

Risk Analysis and Management in Residential Construction Projects in Dhule District

Mr. Rohit Dhakad¹, Prof. Rahul D Shinde²

¹Dept of Civil Engineering

²Assistant Professor, Dept Civil Engineering

^{1,2}RMD Sinhgad SOE,SPPU Pune, India,

Abstract- *In construction projects, risks play a significant part in decision making and may affect the performance of a project. If they are not dealt with sensibly, they may cause cost overruns, delays on schedule and even in poor quality. Each project has a different level and combination of risks and sites will adopt different strategies to minimize them because the characteristics of projects are unique and dynamic. Risks are very common in construction sector. Risk is the possibility of suffering loss and the impact on the involved parties. Risk is identified and then risk assessment and analysis is done. Then risk management and risk mitigation is carried out. Risk affect construction sector negatively and focusing on risk reduction measure it important. Compared with many other industries, the construction industry is subject to more risks due to the unique features of construction activities, such as long period, complicated processes, abominable environment, financial intensity and dynamic organization structures. Hence, effectively identifying and managing risks is very essential in a construction project as to deal with the risks related with variable construction activities.*

Keywords- Risk, Risk Assessment, Managing Risk

I. INTRODUCTION

Risks are very common in construction sector. Risk is the possibility of suffering loss and the impact on the involved parties. Risk is identified and then risk assessment and analysis is done. Then risk management and risk mitigation is carried out. Risk affect construction sector negatively and focusing on risk reduction measure it important. Compared with many other industries, the construction industry is subject to more risks due to the unique features of construction activities, such as long period, complicated processes, abominable environment, financial intensity and dynamic organization structures. Hence, effectively identifying and managing risks is very essential in a construction project as to deal with the risks related with variable construction activities. It is important to notice the difference between risk and uncertainty. Uncertainty can be regarded as the chance occurrence of some event where the probability distribution is genuinely not known. This means that uncertainty relates to

the occurrence of an event about which little is known, except the fact that it may occur. Those who distinguish uncertainty from risk define risk as being where the outcome of an event, or each set of possible outcomes, can be predicted on the basis of statistical probability. This understanding of risk implies that there is some knowledge about a risk as a discrete event or a combination of circumstances, as opposed to an uncertainty about which there is no knowledge. In most cases, project risks can be identified from experience gained by working on similar projects.

II. LITERATURE SURVEY

The main purpose of the paper ‘Risks in Housing and Real Estate Construction Project’ by Madhav Prasad Koirala is identify the risks involved in housing and real estate of construction project and ranks them as per the severity. In this research, first the risks involved in construction projects life cycle has been identified with the help of professional expertise and verified with the help of housing profession arranged in a respondent in systematic hierarchical structure. Questionnaire surveys and literature review were used for data collection. Next, based on the obtained data a network was based on the statically system has been designed for the evaluation of project risks. After data analysis, the result has been published and finally conclusion has been drawn. ‘change order’.

The purpose of the study of the paper ‘Assessment of Risks and Its Application for Residential Construction Projects: A Case Study’ by Prof. Mohan M. Dusane and Prof. Pankaj B. Bhangaleis to identify risk, risk assessment of various risks for ‘The Metrozone Project’ located at Nashik (M.S.), India; as a case study, which can help in prioritizing risks in case of residential construction project for project parties for effective risk management and successful completion of the project to reach their intended goals with greater efficiency. Risks can be assessed qualitatively and quantitatively. Then this ranking gets converted into score. From this score, the risk factor of each risk type is found out. Risk factor and priority model’ technique is used to analyze risk. Risks can be assessed qualitatively and quantitatively.

Then this ranking gets converted into score. From this score, the risk factor of each risk type is found out. Risk profile indicates the priorities of risk in order to resolve it, then risk prioritization of various risks is to be found out. The first priority can be interpreted as most critical whereas the last priority can be interpreted as least critical reflects on achieving project success. To achieve objectives of this study, a questionnaire is designed on basis of objectives for the residential construction project. The questionnaire includes total main 15 risks which are project related of major residential construction project.

III. OBJECTIVES

- 1) To identify project risk management critical success factors to assure success in residential construction projects.
- 2) To identify the most influencing project risk management critical success factors to assure success in residential construction projects.
- 3) To compare the results with SPSS software.
- 4) To find the reliability and to check accuracy of data.
- 5) To provide useful guidelines for forming and operating effective residential construction projects in Dhule district.

IV. METHODOLOGY

In the case study, we have studied the project risk management critical factors responsible for the successful completion of a residential construction project. We have made and distributed questionnaires to different clients, contractors and consultants who have experience in residential buildings in which project risk management critical factors for successful completion of residential construction projects were mentioned. We have studied thirty four respondents from residential construction projects in Dhule district. In this paper, Relative Importance Index (RII) was used to calculate each cause of risk.

The research methodology has been divided into following stages:

- 1) Formulation of objective of study
 - a. Collection of references includes journals, technical reports and books.
- 2) List out the factors causing delay
 - a. To address the most contributing factors and effects of risks specifically in residential projects.
 - b. All factors and effects will be identified by expert advice from professionals.

- 3) Preparation of questionnaire
 - a. Making of questionnaire
 - b. Developed questionnaire then distribute to the targeted respondent.
- 4) Data collection and analysis
 - a. Data collection and analysis based on RII method to rank the factors.
 - b. Spearman's rank correlation to test the agreement between the groups.
- 5) Results and discussion
 - a. To identify the important factors and effects of risks in residential project.
 - b. To identify the relationship between causes and effects of risks in residential projects.
 - c. Methods of minimizing construction risks.

V. DATA COLLECTION

Total 37 questionnaires were distributed to different respondents in Pune. A list of stakeholders who showed their response has been presented. The responses were obtained after personal request and visit to their respective sites of offices. Though the total number of questionnaires sent and responses received were limited but the survey covered most of the known client, consultant and contractor of Dhule. The respondents are top-level experienced stakeholders hence the reliability of the survey results is expected to be high. Following table shows distribution of responses.

Table No. 1: Questionnaire distributed and responses received

Respondents	Questionnaire Distributed	Responses Returned	Percentage of Responses
Client	7	7	100
Consultant	8	7	87.5
Contractor	22	20	90.90
Total	37	34	91.89

The next stage is data collection based on 50 factors of time and cost overrun based on which questionnaire was designed. The questionnaire was organized in the form of importance scale. Respondents were asked to indicate by ticking a column the relative importance of each of the causes of construction delays (1-High Influence, 2-Medium influence, 3-Low influence, 4-Can be neglected). Total 37 questionnaires were distributed to respondents in Pune. The collection of data took 8 to 10 weeks. At end of the period, 34 questionnaires were received for analysis. The response rate by respondents is 91.89%.

VI. DATA ANALYSIS & CHECK APPROACH

The following approaches are used for data analysis:

1. Relative Importance Index (RII) Technique: It is used to determine the relative importance of the various causes of risks. The same method is going to be adopted in this particular project within various groups (i.e. Contractors, clients, and consultant). The four point scale from 1 (High Influence) to 4 (Low Influence) is being adopted and transformed to relative important indices (RII) for each factor as follows:

$$RII = \Sigma W / (A * N)$$

Where, W is the weighting given to each factor by the respondent (ranging from 1 to 4)
 A is the highest weight (i.e. 4 in this case).
 N is the total Number of respondents.
 Higher the value of RII, most important is the cause of risk.

2. Cronbach’s Alpha for Reliability Statistics: It is a measure used to assess the reliability, or internal consistency, of a set of scale or test items. In other words, the reliability of any given measurement refers to the extent to which it is a consistent measure of a concept, and Cronbach’s alpha is one way of measuring the strength of that consistency. It is most commonly used when there is a multiple linkert scale/questions in a survey which forms scale in order to determine there liability of the scale. It will generally increase as the inter-correlations among test items increase and is known as an internal consistency estimate of reliability of test scores.

Cronbach’s alpha is calculated as:

$$\alpha = (k \times c) / (v + (k-1)c)$$

Where,
 k refers to number of scale items,
 c refers to average of all covariance between items,
 v refers to average variance of each item.

Cronbach’s alpha is thus a function of the number of items in a test, the average covariance between pairs of items, and the variance of the total score. Alpha (α) coefficient of reliability ranges from 0 to 1. If all of the scale items are entirely independent from one another (i.e., are not correlated or share no covariance), then $\alpha = 0$; and, if all of the item shave high co variances, then α will approach 1 as the number of items in the scale approaches infinity. In other words, higher the value of α coefficient, the more the items have

shared covariance and probably higher degree of internal consistency.

3. Spearman’s rank correlation factor: It is used to check the accuracy of collected data according to questionnaire provided. Spearman’s rank correlation coefficient is a non-parametric test which is referred as distribution free test. In this research this check approach is used to show strong agreement between the parties. The value of spearman’s rank correlation coefficient (rs) varies between +1 & -1, where +1 shows perfect positive relationship means agreement, whereas -1 implies perfect negative relationship (disagreement). In short value close to unity in magnitude shows good correlation, while value near to zero shows little or no correlation. It is calculated using following formula.

$$rs = 1 - [(6 \Sigma d^2) / (n^3 - n)]$$

Where,
 r is the Spearman’s rank correlation coefficient between two parties,
 d is the difference between ranks assigned to variables to each cause and n is the number of pair of ranks.

VII. RESULTS AND DISCUSSION

The perspectives of clients, consultant and contractor of the 32-risk factors were analysed using Relative Importance Index (RII). The results of Cronbach’s alpha reliability statistics and spearman’s rank correlation coefficient factor were calculated using SPSS software and shown below.

Table No. 2: Reliability Statistics

Cases	N	%
Valid	50	100.00
Excluded	0	0
Total	50	100.00
Cronbach’s Alpha		No of items
0.917		3

After comparing the results with SPSS Software, the Cronbach’s Alpha value obtained is 0.917, which is well above 0.7. Thus, the questionnaire is proved reliable.

The perspectives of clients, consultants and contractors of the 50 risk factors were analysed using Relative Importance Index (RII).

VIII. FINDINGS FROM THE STUDY

The reasons of these overruns were mostly known and controllable. Still they are facing these problems because of the following reasons:

- 1) Lack of knowledge about risk management
- 2) Lacking in project risk identification
- 3) Incomplete, inadequate designs
- 4) Financial Short
- 5) Unskilled Construction Manager
- 6) Irregular flow of finance
- 7) Delay in decision making by all the parties
- 8) Lack of coordination between the parties
- 9) Poor monitoring and control of activities
- 10) Insufficient use of modern technologies available
- 11) Inaccurate estimate of time and cost
- 12) Faulty design
- 13) Land acquisition problem
- 14) Poor bidding
- 15) Irregular flow of finance
- 16) Delay in payment of work done
- 17) Deficiencies in management
- 18) Delay in decision by Client/ Architect
- 19) Lack of coordination between different parties involved
- 20) Change in scope of work

IX. RECOMMENDATIONS TO MINIMIZE TIME AND COST OVERRUN

- 1) Co-ordinate the implementation of the Risk Management Plan.
- 2) Encourage a management climate which is aware of and supports risk management.
- 3) All working drawings must be clearly drawn indicating all the dimensions and labels to scale so as to avoid ambiguity during construction.
- 4) Contractors should pay particular attention to the requirements of the assignment during the pre-contract and bidding period so as to go for works that they have competitive advantage.
- 5) Contractors should ensure that they have enough cash flow to execute the works and desist from the practice of diverting particular project funds to non-project activities to avoid being cash-strapped during the execution of the works. Clients must ensure that their demand in design changes during the construction period should have no adverse effects on the critical activities so as to avoid causing delays.
- 6) All change order demands must be evaluated to assess their impact on quality of work envisaged, scope and cost,

possible claims and disruption to work so as to avoid unnecessary disputes and litigation.

X. CONCLUSION

- This thesis identified 50 project risk management critical success factors responsible for successful completion of the residential construction projects. These attributes were then presented to construction professionals in the form of a questionnaire.
- The study sought the views of clients, consultants, and contractors from Dhule district on the relative importance of the factors in project risk management.
- From the Study critical success factors in project risk management are as follows:
 - Lack of knowledge about risk management, Lacking in project risk identification, Incomplete, inadequate designs, Financial Short, Unskilled Construction Manager, Irregular flow of finance, Delay in decision making by all the parties, Lack of coordination between the parties.
 - After comparing the results with SPSS Software, the Cronbach's Alpha value obtained is 0.917 which is well above 0.7. Thus the questionnaire is proved to be reliable.
 - The Strong correlation is observed between two parties using SPSS software.
 - However the better formulation and appraisal of projects, sound implementation of project risk management plan, timely decision making, advance action, good coordination between different parties, deliveries of materials on time, assurance of funds resources, better contract management, penalties and incentives, good monitoring and management techniques and definitely provides some clues for the remedial steps.

XI. ACKNOWLEDGMENT

The authors of this paper are highly obliged to the Department of Civil Engineering, RMD Sinhgad School of Engineering, Warje, Pune and the Management of RMD Sinhad SOE. Authors are thankful to the Principal, Head of the Department and the other staff of the Institute. Authors would like to express their deep sense of gratitude towards Mr. Parag Ahire, Mr. Vivek Shinde, Mr. Chetan Bhadane and Mr. Akash Patil for their valuable guidance and feedbacks.

REFERENCES

- [1] Madhav Prasad Koirala, 'Risks in Housing and Real Estate Construction Project', Journal of the Institute of Engineering, Vol. 10. No. 1

- [2] Prof. Mohan M. Dusane and Prof. Pankaj B. Bhangale, 'Assessment of Risks and Its Application for Residential Construction Projects: A Case Study', International Journal of Science and Research, ISSN 2319-7064
- [3] K Jayasudha, Dr. B. Videvelli and E.R. Gokul Surjith, 'Risk Assessment and Management in Construction Projects', IJSER, Vol. 5, Issue 8, ISSN 2229-5518
- [4] Mr. Satish K. Kamane and Mr. Sandip A. Mahadik, 'Risk Management in Construction Industry', IOSR Journal of Mechanical and Civil Engineering, ISSN 2278-1684
- [5] K.JayasudhaandB.Vidivelli 'Analysis of Major Risks in Construction Projects', ARPN Journal of Engineering and Applied Sciences, Vol 11, No 11