



ANALYSIS OF ROOT CAUSES OF CONSTRUCTION COST-OVERRUN IN KOLHAPUR CITY

¹ Nikhil V Ganeshkar, ² Nitish M Patil.

¹ P.G. Student of Civil Engineering Department of Sanjay Ghodawat university, Kolhapur, India

² Assistant Professor of Civil Engineering Department Sanjay Ghodawat university, Kolhapur, India

Abstract: The construction sector, being one of the most complex and uncertain industries, plays a crucial role in powerful economic growth. It not only contributes to infrastructure development but also generates employment and revenue for various stakeholders. However, the industry faces persistent challenges that hinder its overall performance. Budget deviations in construction projects are common due to inaccurate cost estimation, fluctuating material prices, design changes, and inefficient resource management. Developing nations face extreme cost overruns, sometimes exceeding 100% of the original budget, leading to financial crises for businesses involved. Poor planning, regulatory approvals, labour shortages, and unforeseen environmental factors contribute to time overruns. Compliance with environmental and safety regulations adds additional layers of complexity. High energy consumption, material waste, and carbon emissions make construction one of the least sustainable industries. The demand for eco-friendly buildings and green construction materials is rising, but adoption remains slow.

Keywords – Carbon emissions, Eco-friendly building, green construction material

1.0 INTRODUCTION

Budget deviations in construction projects are common due to inaccurate cost estimation, fluctuating material prices, design changes, and inefficient resource management. Developing nations face extreme cost overruns, sometimes exceeding 100% of the original budget, leading to financial crises for businesses involved. Poor planning, regulatory approvals, labour shortages, and unforeseen environmental factors contribute to time overruns. Delays increase project costs, affect investor confidence, and reduce profitability. Lack of skilled labour, substandard materials, and poor project management practices often compromise quality. Defective construction results in higher maintenance costs and safety risks. Unlike manufacturing and service industries, construction has been slow to integrate automation, AI, and data analytics. The reluctance to adopt Building Information Modeling (BIM), IoT, and AI-driven project management tools further hampers efficiency. Complex building codes, land acquisition issues, and bureaucratic hurdles delay approvals and project execution. Compliance with environmental and safety regulations adds additional layers of complexity. High energy consumption, material waste, and carbon emissions make construction one of the least sustainable industries. The demand for eco-friendly buildings and green construction materials is rising, but adoption remains slow.

2.0 SCOPE OF THE STUDY

This study examines construction projects across different sectors in Kolhapur, including residential, commercial, institutional, and industrial developments. The primary emphasis is on private-sector projects rather than government-funded initiatives. The main objective is to analyse the factors contributing to cost overruns in construction projects within Kolhapur city. However, since this research is conducted for academic purposes, its scope is limited to providing a general understanding of these cost-related challenges rather than an exhaustive industry-wide analysis. Data collection will be carried out through a questionnaire survey, where participants will share their perspectives on cost overruns. While the responses provide valuable insights, they may not always be entirely precise, as they reflect individual viewpoints. The study aims to rank the causes of cost overruns based on survey data, though the findings may vary depending on the number of respondents. Due to the constraints of this research, results that might have emerged from a larger sample size are beyond the study's scope.

3.0 METHODOLOGY

3.1 To accomplish the research objectives, the following steps were undertaken:

1. Conducted a comprehensive review of the relevant literature.
2. Selected the questionnaire method as the primary data collection tool due to its suitability for the research.
3. Designed the questionnaire based on literature findings and preliminary discussions with consultants, contractors, and clients.
4. Distributed the questionnaire to stakeholders to ensure widespread participation.
5. Collected responses from consultants and contractors, analysed the data, and ranked the causes of cost overruns.
6. Used the results to create a refined questionnaire targeting clients.
7. Tabulated and analysed the data using appropriate statistical methods.
8. Linked the findings with literature insights to identify and rank cost overrun factors based on severity.
9. Conducted a case study on cost overrun causes in Kolhapur's construction industry.
10. Summarized key findings and provided recommendations for mitigating cost overrun issues.

3.2 Questionnaire Design

The questionnaire was meticulously crafted to gather data necessary for achieving the research objectives. It was developed based on a review of the status of the construction industry in Kolhapur, supported by a thorough literature review. Relevant questionnaires from previous studies were examined, and applicable questions were adapted to fit the context of Kolhapur's construction industry. The data required for this study is divided into three main sections. The first section gathers information about the respondents' characteristics and their roles within the construction industry. The second section focuses on the performance of the projects the respondents have been involved in, including the number of projects, the prevalence of cost overruns, and the average cost overrun experienced. The third section addresses the causes of cost overruns, as previously identified, and asks respondents to assess the severity of these causes in Kolhapur's construction projects. remember that mix design procedures can change depending on regional norms, the availability of resources, and particular project and getting advice from knowledgeable concrete technologists.

3.3 Selection of Data Collection Technique

The data collection method was chosen by comparing personal interviews and questionnaires. The questionnaire approach was selected for the following reasons:

1. Anonymity and Honest Feedback: Respondents were not required to disclose their identities, which encouraged honest and unbiased responses.
2. Efficiency: The large number of cost overrun factors made it impractical to cover them all within a 30-minute interview. A questionnaire allowed for more comprehensive data collection in a shorter timeframe.
3. Customization: The questionnaire was carefully designed in English to ensure clarity and accessibility for all respondents.

3.4 Collection of Causes

1. International Literature Review: A thorough review of academic articles and journals yielded an initial list of 64 potential cost overrun factors in construction projects.
2. Local Expert Consultation: Discussions with Kolhapur-based experts were conducted independently of the literature review. These consultations provided insights specific to local conditions and identified 30 additional causes.

3.5 Refinement Process:

1. In the first phase, duplicates and similar causes within each group were consolidated, resulting in 52 causes from the literature review and 19 causes from local consultations.
2. In the second phase, the two lists were combined into a unified pool of 71 causes.
3. A final refinement process was applied to extract distinct, independent factors, culminating in a list of 67 universal causes.

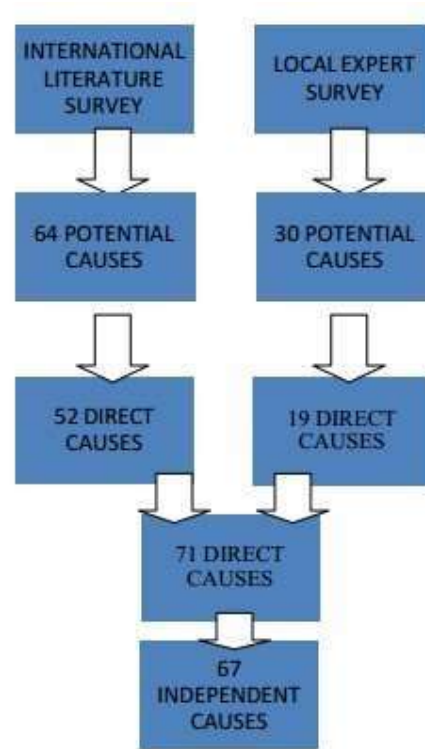


fig 3.1: Flow chart of methodology

4.0 Experiments

4.1 Scoring System and Method of Analysis

The survey employs an ordinal scale to measure data, with categories such as Extremely Significant (E.S), Very Significant (V.S), Slightly Significant (S.S), and Not Significant (N.S). Each category is assigned a numerical value: 1 for Not Significant (0%), 2 for Slightly Significant (<35%), 3 for Moderately Significant (35-60%), 4 for Very Significant (60-75%), and 5 for Extremely Significant (>75%). This system allows for a detailed assessment of the viewpoints of individuals involved in managing construction projects, as shown in Table 4.1.

Table 4.1: Ordinal Scale

Sr. No.	Category	Explanation	Weightage
1	Not Significant (N.S.)	0% cost overrun contributing factors. Total cost is not affected by these factors at all.	1
2	Slightly Significant (S.S.)	<35% cost overrun contributing factors. Total cost is slightly affected by these factors.	2
3	Moderately Significant (M.S.)	35-60% cost overrun contributing factor. Total cost is moderately affected & these factors may be managed during work progress to minimize cost overrun.	3
4	Very Significant (V.S.)	60-75% cost overrun contributing factor. Large part of total cost overrun is contributed by these factors. Even after managing these factors cost overrun may takes place.	4
5	Extremely Significant (E.S.)	>75% cost overrun contributing factor. Total cost is extremely affected & shows cost overrun that may lead to conflicts between parties.	5

This dissertation utilizes the Relative Importance Index (RII) to rank the causes of cost overruns in Kolhapur's construction industry. The RII values, as perceived by all respondents for each individual cause, are used to establish the overall rankings and provide a comprehensive view of the primary factors contributing to cost overruns. The numerical scores assigned to each identified cause are converted into RII values, which are then used to determine their relative importance. A higher RII indicates a more significant cause of cost overruns.

4.2. Importance Index

The identified causes are categorized into five groups based on their Relative Importance Index (RII). Table presents the RII and the corresponding groups. For the analysis of construction cost overruns in Kolhapur, the causes in Group I have been selected for detailed examination and the study has been conducted focusing on these factors.

Table 4.2: Importance Index

Sr. No.	Relative Importance Index (RII)	Group
1	≥ 0.500	I
2	0.375 to 0.499	II
3	0.250 to 0.374	III
4	0.125 to 0.249	IV
5	≤ 0.124	V

Causes of cost overruns with an RII of 0.500 or higher are categorized under Group I in this classification. These factors are considered the primary contributors to construction cost overruns in Kolhapur city and are selected for further analysis. The responses from both professionals and clients are evaluated based on this grouping system.

5.0 RESULTS AND DISCUSSION

5.1 Participation in the Questionnaire Survey

The questionnaire was distributed to contractors, consultants, and clients those who participated in various construction projects in Kolhapur city. Table 5.1 shows the number of distributed questionnaire and the number of received ones. The issue created significant interest among contractors, consultants, and clients, as it addresses a challenge they frequently encounter in their projects. Since they are the primary beneficiaries of the research findings, their engagement was high, leading to an overall participation rate of 90%.

Table 5.1: Respondent's Category and Participation

Respondent Category	Clients	Contractors	Designers	Total
Distributed Questionnaires	10	20	19	49
Received Questionnaires	10	18	16	44
Participation (%)	100	90	85	90

Fig 5.2 below shows the participation percentage achieved in the research questionnaire.

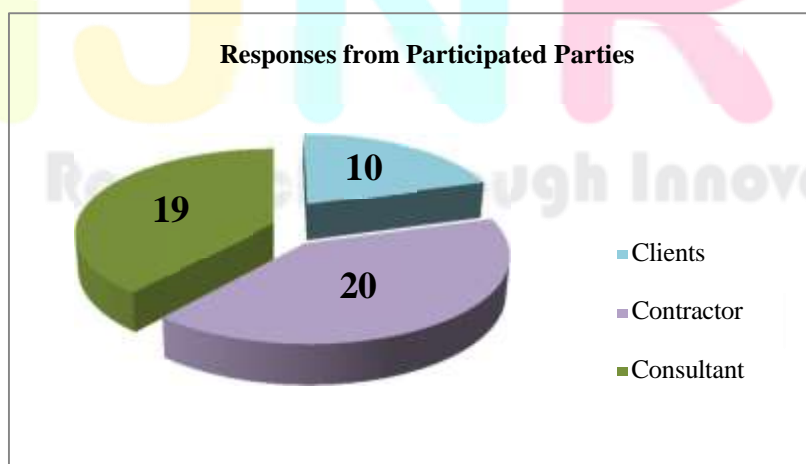
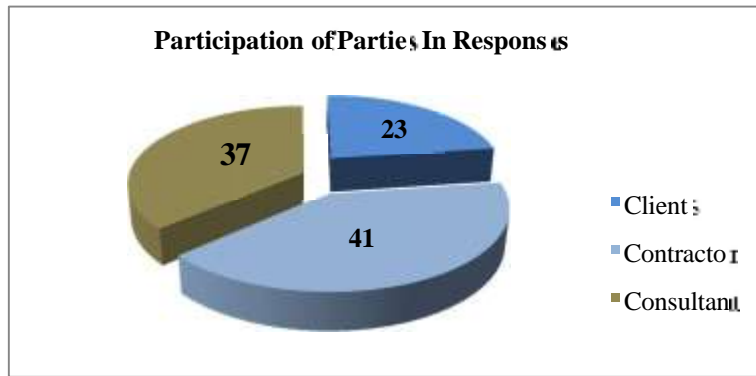


Figure 5.2.1: Participation in the Questionnaire survey



5.3 Respondent's Profile

The questionnaire survey gives information about respondent's experience in construction industry. Contractors and clients are professional respondents while clients are owner or owner representative of the project. Only contractors and consultants are considered for this category of questions. Table 5.1 shows the percentage of respondents in different sectors of construction industry. Most contractors (78%) and consultants (81%) are working in private sector as this project is largely focused on private sector construction projects. Also, about 22% of contractors and 19% of consultants are working in both sectors i.e. private and public.

Table 5.3: Types of Respondent's Sector

Respondent/ Sector	Total	Private	Public	Both
Contractors	18 (100%)	14 (78%)	00 (00%)	04 (22%)
Consultants	16 (100%)	13 (81%)	00 (00%)	03 (19%)

Table 5.4 shows the respondent's years of experience. It is seen that majority of contractors (45%) and consultants (69%) are having experience more than 15 years that makes the obtained data more reliable and helpful to attain the objective of the project. Also, 39% Contractors and 19% consultants have an experience between 10 to 15 years.

Table 5.4: Respondent's Years of Experience

Respondent/ Experience	Total	<5 Yr	5-10 Yr	10-15 Yr	>15 Yr
Contractors	18 (100%)	01 (05%)	02 (11%)	07 (39%)	08 (45%)
Consultants	16 (100%)	00 (00%)	02 (12%)	03 (19%)	11 (69%)

Table 5.5 shows the specialty of construction in which respondents were participated. The specialties considered for studies are residential, commercial, and institutional, specialized industrial and any other. It shows that large percentage of contractors (33%) and consultants (31%) participated in residential construction projects. Also, same percentage of consultants (31%) is involved in residential and commercial projects. In case of contractors, about 28% of respondents are involved in residential and commercial projects, followed by 17% of contractors worked in residential and commercial projects.

Table 5.5: Respondent's Specialty of Construction

Respondent/ Specialty	Contractor	Consultant	Client
Total	18 (100%)	16 (100%)	10 (100%)
Residential	06 (33%)	05 (31%)	05 (50%)
Commercial and Institutional	00 (00%)	02 (13%)	01 (10%)

Specialized Industrial	01 (05%)	01 (06%)	02 (20%)
Residential and Commercial	05 (28%)	05 (31%)	01 (10%)
Residential and Industrial	03 (17%)	01 (06%)	01 (10%)
Residential, Commercial and Industrial	01 (05%)	02 (12%)	00 (00%)
Commercial and Industrial	02 (11%)	00 (00%)	00 (00%)

5.6 Cost Overrun Causes in Feasibility and Early Planning Stage

Feasibility and early planning stage consist of 9 causes of cost overrun as shown in Table 5.6. After ranking, cost overrun in Kolhapur city at this stage occurs mainly due to premature tender documents like drawings, specifications, contracts, and legal documents as it has highest RII 0.452. This causes also stands at 18th rank in overall list of causes. The appointment of incompetent contractor or consultant and inaccurate estimates possess second and third rank respectively in this phase.

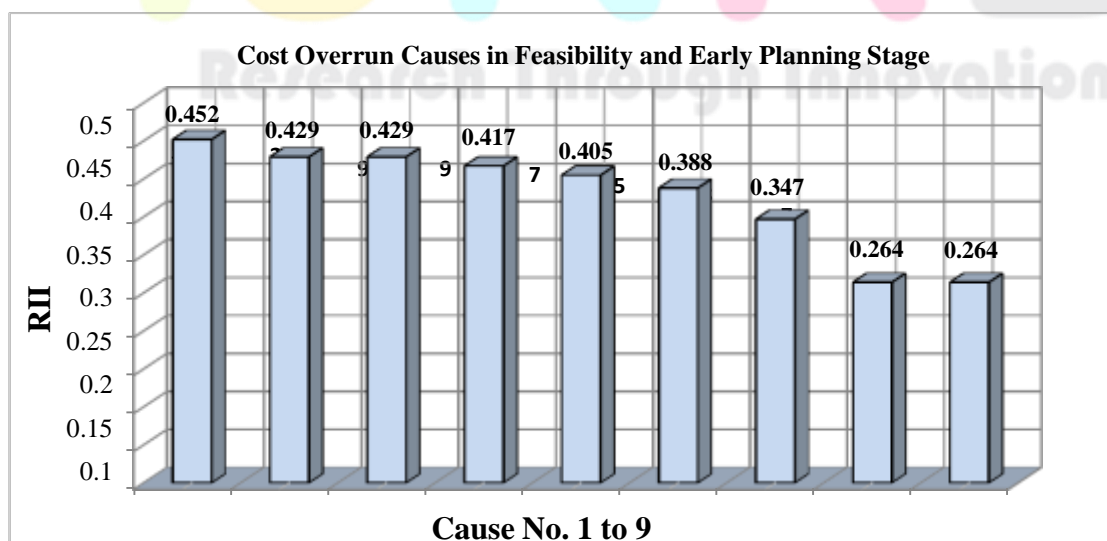
Table 5.6: Ranking of Causes in Feasibility and Early Planning Stage

Cause No.	Description	RII	Rank in Stage	Overall Rank
1.	Unrealistic imposed initial contract duration	0.347	7	58
2.	Difficulties in obtaining work approval	0.388	6	46
3.	Tender-winning price are unrealistically low (Selection of lowest bidding tender)	0.417	4	28
4.	Changes in Government regulations & laws in that region	0.264	8	66
5.	Appointment of incompetent consultant / contractor	0.429	2	23
6.	Inaccurate Estimates	0.429	3	24
7.	Premature tender documents (Drawings, Specification, Contracts & legal documents)	0.452	1	18
8.	Environmental Impact approval of the project	0.264	9	67
9.	Legal disputes between parties	0.405	5	35

This ranking shows that, in Kolhapur cost overrun in feasibility stage occurs due to incomplete tender document which may be produced due to lack of knowledge of concerned party. Also, this ranking shows that second factor of cost overrun is due to appointment of incompetent contractor or consultant and third factor is inaccurate estimates which are common in private and public works in Kolhapur city.

Figure 5.7 shows the graphical ranking of these causes in feasibility and early planning stage and their RII.

Figure 5.7: Cost Overrun Causes in Feasibility and Early Planning Stage



6.0 CONCLUSION

Construction firms operate as profit-driven entities, with their primary objective being to generate revenue and achieve the desired profit margin upon project completion. The successful attainment of this objective largely relies on executing projects within the projected budget, timeframe, and quality expectations. However, cost overruns in construction remain a global challenge. The inherently high-risk nature of construction projects has historically contributed to frequent budget overruns. To mitigate these risks, all stakeholders must adopt a structured approach to risk management. The initial step in addressing this issue is identifying the underlying causes, which enables the implementation of corrective measures. Recognizing these factors supports control systems in examining cause-and-effect relationships within engineering processes, thereby aiding in responsibility allocation, and enhancing workflow efficiency. Categorizing these reasons fosters a shared understanding among owners, consultants, and contractors regarding cost variations, facilitating the issuance and resolution of change orders.

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