EUROPEAN INTERNATIONAL UNIVERSITY

EIU Journal of Action Research

"Extension of Time Claim Management in Large Infrastructure Projects: A Case Study of the Vashi Truck Terminal, Navi Mumbai, India."

Abstract

Construction projects frequently encounter delays arising from unforeseen circumstances such as design modifications, engineering failures, material shortages, and supply chain disruptions. Effective management of such delays is essential in large-scale infrastructure projects to maintain schedule performance and control project costs.

This paper presents a case study on the management of Extension of Time (EoT) claims in the Vashi Truck Terminal project located in Navi Mumbai, India. The project represents a significant public infrastructure initiative aimed at improving logistics and freight operations in the region. Due to the involvement of multiple stakeholders and the technical complexity of the project, several delay events occurred during execution.

The project commenced on 19 December 2020 with an original completion date of 15 March 2024. The project experienced significant delays due to multiple factors, including failures in the initial piling system, structural redesign, changes in building configuration, and supply chain constraints affecting construction materials. These issues necessitated re-engineering works, including re-excavation and re-piling, along with revisions to the structural and mechanical systems.

As a result, the contractor submitted Extension of Time claims to address the schedule impacts caused by these delay events. Following detailed delay analysis and evaluation of the associated technical and contractual factors, the project completion date was revised to 30 December 2025.

This study examines the causes of delay, the process of EoT claim assessment, and the financial implications associated with project prolongation. The findings highlight the importance of systematic delay analysis, effective contract administration, and proactive project management in mitigating the impact of unforeseen technical challenges in complex infrastructure projects.

1. **Introduction**

Construction projects frequently experience delays due to design changes, technical failures, procurement issues, and administrative constraints. These delays can significantly affect project completion timelines and often require contractors to submit Extension of Time (EoT) claims to avoid liability for liquidated damages.

However, substantiating EoT claims in complex infrastructure projects remains challenging because delay events must be clearly linked to contractual entitlements and demonstrated through reliable schedule analysis.

This research examines the Vashi Truck Terminal Project in Navi Mumbai, a large-scale infrastructure and residential development involving multiple stakeholders and significant technical challenges, including piling failures, design revisions, and material shortages.

1.1 Research Problem

Many construction projects encounter difficulties in substantiating EoT claims due to inadequate documentation, weak delay analysis, and unclear contractual interpretation. Despite established contractual frameworks and delay analysis techniques, contractors often struggle to effectively substantiate EoT claims in complex projects with multiple concurrent delays and design changes**.**

1.2 Research Aim

The aim of this study is to analyse how Extension of Time (EoT) claims can be effectively substantiated in large-scale construction projects using delay analysis techniques and contractual frameworks.

1.3 Research Objectives

1. To examine the causes of project delays in the Vashi Truck Terminal project.
2. To evaluate the effectiveness of **Time Impact Analysis (TIA)** in substantiating EoT claims.
3. To analyse the role of documentation, stakeholder coordination, and project controls in supporting delay claims.
4. To identify key lessons for improving delay management practices in complex construction projects.

1.4 Research Gap Although extensive research exists on delay analysis techniques and contractual mechanisms, limited research focuses on the practical challenges of substantiating EoT claims in complex public infrastructure involving multiple concurrent delays**.** projects involving multiple design changes and technical failures. This study addresses this gap through an analytical case study.

2. Literature Review

2.1 Construction Delays in Large Infrastructure Projects

Delays are a persistent and critical issue in construction projects, particularly in large-scale public infrastructure developments characterised by technical complexity, multiple stakeholders, and evolving design requirements. Previous studies have identified a wide range of delay causes, including design changes, material shortages, labour constraints, and regulatory approvals (Arditi and Pattanakitchamroon, 2006; Akhund et al., 2017). In addition, research by Shrestha et al. (2013) highlights that public sector projects are more susceptible to schedule overruns due to administrative inefficiencies and complex approval mechanisms.

More recent studies emphasise that delays in infrastructure projects are rarely attributable to single causes; rather, they arise from interdependent and overlapping factors, including design revisions, procurement disruptions, and stakeholder coordination challenges (Doloi et al., 2012; Love et al., 2016). This multi-causal nature of delays introduces significant challenges in delay attribution, particularly when multiple delay events occur simultaneously or sequentially over the project lifecycle. In such contexts, delay management extends beyond operational control and becomes a matter of contractual substantiation, requiring clear evidence linking delay events to impacts on project completion. This highlights the importance of structured delay analysis methodologies capable of demonstrating causation and entitlement in a defensible manner.

2.2 Delay Analysis Methods and Rationale for Selection

Several delay analysis techniques are used to evaluate project delays, including:

- As-Planned vs As-Built analysis
- Impacted As-Planned analysis
- Time Impact Analysis (TIA)
- Window analysis

Method	Key Advantage	Limitation
As-Planned vs As-Built	Simplicity	Weak in complex delays
Impacted As-Planned	Forward simulation	Ignores actual progress
Time Impact Analysis (TIA)	Strong causation logic	Depends on baseline quality
Window Analysis	High accuracy (retrospective)	Data-intensive

A range of delay analysis techniques have been developed to evaluate schedule impacts, including As-Planned vs As-Built, Impacted As-Planned, Time Impact Analysis (TIA), and Window Analysis (Keane and Caletka, 2015). The selection of an appropriate method depends on project complexity, data availability, and contractual context (Arditi and Pattanakitchamroon, 2006).

Time Impact Analysis (TIA) is widely recommended for prospective delay analysis due to its ability to establish cause–effect relationships by inserting delay events into the baseline schedule and recalculating their impact on the critical path (Society of Construction Law, 2017). However, its effectiveness depends on the availability of reliable baseline programmes and contemporaneous updates (Braimah, 2013). In contrast, Window Analysis is often considered more robust for retrospective claims, as it evaluates actual project performance over discrete time periods. Nevertheless, it requires extensive data and is computationally intensive, limiting its applicability in fast-paced project environments.

In the context of this study, Time Impact Analysis (TIA) was selected as the primary analytical method due to:

- Availability of a structured Primavera P6 baseline and updated schedules
- Presence of identifiable delay events suitable for fragnet insertion
- Requirement to demonstrate incremental delay impact for EoT substantiation

This methodological choice aligns with the project's need to establish defensible causation between delay events and project completion, rather than relying solely on retrospective comparisons.

2.3 FIDIC Contract Clauses and Extension of Time

Under standard construction contracts such as **FIDIC (2017)**, contractors may be entitled to an Extension of Time when delays arise due to employer-related events, variations, or unforeseeable conditions.

Key contractual provisions typically include:

- Notice requirements for delay events
- Demonstration of critical path impact
- Evidence of causation between delay and project completion

Clause 8.4 – Extension of Time for Completion

This clause provides entitlement to additional time where delays arise due to:

- variations
- unforeseeable conditions
- delays caused by authorities
- employer-related disruptions

Key provisions include:

Failure to properly substantiate delays often leads to disputes between contractors and clients.

2.4 Concurrent Delay Theory

Concurrent delay represents a major challenge in delay analysis, particularly in complex infrastructure projects where multiple delay events overlap. According to Keane and Caletka (2015), it is essential to distinguish between true concurrency, sequential delays, and float consumption.

The SCL Protocol (2017) suggests that where employer-related delays contribute to project delay, contractors may be entitled to time extensions, even in the presence of concurrent contractor delays. However, the practical application of concurrency analysis remains challenging due to:

- Overlapping delay events
- Ambiguity in responsibility allocation
- Variability in contractual interpretation

In the VTT project, multiple delay events—including piling failure, design changes, and procurement delays—occurred in overlapping timeframes. This required a structured analytical approach combining:

- Chronological mapping of delay events
- Critical path analysis
- Time Impact Analysis (TIA)

to distinguish between delays affecting the critical path and those that did not materially impact project completion.

2.5 Integration of Delay Analysis with Documentary Evidence

While delay analysis methods provide a technical basis for evaluating schedule impacts, their reliability depends on the quality and consistency of supporting project records. The SCL Delay and Disruption Protocol emphasises the importance of:

- Reliable baseline schedules
- Comprehensive project documentation
- Transparent analytical procedures

However, existing literature provides limited guidance on how multiple data sources should be systematically integrated to validate delay events. To address this limitation, this study adopts a **documentary triangulation approach**, where delay events are validated through cross-verification across:

- Schedule data (Primavera P6)
- Technical records (design changes, failure reports)
- Contractual documentation (EoT notices, correspondence)

This approach ensures that delay attribution is supported by consistent and multi-source evidence, enhancing the credibility of the analysis. In the VTT case study, this triangulation process enabled the validation of key delay events such as piling redesign, design revisions, and material shortages, ensuring that only evidence-backed delays were included in the Time Impact Analysis.

3. Methodology and Research Rigor

This study adopts an analytical case study research design to examine the substantiation of Extension of Time claims in a real construction project.

3.1 Research Approach

The research uses a qualitative documentary analysis approach combined with project schedule analysis. Case study research is appropriate for investigating complex phenomena within their real-world context.

3.2 Data Sources

The analysis is based on project documentation including:

- Baseline and revised project schedules
- Primavera P6 delay analysis
- Progress reports
- contractor records
- cost and resource allocation data
- stakeholder communication records

3.3 Document Analysis Procedure

The document analysis followed a structured process:

1. **Data Screening**
   Identification of relevant documents linked to delay events and schedule changes.
2. **Chronological Mapping**
   All delay-related events were mapped against the project timeline to establish sequence and overlap.
3. **Critical Path Identification**
   Using Primavera P6, critical activities were identified to assess which delays impacted project completion.
4. **Cause–Effect Linking**
   Each delay event was analysed to establish a causal relationship between the event and its impact on the critical path.
5. **Cross-Verification**
   Data from schedules, reports, and correspondence were cross-checked to ensure consistency and accuracy.

Delay events were selected based on the following criteria:

- Impact on Critical Path (primary selection criterion)
- Contractual relevance under FIDIC Clause 8.4
- Availability of supporting documentation
- Significance in terms of time and cost impact

Based on these criteria, the following key delay events were analysed:

- Piling redesign and structural failure
- Design revisions (increase from 20 to 24 floors)
- Material shortages and supply chain disruptions
- Revised construction methodology (parallel execution strategy)
- Administrative and approval delays

4. Case Study: Vashi Truck Terminal Project

4.1 Project Overview

The Vashi Truck Terminal project commenced on 19 December 2020 with an original completion date of 15 March 2024.
The project involves:

- *15* residential towers
- logistics infrastructure
- commercial areas
- supporting amenities

Table 1: Project Scope and Key Details

Project Name	**Vashi Truck Terminal, Navi Mumbai**
Start Date	19th December 2020
Original Completion	15th March 2024
Revised Completion	31st December 2025 (current EoT)
Total No. of Towers	15
Total No. of Units	3131 EWS Quarters
Non-Tower Area	602,161 sq. ft. (truck terminus, podium area, recreational space)
Estimated Cost	INR 683 Crores
Revised Cost	INR 720 Crores
Parking	777 four-wheelers, 110 two-wheelers
Amenities	Solar power, STP, UGT, OHT, lifts, CCTV surveillance, fitness centre

4.2 Project Scope and Key Details

The project involves constructing 15 high-rise residential towers, each with 24 floors. Initially planned for 20 floors, the design was revised during construction to accommodate more floors, increasing the overall height to 87 metres per tower. In addition to the residential quarters, the project includes extensive podium and terminus areas, which serves as logistical hubs for trucks and lorries transporting goods. The table below summarises the key project details:

4.3 Project Objectives:

1. **Increase in Residential Capacity:** The project's redesign expanded the total residential units to 3131 EWS quarters to meet the housing demand.
2. **Improved Logistics Functionality:** The truck terminus will act as a logistics hub for goods transportation, crucial for supply chain.
3. **Sustainability:** The project includes solar power, sewage treatment plants, and energy-efficient systems to reduce environmental impact.

4.4 Project Complexity and Stakeholders

The construction involved multiple stakeholders, including the City and Industrial Development Corporation of Maharashtra Ltd (CIDCO), the primary client, and several contractors, specialised agencies, design consultants, and government regulatory bodies.

4.5 Project Current stage

The project is currently in the third phase of the project management life cycle, specifically focusing on execution. The substructure work has been successfully completed, which includes piling and plinth beams for the towers, NTA, and infrastructure area. For the superstructure, 101 of the planned 403 slabs have been cast for the towers. Additionally, the parallel construction of non-tower areas like shops, and dormitories is ongoing.

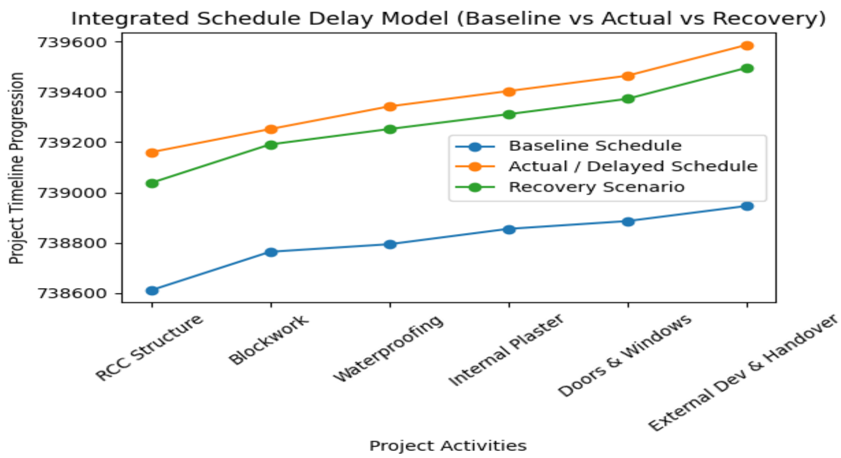
5. Depth of Technical and Analytical Discussion

5.1 Application of Critical Path Method (CPM)

Critical Path Method analysis identified activities directly affecting project completion.

Activity	Total Floors	Baseline Start	Baseline Finish	Revised Start	Revised Finish	Delay Impact
RCC Tower (Main & Core)	405	Dec 2020	Apr 2023	Dec 2020	Oct 2024	+21 Months
Blockwork	405	Jan 2022	Sep 2023	Jul 2023	Jan 2025	+16 Months
Waterproofing	405	Apr 2022	Oct 2023	Nov 2023	Apr 2025	+18 Months
Internal Plaster	405	May 2022	Dec 2023	Dec 2023	Jun 2025	+13 Months
Doors & Windows Installation	405	Jun 2023	Jan 2024	Feb 2024	Aug 2025	+20 Months
External Development & Handover	N/A	Jan 2024	Mar 2024	Sep 2024	Dec 2025	+21 Months

The analysis demonstrated that piling redesign activities significantly affected the critical path.



The recovery curve represents a **hypothetical accelerated schedule** achieved through mitigation measures such as:

- additional labour deployment
- extended working hours
- improved material procurement planning
- parallel execution of finishing works

5.2 Sample Data Triangulation and Analysis Chart

Delay Event	Data Source 1 (Technical)	Data Source 2 (Schedule)	Data Source 3 (Contractual)	Analysis Method	Outcome
Piling Failure & Redesign	Piling failure report, redesign drawings	Critical path shift in P6	EoT submission & client acknowledgment	TIA + CPM	+6 months delay
Design Revision (20→24 floors)	Revised drawings & approvals	Activity duration increase in schedule	Variation approval records	TIA	+4 months delay
Material Shortage	Site stock reports	Activity lag in procurement-linked tasks	Vendor communication	Impact analysis	+2 months delay
Revised Construction Method	Method statements	Parallel activity logic in P6	Internal approvals	TIA	+5 months delay
Approval & Admin Delays	Authority approvals	Delay in start milestones	Correspondence records	Timeline mapping	+4 months delay

5.3 Time Impact Analysis

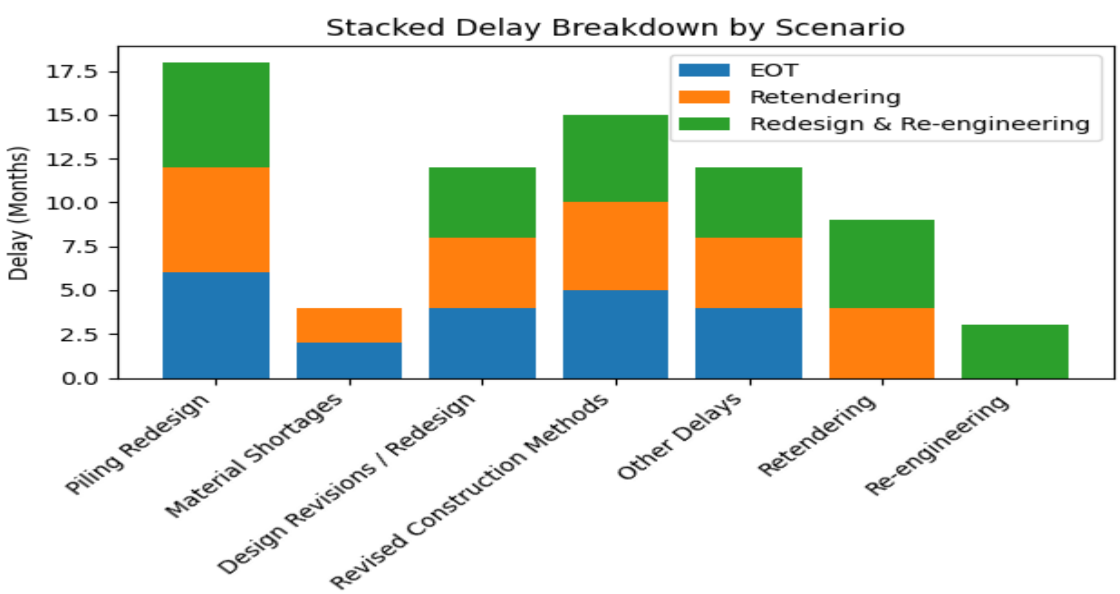
To account for the cumulative delays caused by piling failures and material shortages, Time Impact Analysis (TIA) was conducted using Primavera P6 to evaluate the impact of delay events on the project schedule. The analysis calculated a total EoT of 21 months, extending the project timeline to December 2025. Approvals for parallel work packages allowed concurrent execution in tower and non-tower areas, significantly reducing further delays and ensuring project milestones were realigned with the revised schedule.

Delays in the project arise, including design conflicts, permit approval challenges, and extended subcontractor qualification reviews, all of which disrupt project timelines and the planned sequence of activities. The complexity of delay events necessitates a well-maintained documentary control system Essential records—such as contractor estimates, internal management reports, timesheets, schedule updates, and labour allocation logs—are critical for demonstrating the causes and impacts of delays, mitigation measures undertaken by the project team.

EOT Vs Re Tendering Vs Re – Engineering Summary

Three alternative strategies were evaluated to address project delays:

- **Option 1: Extension of Time (EoT)**
  Continue with the existing contractor and resources with revised schedule.
- **Option 2: Re-tendering**
  Terminate/reassign packages and onboard new subcontractors.
- **Option 3: Re-engineering & Redesign**
  Modify design and execution strategy to optimise performance.



Delays caused by design revisions and piling redesign consumed the available float and eventually impacted the critical path, leading to the approval of a 21-month Extension of Time.

5.4 Comparative Analysis Table

Criteria	Option 1: EoT	Option 2: Re-tendering	Option 3: Re-engineering
Time Impact	+21 months	+25 months	+27 months
Cost Impact	Moderate increase	Additional tendering cost	High due to redesign & rework
Implementation Speed	Immediate continuation	Delayed (mobilisation time)	Delayed (design + approvals)
Risk Level	Low	Medium–High	High
Quality Risk	Controlled (existing team)	Risk due to new contractor	Improved but uncertain
Contractual Complexity	Low	High (termination/re-award issues)	High (variation claims)
Stakeholder Disruption	Minimal	Significant	Significant
Feasibility	High	Moderate	Low–Moderate

The comparative evaluation indicates that the Extension of Time (EoT) approach is the most viable and efficient strategy for managing delays in the Vashi Truck Terminal project. While alternative approaches such as re-tendering and re-engineering offer potential benefits in specific contexts, they introduce additional time delays, higher costs, and increased contractual complexity. The EoT approach ensures continuity of execution, minimises risk, and provides a contractually defensible mechanism for addressing delays arising from factors beyond the contractor's control.

5.5 Cost Variance Analysis – Vashi Truck Terminal Project

Table 1: Financial Assessment of the Vashi Truck Terminal Project

SL NO	ITEMS / DESCRIPTION	Original Project Cost (INR Cr)	Revised Project Cost (INR Cr)
	TOTAL PROJECT REVENUE	6,83	720
1	Redesigning		5.58
2	Re-Tendering		0.85
3	MEP Services		5.11
4	Re-excavation Re-Piling Work		9.49
	Re-engineering Costs		
5	Pile head removal		0.66
6	Additional Stub Column		0.41
7	Labour Cost		3.65
8	Material Cost		3.12
	Prolongation Costs		
9	Site Overhead		2.12
10	Fixed Finance Cost		2.96
11	Inflation & Escalation Cost		3.05

Cost Variance (CV)=Revised Cost−Original Cost

Description	Amount (INR Cr)
Original Project Cost	683
Revised Project Cost	720
Cost Variance	+37 Cr
Cost Variance	5.42 % increase

The financial assessment of the Vashi Truck Terminal project highlights the cost implications associated with delay events and technical redesign. The original project cost was estimated at INR 683 Crores, which increased to INR 720 Crores**,** representing an overall cost escalation of approximately **5.4%**.The project experienced a positive cost variance of INR 37 crore**,** primarily driven by design modifications, re-engineering requirements, and prolongation costs arising from project delays.The primary contributor to cost escalation was the re-excavation and re-piling work**,** which resulted from the structural failure of the original piling system and accounted for INR 9.49 Crores of additional expenditure.

Additional costs were also incurred due to project redesign, re-tendering of subcontract packages, and modifications to MEP services following the change in building height from 20 to 24 floors.

Re-engineering activities further increased project costs through additional labour, materials, and structural adjustments such as pile head removal and stub column extensions.

The delay in project completion also generated **prolongation costs**, including increased site overheads, financing charges, and inflation-related cost escalation. These costs collectively reflect the financial implications of schedule delays and highlight the importance of effective delay management and timely decision-making in complex construction projects.

The financial analysis supports the justification for the Extension of Time claim by demonstrating that many of the additional costs resulted from technical and design changes beyond the contractor’s control.

5.6 The Role of EoT Claims

Extension of Time (EoT) claims serve as a contractual mechanism to address delays beyond the contractor’s control. In this case, the piling failures and design conflicts necessitated the Contractor for the submission of EoT claims to extend the project timeline without incurring liquidated damages or penalties. The client, CIDCO, was highly invested in the timely completion of the project. The substantiation of the EoT claims presented significant challenges due to the complexity of delay events and stakeholder involvement.

Table 2: Roles and Responsibilities Overview	
Causes of Delay	**Details**
Design Conflicts	Delays in securing building permits from CIDCO (Client) and frequent design revisions affected progress.
Piling Failures	Structural issues with the piling system required redesign and re-engineering, halting progress.
Material Shortages	Supply chain disruptions delayed the delivery of critical materials such as concrete and steel.
Cost Overruns	The need for higher-grade materials and larger pile diameters led to budget escalations.

- ***Strategies for Successful EoT Claim for Vashi Truck Terminal Project***

  The successful Extension of Time (EoT) claim was achieved through structured project management practices, supported by comprehensive documentation and analysis This section outlines the key strategies employed to secure the EoT, supported by data from the project case study.

- ***Comprehensive Documentation of Delays***

  A critical factor in the success of the EoT claim was meticulous documentation of delays and their causes. The project faced delays from a structural failure in the piling system and design changes increasing the building height from 20 to 24 floors. This led to redesigning and re-engineering the piling system, extending the project timeline. Records, including timelines and cost reports, substantiated the claim that these delays were unavoidable.

- ***Critical Path Analysis and Real-Time Monitoring***

  The project team used Critical Path Analysis (CPA) and real-time monitoring tools like Primavera P6 and Earned Value Management (EVM) to assess delays' impact. CPA identified bottlenecks, and comparisons between baseline and actual schedules demonstrated how delays affected milestones. These tools provided data supporting the revised completion date of 31st December 2025.

- ***Proactive Stakeholder Coordination***

  Effective communication with stakeholders was key to securing the EoT claim. Regular meetings with the City and Industrial Development Corporation of Maharashtra Ltd (CIDCO) ensured transparency and collaboration, fostering trust. Presentations on delay analysis and cost management led to the claim's approval without dispute.

5.7 Comprehensive Evidence Supporting the Extension of Time Claim

The Vashi Truck Terminal project's EoT claim was substantiated by thorough documentation of delays and their impacts. Initially set for completion by 15th March 2024, the project faced significant setbacks due to piling failures and mid-project design

changes, leading to a revised completion date of 31st December 2025. Key issues included structural piling failure, which incurred additional costs of INR9.49 crores, and a height increase from 20 to 24 floors, complicating structural work and permitting. The project team employed effective cost control measures, reducing potential cost escalations by 15%. Tools like Primavera P6 were pivotal in illustrating delays' impact on the critical path, supporting the EoT claim and ensuring approval without disputes.
The following table summarises the critical data that supported the EoT claim:

Aspect	Details	Impact
Original Timeline	15th March 2024	Original planned completion date.
Revised Timeline	31st December 2025	EoT approved due to piling failures and design changes.
Piling Failure Costs	INR9.49 crores	Re-engineering, re-excavation, and re-backfilling costs caused by structural integrity issues.
Cost Overruns Mitigated	~15% reduction in projected overruns	Achieved through resource optimisation and supplier negotiations.
Design Changes	Increased tower height from 20 to 24 floors	Required structural modifications and re-approval processes, delaying progress.

Key Contributions to Project Success

The project achieved significant outcomes through the application of structured problem-solving, professional judgement, and analytical evaluation in managing delays, controlling costs, and coordinating stakeholders. Effective decision-making enabled the project team to address technical challenges arising from design modifications, piling failures, and construction sequencing constraints. By integrating schedule analysis, cost assessment, and stakeholder communication, the project team was able to maintain progress while minimizing potential disputes and financial impacts.

Successful Extension of Time (EoT) Claim Substantiation

Problem-solving and sound professional judgement played a critical role in substantiating the Extension of Time (EoT) claims. The project experienced complex delays primarily due to piling redesign, structural modifications, and re-engineering requirements. To address these issues, detailed analytical assessments were undertaken, including critical path analysis, schedule impact assessments, and cost evaluations.

Through systematic analysis of the project schedule and delay events, it was demonstrated that the delays were primarily attributable to factors beyond the contractor's control, including design revisions and technical failures in piling works. Comprehensive documentation, supported by revised construction schedules and financial assessments, was prepared to substantiate the EoT request.

The clear presentation of analytical evidence enabled the stakeholders to understand the delay impacts and approve the EoT claim without dispute. As a result, the project was able to continue execution without the imposition of delay penalties, while maintaining transparency and contractual compliance.

Cost Control and Budget Optimisation

During the delays caused by the redesign of the piling system, the project team applied structured problem-solving techniques to mitigate the financial impact on the project. Through value engineering and resource optimisation, resources were strategically reallocated to critical project areas to maintain construction progress. In addition, negotiations were undertaken with contractors and suppliers to obtain more competitive rates for materials and services. These decisions required careful professional judgement to balance cost reduction while ensuring that key construction activities continued without interruption. As a result, the project team was able to maintain budgetary control despite schedule disruptions.

Effective Stakeholder Coordination

In a project involving multiple stakeholders, including the client, consultants, contractors, and suppliers, effective communication and coordination were essential. Professional judgement was exercised by facilitating regular progress review meetings to ensure alignment among all project participants and to proactively address potential risks. By maintaining transparency in decision-making and encouraging collaborative discussions, potential conflicts were identified and resolved at an early stage. This approach helped create a cooperative working environment, enabling timely decision-making and supporting the continuous progress of the project.

Implementation of Robust Project Controls

The implementation of structured project control systems played a critical role in managing overall project performance. Project management tools such as Primavera P6 were utilised to monitor progress, analyse schedule performance, and identify potential delays. Through continuous monitoring of the critical path and key project milestones, corrective measures were implemented before issues escalated into major schedule disruptions. This proactive approach enabled the project team to maintain control over the project timeline and financial performance despite various technical and operational challenges.

Improved Execution Efficiency

Strategic adjustments were implemented to enhance execution efficiency and mitigate delays. Measures such as reducing slab casting cycles and reallocating construction resources helped accelerate critical construction activities. In addition, proactive procurement of additional formwork systems and tower cranes addressed material and equipment shortages, ensuring that productivity levels remained consistent throughout the project lifecycle. Effective coordination among stakeholders also facilitated faster approvals and minimised operational disruptions on site.

Navigating Challenges to Success: A Strategic Approach to Project Completion

The successful progression of the project was achieved through a combination of strategic problem-solving, effective stakeholder communication, and careful cost management. After identifying the root causes of delays, including piling failures and design modifications, a comprehensive Extension of Time (EoT) claim was prepared and supported with detailed documentation, including schedule analyses and technical justifications. This analytical approach enabled the approval of the EoT without dispute and allowed the project to continue without the imposition of delay penalties.

Simultaneously, cost control measures focused on value engineering, resource optimisation, and improved procurement strategies. Regular stakeholder coordination meetings ensured alignment among project participants and helped minimise potential conflicts. Furthermore, the utilisation of project management tools such as Primavera P6 enabled proactive monitoring of project progress and the implementation of timely corrective actions. Collectively, these strategies contributed to maintaining project momentum and supporting the successful delivery of the project despite significant technical and scheduling challenges.

6 . Conclusion

The **Vashi Truck Terminal** project in Navi Mumbai serves as a clear example of the complexities involved in large-scale construction and the critical role of effective project management. The project encountered numerous delays due to unforeseen technical and operational issues. including piling failures, design conflicts, and material shortages. These challenges led to two significant Extension of Time (EoT) claims, pushing the completion date to Dec 2025 Despite these setbacks, the project remains on track thanks to a structured and strategic approach to managing both time and cost overruns.

Effective Management of EoT Claims

One of the most significant achievements during the project was the successful substantiation of the **Extension of Time (EoT)** claims. Given the complexity of the delays, particularly those caused by the piling failures, it was essential to provide the client with clear, detailed justifications for the time extensions

The success of the EoT claims process underscores the importance of meticulous record-keeping, clear communication, and a deep understanding of both the technical and contractual aspects of the project. This strategic approach preserved the client-contractor relationship and allowed the project to proceed under revised timelines.

Cost Control and Budget Management

Alongside the EoT claims, managing the project's budget amid the delays was another critical achievement. Delays in construction projects often lead to increased costs, due to re-engineering as was the case with the redesign of the piling system. To mitigate the financial impact, Team implemented various cost-control measures, including value engineering and resource optimisation.

This proactive approach not only saved costs but also ensured that the project could continue without jeopardising its long-term financial viability.

Coordination and Communication with Stakeholders

Clear and consistent communication was essential to maintaining alignment among stakeholders, particularly when substantiating the EoT claims. The ability to keep all parties informed and engaged allowed for smoother approvals and minimised disputes. This demonstrated the value of robust communication strategies in complex, multi-stakeholder projects.

References

Arditi, D. and Pattanakitchamroon, T. (2006) *Selecting a delay analysis method in resolving construction claims.* International Journal of Project Management.

FIDIC (2017) *Conditions of Contract for Construction.* Geneva: International Federation of Consulting Engineers.

Keane, P. and Caletka, A. (2015) *Delay Analysis in Construction Contracts.* Oxford: Wiley-Blackwell.

Pickavance, K. (2010) *Delay and Disruption in Construction Contracts.* London: Sweet & Maxwell.

Society of Construction Law (2017) *Delay and Disruption Protocol.*

Braimah, N. (2013) *Construction delay analysis techniques – A review*. International Journal of Project Management, 31(4), pp.589–599.

Love, P.E.D., Sing, C.P., Wang, X. and Irani, Z. (2016) *Overruns in transportation*