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Estimation and scheduling off software Projects

Estimation and Scheduling of Software Projects:

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Software sizing: It is an activity in software engineering that is used to determine or estimate the size of a software application or component in order to be able to implement other software project management activities (such as estimating or tracking).

It is different from software effort estimation. It estimates the probable size of a piece of software while effort estimation predicts the effort needed to build it. The relationship between the size of software and the effort required to produce it is called productivity.

LOC and FP based Estimations: It count the total number of lines of source code in a project. The units of LOC are:

KLOC- Thousand lines of code
NLOC- Non comment lines of code
KDSI- Thousands of delivered source instruction.

The area is estimated by comparing it with the existing systems of same kind. The one's having special knowledge to predict the required size of various components of software and then add them to get the total size.

Advantages:

- Universally accepted and is used in many models like COCOMO.
- Estimation is closer to developer's perspective.
- Simple to use.

Disadvantages:

- Different programming languages contains different number of lines.
- No proper industry standard exist for this technique.
- It is difficult to estimate the size using technique in early stages of project.

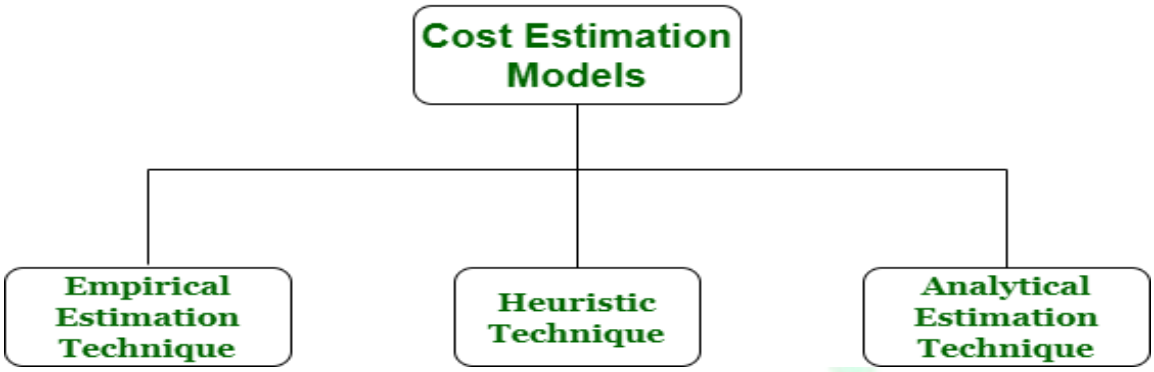
Estimating Cost and Effort: Theyare generally based on results of analysis using models or historical data applied to size, activities, and other planning parameters. Confidence in these estimates is based on rationale for the selected model and the nature of the data.

It 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.

Estimation Models:

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. It is typically concerned with the financial spend on the effort to develop and test the software, this can also include requirements review, maintenance, training, managing and buying extra

equipment, servers and software. Many methods have been developed for estimating software costs for a given project.



Constructive Cost Model (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. It was proposed by Barry Boehm in 1970 and is based on the study of 63 projects, which make it one of the best-documented models.

Mode	*Project size*	*Nature of Project*	*Innovation*	*Deadline of the project*	*Development Environment*
Organic	Typically 2-50 KLOC	Small size project, experienced developers in the familiar environment. For example, pay roll, inventory projects etc.	Little	Not tight	Familiar & In house
Semi detached	Typically 50-300 KLOC	Medium size project, Medium size team, Average previous experience on similar project. For example: Utility systems like compilers, database systems, editors etc.	Medium	Medium	Medium
Embedded	Typically over 300 KLOC	Large project, Real time systems, Complex interfaces, Very little previous experience.	Significant	Tight	Complex Hardware/ customer

Basic COCOMO model takes the form

$E = a_b (KLOC)^{b_b}$

$D = c_b (E)^{d_b}$

where E is effort applied in Person-Months, and D is the development time in months. The coefficients a_b, b_b, c_b and d_b

Software Project	a_b	b_b	c_b	d_b
Organic	2.4	1.05	2.5	0.38
Semidetached	3.0	1.12	2.5	0.35
Embedded	3.6	1.20	2.5	0.32

When the effort and development time are known then the average staff size to complete the procject can be evllautaetd as:

Average staff size(SS) = E/D persons

When the project size is known the productivity level may be calucluated as :

Producivity (P) = KLOC/ E KLO/PM

Example: A project size of 200 KLOC is to be developed. Software development team has average experience on similar type of projects. The project schedule is not very tight. Calculate the Effort, development time, average staff size, and productivity of the project.

Solution: The semidetached mode is the most appropriate mode, keeping in view the size, schedule and experience of development time.

Hence E=3.0(200)1.12=1133.12PM

D=2.5(1133.12)0.35=29.3PM

$$\text{Average Staff Size (SS)} = \frac{E}{D} \text{ Persons}$$

$$= \frac{1133.12}{29.3} = 38.67 \text{ Persons}$$

$$\text{Productivity} = \frac{\text{KLOC}}{E} = \frac{200}{1133.12} = 0.1765 \text{ KLOC/PM}$$

P = 176 LOC/PM

The basic COCOMO equation take the form:

$E = a_b (KLOC)^{b_b}$

$D = c_b (KLOC)^{d_b}$

Example : Suppose a project was estimated to be 400 KLOC. Calculate the effort and development time for each of the three model i.e., organic, semi-detached & embedded.

Solution: The basic COCOMO equation takes the form:

Effort=a_1*(KLOC) a_2 PM
Tdev=b_1*(efforts)b_2 Months
Estimated Size of project= 400 KLOC

(i)Organic Mode

E = 2.4 * (400)1.05 = 1295.31 PM
D = 2.5 * (1295.31)0.38=38.07 PM

(ii)Semidetached Mode

E = 3.0 * (400)1.12=2462.79 PM
D = 2.5 * (2462.79)0.35=38.45 PM

(iii) Embedded Mode

E = 3.6 * (400)1.20 = 4772.81 PM
D = 2.5 * (4772.8)0.32 = 38 PM

Project Scheduling and Staffing :It is a significant project planning activity. It comprises deciding which functions would be taken up when. To schedule the project plan, a software project manager wants to do the following:

1. Identify all the functions required to complete the project.
2. Break down large functions into small activities.
3. Determine the dependency among various activities.
4. Establish the most likely size for the time duration required to complete the activities.
5. Allocate resources to activities.

Staffing: It deals with the appoint personnel for the position that is identified by the organizational structure.

It involves:

- Defining requirement for personnel
- Recruiting (identifying, interviewing, and selecting candidates)
- Compensating
- Developing and promoting agent

For personnel planning and scheduling, it is helpful to have efforts and schedule size for the subsystems and necessary component in the system.

Time Line Charts:

It displays a project plan schedule in chronological order. It is used in project management to depict project milestones and visualize project phases, and show project progress.

It is an effective way to visualize a process using chronological order. Details are showed graphically, important points in time can be easy seen and understood.

It is a chronological order of events. In most cases, it is a line with dates, events or actions. It is important for project managers to establish skills to build an accurate timeline. It indicates what phases are in the past, what is in the progress now and what is supposed to be end in future.

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