Department of Computer Engineering

Academic Term: First Term 2023-24

Class: T.E /Computer Sem – V / Software Engineering

Practical No:	5
Title:	Estimating project cost using COCOMO Model
Date of Performance:	
Roll No:	9563
Team Members:	Sanika Patankar, Lisa Gonsalves, Eden Evelyn Charles

Rubrics for Evaluation:

Sr. No.	**Performance Indicator**	**Excellent**	**Good**	**Below Average**	**Total Score**
1	On time Completion & Submission (01)	01 (On Time)	NA	00 (Not On Time)	
2	Theory Understanding (02)	02 (Correct)	NA	01 (Tried)	
3	Content Quality (03)	01 (All used)	02 (Partial)	03 (Rarely allowed)	
4	Post Lab Questions (04)	04 (Done Well)	03 (Partially Correct)	02 (Submitted)	

Signature of the Teacher:

Sanika Patankar
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TE COMPS B

SE EXP 5: Estimating project cost using COCOMO Model

Aim: To estimate project cost using COCOMO Model for Placement Predictor.

Description

The table for constants for **Basic COCOMO mode**l is as follows:

E = a(KLOC)^{b}

Function Point of project : 78.1

for average LOC/FP for Java : 63

LOC = 63 x 78.1 = 4920

KLOC = 4920/1000 = 4.920

Software Project is taken to be **Organic** type

taking values of a = 2.4 and b = 1.05

substituting all values in the equation

E = 2.4(4.920)$^{1.05}$

= 2.4 x 5.327

= 12.784

Effort for basic COCOMO model = 12.784

D(Time) = c(E)^{d}

= 2.5 x (12.784)$^{0.38}$

= 2.5 x 2.63

D = 6.575

Average Staff Size : E/T = 12.784/6.575 = 2

For intermediate COCOMO model

E = a(KLOC)^b * (EAF)

COST DRIVERS:

Personal attributes:

Analyst Capability (ACAP) , Low = 1.19

Application Experience (AEXP), Nominal = 1.00

Software Engineering capability (PCAP), Low = 1.17

Experience using VM (VEXP), Nominal = 1.00

Programming language experience (LEXP), High = 0.95

Project attributes:

Applications of Software Eng Methods (MODP), Nominal = 1.00

Applications of Software Tools (TOOL), High = 0.91

Required Development Schedule (SCED), Nominal = 1.00

Product attributes:

Required Software reliability (RELY), HIgh= 1.15

Database size (DATA), High = 1.08

Product Complexity (CPLX), Very High = 1.30

Computer attributes:

Execution time constraints (TIME), High = 1.11

Main storage constraints (STOR), High = 1.06

Virtual Machine Volatility (VIRT), Nominal = 1.00

Required turnaround time (TURN), High = 1.07

Calculating EAF:

EAF = ACAP x AEXP x PCAP x VEXP x LEXP x MODP x TOOL x SCED x RELY x DATA x CPLX x TIME x STOR x VIRT x TURN)

= 1.19 x 1.00 x 1.17 x 1.00 x 0.95 x 1.00 x 0.91 x 1.00 x 1.15 x 1.08 x 1.30 x 1.11 x 1.06 x 1.00 x 1.07

EAF =2.446

Calculating E:

substituting values in the equation:

$E = 12.784 \times 2.446$

$\mathbf{E = 31.269}$

Effort for intermediate COCOMO model = 31.269

Time Required:

$D=c(E)^d$

$D= 2.5(31.269)^{0.38}$

$\mathbf{D= 9.24}$

Average Staff Size : E/T = 31.269/9.24 = 3

<u>For Detailed COCOMO model:</u>

$E_p = \mu_p * E$

$D_P = \tau_P * D$

It is a **Organic small** model

For Plan and Requirements:

$E_p = 0.06 \times 31.269 =$ **1.876**

$D_P = 0.10 \times 9.24 =$ **0.924**

For System Design:

$E_p = 0.16 \times 31.269 =$ **5.003**

$D_P =0.19 \times 9.24 =$ **1.755**

For Detailed Design:

$E_p = 0.26 \times 31.269 =$ **8.129**

$D_P =0.24 \times 9.24 =$ **2.217**

For Module Code and Test:

E_p = 0.42 x 31.269 = **13.132**

D_P =0.39 x 9.24 = **3.603**

For Integration and Test:

E_p = 0.16 x 31.269 = **5.003**

D_P =0.18 x 9.24 = **1.663**

POSTLABS:

a. Analyse the COCOMO model and its different modes (Organic, Semi-detached, Embedded) to determine the most suitable mode for a specific project type.
COCOMO (COnstructive COst MOdel) is a widely used software cost estimation model that aids in predicting the effort, time, and resources needed for software projects. It offers three modes: Organic, Semi-Detached, and Embedded, each suited to different project types:

1. Organic Mode is for small and simple projects with well-understood requirements, a small team, and low complexity. It's suitable for standalone applications or basic web apps.
2. Semi-Detached Mode fits medium-sized projects with moderate complexity, some interaction with external systems, and a moderately experienced team. Examples include e-commerce platforms and database applications.
3. Embedded Mode is ideal for large, complex projects involving significant integration, interdependencies, and potential regulatory requirements. It's used for projects like enterprise resource planning (ERP) systems and complex software products.

To choose the right mode:

- Assess your project's size, complexity, and requirements.
- Consider your development team's experience.
- Evaluate project environment stability and external interactions.
- Account for regulatory constraints.
- Select the most appropriate COCOMO mode that aligns with these characteristics.

COCOMO is a valuable estimation tool, but it's essential to use it in conjunction with other techniques and adapt it as the project evolves and more information becomes available.

b. Apply the COCOMO model to estimate the project cost and effort required for a given software development project.
The COCOMO (COnstructive COst MOdel) is a software cost estimation model that helps estimate the effort and cost for software development projects. To apply COCOMO, specific data and parameters are required.

In a simplified example for an e-commerce website project:

- Estimated Lines of Code (LOC) are 50,000.
- Development mode is assumed to be Semi-Detached.
- Cost per Person-Month is $10,000.

Using COCOMO II for Semi-Detached mode:

1. Effort (E) is calculated using the formula: E=2.5×(50,000)1.05E=2.5×(50,000)1.05 Result: Approximately 130 person-months of effort.
2. Project Duration is calculated based on effort and team size (5 developers): Duration(months)≈26monthsDuration(months)≈26months
3. Project Cost is calculated by multiplying effort by cost per person-month: Cost ≈ $1,300,000

So, for this e-commerce website project, COCOMO estimates approximately 130 person-months of effort, a duration of about 26 months with 5 developers, and a project cost of $1,300,000. It's important to note that this is a simplified example, and real-world COCOMO estimations involve more factors and a detailed project analysis. Uncertainties and variations also need consideration in practical estimations.

c. Evaluate the factors influencing COCOMO estimates, such as project size, personnel capabilities, and development tools, and their implications on project planning and scheduling.

COCOMO (COnstructive COst MOdel) is a widely used software cost estimation model that helps predict the effort, time, and resources required for a software project. Several key factors influence COCOMO estimates, and these factors have important implications for project planning and scheduling:

1. **Project Size**: Larger projects require more extensive planning, longer durations, and proper scope management to avoid cost and schedule overruns.
2. **Personnel Capabilities**: The skills and experience of the development team impact productivity, necessitating consideration in effort and timeline estimates.
3. **Development Tools**: Efficient tools and modern technologies can improve project efficiency. Project schedules should consider learning curves associated with new tools.
4. **Project Complexity**: Highly complex projects require detailed planning, more time for design and testing, and effective risk management.
5. **Project Environment**: Regulatory requirements, customer expectations, and the availability of existing assets affect effort and time estimation. Compliance with regulations and customer feedback should be integrated into the project schedule.

In conclusion, COCOMO estimates are influenced by various factors, and project planning and scheduling must account for these factors to create realistic and achievable project plans. Proper management of project size, personnel capabilities, development tools, project complexity, and the project environment can reduce the risk of cost overruns and project delays.