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Original Research Paper

Management

PRIORITIZATION OF RISKS IN REAL ESTATE PROJECTS USING ANALYTICAL HIERARCHY PROCESS

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ABSTRACT Contractors frequently face significant challenges as a result of the inherent and unique risks associated with construction projects. Risk management is an important step in construction project management for identifying potential hazards and evaluating the risks associated with the hazards. Adequate risk prioritization during risk assessment is critical for risk planning, budgeting, and management. In this paper, a risk assessment framework is presented using Analytical Hierarchy Process (AHP). A total of thirteen risks associated with real estate projects were shortlisted amongst a pool of risks based on their criticality. The risks were prioritized by AHP modeling to determine risk with the highest criticality on the project. The Paper further provides details on risk identification, risk assessment methods as well as merits of using AHP for risk assessment.

KEYWORDS : Risks, Analytical Hierarchy Process, Risk Response

1. INTRODUCTION

A risk is defined as the possibility of economic and financial loss or gain, damage or physical injury, or delay as a result of the uncertainties associated with the pursuit of a specific course of action. Risk is also defined as the accumulation of all uncertain factors that will have a cumulative negative impact on project objectives. Risk can also refer to the possibility that a project will fail to meet its objectives.

The activities of the real estate sector cover the housing and construction sector. All these activities involved in developing a real estate project constitutes high amount of risk involved. Risk management is the process of identifying the risk in the project and how to reduce & control the risk by using different methods to mitigate the unforeseen event or foreseen event for which uncertainty was not appropriately accommodated and to keep the project on schedule and cost targets on track. The risk management is done in the starting of the project; an effective risk management requires a good experience and knowledge, tools for proper approach. Real estate project has number of risks from the beginning of the project till the end of the project. The model for risk management process is shown below

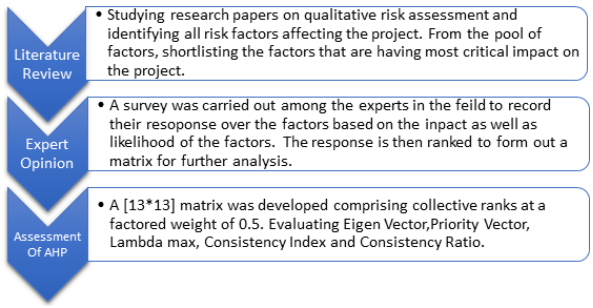
2. Objective

1. Identification and short listing of risk based on its criticality on the project.
2. Data gathering of expertise review on basis of likelihood and impact on the project. Data is to be collected by floating survey form.
3. Analysis of the data gathered and processing it by formulating the matrix distribution to conduct the Analytical Hierarchy Process.
- 4.Interpretation the criticality of the prioritized risk and providing recommendation to mitigate them.

3. Methodology

In the study, the risks affecting the project were shortlisted and they were prioritized based on high impact factors using expert opinion. A survey questionnaire was prepared and floated to gather data on the factorized risk based on their likelihood and impact on the project then the data collected was analyzed and a matrix was formulated in order to performed Analytical Hierarchy Process.

A priority vector was developed to identify the risk with the highest effect on the project based on its impact and likely hood.



4. Risk Assessment using AHP

Risk assessment plays a major role in factorizing and prioritizing the risk associated with the project. Thus, it is essential to evaluate different methods used in risk assessment to formalize a full-proof risk response strategy. The main reasons for selecting AHP as a risk assessment tool for this study are:

1. The flexibility, intuitive appeal to decision-makers, and ability to check for inconsistencies distinguish AHP from other multi-criteria methods. In general, users find the pair-wise comparison data input form to be simple and convenient.
2. It takes its constituent parts and creates criteria hierarchies. The significance of each element (criterion) becomes clear at this point. AHP aids in the collection of both subjective and objective evaluation measures. AHP reduces bias in decision making by providing a useful mechanism for verifying the consistency of evaluation measures and alternatives.
3. The AHP method provides group decision-making through harmony by calculating the geometrical average of individual comparisons in pairs.
4. AHP is in a unique position to assist in the modelling of uncertain and risky situations because it is capable of deriving scales where measurements do not normally exist.

4.1 Structuring the critical risk factors and application of Analytical Hierarchy Process (AHP)

The steps below provide the methodology adopted to determine the rank of importance for key factors by AHP method.

Selection of factors and its evaluation

In the present study, the ranks of importance of the factors are required to be estimated. The critical factors that are to be evaluated are identified by shortlisting the critical factors identified in different research papers. The factors are then thoroughly analyzed and factors with highest impact on

project are selected from pool of factors. The weights of importance of the factors are determined through inputs from the experts. The critical factors are being ranked on basis of their likelihood and impact on the project.

The table 1 below provides details of the factors as well as their rank.

Table No: 1 Ranking of Likelihood and Impact

Criteria: Likelihood	Rank	Criteria: Impact	Rank
1) Economic	2	1) Economic	4
2) Regulatory	3	2) Regulatory	2
3) Political	7	3) Political	12
4) Environmental	9	4) Environmental	6
5) Design	12	5) Design	10
6) Construction cost	13	6) Construction cost	13
7) Bidding	1	7) Bidding	1
8) Contract Duration	10	8) Contract Duration	9
9) Quality	4	9) Quality	8
10) Site Management	6	10) Site Management	5
11) Safety	5	11) Safety	3
12) Material Procurement	8	12) Material Procurement	11
13) Manpower	11	13) Manpower	7

Determination of Eigen Vector weight

In AHP approach; a [13x13] reciprocal matrix for factors is developed in order to determine the Eigen Vector weight of each of factors. The comparative ranking was given in range of 1 to 13 to rate each of factor. The method to be used for derivation in the matrix is normalized matrix method. There after Eigen Vector weight is determined for factor reciprocal matrix. In order to confirm the consistency of the pair wise rating for factors, consistency ratio (CR) of the factor reciprocal matrix is determined. As per hypothesis, if CR≤0.1 or 10%, the inconsistency is acceptable, otherwise the pairwise comparison should be reconsidered.

$$CR = \frac{CI}{RI}, \text{and } CI = \frac{(\lambda_{max} - N)}{(N-1)}$$

Fig. 1: Formula of Consistency Ratio.

Here Consistency Index (CI) is derived from λ_{max} and N (number of factors).

Random Consistency Index(RI) is derived from the size of matrix i.e. 13 in this study which is equal to 1.56.

The table below gives the Priority vector for different risk factors calculated from Excel.

Table. 2: Priority Vector

Criteria	Priority vector
Economic	3.296703297
Regulatory	2.197802198
Political	9.89010989
Environment	7.692307692
Design	13.18681319
Construction cost	14.28571429
Bidding	1.098901099
Contract Duration	12.08791209
Quality	6.593406593
Site Management	5.494505495
Safety	4.395604396
Material Procurement	10.98901099
Manpower	8.791208791

The data presented in the table provides information about the percentage of the criticality of the risk occurring on any project based on analysis of expert opinion. Thus, from this data we can depict that the priority of the factors based on their impact as well as likelihood can be ranked as:

1. Construction Cost.
2. Design.
3. Contract Duration.
4. Material Procurement.
5. Political.
6. Manpower.
7. Environment.
8. Quality.
9. Site Management.
10. Safety.
11. Economic.
12. Regulatory.
13. Bidding.

5. Conclusion and Recommendation

From the performed analysis, we can conclude that construction cost, being the most important aspect of risk that has a high chance of occurrence as well as the impact on the project should be treated with high importance and utmost significance to proceed with the smooth execution of any project.

Construction Cost

Deviation from actual construction cost greatly affects the project as it leads to a significant increase in projects estimate or project budgeted costs. Some factors can be highlighted that can be a reason to increased construction cost are:

- Complexity of project.
- Method of construction.
- Site Constraints.
- Location of Project.
- Type of Structure.
- Project Team's Experience.
- Construction Teams Capability.
- Quality of Information.
- Projects Duration.
- Form of Procurement and Lead Time of Materials.
- Amount of Special Works.
- Expertise of Consultants.
- Number of Project Teams.

Design

Design greatly affects the project as it has a direct impact on the project management triangle which comprises of scope, time, cost, and quality. Some factors that identify design as a risk are:

- Not complying with building regulations.
- Overambitious scope in relation to a budget.
- Sub-contractor drawings commissioned late.
- Detailing of drawings not up to the mark.
- Major re-designing due to deviation in client's requirements.

Thus, working on these factors and having a proactive risk response strategy to avoid, transfer or mitigate this risk can be a beneficiary for the smooth execution of any project.

REFERENCES:

1. Adam Abderisak and Göran Lindahl. (2015). Take a chance on me? Construction client's perspectives on risk management. Procedia Economics and Finance 21, 548 – 554.
2. Adnan, H., & Rosman, M. R. (2018). Risk Management in Turnkey Projects in Malaysia.
3. Chaitali S. Pawar, Suman S. Jain, Jalinder R. Patil. (2015). Risk Management in Infrastructure Projects in India. International Journal of Innovative Research in Advanced Engineering (IJIRAE) Issue 4, Volume 2 (April 2015).
4. Kaur, M., & Singh, D. (2018). Risk and Risk Handling Strategies in Construction Projects. International Journal of Management Studies, 5(1), 1-7.
5. Zou, P. X., Zhang, G., & Wang, J. (2007). Understanding the key risks in construction projects in China. International Journal of Project Management, 14.