Project Cost Estimation

for

Retail and E-commerce: Demand Forecasting

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Project Cost Estimation using COCOMO Model

1. Introduction

The Constructive Cost Model (COCOMO) is used to estimate the effort, time, and personnel required for the Retail and E-commerce Demand Forecasting System. This estimation is based on the project's estimated size in thousands of lines of code (KLOC).

2. KLOC Breakdown by Module

Module	Description	Estimated KLOC
Frontend (UI/UX & Dashboard)	React.js/Angular-based dashboard for visualization.	10 KLOC
Backend (API & Business Logic)	Django/Flask-based backend, API handling, authentication.	12 KLOC
Machine Learning Module	Data preprocessing, model training (ARIMA, LSTM, etc.).	5 KLOC
Database & Data Management	PostgreSQL/MySQL-based database schema and integration.	5 KLOC
Inventory Management System	Stock updates, supplier ETA integration, order processing.	3 KLOC
Notifications & Alerts	Automated alerts for stockouts, supplier delays.	2 KLOC
Security & User Management	Authentication, RBAC (Role-Based Access Control).	3 KLOC
Total	Complete System Size	40 KLOC

3. COCOMO Model Formulas

The following formulas are used to estimate effort, time, and team size using the COCOMO model.

3.1 Effort Estimation (E in Person-Months)

Formula: $E = a \times (KLOC)^b$

Where:
- E = Effort in Person-Months (PM)
- a, b = Constants based on project mode
- KLOC = Estimated lines of code in thousands

3.2 Time Estimation (T in Months)

Formula: $T = c \times (E)^d$

3.3 Team Size Estimation (P in Number of Developers)

Formula: $P = E / T$

4. Applying COCOMO Model to This Project

Given: Estimated KLOC = 40 KLOC

4.1 Organic Mode Calculation

Effort (E) Calculation:
E = 2.4 × (40)^1.05 = 114.5 PM

Time (T) Calculation:
T = 2.5 × (114.5)^0.38 = 13.2 Months

Team Size (P) Calculation:
P = 114.5 / 13.2 = 9 Developers

4.2 Semi-Detached Mode Calculation

Effort (E) Calculation:
E = 3.0 × (40)^1.12 = 154.3 PM

Time (T) Calculation:
T = 2.5 × (154.3)^0.35 = 14.6 Months

Team Size (P) Calculation:
P = 154.3 / 14.6 = 11 Developers

4.3 Embedded Mode Calculation

Effort (E) Calculation:
E = 3.6 × (40)^1.20 = 228.8 PM

Time (T) Calculation:
T = 2.5 × (228.8)^0.32 = 16.8 Months

Team Size (P) Calculation:
P = 228.8 / 16.8 = 14 Developers

5. Summary Table

Mode	Effort (PM)	Time (Months)	Team Size
Organic	114.5	13.2	9
Semi-Detached	154.3	14.6	11
Embedded	228.8	16.8	14

6. Interpretation of Results

• Organic Mode: Suitable for small, simple projects with a highly experienced team.
• Semi-Detached Mode: Ideal for moderate-size projects with a mix of experienced and new developers.
• Embedded Mode: Required for large, complex, real-time systems with strict constraints.