|  |  |
| --- | --- |
| Academic Year : 2020-21 | |
| Subject: *Software Engineering* CLASS: *SE (I)* SEMESTER: *IV* | |
| ERP ROLL NO: *34*  Teams Sr. No. :  *20* | **NAME**: *Kaustubh Shrikant Kabra* |
| Assignment No.: 3 | **Date of submission**: 21/04/2021 |

**Title of assignment:** Calculate cost estimation of your mini project

**Theory:**

**1] Write different software cost estimation methods.**

**--->** Cost Estimation Models in Software Engineering

Cost estimation simply means a technique that is used to find out the cost estimates. The cost estimate is the financial spend that is done on the efforts to develop and test software in Software Engineering. Cost estimation models are some mathematical algorithms or parametric equations that are used to estimate the cost of a product or a project.

Various techniques or models are available for cost estimation, also known as Cost Estimation Models as shown below :

**1)Heuristic Technique(COCOMO) –**

Heuristic word is derived from a Greek word that means “to discover”. The heuristic technique is a technique or model that is used for solving problems, learning, or discovery in the practical methods which are used for achieving immediate goals. These techniques are flexible and simple for taking quick decisions through shortcuts and good enough calculations, most probably when working with complex data. But the decisions that are made using this technique are necessary to be optimal.

In this technique, the relationship among different project parameters is expressed using mathematical equations. The popular heuristic technique is given by Constructive Cost Model (COCOMO). This technique is also used to increase or speed up the analysis and investment decisions.

**2)Empirical Estimation Technique –**

Empirical estimation is a technique or model in which empirically derived formulas are used for predicting the data that are a required and essential part of the software project planning step. These techniques are usually based on the data that is collected previously from a project and also based on some guesses, prior experience with the development of similar types of projects, and assumptions. It uses the size of the software to estimate the effort.

In this technique, an educated guess of project parameters is made. Hence, these models are based on common sense. However, as there are many activities involved in empirical estimation techniques, this technique is formalized. For example Delphi technique and Expert Judgement technique.

**3)Analytical Estimation Technique –**

Analytical estimation is a type of technique that is used to measure work. In this technique, firstly the task is divided or broken down into its basic component operations or elements for analyzing. Second, if the standard time is available from some other source, then these sources are applied to each element or component of work.

Third, if there is no such time available, then the work is estimated based on the experience of the work. In this technique, results are derived by making certain basic assumptions about the project. Hence, the analytical estimation technique has some scientific basis. Halstead’s software science is based on an analytical estimation model.

**2]Explain COCOMO model in detail.**

**--->** Cocomo (Constructive Cost Model) is a regression model based on LOC, i.e **number of Lines of Code**. It is a procedural cost estimate model for software projects and often used as a process of reliably predicting the various parameters associated with making a project such as size, effort, cost, time and quality.

The key parameters which define the quality of any software products, which are also an outcome of the Cocomo are primarily Effort & Schedule:

* **Effort:** Amount of labor that will be required to complete a task. It is measured in person-months units.
* **Schedule:** Simply means the amount of time required for the completion of the job, which is, of course, proportional to the effort put. It is measured in the units of time such as weeks, months.

Different models of Cocomo have been proposed to predict the cost estimation at different levels, based on the amount of accuracy and correctness required. These characteristics pertaining to different system types are mentioned below.

1. **Organic –** A software project is said to be an organic type if the team size required is adequately small, the problem is well understood and has been solved in the past and also the team members have a nominal experience regarding the problem.
2. **Semi-detached –** A software project is said to be a Semi-detached type if the vital characteristics such as team-size, experience, knowledge of the various programming environment lie in between that of organic and Embedded.
3. **Embedded –** A software project requires a larger team size than the other two models and also the developers need to be sufficiently experienced and creative to develop such complex models.

**Types of Models:** COCOMO consists of a hierarchy of three increasingly detailed and accurate forms. Any of the three forms can be adopted according to our requirements. These are types of COCOMO model:

1. Basic COCOMO Model
2. Intermediate COCOMO Model
3. Detailed COCOMO Model

**1]Basic Model –**

**Basic COCOMO** can be used for quick and slightly rough calculations of Software Costs. Its accuracy is somewhat restricted due to the absence of sufficient factor considerations.

**2]Intermediate Model –**

The basic Cocomo model assumes that the effort is only a function of the number of lines of code and some constants evaluated according to the different software system. However, in reality, no system’s effort and schedule can be solely calculated on the basis of Lines of Code. For that, various other factors such as reliability, experience, Capability. These factors are known as Cost Drivers and the Intermediate Model utilizes 15 such drivers for cost estimation.

Classification of Cost Drivers and their attributes:

**(i) Product attributes –**

* + Required software reliability extent
  + Size of the application database
  + The complexity of the product

**(ii) Hardware attributes –**

* + Run-time performance constraints
  + Memory constraints
  + The volatility of the virtual machine environment
  + Required turnabout time

**(iii) Personnel attributes –**

* + Analyst capability
  + Software engineering capability
  + Applications experience
  + Virtual machine experience
  + Programming language experience

**(iv) Project attributes –**

* + Use of software tools
  + Application of software engineering methods
  + Required development schedule

**3]Detailed Model –**  
Detailed COCOMO incorporates all characteristics of the intermediate version with an assessment of the cost driver’s impact on each step of the software engineering process. The detailed model uses different effort multipliers for each cost driver attribute. In detailed cocomo, the whole software is divided into different modules and then we apply COCOMO in different modules to estimate effort and then sum the effort.

The Six phases of detailed COCOMO are:

1)Planning and requirements

2)System design

3)Detailed design

4)Module code and test

5)Integration and test

6)Cost Constructive model

**3)As per COCOMO model parameters ,consider your mini project**

**parameters and find out cost of Mini project**

**--->**As per our mini project we have use

The mode as **Organic**,

The type of COCOMO model as **Intermediate Model.**

Effort = 5.289 Person-Month

Development Time = 1.06237 Months

Average Staff Required = **5 Persons**

**(i) Product attributes –**

* + Required software reliability extent- Any Operating System, Python3, Python IDLE, OpenCV Library.
  + Size of the application database-None

**(ii) Hardware attributes –**

* + Run-time performance constraints- Monitering on Yawning,Amount of eye closure, Eye Blinking, Head Position
  + Memory constraints-512Mb RAM,16Gb ROM.

**(iii) Personnel attributes –**

* + Analyst capability**-**Python, Python Libaraies
  + Applications experience- with 75% accuracy
  + Programming language experience-Python

**Conclusion:** Hence, we have calculated cost estimation for mini project