

An Analysis of Global Construction Projects: Causes and Implications of Cost Overruns

Ahmed Mohammed Mohsen El-Sayed Morad

Project Controls Engineer, Planning, Cost Control, and Data Analytics in Construction, Infrastructure, and Manufacturing Industries. Cairo, Egypt

Corresponding Author: Ahmed Mohammed Mohsen El-Sayed Morad, **E-mail:** ahmedmorad1095@gmail.com

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ABSTRACT

This Paper aims to analyze and study the most important reasons for the cost overruns of construction projects within the municipality of various sources, to propose solutions to avoid these reasons or reduce their impact on the project, and to determine the relative importance of the cost overruns factors. The problem studied is that many building and construction projects Exceed the budget in the implementation process Hence, the paper question can be formulated as follows: What are the reasons for the cost overruns / Exceeding the budget in construction projects? The analytical descriptive approach was followed to find out and evaluate the reasons for the cost overruns in the implementation of projects by using statistical analysis of the data collected by the electronic spreadsheet program. The analysis included arranging the various factors according to indicators of relative importance. The analysis revealed the factors and categories most contributing to the cost overruns.

KEYWORDS

Budget, Cost Overruns, Causes, Cost Estimation, Delay, Construction projects, factors Exceeding the budget.

INTRODUCTION

The construction sector has emerged as one of the largest industries globally, encompassing various infrastructure projects such as roads, bridges, airports, and buildings. Project Cost Overruns have become a growing concern due to the intricate nature of design and execution and maintaining the gross profit margin.

The cost overruns factors impose a significant burden on both the public and private sectors, deliberately creating a disparity between planned and actual construction costs Due to the financial and economic consequences on countries and the construction industry as a whole, along with negative effects on key stakeholders such as employers, consultants, and contractors.

The analysis of global construction projects reveals that cost overruns have been a persistent issue for the past 70 years, lacking effective control or solutions. Studies have shown that construction projects experience an average of 28% cost overrun. analysis conducted on Several infrastructure projects indicates that cost overruns predominantly occur during the initial stages of design and planning, due to technical and administrative challenges. This highlights the significance of addressing pre-construction issues to avoid cost overruns and emphasizes the importance of proper cost control in project management.

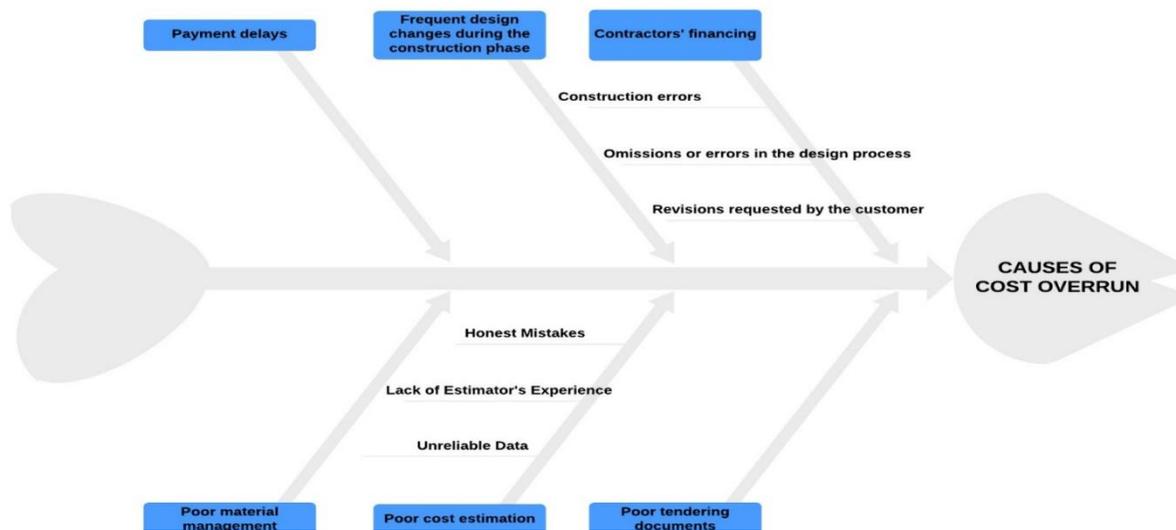
While cost control is crucial, it alone cannot resolve the problem, Cost management encompasses three key processes: cost estimating, cost budgeting, and cost controlling. Accurate project estimation and budgeting is essential for successful project delivery within the allocated budget to ensure project execution within the expected budget, accurate estimation is required, enabling reliable decision-making.

Monitoring actual costs during project implementation is also vital. It is necessary to explore the significant causes and their impact on project development costs to inform the decisions of the project stakeholders and financing institutions. Traditional cost estimation models primarily focus on base values (material, labour, equipment costs), overheads, and profits, with limited integration of risk assessment factors during the planning stage. Therefore, there is a need for a comprehensive cost estimation model that addresses all potential causes of cost overruns.

WHAT COSTS OVERRUN IN CONSTRUCTION?

Cost overrun in construction refers to the situation where the actual costs incurred during a project exceed the initial budget or estimated costs agreed upon with the client. It is also referred to as a cost increase or budget overrun. This occurrence is typically attributed to underestimating the true cost of the project during the budgeting and project scoping phase. Various factors can contribute to cost overruns, which will be further explored in the subsequent section.

CAUSES OF COST OVERRUN / Exceeding the Budget.



Several factors can significantly impact construction projects, potentially leading to delays and exceeding the budget. These factors range from material costs and labour shortages to other issues. The International Journal of Innovation, Management, and Technology highlights seven commonly identified causes of cost overrun in the construction industry:

- I. **Frequent design changes during the construction phase:** Changes in project design can result in additional expenses and delays.
- II. **Contractors' financing:** Issues related to contractors' financial resources and funding can impact project progress and budget.
- III. **Payment delays:** Delays in payments to contractors and suppliers can disrupt the project's cash flow and lead to cost overruns.
- IV. **Lack of contractors' experience:** Inexperienced contractors may face challenges in project execution, potentially resulting in higher costs and delays.
- V. **Poor cost estimation:** Inaccurate estimation of project costs can lead to underestimation, causing cost overruns during construction.
- VI. **Poor tendering documents:** Insufficient or unclear tendering documents can lead to misunderstandings, disputes, and ultimately, increased costs.
- VII. **Poor material management:** Inadequate management of construction materials, such as procurement and storage, can contribute to project delays and increased costs.

Understanding and addressing these factors are crucial for minimizing cost overruns in construction projects

I. Frequent design changes during the construction phase

Frequent changes in design have become a common occurrence in the construction industry, with a significant number of incidents (up to 70%) attributed to design inconsistencies or errors. Identifying these design flaws during the construction process often requires contractors to issue change orders, which involve making necessary modifications or additions to the project after the initial models and budgets have been finalized.

Several factors can lead to the need for change orders:

- i. **Construction errors:** Improper installations or mistakes made during the construction phase can necessitate changes to the original plan.
- ii. **Omissions or errors in the design process:** Design flaws or oversights can require adjustments or corrections during construction.
- iii. **Mistakes in fabrication:** Errors made during the fabrication process can lead to modifications being required on-site.
- iv. **Revisions requested by the customer:** Changes requested by the client or end-user may require alterations to the project's specifications.

Implementing these additional requirements often results in higher costs, causing the original project budget to exceed its initial estimation. Additionally, the process of addressing rework involves allocating additional time, manpower, and materials, further contributing to cost overruns in construction projects.

II. Contractors' financing:

Unlike other businesses that offer products or services in exchange for immediate payment, the construction industry operates differently. Contractors often receive payment after completing certain project milestones or even after the entire project is finished. This creates a unique financing challenge for contractors as they need to manage multiple projects and budgets simultaneously. They must ensure that they have enough funds available to cover project expenses and pay their workers, all while maintaining a continuous workflow and adhering to project timelines.

This balancing act becomes even more challenging as approximately 25% of all projects experience significant scope expansion in the field, exceeding the initial project plans by over 30%. This means that contractors must adapt to unforeseen changes and address additional requirements during the construction process, which can strain their financial resources. Furthermore, the construction industry has been impacted by the long-term effects of the COVID-19 pandemic. The economic repercussions and market uncertainties resulting from the pandemic have put additional strain on financing markets, making it even more challenging for contractors to secure the necessary funding for their projects.

Overall, contractors in the construction industry face unique financing challenges due to the nature of their payment structure and the need to balance multiple projects and budgets. This challenge is further exacerbated by the potential for scope expansion during construction and the ongoing effects of the COVID-19 pandemic on financing markets.

III. Payment delays:

In the construction industry, reputation is crucial. Being a trustworthy construction company means honouring commitments, adhering to designs and project scopes, and delivering projects within the agreed-upon timeline and budget. However, one of the challenges construction companies faces is managing their cash flow effectively. With limited cash reserves, it can be difficult to make timely payments to subcontractors for the work they have completed. This creates a detrimental cycle where delayed payments to subcontractors make it harder for construction companies to meet project objectives, resulting in potential delays in project timelines.

The consequences of late payments go beyond financial implications. They can disrupt project schedules, impact profit margins, and most importantly, erode the trust and credibility that construction companies have built with their subcontractors and clients. Trust is a valuable asset in the industry, and any breach of trust can have significant long-term effects on relationships and future business opportunities.

Therefore, maintaining a healthy cash flow and ensuring timely payments to subcontractors are crucial not only for financial stability but also for preserving a high level of trust and maintaining strong relationships within the construction industry.

IV. Lack of contractors' experience:

Construction projects are becoming increasingly complex, requiring more time and specialized expertise to complete successfully. However, the industry is currently facing a significant challenge in the form of labour shortages. It is estimated that around 80% of construction companies are struggling to find qualified and experienced craft workers to fill crucial roles.

The shortage of skilled labour has severe implications for construction projects. One of the main concerns is the increased risk of expensive rework. Without experienced contractors and workers, design errors and inconsistencies are more likely to occur, leading to the need for costly revisions and modifications. In addition to the financial impact, rework also causes project delays and deviations from the planned timeline. Nearly half of the construction firms have reported that labour shortages have extended the completion time for ongoing projects.

The shortage of skilled labour also puts additional pressure on experienced tradespeople. They are often tasked with training and mentoring new hires, which can disrupt workflows and require adjustments to accommodate the learning curve of inexperienced workers. This further contributes to project complexities and may require a reevaluation of the traditional project timeline until the new staff members are fully onboarded and proficient.

Addressing the labour shortage issue and ensuring access to a skilled workforce is crucial for the construction industry to mitigate the risks of rework, maintain project schedules, and deliver projects within the allocated timeframes. It may involve initiatives such as improving training programs, attracting new talent to the industry, and implementing strategies to retain experienced workers.

V. Poor cost estimation:

The role of estimators in construction projects is crucial as they determine the anticipated resource expenditures based on project plans and specifications. However, this process is inherently complex and involves handling a large amount of interrelated cost and non-cost data. Complicating matters further, construction projects are often associated with a high level of uncertainty, and many unknown factors arise during the project execution phase.

Due to these complexities and uncertainties, cost estimates in construction projects can be prone to inaccuracies, leading to cost overruns. There are several causes for inaccurate cost estimates:

- i. **Optimism Bias:** Estimators may exhibit an overly optimistic mindset, underestimating the potential challenges and costs involved in the project. This psychological bias can skew cost estimates and lead to unrealistic projections.
- ii. **Unreliable Data:** Cost estimates heavily rely on data, including material costs, labour rates, and other relevant information. If the data used for estimation is unreliable or outdated, it can result in inaccurate cost projections.
- iii. **Lack of National Database:** The absence of a comprehensive national database that provides standardized and up-to-date pricing information can hinder the accuracy of cost estimates. Without a reliable baseline for prices, estimators may struggle to make accurate projections.
- iv. **Lack of Estimator's Experience:** The experience and expertise of the estimator play a significant role in generating accurate cost estimates. Inexperienced estimators may lack the necessary knowledge and judgment to account for all relevant factors, leading to estimation errors.
- v. **Honest Mistakes:** Despite efforts to ensure accuracy, human errors can occur during the estimation process. This can include mathematical errors, overlooking certain cost elements, or misinterpretation of project specifications.

Addressing these causes of inaccurate cost estimates requires measures such as promoting transparency and data accuracy, providing adequate training and professional development for estimators, utilizing reliable and up-to-date databases for pricing information, and implementing robust quality control procedures to minimize errors. By improving the accuracy of cost estimates, construction projects can have a better foundation for budget planning and cost control, reducing the likelihood of cost overruns and supporting the overall success of the project.

VI. Poor tendering documents:

Tendering, or the bidding process, plays a significant role in construction projects by inviting subcontractors to participate. However, inadequate tendering documents have been identified as a root cause of cost overruns in several studies. This issue can be attributed to various factors:

- i. **Miscommunication between Contractor and Designer:** Lack of clear communication and understanding between the contractor and designer can result in incomplete or inaccurate tendering documents, leading to cost overruns.
- ii. **Insufficient Details and Lack of Coordination:** Inadequate details in working drawings and a lack of coordination among relevant parties can contribute to errors, conflicts, and changes during the construction phase, ultimately leading to cost overruns.
- iii. **Limited Human Resources in Design Firms:** Design firms with insufficient staffing levels may struggle to dedicate enough resources to produce comprehensive and accurate tendering documents, increasing the risk of cost overruns.
- iv. **Designer's Lack of Material and Equipment Knowledge:** When designers lack knowledge about available materials and equipment, it can lead to inappropriate or suboptimal choices in the tendering documents, resulting in cost overruns during construction.

Use of Incomplete Shop Drawings and Specifications: If the tendering documents include incomplete or inadequate shop drawings and specifications, it can create ambiguity and misinterpretation, leading to additional costs and delays.

VII. Poor material management:

Lack of proper material management in construction projects can lead to significant inefficiencies and financial losses. Some of the consequences include:

- i. **Waiting Time for Materials:** Inadequate planning or not knowing the availability of materials can result in delays as workers have to wait for the necessary materials to arrive. This waiting time can accumulate to as much as 80 minutes per day, reducing productivity and impacting project timelines.
- ii. **Lost Productivity:** Inefficient material management practices can cause disruptions and inefficiencies in the construction process. This can lead to lost productivity, as workers may need to pause or divert their attention to other tasks while waiting for materials, resulting in wasted time and resources.
- iii. **Increased Costs:** Inefficient material management can result in additional costs. For example, if materials are not properly stored and protected, they may get damaged or lost, requiring reordering and incurring additional expenses. Moreover, delays caused by material unavailability or mismanagement can lead to project extensions, which can result in increased labour costs, overhead expenses, and penalties.
- iv. **Inaccurate Project Budgeting:** Poor material management can make it challenging to accurately estimate and budget for construction projects. Unexpected material delays or increased costs due to inefficiencies can lead to budget overruns, affecting the financial viability of the project.

To address these issues, construction companies should prioritize effective material management practices. This includes:

- i. **Inventory Management:** Maintaining an accurate inventory of materials, tracking their availability, and implementing systems to ensure timely reordering when necessary.
- ii. **Supply Chain Coordination:** Establishing strong relationships with suppliers and coordinating deliveries to ensure materials are available when needed, reducing waiting time.
- iii. **Planning and Forecasting:** Conducting thorough project planning and forecasting to anticipate material requirements, allowing for timely procurement and minimizing delays.
- iv. **Communication and Collaboration:** Encouraging open communication and collaboration among project stakeholders, including designers, contractors, and suppliers, to ensure everyone is aware of material needs and timelines.

By implementing effective material management strategies, construction projects can reduce waiting times, improve productivity, minimize financial losses, and enhance overall project efficiency.

The data analysis and discussion of results focused on identifying the factors contributing to cost overruns in construction projects. The relative importance index (RII) was calculated for each factor based on the weighting given by respondents using a scale from 1 to 5, with 1 indicating insignificance and 5 indicating extreme significance.

The RII formula was employed to determine the importance of each factor

$$\sum W / A \times N$$

Where:

W: Weighting given to each factor by the respondents and ranges from 1 to 5 where '1' is 'not significant' and '5' is 'extremely significant'.

A = Highest weight (i.e., 5 in this case)

N = Total number of respondents

The summary of the cost overrun factors and their respective RII values is presented in the below Table. The RII values for different groups of respondents, including owners / Clients, contractors / Sub-Contractors, and the overall Values were calculated based on the weighting given by the respondents for different groups. This analysis and discussion of results provide valuable insights into the most significant factors contributing to cost overruns in construction projects. The findings can help stakeholders and decision-makers in the construction industry prioritize their efforts in addressing these factors to improve cost control and project performance.

SR NO	FACTORS OF COST OVERRUN	OVERALL	
		RII	RANK
1	Material shortage	0.678	1
2	Shortage of labor	0.631	2
3	Late delivery of materials and equipment	0.595	3
4	Unavailability of competent staff	0.566	4
5	Low productivity level of labors	0.541	5
6	Quality of equipment and raw material	0.541	5
7	Delay in progress payment	0.538	6
8	Financial difficulties by contractor	0.533	7
9	Poor site management	0.526	8
10	Escalation and fluctuation of material prices	0.523	9
11	Poor communication and coordination by owner and other parties	0.520	10

Case Study: Analysis of the Projects in World Wide.

The construction industry operates within a rapidly changing global business environment, playing a vital role in employment and a country's economy. However, project cost overruns pose a significant challenge in the industry, leading to delays and increased costs during project execution. Developing countries face particular difficulties with project overruns due to uncertainties in implementation, resulting in the wastage of financial resources and higher construction costs. Given globalization and technology-driven economic growth worldwide, a scientific and systematic approach to project management is crucial to achieving project objectives within the constraints of time and resources. To investigate the factors influencing cost overruns in construction projects, a data analysis was prepared and feedback was obtained from professionals in the construction industry.

The analysis focused on the occurrence of cost overruns in construction projects. It was found that cost overruns are a prevalent issue, with a significant percentage of projects exceeding their Value costs. The analysis revealed that in 2022 approximately the total no of 12,206 construction projects in – the Infrastructure Sector with Values of 24,681.20 billion U.S dollars experienced cost overruns globally with a value of 10,457.01 billion U.S dollars

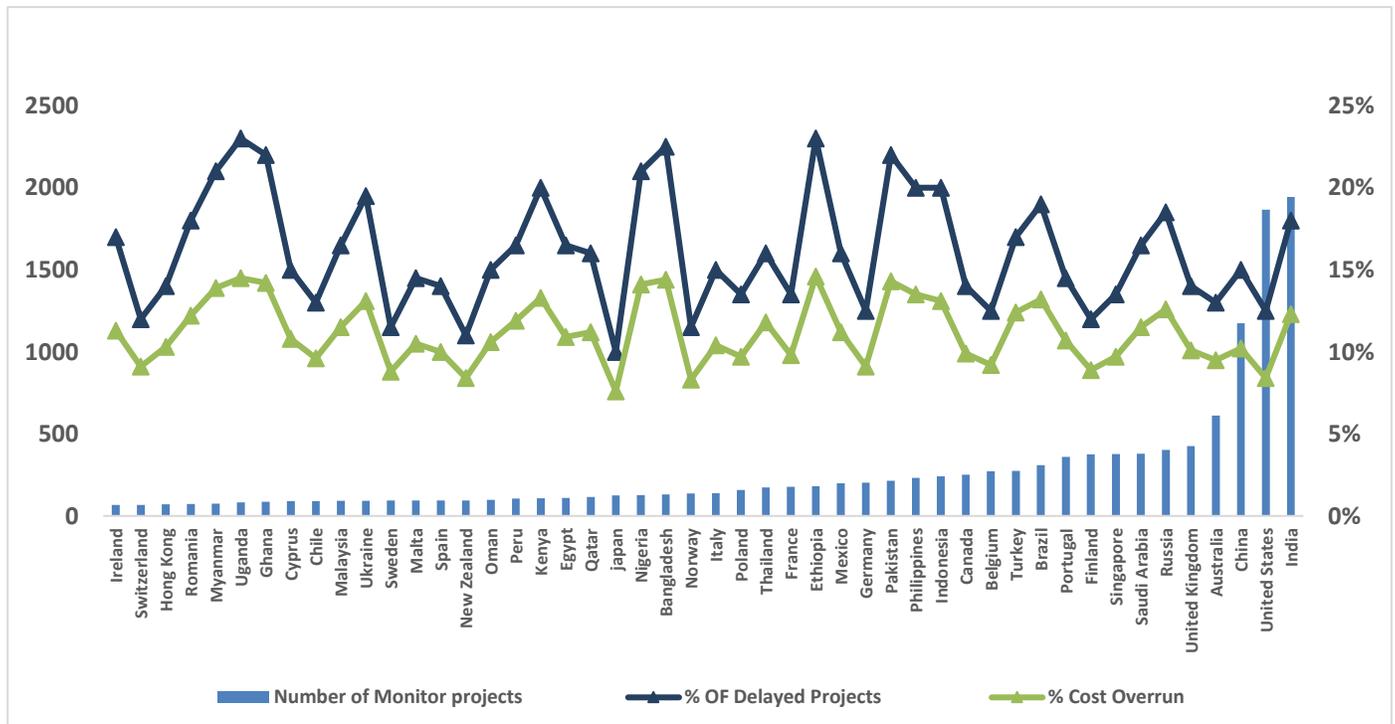


Figure 1: Trend of Delay & Cost Overrun in Construction Projects - Infrastructure world Wide - 2022

Looking also at the Previous years and Studies we can get that Even developed countries are not spared from the problem of construction delays for example:

- Ansar et al. (2016) examined 65 projects in rich democracies and found an average schedule overrun of 42.7%. The research indicates that delays have been extensively studied, but few studies have focused on specific factors.

- Marzouk et al. (2008) conducted a study on engineering-related delays in Egypt, identifying 22 factors across categories such as design development, workshop drawing supervision, workshop drawing approval, and project parties' changes. Critical factors of delay included mistakes/changes in design documents, delays in responding to contractor queries by the employer, and delays in drawing preparation by the contractor due to resource and management issues.
- Rahman et al. (2009) investigated financial-related factors contributing to project delays in Malaysia, highlighting late payment, poor cash flow management, insufficient financial resources, and financial market instability as significant factors.
- Yang and Wei (2010) identified changes in client requirements, poor scope definition, unreasonable initial plans, change orders by clients, and project complexity as the main causes of delay in the planning and design phases of construction projects in Taiwan.
- Semple et al. (1971) examined contractor and subcontractor claims in Canada and found that delays in several cases exceeded the original contract duration by over 100%.
- Bromilow (1974) observed that only one-eighth of building projects in Australia were completed on time, with average time overruns exceeding 40%.
- In the UK, Bordoli and Baldwin (1998) reported an average time overrun of 23.2% for government construction projects during the period of 1993-1994.
- Ellis and Thomas (2002) conducted a study on the root causes of delays in highway projects in the USA and found an average time overrun of 272 days or 25% of the contract duration across 150 projects.

These studies highlight the widespread issue of schedule overruns and the various factors contributing to project delays in different countries. Understanding these causes can help industry professionals and decision-makers address the underlying issues and implement effective measures to mitigate delays in construction projects.

CONCLUSION.

Numerous studies and reports consistently reveal alarming statistics regarding cost overruns and delays in construction projects. The data speaks for itself: In study after study and report after report, it has been found that a staggering 98% of construction projects experience cost overruns or delays.

Rising costs and expanding budgets are widespread issues in the construction industry, with as many as 9 out of 10 projects encountering cost overruns. Another study shows that a staggering 92% of construction projects go over budget, and only a mere 8% of projects are completed within the initially specified contract duration.

These statistics highlight the significant challenges faced by the construction industry, indicating the need for improved project management, better cost estimation, and enhanced efficiency to mitigate the frequency and severity of cost overruns and delays.

The study focused on identifying and analysing the causes of cost overruns in the construction industry Globally. The factors identified as contributing to cost overruns include material shortage, labor shortage, late delivery of materials and equipment, unavailability of competent staff, low productivity levels of labor, and issues related to the quality of equipment and raw materials.

To achieve effective cost control in construction projects, adopting strategies such as material management, resource planning and management, and proper financial management. These measures can help mitigate cost overruns and ensure more efficient project development.

The study also emphasized the importance of using data Analysis different methods to analyze and understand the variables that explain the occurrence or non-occurrence of cost overruns in construction projects. By utilizing statistical analysis, decision-makers can gain valuable insights into the factors that contribute to cost overruns, enabling them to make informed decisions and prevent delays, ultimately leading to the completion of projects according to the planned schedule.

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