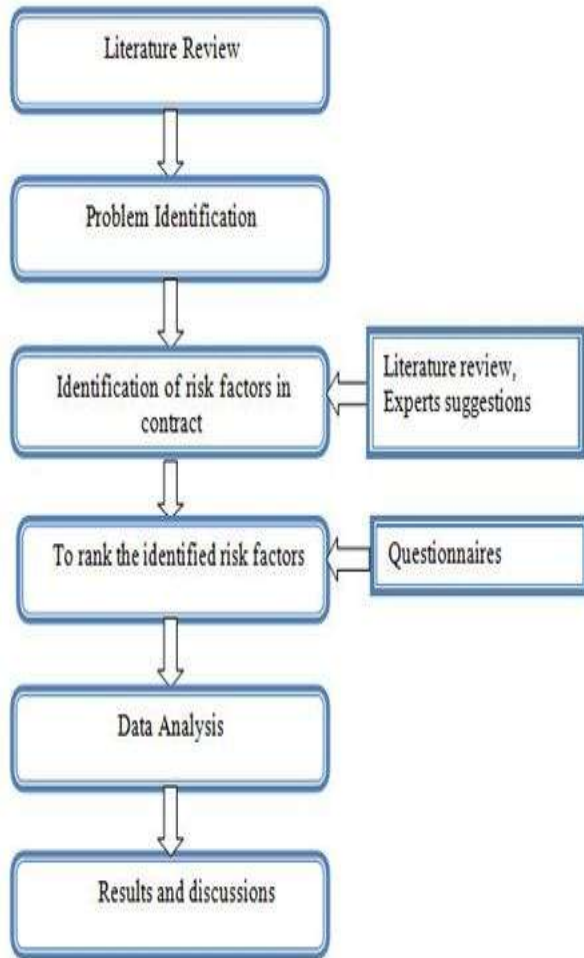


Fig.1 Project methodology

**RISKS FACTORS IN CONTRACT**

From the literatures reviewed and suggestions from the experts the major risks factors in the construction contracts are identified. The risk factors identified are comes under three stages of construction they are Planning and design, Financial and Execution.

The following are the identified risk factors of contracts in construction projects:

Table.1 Risk factors in construction contracts

STAGES	RISKS FACTORS
Planning and Design	<ul style="list-style-type: none"> <li>• Poor scope definition by contractor</li> <li>• Improper technical study by contractor during bidding stage</li> <li>• Inaccuracy of materials estimate</li> <li>• Improper or inaccurate cost estimation by contractor</li> <li>• Exceptionally low bids by contractor</li> <li>• Ambiguity in specifications and conflicting interpretation by parties</li> <li>• Design changes by owner or his agent during construction</li> <li>• Errors or inconsistencies in project documents</li> <li>• Unreasonable risk allocation in contract</li> </ul>
Financial	<ul style="list-style-type: none"> <li>• Delay in monthly payments from owners</li> <li>• Contractors and owners financial difficulties</li> <li>• Late payment from contractor to sub-contractors or suppliers</li> <li>• Delay in the settlement of contractor claims by the owner</li> </ul>
Execution	<ul style="list-style-type: none"> <li>• Failure to provide required construction site by owner</li> <li>• Noncompliance with conditions of contract</li> <li>• Lack of contractor's experience and control over project</li> <li>• Non-performance of subcontractors and nominated suppliers</li> <li>• Unrealistic contract duration imposed by owner</li> <li>• Variation orders/changes of scope by owner during construction</li> <li>• Unrealistic inspection and testing methods proposed in contract</li> <li>• Lack of process for comprehensive dispute resolution</li> <li>• Changes in government regulations and laws</li> <li>• Force Majeure as war, revolution, riot, strike, and earthquake, etc</li> <li>• Political influence</li> <li>• High inflation, insurance and interest rates</li> </ul>

**DATA COLLECTION**

An extensive literature survey is conducted and twenty six risk factors are identified in the contracts. The identified factors are classified into three major stages a) Planning and design b) Financial and c) Execution. A questionnaire was prepared and survey is conducted among contractors, engineers and experts of various organizations and the required data is collected. A total of 31 respondents were collected from government, private and PPP organizations. The respondents are classified based on their position, age and working experience.

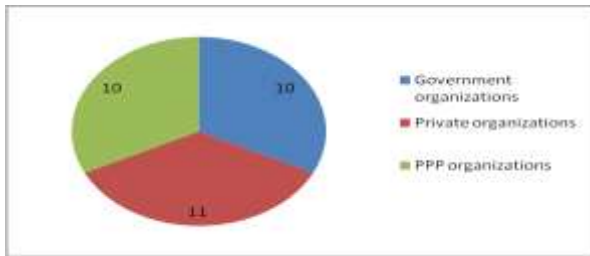


Fig.2 Total number of respondents

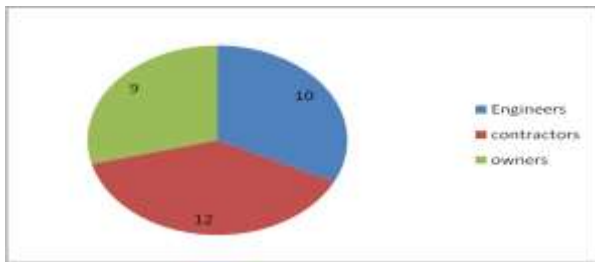


Fig.3 Position of respondents

**DATA ANALYSIS**

The approach used for data analysis was Relative Importance Index method. It is used to rank the risk factors in contracts. This method is based on the evaluation of risk factors from the respondents (i.e. owners, engineers or contractors). The five-point scale ranged from 5 (very high significant risks) to 1 (very low significant risks) was adopted and transformed to relative importance indices (RII) for each factor as follows:

$$RII = \frac{\sum(P_i * U_i)}{N * n}$$

Where,

P<sub>i</sub> = Respondents rating

U<sub>i</sub> = Number of respondents placing identical rating

N = Sample size

n = Highest value on likert scale

The responses from experts were collected by means of questionnaire survey regarding risk factors affecting the construction contracts, and the identified risk factors were ranked based on relative importance index.

**IV. RESULTS AND DISCUSSION**

*Major Risk Factors In Government Projects*

The following are the major risks factors that are identified in the Government projects. The results shows that Improper or

inaccurate cost estimation by contractor, delay in settlement of contractor claims by the owner and political influence are the major risk factors that occurs in government projects

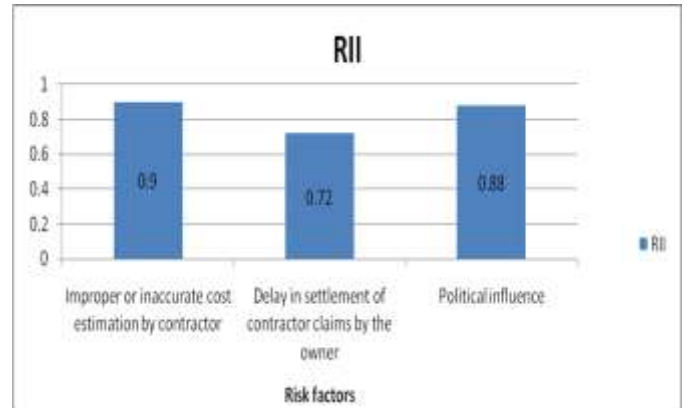


Fig.4 Major risk factors in government projects

*Major Risk Factors In Private Projects*

The following are the major risks factors that are identified in the Private projects. The result shows that exceptionally low bids by contractor to receive project, noncompliance with conditions of contract and changes in government regulations and laws are the major risk factors that occurs in private projects

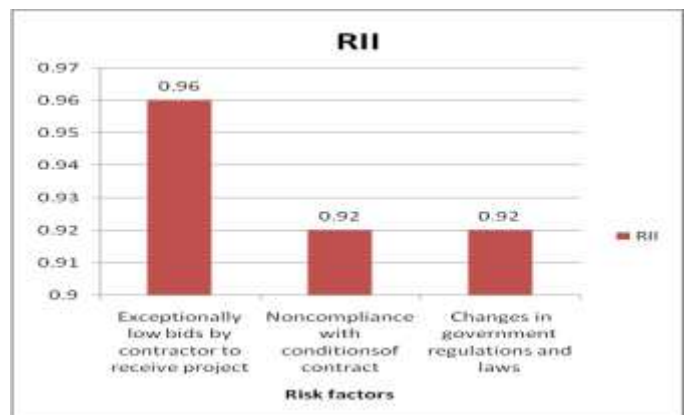


Fig.5 Major risk factors in Private projects

*Major Risk Factors In Ppp Projects*

The following are the major risks factors that are identified in the PPP projects. The result shows that failure to provide required construction site by owner, variation orders/changes of scope by owner during construction and unreasonable risk allocation in contract are the major risk factors that occurs in PPP projects

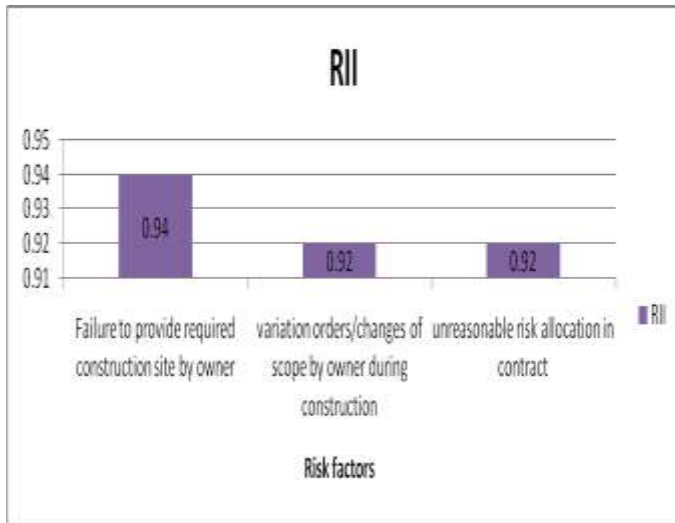


Fig.6 Major risk factors in PPP projects

Comparison of Major Risk Factors

RISK FACTORS	RII
Government projects	
▪ Improper or inaccurate cost estimation by contractor	0.9
▪ Political influence	0.88
▪ Delay in settlement of contractor claims by the owner	0.72
Private projects	
▪ Exceptionally low bids by contractor to receive project	0.96
▪ Noncompliance with conditions of contract	0.92
▪ Changes in government regulations and laws	0.92
PPP projects	
▪ Failure to provide required construction site by owner	0.94
▪ Variation orders/changes of scope by owner during construction	0.94
▪ Unreasonable risk allocation in contract	0.92

The results shows that the major risk factors varies according to the type of projects. These risk factors are the major causes for the delay of various projects in India. Hence it is necessary to manage the risk in contracts.

V. SUMMARY AND CONCLUSION

This study investigated the importance of Managing risks in construction contracts. For this purpose, an extensive

literature review was conducted and twenty six factors were identified. These factors were categorized into 3 major phases namely: a) Planning and design, b) Financial and c) Execution. Questionnaire(samples given under annexure) was prepared for each phases based on information gathered from the literature review and experts opinions. Then based on responses, the risk factors in construction contracts were ranked according to their relative importance index for the Government, Private and PPP projects. Thus the major risk factors in the construction contracts for Government, Private and PPP projects are identified and listed. Thereby analysing the importance of risk factors and its impacts on projects, a framework will be developed for managing risk in contracts by a suitable risk management techniques like Fuzzy-set analysis, Monte-carlo simulation, Game theory, MCDM models etc.,

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