A Comprehensive Review of Cost Overrun Factors in Construction Projects

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Abstract

Cost overruns are the common issue encountered in current construction developments and they often lead to cost increase strain, project overrun delays, and poor relationship between the project stakeholders. This paper discusses the major reasons behind cost overruns as well as ways of enhancing its management. The findings indicate that issues such as adjustments in design, poor planning, communication, and the unexpected environmental and financial situations often lead to project over-budgeting. To ensure the projects do not exceed their set budget and program, the study emphasizes the relevance of teamwork, transparency and timely decisions. Put together, these tactics are likely to deliver more successful, efficient and predictable project outcomes.

Keywords — Cost overrun, construction management, project cost performance, risk analysis, estimation error, forecasting models, delay factors, public infrastructure, cost control.

I. INTRODUCTION

A. Background

The construction sector is a vital component of economic growth, yet it consistently faces the persistent challenge of cost overruns — the difference between actual expenses and projected budgets. Despite advances in digital project management tools, risk analysis, and forecasting systems, unanticipated financial deviations continue to occur across the globe.

Research from both developed and developing nations has revealed that budget overruns can range from 10% to over 60%, depending on project type, scale, and complexity. Early studies, such as those by Arditi et al. (1985), identified cost escalation as a reflection of weak resource allocation and poor administrative efficiency. Later analyses by Soundarya et al. (2025) and Kavuma et al. (2019) reaffirmed that technological advancement alone does not eliminate managerial and behavioral shortcomings that cause overspending.

As infrastructure becomes more complex and global supply networks face frequent disruptions, the likelihood of inaccurate forecasts and poor cost control rises. Eliasson (2025) emphasized that cost overruns in large-scale infrastructure are not merely technical failures but also the result of institutional inefficiencies and cognitive biases, such as over-optimism and strategic misrepresentation.

B. Significance of Cost Overrun Studies

The social and economic impact of cost escalations is tremendous. In short, cost overruns for governments mean reallocations of budget costs, delays in the delivery of infrastructure and possible political consequences. They cause financial pain, disputes and reputational anguish to contractor. For the public, overruns result in higher taxes, diminished service quality, and deferred access to critical infrastructure.

Love et al. [5] say that in order to make good contingency plans, you need to know how likely cost overruns are and how they act. Cost contingency estimation, which is the process of preparing for cost overruns, is becoming more and more like a scientific field than a rule-of-thumb practice. Wanjari and Dobariya [6] also stressed the importance of finding and

classifying cost overrun factors that are unique to local construction settings, especially in countries like India that are growing quickly.

In recent years, there has been a big need for a complete, up-to-date summary of research on cost overruns. Recent studies by Belay and Torp [7], Ma et al. , Adepu et al. [8], and Soundarya et al. [2] have introduced new dimensions, including quality-gated frameworks, AI-driven forecasting, and post-COVID-19 disruptions, necessitating a comprehensive revaluation of existing knowledge.

C. Definition and Conceptual Understanding

Cost overrun can be defined as the excess of actual cost incurred over the estimated cost approved at the project's outset. Mathematically, it can be represented as:

$$\{Cost\ Overrun\ (\%)\} = \frac{\{\{Actual\ Cost\} - \{Estimated\ Cost\}\}}{\{Estimated\ Cost\}} \times 100$$

This ratio captures the deviation magnitude and helps in benchmarking project performance. However, as Love et al. [9] pointed out, the challenge lies in defining a consistent baseline estimate since early-stage forecasts are subject to significant uncertainty.

Over time, various classifications have been developed to understand cost overruns:

1. **Technical causes** – inaccurate designs, estimation errors, and inadequate scope definition.
2. **Managerial causes** – poor coordination, delayed decision-making, and weak contract management.
3. **External causes** – inflation, market volatility, and policy changes.
4. **Behavioural causes** – optimism bias and deliberate underestimation.

The optimal way of determining factors that contribute to cost overrun was presented by Youssefi and Celik [10] through statistical prioritization methods. Their results affirmed that there is not one factor that is always overwhelming but cost over-runs are the resultant effect of several variables interacting together throughout the project life cycle.

D. Global Trends

According to research evidence, cost overruns are a universal issue, but their extent and causes of occurrence are diverse in relation to regions. In India, Venkateswaran and Murugasan [11] discovered that road over bridge (ROB) projects have cost overruns that are caused by design changes, land acquisition, and utility services relocation delays. On the same note, Rajan et al. [12] examined Indian public-private partnership (PPP) road projects and found that scope creep of the project, insufficient feasibility studies, and regulatory bottlenecks are some of the major contributors of overruns.

Conversely, Belay and Torp [7] noted that the Norwegian road construction projects that were under quality-gated type of management were relatively better in terms of cost performance since quality control was stricter and approval systems were progressive. Nevertheless, even these projects ran over with the uncertainties in the environment, the unexpected conditions at the sites.

Comparisons across the borders show similarities: the projects in the public sector are more susceptible to failure than the ones in the private sector, high percentage overruns are more common on large-scale undertakings, and the cost estimates made at the initial stage are usually underestimated. Kansal and Agarwal [13] pointed that geological risks and environmental factors add to the uncertainty of hydropower projects, which explains the necessity of uncertainty-based planning.

II. LITERATURE REVIEW

The issue of cost overrun in construction projects is an issue that has been widely researched upon in the last four decades, both in developed and developing nations. Research encompasses empirical research, statistical research, risk research and predictive models. It is possible to synthesize the literature according to regional context, the type of project, causal factors, and mitigation measures. In this section, major studies key findings have been systematically reviewed and gaps, patterns, and emerging trends have been mentioned.

A. Preliminary Research and First Impression

Administrative inefficiencies, inadequate planning and poor coordination among other factors are the main contributors to cost overruns in the construction projects of the government, which was the first to be researched by Arditi et al. [1]. Their study pointed out that bureaucracy coupled with inadequate accountability systems increases the cost overrun of their projects more than in the case of private projects.

This analysis was generalized to projects in construction of highways by Creedy et al. [15], who proposed a risk-driven approach in which cost overruns are considered as the cumulative effects of many interacting risks. They underlined that financial deviation could be dramatically reduced by planning the project on its initial stage, referring to the allocation of contingency and quantification of risks.

Love et al. [5] suggested probabilistic frameworks to find out the possibility of cost overruns, which they emphasized uncertainties in estimation and changes in the price of materials are paramount contributors.

Doloi [16] went further to suggest that the stakeholder behavior and defining governance are critical in the cost performance of the project. Their work has proved that a lack of clarity in the responsibilities, miscommunication, conflicting priorities is a frequent aggravating element, which makes the cost escalation.

These initial studies stipulated that cost overruns are not just technical failures but are a mix of managerial, behavioural and systemic factors.

B. Overruns in the Indian Construction Industry

Due to the prolific infrastructure growth and bureaucratic administrative systems India has been of special interest to cost overrun research.

Venkateswaran et al. [11] researched on Road Over Bridge (ROB) projects and discovered that the amount of cost overruns was due to design change, delay in land acquisition as well as inadequate inter-agency coordination with 22-28 average. In their work, they stressed that early-stage planning and alignment of the stakeholders is essential in the process of reducing the financial deviations.

Wanjari et al. [6]examined the large field of Indian construction projects and categorized the overrun causes into client related, contractor related, consultant related and external. Their survey based research established that misstatement of cost, late payments and inflation are the biggest factors. Their suggested mitigation measures were integrated project delivery (IPD), regular auditing, and improved communication.

Soundarya et al. [2] concentrated on individual residential buildings projects with an average of 1825 overruns. The correlation between project duration and cost escalation was very strong as shown in regression analysis which implies that the longer projects are, the higher the deviation as a result of inflation and inefficiency in utilization of resources.

Tayyab et al. [17] furthered this study to high-rise buildings where they found delay in approval, cash flow, and price increase as the key determinants. Their suggestion was to use the digital project control systems and BIM-based monitoring to manage finances better.

Rajan et al. [12] researched on PPP road project in India and concluded that poor feasibility studies and ambiguity in the contract are major factors that led to cost increase. Their review suggested effective risk assigning models and enhanced contractual control to ascertain fair financial accountability.

Table 1 summarizes key studies from India:

Author(s)	Year	Project Type	Avg. Overrun (%)	Key Causes	Methodology
Venkateswaran et al. [11]	2017	Road Over Bridge	22–28	Design changes, land delays, poor coordination	Empirical survey
Wanjari et al. [6]	2016	Mixed	25–35	Estimation errors, delayed payments, inflation	Questionnaire analysis

Soundarya et al. [2]	2025	Residential	18–25	Material changes, labor inefficiency	Regression analysis
Tayyab et al. [17]	2023	High-rise buildings	20–30	Delays, cash flow, inflation	Survey & statistical study
Rajan et al. [12]	2014	PPP Road	25–30	Feasibility, contractual issues	Regression & comparative study

C. International Perspectives

The phenomenon of cost overrun is not new and is common in most countries around the world, although their levels differ depending on the projects and the countries.

Belay et al. [2] discussed Norwegian road construction projects in the framework of quality-gated projects, and the average overrun was 9%. Based on their work, it was demonstrated that phased approvals and stringent quality control minimized, but could not exclude the effects of cost deviations, which were still impacted by any unexpected site conditions and environmental uncertainties.

Senouci et al. [18] investigated Qatari public construction projects and indicated that combined time and cost overruns were observed in 54 percent of the projects. The reasons were scope changes, lack of communication, and inefficiency in supervision. Some of the preventive measures proposed in the study were standardized project management protocols and Earned Value Management (EVM).

A meta-analysis of European infrastructure projects was conducted by **Eliasson [4]**, which concluded that the type of project, procurement mode, and the type of governance have a significant impact on cost performance. Technical complexity increased overruns with rail and road projects in comparison to utility or building projects.

In a study by **Kavuma et al. [3]** on freeform construction projects, the study reported an overrun range of 1530 percent with the main causes being technological uncertainty and non-standardized materials. Their study suggested cost estimation frameworks and adaptive management methods that are project-specific.

Zhu et al. [19] emphasized the overseas infrastructure projects, and they examined the risks unique to countries, including political instability and regulatory hurdles. Regression modeling showed that the overruns on projects in high-risk countries may go up to 35 percent than on projects in stable environments.

D. Risk Identification and Analytical Approaches.

Recent studies underline the risks-based means of cost overruns detection and prevention.

In their study, **Annamalaisami et al. [20]** developed a taxonomy of the factors cost overruns, as follows: design, management, finance, external environment, contract administration and stakeholder behaviour. The paper has pointed out that these factors tend to have a compounding effect on financial deviations.

Youssefi et al. [10] described a prioritization of the causes of overrun using a multi-criteria decision analysis (MCDA) model that is optimized. They have found the factors most affecting it were inaccurate estimation, delays in decision-making, and fluctuation of material prices. The research recommended dynamic cost-risk model of project planning.

Rosenfeld et al. [19] conducted a root-cause analysis and revealed that inefficient procurement and execution phases spread mistakes in the early phase, and they usually result in foreseeable though avoidable overruns. They emphasized proactive quality reviews and external cost reviews.

Kansal et al. [13] created an uncertainty assessment of hydropower projects on a probabilistic basis. Their work revealed that geological variability and hydrological risks could be 20-40% overrun when they were not reflected in initial estimates.

To allow overruns **Love et al. [9]**suggested contingency estimation methods based on stochastic models and human judgment. All of these studies are an indication of the change of descriptive analysis to predictive, model based structures.

E. External Events and Market Dynamics.

Cost overruns are affected by external variables such as global occurrences and economic changes.

Adepu et al. [8] discussed construction projects that occurred in the COVID-19 pandemic, with the observation of 1020 percent extra costs, which constituted of labor shortages, supply chain disruption, and health compliance. Overruns were also increased by material price volatility and delayed approvals.

Ma et al. [14] sampled the construction price forecasting models and discovered that conventional approaches tend to be unable to consider market changes after the pandemic. They were in favor of AI-based and machine learning models of dynamic forecasting.

As **Eliasson [4]** pointed out, emerging factors of cost increase in large infrastructure projects are geopolitical risks, high commodity prices, and changes in policies. Risk mitigation is suggested to be performed with the aid of adaptive budgeting structures that include inflation indexing and contingency planning.

F. Stakeholder Behaviour and Governance.

Behavioural and governance aspects have also become a significant factor that is known to be a key determinant of cost overruns.

Doloi [16] showed that strategic misrepresentation that is a calculated underestimation of costs to gain approval is widespread in public projects. According to Rosenfeld et al. [19], optimism bias causes systematic underestimation of the risks, and it is necessary to verify the costs independently.

Larsen et al. [21] pointed out that the quality of communication and collaboration between the stakeholders and the company are associated with the cost performance. Overruns can be minimized by about 30 through transparent reporting, joint decision making and active supervision.

Rosenfeld [22] supported the association between the quality of governance, the dedication of leaders, and the management of expenses and implemented the organized accountability systems to reduce financial variations.

G. Comparative Summary Table

Author(s)	Year	Region	Project Type	Avg. Overrun (%)	Dominant Causes	Method Used
Arditi et al. [1]	1985	USA	Public works	20–40	Planning & admin inefficiency	Case analysis
Wanjari et al. [6]	2016	India	Mixed	25–35	Estimation error, delayed payments, inflation	Survey
Senouci et al. [18]	2016	Qatar	Public	54	Scope changes, communication gaps	Statistical survey
Rajan et al. [12]	2014	India	PPP Roads	25–30	Feasibility, contractual issues	Regression
Love et al. [9]	2015	Australia	Roads	10–20	Contingency estimation	Probabilistic modeling
Kavuma et al. [3]	2019	Global	Freeform structure	15–30	Technological uncertainty	Comparative study
Youssefi et al. [10]	2023	Global	Buildings/Infra	20–35	Estimation, inflation	MCDA modeling
Adepu et al. [8]	2024	Global	Mixed	10–20	Pandemic disruptions	Survey

Soundarya et al. [2]	2025	India	Residential	18–25	Material cost, labor inefficiency	Regression
Eliasson [4]	2025	Europe	Infrastructure	15–40	Governance, optimism bias	Meta-analysis

III. CLASSIFICATION AND ANALYSIS OF COST OVERRUN FACTORS

The complex nature of constructions, caused by technical, managerial, financial, and external factors, enables cost overheats in the cost of construction projects. The systematic classification will help stakeholders to find out areas of key risks, mitigation strategies that need to be prioritized, and predictive models. Based on the literature review of 22 studies presented in this section, a structure of analysing these factors is detailed.

A. Technical Factors

Technical reasons refer to the designing of the project, geographic conditions, and the complexity of engineering. They are part of the construction process and tend to increase cost variations in cases where they are not properly dealt with.

Designing Changes and Complexity Designing a complex system to change over time is a complex task that may occasionally be unfeasible to complete.<|human|>1) Design Complexity and Changes Designing a complex system to evolve over time is a complex task, which can sometimes be impossible to accomplish.

The first cause of cost overrun is design changes as the project is underway. According to Venkateswaran et al. [11], a high frequency of changes in the ROB designs led to the escalation of the project costs to a maximum of 28% increment. Likewise, Kavuma et al. [3] observed that the freeform and unconventional architectural projects have a 15-30 percent increase in cost escalation because of the necessity to use non-standard materials and adaptive building processes.

Causes include:

- Poor initial designs or unfinished ones.
- Late require input of change-requested by a client.
- Architectural-structural integration problems.

2) Inaccurate Cost Estimation

The problem of inaccurate estimation is always emphasized in both global and Indian research. Estimation errors stem from:

- Over-optimism or insufficient estimation of resources.
- Lack of historical cost information.
- Disregarding contingencies of price change.

Table 2: Technical Factors and Severity

Technical Factor	Severity (%)	References
Design complexity/changes	20–28	C. B. Venkateswaran et al. [11], M. K. Soundarya et al. [2], Kavuma et al. [3]
Inaccurate cost estimation	15–25	Youssefi et al. [10], S. P. Wanjari et al. [6], M. Tayyab et al. [17]
Poor material planning	10–15	M. K. Soundarya et al. [2], N. Adepu et al. [8]
Technological uncertainty	15–20	Kavuma et al. [3], F. Zhu et al. [19]
Unforeseen site conditions	10–18	Senouci et al. [18], S. S. Agarwal et al. [13]

B. Managerial Factors

Managerial factors are associated with planning, supervision, coordination of stakeholders and governance. The reason as to why they are critical is that despite the well-estimated projects, they can run overboard because of poor management.

1) Project planning and scheduling is the first task.

Poor planning, absence of milestones, and impractical schedules are some of the factors that lead to delays and cost increase. According to Soundarya et al. [2], the longer the residential project, the higher the overrun and this indicates the association between poor planning and cost variance.

2) Stakeholder Coordination

Lack of communication between clients and contractors, consultants, and regulatory bodies results in time wastage and duplications. According to Doloi [16] and Larsen et al. [21], missing stakeholder goals are behind as many as 30 per cent of overruns.

3) Governance and Contractual Issues.

Similar to what was observed by Rajan et al. [12] and Eliasson [4], ambiguous contracts and poor governance increase the risk of cost overruns. Key issues include:

- Undefined risk allocation
- Ineffective supervision and accountability.
- Fraud in cost strategic reporting by contractors.

Table 3: Managerial Factors and Severity

Managerial Factor	Severity (%)	References
Poor planning/scheduling	15–25	M. K. Soundarya et al. [2], T. A. Rajan et al. [12], S. S. Agarwal et al. [13]
Inadequate stakeholder coordination	20–30	J. K. Larsen et al. [21], H. Doloi et al. [16]
Contractual ambiguity	10–20	J. Eliasson et al. [4], T. A. Rajan et al. [12], M. Tayyab et al. [17]
Weak governance	15–25	J. Eliasson et al. [4], Y. Rosenfeld et al. [22], H. Doloi et al. [16]
Inefficient supervision	10–18	A. Senouci et al. [18], T. A. Rajan et al. [12]

C. Financial Factors

Financial considerations include financial estimations, inflation, cash flow problems, and price fluctuations that are caused by the market.

1) The first one is inflation and price escalation.

Overruns are caused by a significant percentage of material and labor cost inflation. According to the report by Tayyab et al. [17], high-rise building projects in India faced an increase of 2030% of cost because of the increase in material prices. As observed by Adepu et al. [8], the cost of materials and labor was increased by the global shocks including COVID-19.

2) Contractor Cash Flow Issues

The poor management of the cash flows by contractors and delays in payment translates to the work stoppage and the extra mobilization expenses ([10], [22]).

3) Budgeting and Contingency Deficiency.

Love et al. [9] stressed that inadequate contingency allocation does not support cost uncertainties. Unbudgeted projects are more prone to overruns especially in long term infrastructure projects.

Table 4: Financial Factors and Severity

Financial Factor	Severity (%)	References
Inflation & price escalation	15–30	M. K. Soundarya et al. [2], N. Adepu et al. [8], M. Tayyab et al. [17]
Contractor cash flow issues	10–20	S. P. Wanjari et al. [6], M. Tayyab et al. [17]
Inadequate contingency	10–18	Youssefi et al. [10], C.-P. Sing et al. [18]
Payment delays	8–15	S. P. Wanjari et al. [6], T. A. Rajan et al. [12]
Poor financial planning	10–12	C. D. Annamalaisami et al. [20], S. S. Agarwal et al. [13]

D. External Factors

External variables are those that cannot be directly controlled by the project management, but the factors which have a great impact on the cost results.

1) Regulatory/ Approval Delays.

Cost escalation is caused significantly by delayed permits, approvals and legal problems. According to Venkateswaran et al. [11] Government approval delay as reported by Tayyab et al. [22] contribute to the overall total cost overrun up to 12-15%.

2) Environmental and Site Conditions.

Instances of unforeseen geological or environmental factors will also require redesign or extra precautions.

3) Global and Macroeconomic Risk.

Eliasson [4], Zhu et al. [19], and Adepu et al. [8] stressed the fact that the global market, pandemics, and geopolitical events might influence the material availability and costs. The foreign projects are exposed to increased risks because of the volatility of the exchange rate, political instability, and regulatory environments.

Table 5: External Factors and Severity

External Factor	Severity (%)	References
Regulatory/approval delays	10–15	C. B. Venkateswaran et al. [11], T. A. Rajan et al. [12] M. Tayyab et al. [22]
Environmental/site conditions	10–18	Senouci at al. [18], S. S. Agarwal et al. [13]
Global economic risks	10–20	J. Eliasson et al. [4], N. Adepu et al. [8], F. Zhu et al. [19]
Political instability	8–15	T. A. Rajan et al. [12], F. Zhu et al. [19]
Unforeseen disasters	5–10	J. Eliasson et al. [4], N. Adepu et al. [8]

E. Severity Ranking of Factors

A combination of all of the four categories brings about a list of the worst factors of cost overrun:

Rank	Factor	Category	References
1	Stakeholder misalignment & poor coordination	Managerial	J. K. Larsen et al. [21], H. Doloi et al. [16]
2	Design changes & complexity	Technical	C. B. Venkateswaran et al. [11], M. K. Soundarya et al. [2], Kavuma et al. [3]
3	Material price escalation & inflation	Financial	M. K. Soundarya et al. [2], N. Adepu et al. [8], M. Tayyab et al. [17]
4	Inaccurate cost estimation	Technical	Youssefi et al. [10], S. P. Wanjari et al. [6], M. Tayyab et al. [17]
5	Contractual ambiguity & weak governance	Managerial	J. Eliasson et al. [4], T. A. Rajan et al. [12], H. Doloi et al. [16]
6	Regulatory & approval delays	External	C. B. Venkateswaran et al. [11], T. A. Rajan et al. [12], M. Tayyab et al. [17]
7	Technological uncertainty	Technical	Kavuma et al. [3], F. Zhu et al. [19]
8	Contractor cash flow issues	Financial	S. P. Wanjari et al. [6], M. Tayyab et al. [17]
9	Global economic & political risks	External	J. Eliasson et al. [4], N. Adepu et al. [8] F. Zhu et al. [19]

This ranking explains why the major causes of cost overruns are managerial and technical factors, which are enhanced by financial and external factors.

F. Cross-relationships between Factors.

Single factors do not often lead to cost overruns. The interaction effects have a big impact on project cost deviation. For example:

- Design variations raise the material requirement → enhanced inflation effect on the contractor cash flow.
- Scenario: bad planning results in time wastage which translates to higher costs of financing the project, which in turn causes the stakeholders to start arguing.
- Outside factors such as regulatory delays or pandemics make scheduling problems worse and mishandling of resources.

G. Sub-Factor Analysis

A detailed sub-factor analysis provides deeper insights:

Category	Sub-Factor	Impact Level	References
Technical	Design ambiguity	High	C. B. Venkateswaran et al. [11], Kavuma et al. [3]
Technical	Inaccurate estimation	High	Youssefi et al. [10], S. P. Wanjari et al. [6],
Technical	Site/geology surprises	Medium	Senouci et al. [18], S. S. Agarwal et al. [13]
Managerial	Stakeholder coordination	High	J. K. Larsen et al. [21], H. Doloi et al. [16]
Managerial	Planning/scheduling inefficiency	Medium	M. K. Soundarya et al.[2], T. A. Rajan et al. [12]
Managerial	Weak supervision	Medium	A. Senouci et al. [18], T. A. Rajan et al. [12]
Financial	Inflation/material costs	High	N. Adepu et al. [8], M. Tayyab et al. [17]
Financial	Payment delays	Medium	S. P. Wanjari et al. [6], T. A. Rajan et al. [12]
Financial	Insufficient contingency	Medium	Youssefi et al. [10], C.-P. Sing et al. [18]
External	Regulatory delays	Medium	C. B. Venkateswaran et al. [11], M. Tayyab et al. [17]
External	Global risks/pandemic	Medium	J. Eliasson et al. [4], N. Adepu et al. [8], F. Zhu et al. [19]
External	Political instability	Medium	T. A. Rajan et al. [12], F. Zhu et al. [19]

IV. US AID plans, and mitigation strategies and predictive models.

Risk management, predictive modelling, and operationalized governance can be employed to eliminate cost overruns in construction endeavours. According to the lessons of the past research proactive measures minimize the frequency and severity of overruns.

A. Risk-Based Mitigation Strategies.

Early Risk Identification and Assessment 1) Early Risk Identification and Assessment.

Research indicates that risk identification at the early stages is important. According to Youssefi et al. [10] and Creedy et al. [15], multi-criteria decision analysis (MCDA) is suggested to rank the high impact risks. Key steps include:

- Determining possible technical, managerial, financial and external risks.
- Giving impact and probability scores.

Development of high-priority combating strategies.

2) Contingency Planning

According to Love et al. [9], Kansal et al. [13], such contingency budgets are to be allocated on the bases of probabilistic simulations. Typical approaches:

- Fixed contingency: Classification percentage of project cost (e.g. 5-10 percent)
- Dynamic contingency: Modified, depending on the stage of the project, the exposure of the risks, and the previous performance.

3) Stakeholder Engagement

As Doloi [16] and Larsen et al. [21] illustrate, conflicts and reworks are minimized by effective communication and governance. Practices include:

- Scheduling of coordination meetings.
- Transparent reporting
- Combined decision-making models.

Table 6: Risk-Based Mitigation Summary

Strategy	Key Benefits	References
Early risk identification	Prioritizes high-impact risks	Youssefi et al. [10], G. D. Creedy et al. [15]
Contingency budgeting	Absorbs cost deviations	S. S. Agarwal et al. [13], C.-P. Sing et al. [18]
Stakeholder engagement	Reduces delays and disputes	J. K. Larsen et al. [21], H. Doloi et al. [16]

B. Predictive and Digital Models.

1) Forecasting Techniques

Belay et al. [2] and Ma et al. [14] point at models that are used to anticipate cost overrun:

- Statistical regression: Guess the cost on historic data.
- Monte Carlo simulation: Measured uncertainty of probability.
- AI/machine learning: Based on multi-factor input the cost is predicted to escalate.

2) Building Information Supporting (BIM)

BIM uses visualization technology, clash detection technology and automated quantity estimate, minimizing errors in estimation and design changes ([4], [22]). Benefits:

- Early detection of design conflicts.
- Improved material planning
- Real-time cost monitoring

3) Integrated Project Management Systems.

The use of BIM, AI, and EVM (Earned Value Management) is improved to boost cost, schedule, and quality monitoring. Research indicates a maximum of 20% improvement in cost variances being used in high rise and infrastructure developments ([22], [13]).

C. Policy and Governance Solutions.

1) Contractual Clarity

According to Rajan et al. [12], there should be a clear allocation of risk in the contract such as cost escalation clause and performance-based remuneration.

2) Regulatory Streamlining

Venkateswaran et al. [11] and Tayyab et al. [17] suggest that the simplified approval of projects can help reduce delays, particularly urban and public projects.

3) Independent Cost Review

The independent audit guarantees accountability and discourages strategic underestimation by performing these audits on a periodic basis ([22], [21]).

D. Case Study Insights

- Norwegian Road Projects: Belay et al. [2] discovered that quality-gated framework, after imposing a gradual approval and rigor, limited cost overruns to approximately 9% due to managing strict supervision.
- Indian High-Rise Buildings: Tayyab et al. [17] found that BIM + online scheduling minimized the error by 15-20 percent in estimations.
- Hydropower Projects: Kansal et al. [13] demonstrated an exposure to financial risk, which was cut by a quarter using probabilistic contingency modeling.

V. CONCLUSION

Cost overrun remains one of the greatest problems of the construction industry as it influences project delivery and trust of the stakeholders. The problem occurs due to a tangled combination of technical failures, managerial inefficiencies, financial factors, and unpredictable exogenous factors. Although a solution is not a one liner in the way to get rid of cost overruns, its effects can be significantly mitigated by proper planning, effective communication, and proactive risk management.

High usage of digital tools, data analytics, and automation in project management has provided new grounds of accuracy in cost and decision making. Risk identification, constant progress monitoring and cooperation between all parties involved in the project are some of the most important steps, which can help to reduce cost deviation to minimum.

Finally, cost overruns can only be prevented by more than technical accuracy, but by an atmosphere of candor, responsibility and flexibility. Once coordination, foresight, and innovation are the priorities of teams, the construction process can be not only more cost-effective but also more sustainable and stronger in the long term.

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