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Experimental Study on Time and Cost Overrun in Construction Project

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Abstract: *Time and cost overruns are among the most critical challenges affecting the successful completion of construction projects. This study aims to examine the major factors responsible for such overruns and to suggest practical measures for their mitigation. A descriptive research approach was adopted to collect the perspectives of key stakeholders, including contractors, engineers, clients, owners, and builders. The research was carried out in two phases. In the first phase, a detailed review of existing literature was conducted to identify research gaps, which formed the basis for designing a structured questionnaire. The survey responses were analysed using the Relative Importance Index (RII) method to determine the ranking of significant factors. In the second phase, a comparison between planned and actual progress of construction activities was performed using MS Project to evaluate schedule deviations. The findings indicate that frequent design changes by clients, rework due to poor workmanship, low labour productivity, supplier-related issues, material wastage, transportation costs, adoption of new technologies, equipment availability, and land disputes are the primary contributors to time delays and cost escalation. The study concludes with recommendations aimed at improving project planning, coordination, and resource management to reduce overruns and enhance overall project performance.*

Keywords: Time Overrun, Cost Overrun, Relative Importance Index (RII), Construction Project, MS Project, Residential Building.

I. INTRODUCTION

The construction industry is a key driver of economic growth in India, contributing significantly to infrastructure development such as transportation, housing, and energy systems. Despite its importance, the industry faces major challenges related to time and cost overruns, which have become common in both public and private sector projects. These issues not only affect individual project performance but also impact the overall economic development of the country.

Time overrun refers to delays in project completion beyond the planned schedule, while cost overrun occurs when the actual project cost exceeds the estimated budget. In India, many infrastructure projects experience such overruns due to increasing project complexity, involvement of multiple stakeholders, and uncertainties in the construction environment. These challenges place significant pressure on project managers to ensure timely delivery within budget while maintaining quality standards.

Several factors contribute to time and cost overruns, including poor planning and scheduling, inaccurate cost estimation, design changes, delays in material supply, labour shortages, and inefficient project management practices. External factors such as inflation, regulatory delays, and land acquisition issues further worsen the situation. Additionally, delays often lead to increased costs, showing a strong interrelationship between time and cost performance.

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Cost and time management aims to identify and control these factors throughout the project lifecycle. By improving planning, estimation, and monitoring techniques, the impact of overruns can be minimized. Proper management not only reduces risks and losses but also enhances project efficiency and productivity.

A. Cost Overrun in Projects

Cost and budgeting are key factors in any construction project. If they are not properly managed, the project cost can fluctuate significantly. Cost overrun is one of the most common problems in construction projects in India as well as worldwide, and it requires further research to reduce its occurrence in the future.

In developing countries, cost overruns are frequently observed and may rise up to 100% of the estimated project cost, which is a serious concern. Cost overrun, also known as cost escalation or budget overrun, refers to the additional costs incurred when the actual project cost exceeds the estimated budget due to underestimation or unforeseen factors. According to a study by Bent Flyvbjerg (2002), about 9 out of 10 projects experience cost overruns, making it a major issue in both developed and developing countries.

B. Time Overrun in Projects

Construction projects in India often face delays, which mainly affect consumers who have already paid for them. These delays can also slow down future development plans. While modern technology helps reduce construction time, a lack of skilled labour can still increase delays.

Environmental factors like water shortage, heavy rainfall, and earthquakes also impact construction work, especially when proper preparation is missing. Good planning is important to manage resources and complete work on time. Even with better project management, time overruns remain a major issue. Common reasons include late material delivery, equipment failure, political issues, and bad weather.

II. LITERATURE REVIEW

Time and cost overruns are major problems in the construction sector. Almost every project faces these issues, but their impact differs from one project to another. To control or reduce such overruns, it is important to clearly identify the main causes behind them. A comprehensive review of 21 research papers was conducted covering global and Indian construction contexts.

A. Key Findings from Literature

Mujaddidi et al. (2025) examined time and cost overruns in Central Sector Projects in India between 2015 and 2021. The study found a strong relationship between time delay and cost overrun, with major causes including poor planning, rising material costs, and slow decision-making.

Soundarya et al. (2025) analysed residential construction projects in Chennai and found that delay in project schedule is the most critical factor, leading to increased labour, material, and overall project costs. Rework due to unforeseen conditions, lack of skilled labour, and frequent design changes were also major contributors.

Isfahani et al. (2024) studied toll road construction projects in Indonesia and identified 85 variables grouped into six management elements: material, labour, equipment, subcontractor, financial, and external factors. Land acquisition issues were the most dominant cause of cost overruns, followed by high interest rates and economic instability.

Belay et al. (2021) examined infrastructure projects in Ethiopia and found that building projects experienced an average cost overrun of about 35%, while road projects had an average of 18%. Delays were very high, with building projects averaging 143% delay and road projects around 110%.

Wanjari & Dobariya (2016) identified price escalation of raw materials, delay in planned activities, and lack of coordination among construction parties as the top three factors contributing to cost overruns in Indian projects.

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B. Literature Summary

From a consultant's perspective, cost overrun remains a significant challenge, with increases typically ranging between 10% and 30% above the initial estimated cost. One of the primary contributing factors is the fluctuation in material prices, often influenced by market instability. Frequent changes initiated by project owners further accelerate cost escalation. Inadequate supervision and insufficient managerial expertise on the part of site engineers and project managers can significantly contribute to delays.

Comprehensive risk assessment and strong communication among all project participants are critical components in minimizing uncertainties and controlling cost overruns. Effective cash flow management, strategic planning, and timely decision-making are essential for ensuring smooth project execution.

C. Research Gaps

Existing research does not sufficiently examine how risk identification, assessment, and mitigation strategies influence cost overruns in residential projects. Most projects face issues due to limited or improper use of relevant software tools like MS Project and Primavera. Earlier research often ignores local factors such as labour availability, material supply issues, local regulations, and climatic conditions (like monsoon effects and storms). Most research emphasizes large infrastructure or mega projects, while small and medium residential projects are not adequately studied.

III. RESEARCH METHODOLOGY

A. Objectives

(1) To identify the causes of time and cost overruns in construction projects. (2) To determine the key factors contributing to these overruns based on data collected through questionnaire surveys. (3) To evaluate the critical factors and propose suitable measures for building construction projects to avoid these issues in future projects.

B. Scope

The causes of project delays are identified through a questionnaire survey and analysed using the Relative Importance Index (RII) method. A case study on a residential building project (B+G+7) — Antriksh Opulence, developed by Home Maker Group, Jamnagar — is conducted to analyse delays in construction.

C. Questionnaire Survey

A structured questionnaire was prepared based on a detailed literature review and distributed among construction professionals including project managers, contractors, engineers, customers, and owners. The questionnaire used a five-point Likert scale ranging from 1 (very low effect) to 5 (very high effect). A total of 70+ survey responses were collected. The questionnaire covered 21 key factors related to equipment, communication, materials, design changes, labour, finance, technology, land acquisition, and workforce availability.

D. Case Study Project Details

Project Name: Antriksh Opulence | Builder Group: Home Maker | Engineer & Owner: Er. Dhimant Shah & Nishith Shah | No. of Stories: B+G+7 | Estimated Project Duration: 1.5 Years | Estimated Project Cost: INR 10–12 Crore. A comparison was made between the planned (baseline) schedule and the actual progress of work on site, based on activity-wise completion durations, using MS Project.

IV. RESULTS AND DISCUSSION

A. Relative Importance Index (RII) Analysis

The Relative Importance Index (RII) method was used to evaluate and rank the significance of various factors affecting time and cost overruns. The formula used is:

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

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Where W = Weight given to each factor by respondents (1 to 5 scale), A = Highest weight (5), N = Total number of respondents.

TABLE I: RII Ranking of Factors Affecting Time and Cost Overrun

No.	Factor	Avg. Rating	RII Value	Rank	Importance Level
1	Inappropriate Planning & Scheduling	4.36	0.87	1	Very High
2	Inaccurate Cost Estimation	4.32	0.86	2	Very High
3	Low Labour Productivity	4.27	0.85	3	Very High
4	Inflation & Material Price Escalation	4.23	0.85	4	Very High
5	Design/Plan Changes During Execution	4.18	0.84	5	Very High
6	Rework Due to Poor Workmanship	4.14	0.83	6	Very High
7	Material Shortages Causing Delays	4.09	0.82	7	Very High
8	Insufficient & Unskilled Workforce	4.05	0.81	8	Very High
9	Communication Gaps	4.00	0.80	9	High
10	Equipment Breakdowns	3.95	0.79	10	High
11	Transportation Cost Impact	3.91	0.78	11	High
12	Material Wastage on Site	3.86	0.77	12	High
13	Supplier Quality Issues	3.82	0.76	13	High
14	Owner's Additional Work	3.77	0.75	14	High
15	Land Acquisition & Site Clearance Delays	3.68	0.74	15	Moderate
16	Equipment Availability	3.64	0.73	16	Moderate

Factors with RII > 0.80 are considered critical and need immediate attention. The top eight factors — including inappropriate planning & scheduling (RII = 0.87), inaccurate cost estimation (0.86), low labour productivity (0.85), and design changes during execution (0.84) — all fall in the 'Very High' importance category.

B. Project Schedule Analysis

The analysis of the Antriksh Opulence project schedule clearly shows that the actual duration of most construction activities exceeded the planned baseline duration. Major delays were observed in formwork, reinforcement (RFM), and slab-related activities, which are critical components of structural work. Formwork activities experienced significant increases in duration — for example, Basement Column Formwork increased from 3 days (planned) to 10 days (actual), and Slab Formwork from 6 days to 14 days.

Similar delays occurred repeatedly at each floor level, especially in column and slab construction. These small but consistent delays accumulated over time and resulted in a substantial increase in total project duration. Finishing works such as brickwork, plastering, tiling, and putty also showed noticeable delays, suggesting poor coordination and planning during the later stages of the project.

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Additional delays were caused by festive holidays, labour shortages, non-working days, frequent design changes from the owner/customer side, material selection changes, and weather disruptions. In 2024, the project experienced a severe storm with continuous heavy rainfall for three consecutive days, adversely affecting overall progress.

V. CONCLUSION

The study concludes that time and cost overruns are major challenges in construction projects and are mainly caused by poor planning, weak scheduling, and ineffective project management. From the data analysis using the RII method, factors such as inappropriate planning, inaccurate cost estimation, low labour productivity, frequent design changes, and rework due to poor workmanship have the highest impact on project performance. Material shortages, inflation in material prices, and lack of skilled workforce further contribute to delays and increased costs.

The case study of the residential building project shows that repeated small delays in activities such as formwork, reinforcement, and finishing work accumulate over time and significantly extend the overall project duration. External factors such as weather conditions, labour shortages, festive holidays, and client-requested changes also play an important role.

Proper planning, accurate estimation, effective monitoring, and better coordination among stakeholders are essential to reduce time and cost overruns. The use of modern project management tools like MS Project and Primavera, improved labour management, and timely decision-making can help in completing projects within the planned schedule and budget.

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