

NATIONAL INSTITUTE OF TECHNOLOGY SILCHAR

Cachar, Assam

B.Tech. Vth Sem

Subject Code: CS-304

Subject Name: Software Engineering

Submitted By:

Name : Subhojit Ghimire

Sch. Id. : 1912160

Branch : CSE – B

Q.1. Explain the types of COCOMO model. What are the advantage and disadvantage of COCOMO model? Suppose a project was estimated to be 30,000 LOC. (a, b) = (2.4, 1.05) and (c, d) = (2.5, 0.38) are the multiplicative and exponential factor for Intermediate Model COCOMO effort estimation eqn. and development time estimation eqn. Compute the Effort, development time, average staff size, and productivity of the project.

➔ The COCOMO has been categorised into three parts depending upon the complexity:

1. **The Basic COCOMO:** It computes the software development effort, time and cost as a function of program size. The program size is expressed in estimated Thousands of Source Line (KLOC). The formulas in use here are:

$$\text{EFFORT} = a_1 * (\text{KLOC})^{a_2} \text{ PM}$$

$$T_{\text{dev}} = b_1 * (\text{EFFORT})^{b_2} \text{ Months}$$

2. **The Intermediate COCOMO:** It computes the software development effort as function of program size and a set of “cost drivers” that include subjective assessment of product, hardware, personnel and project attributes. It uses set of 15 cost drivers. The formulas in use here are:

$$\text{EFFORT} = a_1 * (\text{KLOC})^{a_1} * \text{EAF PM}$$

$$T_{\text{dev}} = b_2 * (\text{EFFORT})^{b_2} \text{ Months}$$

where, EAF is Effort Adjustment Factor

3. **The Detailed/Complete COCOMO:** It was proposed to overcome the shortcomings and limitation of Basic and Intermediate COCOMO such as:
 - a. Considers a software product as a single homogenous entity.
 - b. Most large systems are made up of several smaller sub-systems.
 - c. Some sub-systems considered as organic type, some as embedded, etc.
 - d. For some sub-systems, the reliability requirements may be high and so on.

The Complete COCOMO incorporates all the characteristic of an intermediate version with an assessment of the cost driver's impact on each step (analysis, design etc.) of the software engineering process. It also considers the differences in the characteristics of all the subsystems and estimates the effort and development time as sum of the estimates for the individual subsystems.

Some of the pros and cons of COCOMO Model are:

PROS:

1. Easy to estimate the total cost of the project.
2. Easy to implement with various factors.
3. Provide ideas about historical projects.

CONS:

1. It ignores requirements, customer skills, and hardware issues.
2. It limits the accuracy of the software costs.
3. It mostly depends on time factors.

Suppose a project was estimated to be 30,000 LOC. $(a, b) = (2.4, 1.05)$ and $(c, d) = (2.5, 0.38)$ are the multiplicative and exponential factor for Intermediate Model COCOMO effort estimation eqn. and development time estimation eqn. Compute the Effort, development time, average staff size, and productivity of the project.

Given,

$$\begin{aligned} \text{LOC} &= 30\text{K} \Rightarrow \text{KLOC} = 30 \\ (a, b) &= (2.4, 1.05) \\ (c, d) &= (2.5, 0.38) \end{aligned}$$

We have,

$$\begin{aligned} \text{EFFORT} &= a * (\text{KLOC})^b && \text{PM} \\ &= 2.4 * (30)^{1.05} && \text{PM} \\ &= 85.34 && \text{PM} \end{aligned}$$

$$\begin{aligned} T_{\text{dev}} &= c * (\text{EFFORT})^d && \text{months} \\ &= 2.5 * (85.34)^{0.38} && \text{months} \\ &= 13.54 && \text{months} \end{aligned}$$

$$\begin{aligned} SS_{\text{avg}} &= \text{EFFORT} / T_{\text{dev}} && \text{staff} \\ &= 85.34 / 13.54 && \text{staff} \\ &= 6.30 && \text{staff} \\ &= 6 && \text{staffs} \end{aligned}$$

$$\begin{aligned} \text{Productivity} &= \text{KLOC} / SS_{\text{avg}} && \text{KLOC per staff-month} \\ &= 30 / 6 && \text{KLOC per staff-month} \\ &= 5 && \text{KLOC per staff-month.} \end{aligned}$$

Therefore,

Effort = 85.34 PM
 $T_{\text{dev}} = 13.54$ months
 Avg. Staff Size = 6 staffs
 Productivity = 5 KLOC per staff