Department of Computer Engineering

Academic Term: First Term 2023-24

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

Practical No:	**5**
Title:	**Software Requirement Specification**
Date of Performance:	06/09/2023
Roll No:	9615
Team Members:	Emmanuel Gudinho(9609), Omkar Surve(9643), Soham Khochare(9615)

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)	03(All used)	02 (Partial)	01 (rarely followed)	
4	Post Lab Questions (04)	04(done well)	3 (Partially Correct)	2(submitted)	

Signature of the Teacher:

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Lab Experiment 05

Experiment Name: Estimating Project Cost Using COCOMO Model in Software Engineering

Objective: The objective of this lab experiment is to introduce students to the COCOMO (Constructive Cost Model) estimation technique for estimating software project cost and effort. Students will gain practical experience in using the COCOMO model to estimate the development effort, duration, and resources required for a sample software project.

Introduction: COCOMO is a widely used algorithmic cost estimation model in software engineering. It helps in quantifying the effort and resources needed for software development based on project size, complexity, and other factors.

Lab Experiment Overview:

1. Introduction to COCOMO Model: The lab session begins with an introduction to the COCOMO model, explaining the different versions (Basic, Intermediate, and Advanced) and their application in software cost estimation.
2. Defining the Sample Project: Students are provided with a sample software project along with its functional and non-functional requirements, complexity, and size metrics.
3. COCOMO Parameters: Students learn about the COCOMO model parameters, such as Effort Adjustment Factor (EAF), Scale Factors, and Cost Drivers, and how they influence the project's effort estimation.
4. Effort and Duration Estimation: Using the COCOMO model formula, students estimate the effort and duration required to complete the sample project based on the provided size and complexity metrics.
5. Resource Allocation: Students estimate the number of required resources, such as developers, testers, and project managers, based on the calculated effort and project duration.
6. Sensitivity Analysis: Students perform sensitivity analysis by varying the COCOMO parameters to observe their impact on the project cost estimation.
7. Conclusion and Reflection: Students discuss the significance of COCOMO in software project estimation and reflect on their experience in estimating project cost using the COCOMO model.

Learning Outcomes: By the end of this lab experiment, students are expected to:

- Understand the COCOMO model and its application in software cost estimation.
- Gain practical experience in using the COCOMO model to estimate effort, duration, and resources for a software project.
- Learn to consider various project factors and adjust COCOMO parameters for accurate cost estimation.
- Develop estimation skills for resource allocation and project planning.
- Appreciate the importance of data accuracy and project size metrics in project cost estimation.

Pre-Lab Preparations: Before the lab session, students should familiarize themselves with the COCOMO model, its parameters, and the cost estimation formula. They should also review the factors that influence the project's size and complexity.

Materials and Resources:

- Project brief and details for the sample software project
- COCOMO model guidelines and cost estimation formula
- Calculators or spreadsheet software for performing calculations

Conclusion: The lab experiment on estimating project cost using the COCOMO model provides students with practical insights into software cost estimation techniques. By applying the COCOMO model to a sample software project, students gain hands-on experience in assessing effort, duration, and resource requirements. The sensitivity analysis allows them to understand the impact of various factors on cost estimation. The lab experiment encourages students to use COCOMO in real-world scenarios, promoting informed decision-making in software project planning and resource allocation. Accurate cost estimation using COCOMO enhances project management and contributes to the successful execution of software engineering projects.

EXPERIMENT NUMBER 5

Estimating the project cost for developing a "Waste Management System" application. This app is designed to set up an efficient Waste Management System using Advanced Technology

Project Scope : The "Waste Management System" app aims to assist sanitation workers as well as general public in managing their waste. It will include features such as waste level detection, wet and dry waste seperator, and a website to see the results of the system.

COCOMO Model: Given the project's scope, we'll use the Intermediate COCOMO mode to account for the complexity and project-specific factors.

Size of the Software: To estimate the size, we can use function points (FP). Let's assume that the "Farmer Helper" app has a size of 1,200 function points.

Step 4: Identify Project-Specific Factors For this estimate, we'll consider various project-specific factors:

- **Product Attributes**:
  - Required software reliability: Moderate (R_moderate) = 1.10
  - Complexity of the product: High (R_high) = 1.21

1. Product

	Description	*Very Low*	*Low*	*Nominal*	*High*	*Very High*	*Extra High*
RELY	Required software reliability	0.75	0.88	1.00	1.15	1.40	-
DATA	Database size	-	0.94	1.00	1.08	1.16	-
CPLX	Product complexity	0.70	0.85	1.00	1.15	1.30	1.65

- **Personal Attributes**:
  - Analyst capability: Good (R_analyst) = 0.85
  - Programmer capability: Very Good (R_programmer) = 0.88
  - Team cohesion: Moderate (R_team) = 1.05

3. Personnel

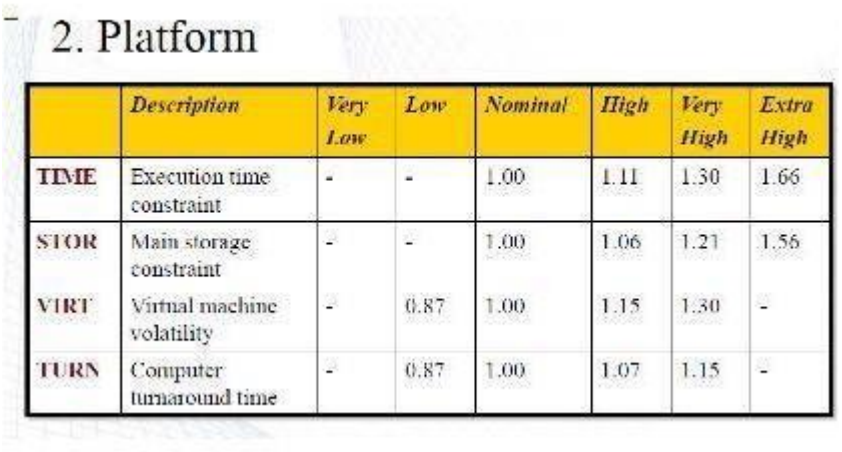
	Description	Very Low	Low	Nominal	High	Very High	Extra High
ACAP	Analyst capability	1.46	1.19	1.00	0.86	0.71	-
AEXP	Applications experience	1.29	1.13	1.00	0.91	0.82	-
PCAP	Programmer capability	1.42	1.17	1.00	0.86	0.70	-
VEXP	Virtual machine experience	1.21	1.10	1.00	0.90	-	-
LEXP	Language experience	1.14	1.07	1.00	0.95	-	-

- **Project Attributes**:
  - Development flexibility: High (R_flex) = 1.15
  - Risk management: Moderate (R_moderate) = 1.10
  - Process maturity: Moderate (R_moderate) = 1.10

4. Project

	Description	Very Low	Low	Nominal	High	Very High	Extra High
MODP	Modern programming practices	1.24	1.10	1.00	0.91	0.82	-
TOOL	Software Tools	1.24	1.10	1.00	0.91	0.83	-
SCED	Development Schedule	1.23	1.08	1.00	1.04	1.10	-

- **Platform Attributes**:
  - Database complexity: Moderate (R_moderate) = 1.10
  - Platform experience: Moderate (R_moderate) = 1.10



2. Platform

	Description	Very Low	Low	Nominal	High	Very High	Extra High
TIME	Execution time constraint	-	-	1.00	1.11	1.30	1.66
STOR	Main storage constraint	-	-	1.00	1.06	1.21	1.56
VIRT	Virtual machine volatility	-	0.87	1.00	1.15	1.30	-
TURN	Computer turnaround time	-	0.87	1.00	1.07	1.15	-

Step 5: Calculate Effort and Schedule We'll use the Intermediate COCOMO formulas for estimating effort (E) and schedule (S):

scss

```
Effort (E) = a * (Size)^b * ∏(Ri)
Schedule (S) = c * (Effort)^d
```

For a "semi detached" project type, we'll use typical constants:

- `a` = 3.0
- `b` = 1.12
- `c` = 2.5
- `d` = 0.35

Calculate `∏(Ri)`:

scss

```
∏(Ri) = R_moderate * R_high * R_analyst * R_programmer * R_team *
R_flex * R_moderate * R_moderate * R_moderate * R_moderate
∏(Ri) ≈ 1.10 * 1.21 * 0.85 * 0.88 * 1.05 * 1.15 * 1.10 * 1.10 * 1.10
* 1.10
∏(Ri) ≈ 1.92
```

Now, calculate Effort (E):

scss

```
Effort (E) = 3.0 * (1,200)^1.12 * 1.92
Effort (E) ≈ 5,149 Person-Months
```

Next, calculate Schedule (S):

scss

```
Schedule (S) = 2.5 * (5,149)^0.35
Schedule (S) ≈ 17.55 Months
```

Estimate Cost : Assuming your organisation's cost per person-month is $7,000:

bash

```
Cost = Effort * Cost per Person-Month
Cost = 5,149 * $7,000
Cost ≈ $36,043,000
```

So, the estimated cost of developing the "Waste Management System" app is approximately $36,043,000.Remember that this is a high-level estimate, and actual costs may vary based on many factors, including feature changes and market dynamics.