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ANALYSIS OF MAJOR RISKS IN APARTMENT CONSTRUCTION PROJECTS

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Abstract:- Risk management and project success are linked. Project management literature describes a four-step risk management process: identification, estimate, reaction planning, and execution. These periods frequently require risk management control. Effective construction project management requires identifying work activities, their linkages, and estimating resource requirements and activity durations. The research assessed construction professionals' understanding of planning tools and practices utilised on building sites. A chosen group of project managers, engineers, architects, contractors, and subcontractors engaged in project planning and implementation received questionnaires. Using SPSS for Windows, pie charts and frequency tables were used to analyse the data. Professionals lack actual understanding of building planning tools and processes, according to the report. These tools and techniques should be used in all building projects, emphasising the need for regular and adequate training on information technology's use in construction, particularly in project planning and execution.

Keywords:- Risk management, Project success, Construction project management, Planning tools and practices, Information technology in construction.

1. Introduction

Construction projects initiated under tight time constraints amid complex and dynamic conditions generate significant levels of uncertainty and risk. In recent years, the construction industry has witnessed notable transformations, notably with the rise of securitized real estate, predominantly driven by private investors. This sector is vulnerable to various business and technological risks, often of higher magnitude compared to traditional ones, necessitating thorough risk assessment processes.

Risk assessment serves as a crucial tool for identifying and managing risks inherent in construction projects. It involves evaluating potential risks to both individuals and property associated with a project. This study employed a methodology primarily based on survey questionnaires distributed among local building contractors of different scales, aiming to assess the risk variables influencing the construction industry's performance.

Within the construction realm, risk pertains to the likelihood of specific events occurring throughout the project's lifecycle, encompassing various interconnected factors. These risks pose challenges in decision-making processes and can significantly impact project execution. Risk assessment techniques rely on subjective analysis incorporating historical data and stakeholders' experiences to evaluate and quantify project risks. Risk assessment plays a crucial role in identifying, analysing, and mitigating the impact of uncertainties inherent in construction projects, thereby enhancing their overall management and success.

2. Literature retrieval

David M. Young and Wenzhe Tang's study in December 2007 delved into risk management within the Chinese construction industry through an empirical survey. The research explored the importance of project risks, the adoption of risk management strategies, the state of risk management systems, and perceived obstacles faced by key project stakeholders. Their findings revealed a shift in the industry from risk transfer to risk reduction, with project participants primarily concerned about project hazards. Similarly, Akintola Akintoye and Riaan van Wyk's work in March 2007, building upon earlier research by Akintoye and MacLeod in March 1997, emphasized the significance of risk management in construction operations for minimizing losses and enhancing profitability. Construction risks, as commonly defined, encompass factors that could impact project budget, schedule, or quality.

Roozbeh Kangari's study in December 1995 explored the perspectives of major American construction companies on risk management, indicating a growing openness among contractors to share risks associated with real and legal issues with project owners. Construction risks can be categorized based on their source or project phase. Internal risks originate within the project, while external risks stem from the project environment. Proper risk identification, assessment, and evaluation are crucial steps in managing these risks. Various methods, such as those proposed by Zeng et al. in 2007 and Mulholl and Christian in 1999, offer systematic approaches to control and measure risks associated with construction projects.

The PMBOK emphasizes risk management as a key aspect of project management, involving planning, identification, analysis, response, and monitoring. However, managing risks in construction projects remains challenging due to factors like environmental changes, the involvement of numerous project stakeholders, and the unique nature of construction processes. Effective risk management practices are essential for navigating the complexities and uncertainties inherent in construction projects, ultimately improving project performance and outcomes.

Risk Concept

The idea of risk has several facets. In the context of the construction business, it could be the possibility that a specific event or factor, or a combination of events or variables, would occur during the entire construction process and negatively impact the project. a decision's or planned situation's lack of predictability regarding the structure of the outcome or consequences, the uncertainty around outcome estimates—there's a risk that the results could turn out better or worse than anticipated, etc. Apart from the many interpretations of risk, there exist multiple approaches to classify risk for distinct objectives. While some place risks in building projects into more specific categories like political risk, financial risk, technical risk, environmental risk and internal hazards, others place risks in more general categories like external and internal risks. The categorization is displayed in Figure 1. The primary determinant of risk typology appears to be the project's location—that is, whether it is domestic or international.

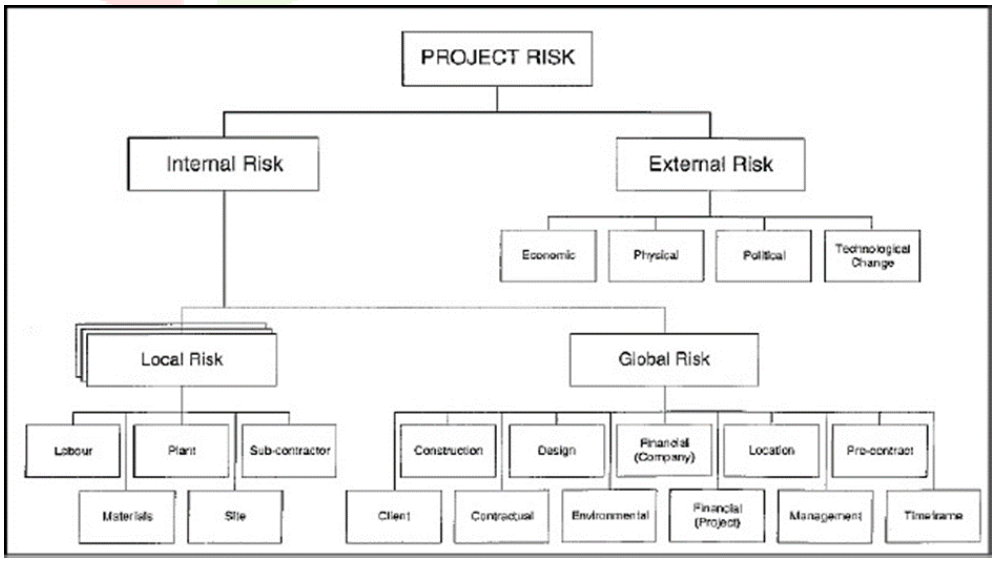


Figure-1. Hierarchical risks involved in a project.

3. Project risk management

Risk management encompasses the identification of factors that could adversely affect a project's budget or quality standards, assessing the potential impact of these risks, and implementing measures to manage and mitigate them. Poor decisions in risk management can lead to increased expenses, especially for activities with higher inherent risks. Businesses often seek to quantify risks for various reasons. Evaluating the level of risk helps determine if costly measures to mitigate it are justified and whether risk sharing with an insurance provider is advisable. Some risks, such as natural disasters, are pervasive and challenging to avoid entirely. While risks cannot always be eliminated, they can be minimized through appropriate measures. Risk is typically quantified as the probability of an event occurring multiplied by the loss incurred if it does occur. Graphical representations, such as Figure 2, depicting the relationship between probability and severity, can aid in visually expressing risk assessments.

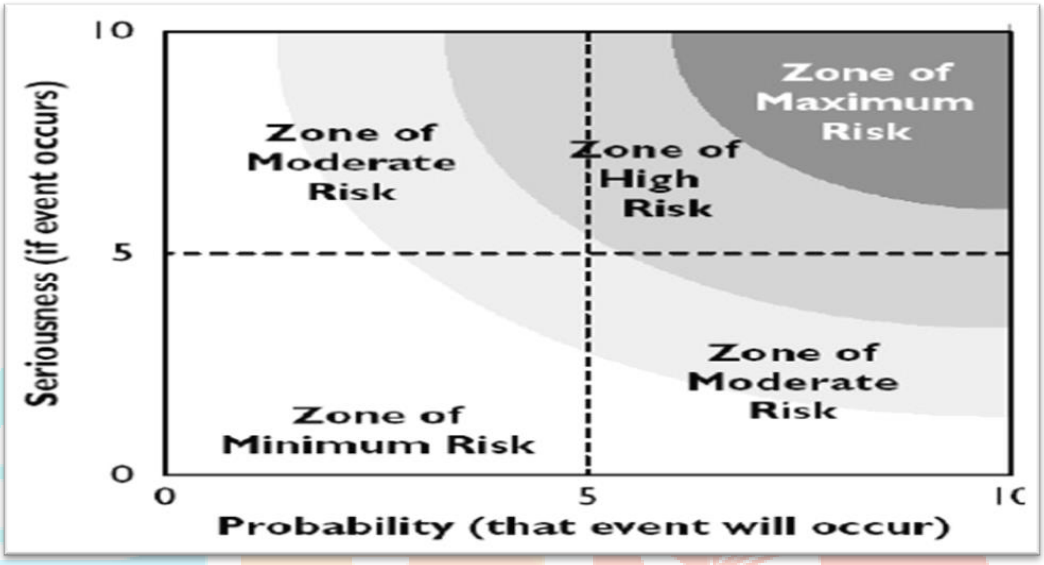


Figure-2. Graphical representations of risk rating.

4. General types of risks

Risks in projects can be categorized into operational, technical, or financial domains. Technical risks involve challenges in meeting product specifications, while operational risks stem from issues such as customer collaboration difficulties. Whether risks are acceptable or not depends on their impact on project tasks. Risks affecting non-critical tasks are generally acceptable, whereas those impacting critical path activities are deemed unacceptable. Risks can also be classified as transient or permanent. Transient risks have immediate effects, such as altering deliverable specifications, while permanent risks manifest in the distant future, like releasing a product without adequate testing. Additionally, risks can be internal, project-specific issues, or external factors originating from sources beyond the project's control, such as sudden budget cuts or fluctuations in exchange rates decided by upper management.

The risks in Apartment construction is mainly categories under following six heads-

Technical Risk -The capacity to mitigate the project's technical risks. This risk factor relates to problems or worries about the technologies used in the project's operational and executional technologies.

Financial risk - The capacity to mitigate the project's risks related to its economic impact. This risk factor relates to problems or worries about how the project's macroeconomic effects may affect the neighbourhood and area in which it will be placed.

Construction Risk- The risk related to the construction of the building such as labour productivity, labour disputes, site condition, design change, too high-quality standards, inaccurate BOQ, and delay in procurement.

Organizational risks-The risks related to organization such as business relationship, contractor's experience, mindset of participants, inexperienced manpower, communication, and budget and schedule impact are major types of organizational risks.

Socio- Political risk- The project's socio-political risk, which encompasses opposition from local, state, and national political figures as well as regulatory and legal barriers, must be surmounted. This risk factor relates to problems or worries about the political and regulatory environment that the project is subject to at the local, state, and federal levels and risk factors include problems or worries about how the project may affect the local community and culture on a social and cultural level.

Environmental Health and Safety Risks- This risk factor relates to issues or worries about environmental issues, worries, and activities that the project will face during its execution and operation such as natural disaster, weather implications, sudden unforeseen events, environmental analysis incomplete, site unsafe conditions, improper safe work method statement (SWMS) and poor monitoring.

5. ANALYSIS AND DISCUSSION ON IDENTIFICATION AND ASSESSMENT OF DIFFERENT RISK FACTORS

The survey analysis is divided into two sections for clarity: one focusing on projects under fifty crores and the other on projects beyond fifty crores. To streamline the analysis, only the first three risks in each category are selected for detailed examination, given the time constraints. One of the primary risks faced by construction companies is the scarcity of skilled labour, which contributes to shortfalls in project execution. This scarcity arises from the influx of unskilled labourers from other industries attracted by lower wages, while skilled labour remains limited and costly. To address this, there is a need for nationwide establishment of training institutes by the government and industry stakeholders to bolster the pool of trained workers. Time constraints pose another significant risk, as construction firms often face strict deadlines and potential penalties for project delays. Some projects, such as information technology parks constructed on fast-track schedules, can be completed in as little as eight to fourteen months. Issues related to subcontractors are widespread in the construction industry and can cause delays and quality concerns, primarily due to subcontractor actions. Moreover, smaller construction businesses may encounter fierce competition from larger firms with greater financial and technological resources. Planning and budgeting challenges are prevalent across both large and small construction enterprises, with the likelihood of these issues varying based on other factors and sub-risks. Currently, two major industry challenges are rising bank interest rates and inflation fluctuations, significantly impacting the construction sector's operations. A notable issue among clients is the communication gap, which can lead to preventable negative outcomes. Effective communication is crucial for ensuring project success and avoiding misunderstandings.

Risk rating- A Likert scale ranging from 1 to 5 was employed in the survey. The most popular scale in survey research is the Likert scale, which is a kind of psychometric response scale questionnaire. Respondents indicate how much they agree with a statement by checking a box on a Likert questionnaire. Rensis Likert, who authored a study outlining its application, is honoured by the scale's name. The respondents had to rate each probability of risk factor's criticality and efficacy, as well as how it affected management.

6. Demographical analysis and results of survey

The questionnaire survey was conducted through mail or staff meetings, gathering responses from various construction projects. A pilot survey was conducted to assess the questionnaire's usability, clarity, and potential value in data collection. The survey consisted of two sections: the first gathering general information such as company type, experience, and project value, while the second section evaluated construction risk factors across six categories: financial, organizational, construction, socio-political, and environmental health, and safety risks.

The questionnaire served as a valuable tool for collecting diverse data from a large number of respondents, informed by relevant literature studies and discussions. Its purpose was to comprehensively assess significant risks anticipated in construction projects. Out of the two hundred companies surveyed, one hundred and fifty-six provided effective responses, resulting in a response rate of approximately 78%, which is considered satisfactory for this type of survey.

Respondents to the questionnaire included project's general managers, project managers, project engineers, and site engineers. Due to difficulty in arranging direct meetings, email responses were also accepted. Demographic analysis based on designation, qualification, experience, and organization is presented in the table. The highest risk ratings for construction organizations were assigned to Financial

Risk, Time Risk, and Construction Risk, highlighting their significance in project management and execution.

Table-1. Overall risk factors.

S. No.	Description of risk	Mean	Std. deviation
1	Inadequate design	3.20	1.00
2	Inadequate site investigation	3.13	1.00
3	Amendment of Scope	2.852	0.87
4	Inadequate specification	2.884	0.93
5	Lack of Resource Availability	2.7871	0.86
6	Human Resource Management Challenges	2.8581	0.84
7	Equipment Failure	3.0065	.71
8	Construction process	2.9356	.76
9	Surge in Material Cost	2.8645	1.09
10	Low Market Demand	3.1742	0.87
11	Variation in Exchange Rate	2.7806	0.75
12	Delay of Payment	2.9355	0.88
13	Improper Estimation	2.9484	0.76
14	Taxes	3.1290	0.77
15	Risk Incurred due to Time Loss	2.8710	0.94
16	Risk Affecting Profitability	3.1613	0.79
17	Liquidity Risk	3.2645	0.81
18	Productivity of Labor	3.0065	0.86
19	Disputes between Labor	3.0774	0.93
20	Condition of Construction Site	3.1290	0.86
21	Equipment failure	3.452	1.00
22	Design alteration/Inaccurate BOQ	3.2516	0.74
23	Very High-Quality Standards	3.1355	1.23
24	Partial Pre-Planning	3.3290	1.11
25	Delay in Procurement	3.0744	.96
26	Contractual Relations	3.2258	0.87
27	Contractor's Experience	3.0258	0.80
28	Attitudes of Stake Holders	3.0387	0.68
29	Inexpert Workforce	3.1161	0.81
30	Communication between Stakeholders	3.1290	0.77
31	Expense	3.2710	0.82
32	Impact on Schedule	3.0744	.96
33	Changes in Rules and Regulations	3.1484	0.92
34	Pollution and Safety Rule	3.2968	1.17
35	Bribery/Corruption	3.0258	0.80
36	Language/Cultural Barrier	2.9484	1.19

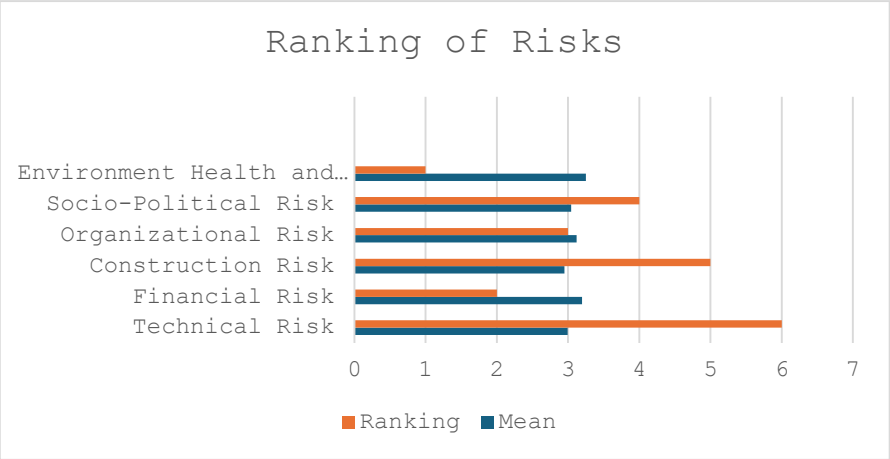
37	Law and Order	3.0903	0.88
38	War and Civil disorder	2.954	1.19
39	Requirement for Permits and Approval	2.9935	0.94
40	Economic Risk	3.3806	079
41	Natural Calamities	3.3484	1.20
42	Weather effect	3.1355	0.88
43	Unexpected Events	2.8129	0.98
44	Environmental Analysis Incomplete	3.0516	1.27
45	Inappropriate SWPS	2.9677	1.05
46	Site Unsafe Condition	2.9613	1.30
47	Non-Observance of Safety Rules	3.0065	0.86
48	Bad Monitoring	3.04516	0.86

7. Ranking of risk factors-

The Statistical Packages of Social Studies (SPSS) tools are used to calculate the overall risk variables. One management tool that aids in the examination of the 5-scale Likert factor analysis is this one. The average value needs to be determined for the different risk variables and to establish the risk factors' ranking. The risk factors associated with the construction industry will be ranked according to the results of this questionnaire survey. Environmental Health and Safety (EHS) Risk, Financial Risk, and Organizational Risk has the maximum risk rating.

Table-2. Ranking of risks factors.

S. No.	Types of risk factors	Mean	Ranking
1	Technical Risk	2.9952	6
2	Financial Risk	3.1947	2
3	Construction Risk	2.9467	5
4	Organizational Risk	3.1217	3
5	Socio-Political Risk	3.0430	4
6	Environment Health and safety Risk	3.2495	1



Graph -1 Showing ranks and mean of different type of Risks

8. Conclusion

In India, the adoption of risk management practices within the building industry is relatively nascent and requires immediate attention. The government is currently proposing the implementation of a risk grading system aimed at facilitating swift decision-making and project progression for developers. Each rating Agency will employ a distinct methodology to assess projects, contributing to the formulation of a comprehensive risk reduction plan by the government.

The introduction of this system is expected to incentivize developers and investors to engage more readily in public-private partnership initiatives, potentially intensifying competition for projects. Additionally, it will enable lenders to expedite lending decisions, thereby accelerating the financial closure of projects.

By conducting third-party risk assessments, significant issues that may otherwise be overlooked during project execution can be identified. This study aims to pinpoint activities posing risks related to finance, time, and construction, empowering management to make informed decisions to mitigate these risks. These insights are crucial for implementing prudent measures to steer future development projects in the right direction.

Risk management is emphasized as the cornerstone of project assessment, highlighting its indispensable role in project planning and execution. The collected data underwent analysis using an Impact Grid, utilizing Risk Scores on a 5-scale to compare perceived risks between general managers, project managers, project engineers, and site engineers. This analysis was facilitated using SPSS software.

Overall, the proposed risk grading system promises to enhance project management practices, foster transparency, and ultimately contribute to the sustainable growth of the building industry in India.

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