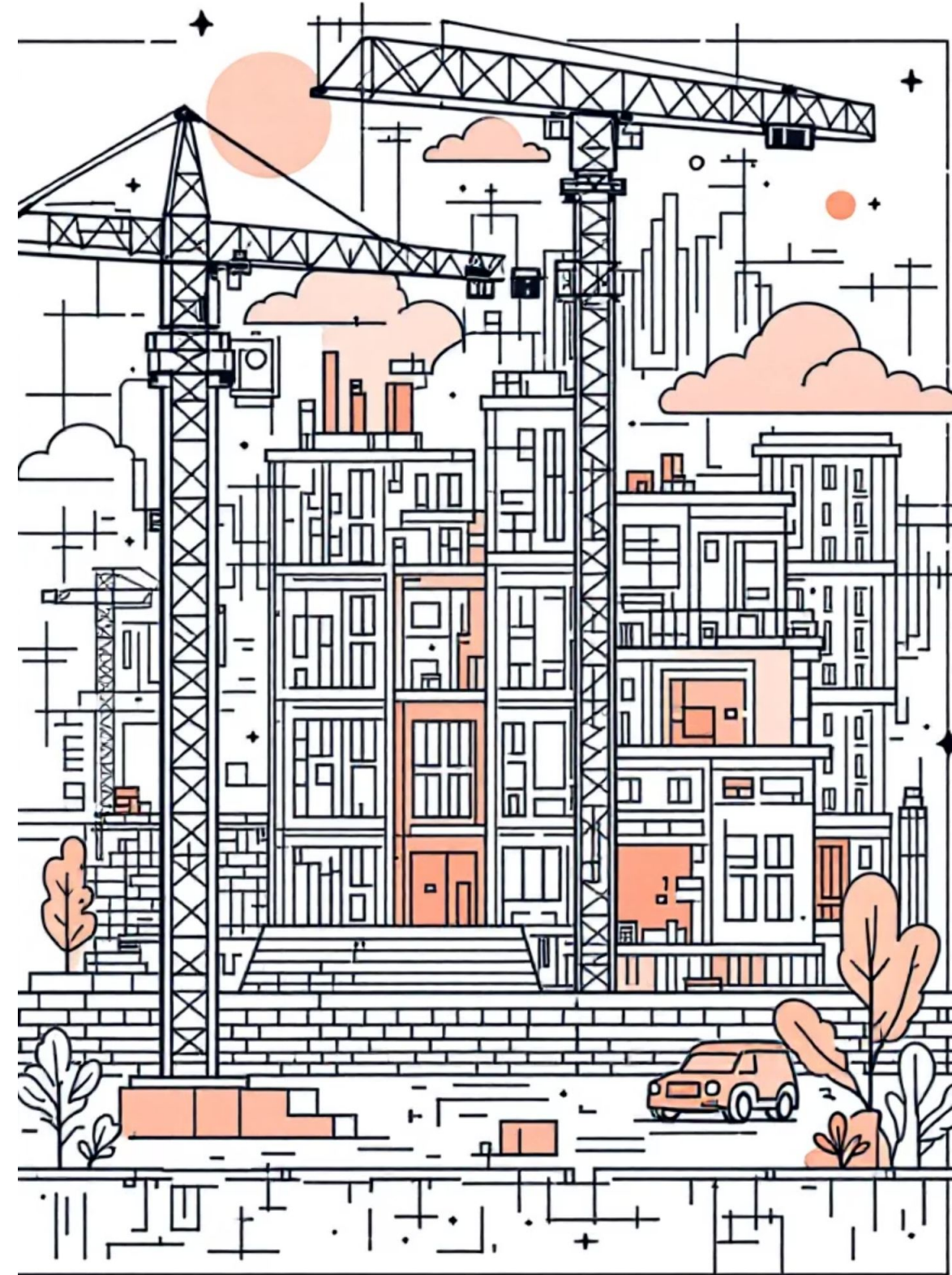# Cost Progression and Forecasting from Stage-Wise Billing Data in Public Infrastructure Projects

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Course: BDM Capstone Project

Project & Business Overview

Our project focuses on Taneja Vidyut Control Pvt. Ltd., a key player in large-scale public infrastructure.

We manage complex Civil & Electrical divisions within construction projects.

The core goal is to analyse stage-wise billing data to identify critical cost drivers and develop a predictive forecasting model for future project expenditures.

The Core Business Problem: Fragmented Financial Tracking

Fragmented Data
Financial tracking was scattered across numerous disconnected files, making comprehensive oversight impossible.

No Clear Cost Drivers
Without consolidated data, identifying the true cost drivers was a significant challenge.

Difficult Reconciliation
Reconciling financial discrepancies was a laborious and often inaccurate process.

Intuition Over Data
Forecasting relied on intuition rather than robust, data-driven insights, leading to potential inaccuracies.

Methodology & Data: Building a Single Source of Truth

Data Consolidation

We gathered 11 Running Account (RA) Bills (6 Civil, 5 Electrical), Recovery Sheets, Extra Item abstracts, and Bill Summaries, consolidating fragmented files into a "single source of truth."

Cost-Driver Analysis

Utilised Pareto Analysis to pinpoint the most significant cost contributors, focusing management attention on "the vital few."

Comparative Trend Analysis

Examined spending patterns across different divisions to understand financial progression over time.

Financial Data Integrity Audit

Conducted a thorough audit to validate the accuracy and reliability of all financial data.

Predictive Cost Forecasting

Implemented Linear Regression to develop a robust model for forecasting future project costs.

Methodology Justification: Precision in Analysis

Why Pareto 80/20?

Used the 80/20 rule, a standard business principle, to identify the 'vital few' items driving the majority of the cost. This focuses management attention on what truly matters.

Why Linear Regression for Civil?

Trend analysis showed Civil division's spending was strongly linear, making a simple, interpretable Linear Regression model the most appropriate choice.
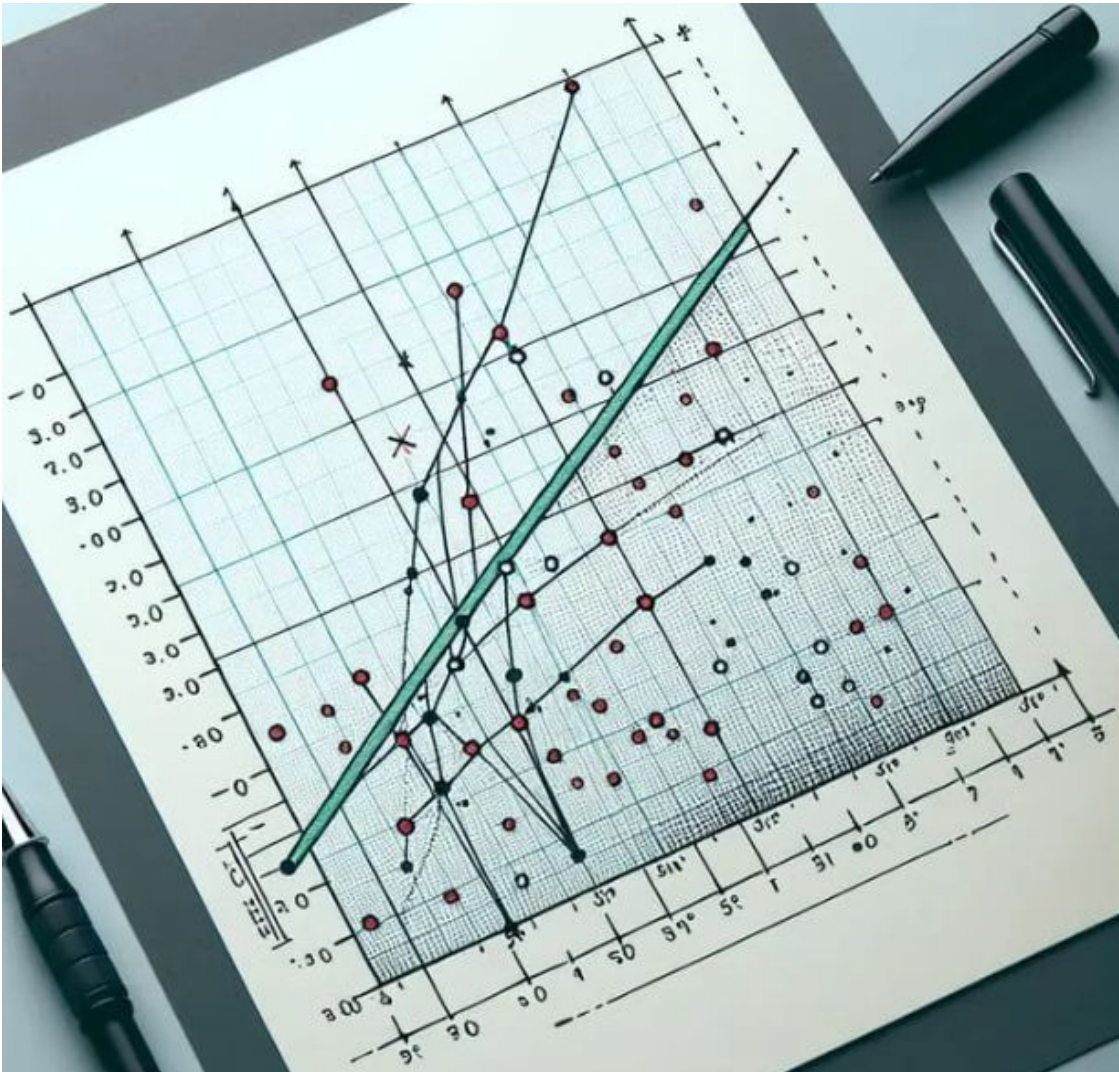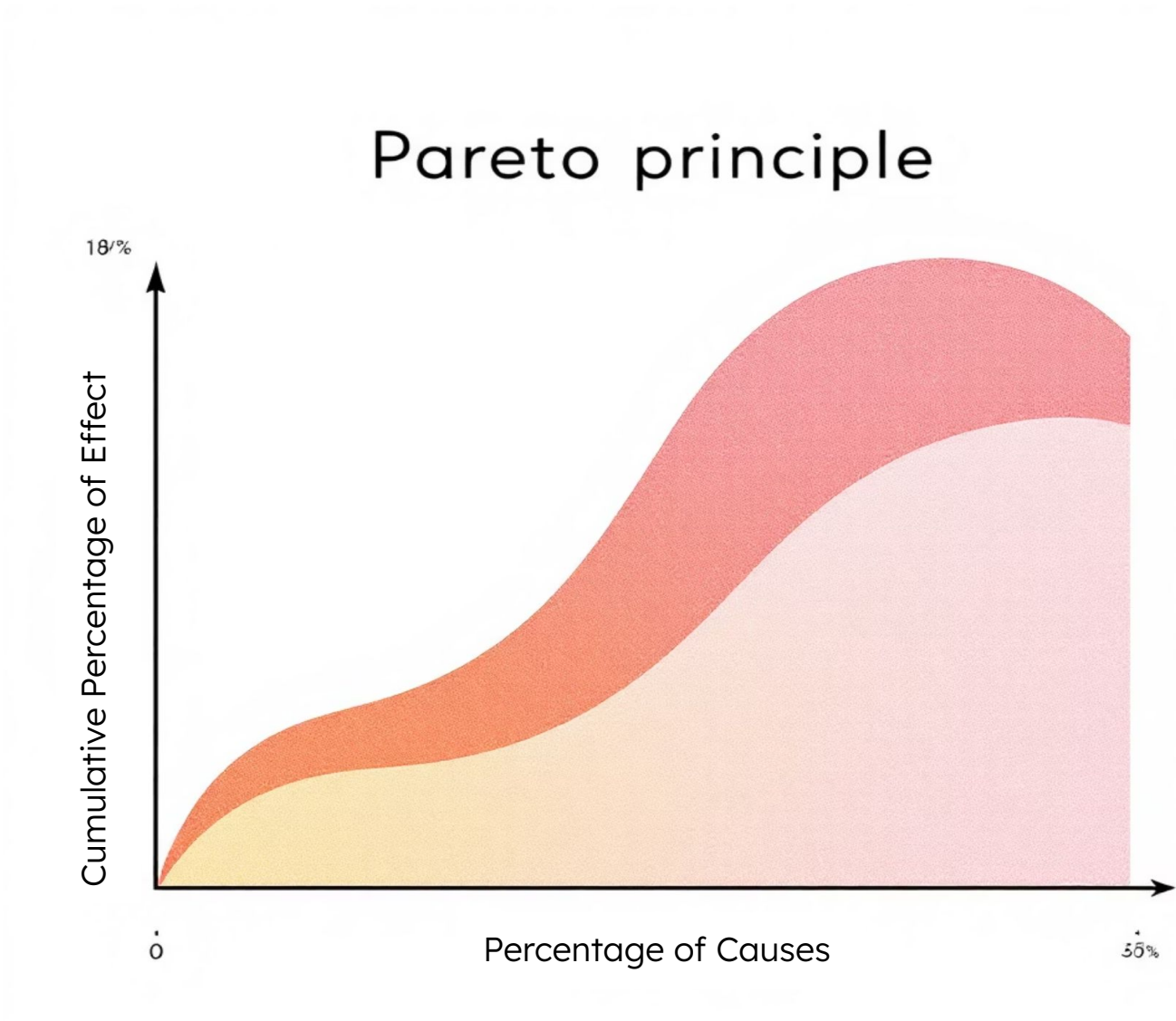
Finding 1: Project Costs Driven by a Few Key Items

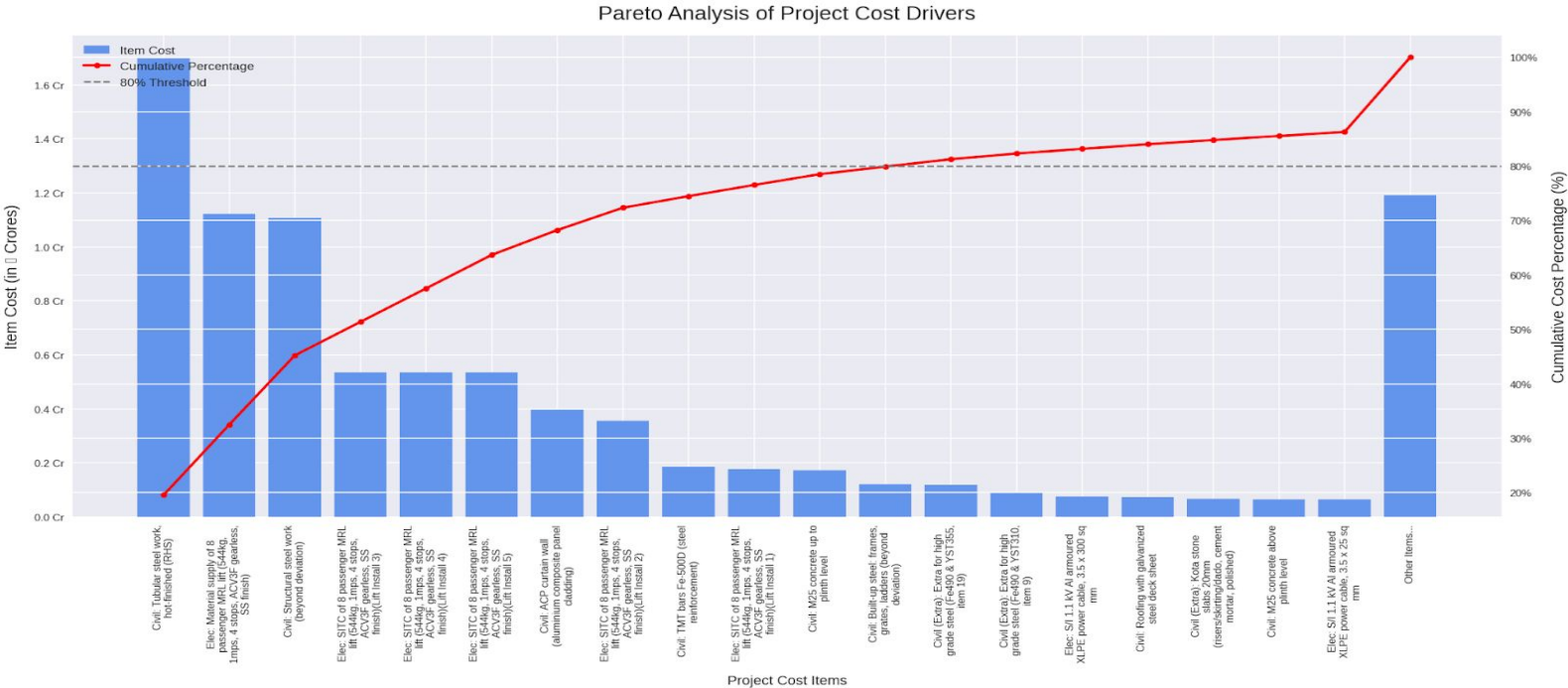The entire project's cost is driven by just 7 of 104 items.

Civil Tubular Steel
A major contributor.

MRL Lift Material
Significant impact on costs.

Civil Structural Steel
A core component of expenses.

Pareto Analysis of Project Cost Drivers

These top 3 items account for nearly 60% of the total cost.

The firm doesn't need to track 100 items; it needs to aggressively control these 7 critical items.

Finding 2: Asymmetrical Timelines & Cost Structure

Civil Division Costs

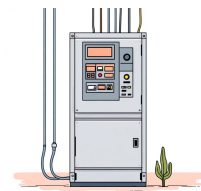Steel (Structural, Tubular, etc.) accounted for 73.8% (₹2.97 Cr) of the total ₹4.02 Cr Civil cost.

Spending demonstrated a steady ramp-up over time.

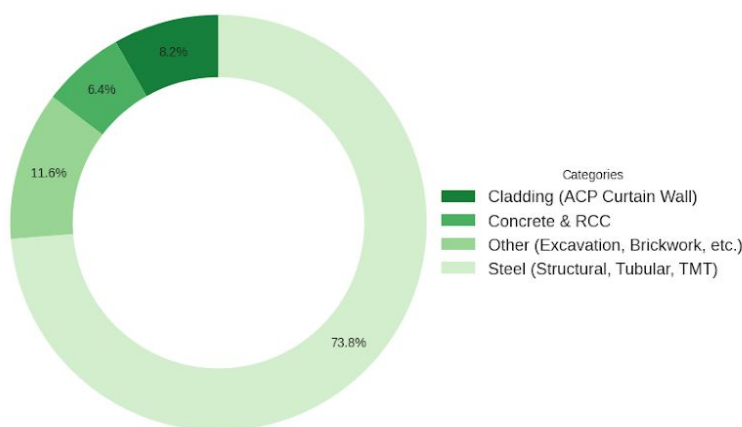## Electrical Division Costs

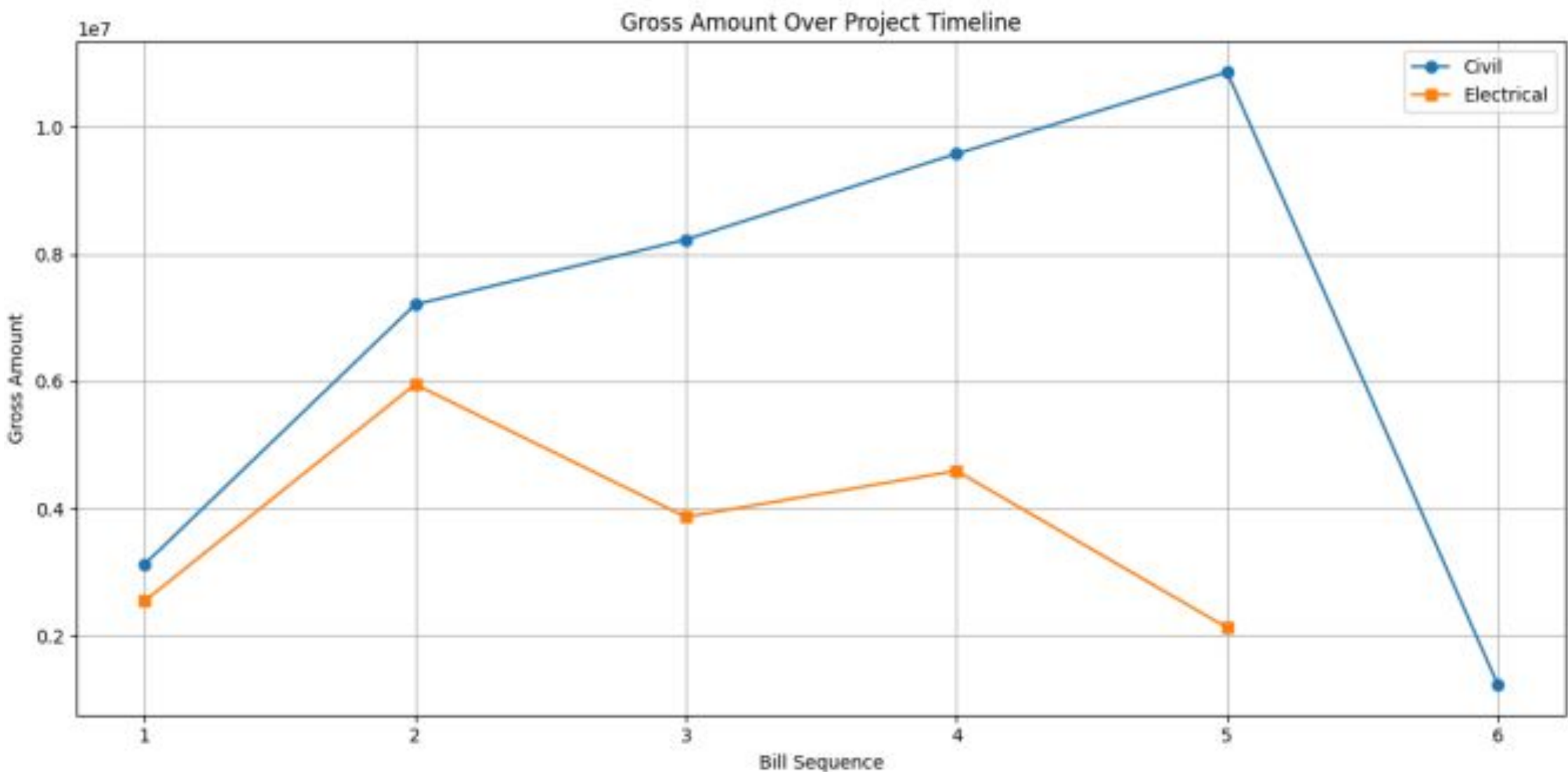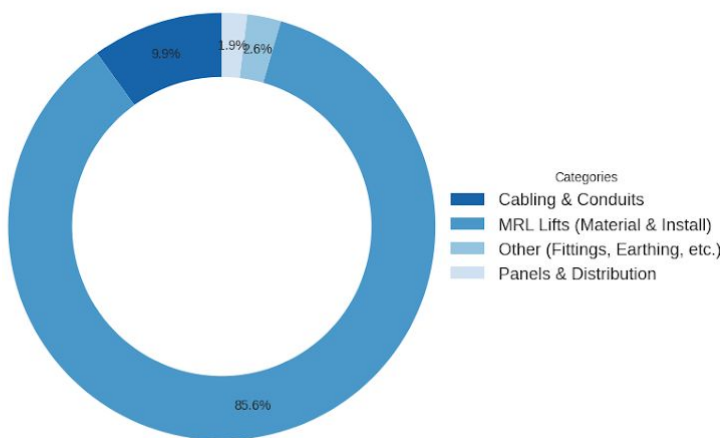MRL Lifts (Material & Install) dominated with 80.0% (₹1.53 Cr) of the total ₹1.91 Cr Electrical cost.

Spending was 'front-loaded' due to this significant one-time purchase.

Civil Final Cost Composition

Categories
- Cladding (ACP Curtain Wall)
- Concrete & RCC
- Other (Excavation, Brickwork, etc.)
- Steel (Structural, Tubular, TMT)

8.2%
6.4%
11.6%
73.8%

Electrical Final Cost Composition

Categories
- Cabling & Conduits
- MRL Lifts (Material & Install)
- Other (Fittings, Earthing, etc.)
- Panels & Distribution

9.9%
1.9% 2.6%
85.6%

Gross Amount Over Project Timeline
- Civil
- Electrical

Gross Amount
Bill Sequence

🔥 CRITICAL RISK: 100% Data Integrity Flaw 🔥

> "The firm's intermediate financial data was 100% unreliable."

The 'Reported' recovery value did not match the 'Calculated' value for any of the 5 Electrical bills. For instance, in the 3rd RA bill alone, there was a discrepancy of ₹8.75 Million.

This proves the 'fragmented system' is not just inefficient; it's a severe financial risk. Decisions are being made on mathematically incorrect data, leading to potential losses and misallocation of resources.
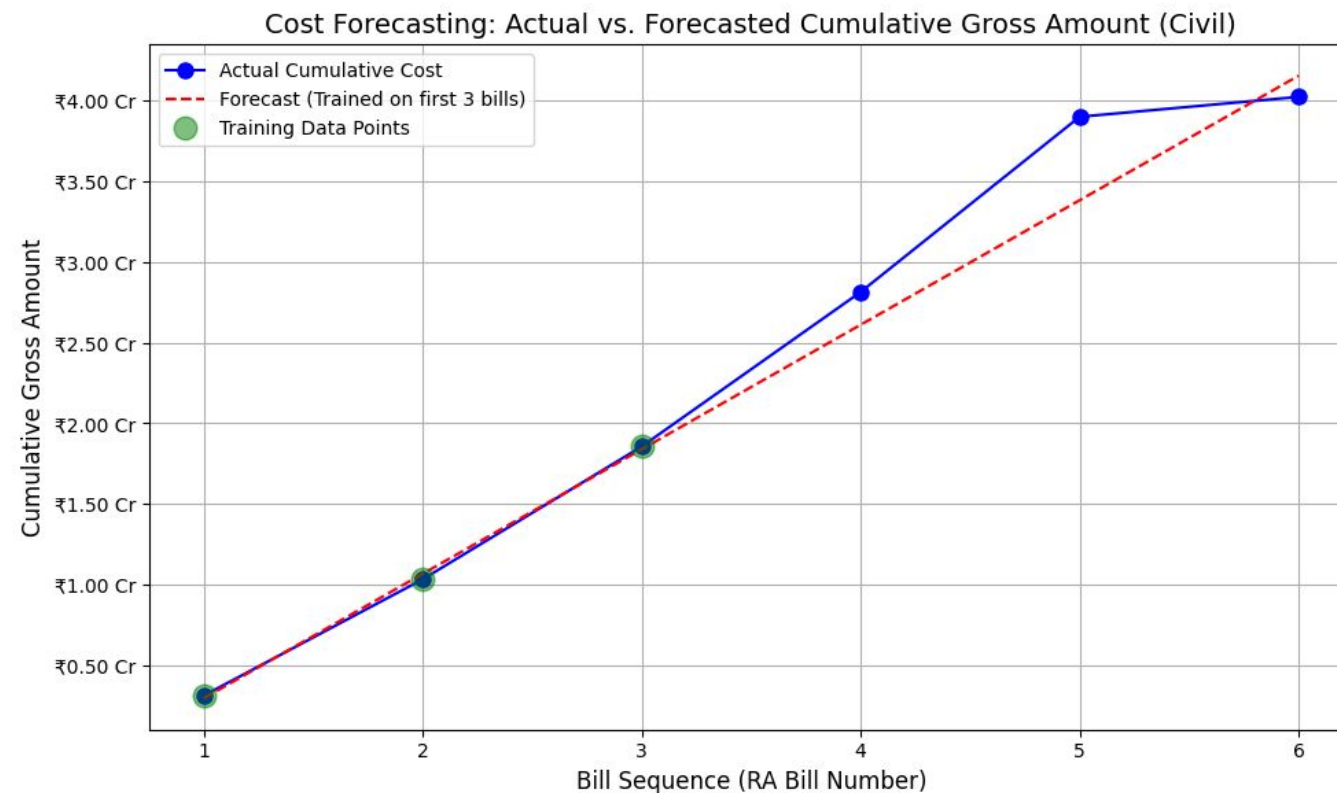
Finding 4: The Power of Forecasting

Predictable Civil Costs

The Final Civil Cost was 96.7% Predictable.

Early Accuracy

Using data from just the first 3 bills, our regression model accurately predicted the final ₹4.02 Cr cost.

This moves the firm from 'reactive guessing' to proactive, data-driven financial planning, enabling better budget allocation and risk management.

Cost Forecasting: Actual vs. Forecasted Cumulative Gross Amount (Civil)

Actionable Recommendations for Financial Control

Data Integrity Audit

Implement a Mandatory Data Integrity Audit for all bills before submission to address the 100% data integrity failure.

Key Item Cost Dashboard

Create a "Key Item Cost Dashboard" for leadership to monitor the 7 items driving 80% of costs in real-time.

Adopt Predictive Model

Integrate the Predictive Forecasting Model as a standard tool, to be run after the 3rd RA bill of every project.

These recommendations will transform fragmented data into a clear, actionable model for financial control, mitigating risk and enabling precise future predictions.