Topics:

1. Software Project Planning
2. Software Project Planning Activities
3. Software Cost Estimation
4. Software Cost Estimation Model

Software Project Planning

A Software Project is the complete methodology of programming advancement from requirement gathering to testing and support, completed by the execution procedures, in a specified period to achieve intended software product.

Software Project Planning Activities:

1. *Identify project scope and objectives*

© Establish a project authority
© Identify all stakeholders in the project and their interests
© Modify objectives in the light of stakeholders analysis
© Establish methods of communications with all parties.

2. *Identify project infrastructure*

© Establish relationship between project and strategic planning
© Identify installation standards and procedures
© Identify project team organization

3. *Analyze project characteristics*

© Distinguish the project as either objective or product driven
© Analise other project characteristics,
© Identify high level project risks
© Take into account user requirement concerning implementation
© Select general lifecycle approach
© Review overall resource estimates

4. *Identify project products and activities*

- © Identify and describe project products
- © Document generic product flows
- © Recognize product instances
- © Produce Ideal activity network
- © Modify ideal to take into account need for stages and check

5. *Estimate effort for each activity*

- © Carry out bottom up estimates
- © Revise plan to create controllable activities

6. *Identify activity risks*

7. *Allocate resource*

8. *Review/ Publicize plan*

9. *Execute plan*

Software Cost Estimation

For any new software project, it is necessary to know how much it will cost to develop and how much development time will it take. These estimates are needed before development is initiated, but how is this done? Several estimation procedures have been developed and are having the following attributes in common.
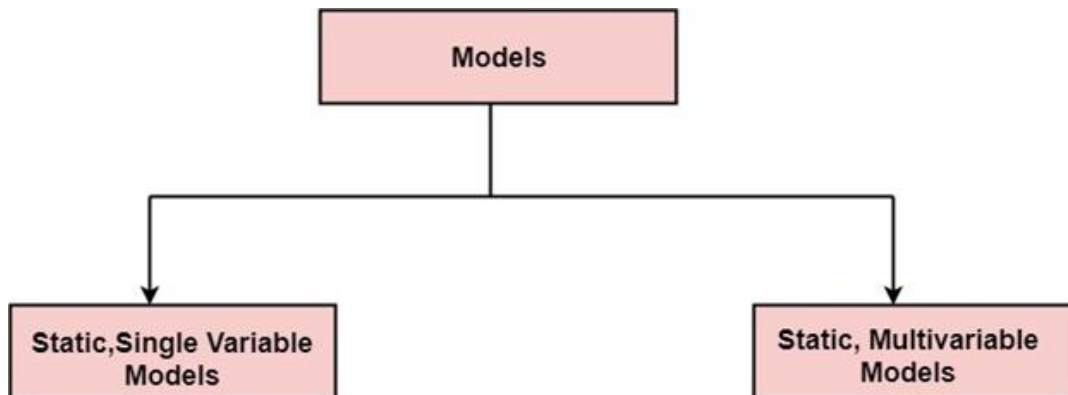
1. Project scope must be established in advanced.
2. Software metrics are used as a support from which evaluation is made.
3. The project is broken into small modules which are estimated individually. To achieve true cost & schedule estimate, several option arise.
4. Delay estimation
5. Used symbol decomposition techniques to generate project cost and schedule estimates.
6. Acquire one or more automated estimation tools.

Uses of Cost Estimation

1. During the planning stage, one needs to choose how many engineers are required for the project and to develop a schedule.

2. In monitoring the project's progress, one needs to access whether the project is progressing according to the procedure and takes corrective action, if necessary.

Cost Estimation Models

A model may be static or dynamic. In a static model, a single variable is taken as a key element for calculating cost and time. In a dynamic model, all variable are interdependent, and there is no basic variable.

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              ┌──────────────────┴──────────────────┐
              ▼                                      ▼
   ┌─────────────────────┐              ┌─────────────────────┐
   │ Static,Single Variable│             │ Static, Multivariable│
   │       Models         │              │       Models         │
   └─────────────────────┘              └─────────────────────┘
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Static, Single Variable Models:

When a model makes use of single variables to calculate desired values such as cost, time, efforts, etc. is said to be a single variable model. The most common equation is:

$$C=aL^b$$

Where   C = Costs
        L= size
        a and b are constants

The Software Engineering Laboratory (SEL) established a model called SEL model, for estimating its software production. This model is an example of the static, single variable model.

$$E=1.4L^{0.93}$$
$$DOC=30.4L^{0.90}$$
$$D=4.6L^{0.26}$$

Where   E= Efforts (Person per Month)
         DOC=Documentation (Number of Pages)
         D = Duration (D, in months)
         L = Number of Lines per code

Static, Multivariable Models:

These models depend on several variables describing various aspects of the software development environment. In some model, several variables are needed to describe the software development process, and selected equation combined these variables to give the estimate of time & cost. These models are called multivariable models.

WALSTON and FELIX develop the models at IBM provide the following equation gives a relationship between lines of source code and effort:

E=5.2L$^{0.91}$

In the same manner duration of development is given by

D=4.1L$^{0.36}$

Example:

Compare the Walston-Felix Model with the SEL model on a software development expected to involve 8 person-years of effort.

   a) Calculate the number of lines of source code that can be produced.
   b) Calculate the duration of the development.
   c) Calculate the productivity in LOC/PY
   d) Calculate the average manning

Solution:

The amount of manpower involved = 8 PY = 96 persons-months

(a) Number of lines of source code can be obtained by reversing equation to give:

$$L = \left(\frac{E}{a}\right) 1/b$$

Then

$$L \ (SEL) = (96/1.4)^{1/0.93} = 94.264 \ LOC$$

$$L \ (W\text{-}F) = (96/5.2)^{1/0.91} = 24.632 \ LOC$$

(b) Duration in months can be calculated by means of equation

$$D \ (SEL) = 4.6 \ (L)^{0.26}$$
$$= 4.6 \ (94.264)^{0.26} = 15 \ months$$

$$D \ (W\text{-}F) = 4.1 \ L^{0.36}$$
$$= 4.1 \ (24.632)^{0.36} = 13 \ months$$

(c) Productivity is the lines of code produced per persons/month (year)

$$P(SEL) = \frac{94.264}{8} = 11.783 \ \frac{LOC}{Person}(Years)$$

$$P(W - F) = \frac{24.632}{8} = 3.079 \ \frac{LOC}{Person}(Years)$$

(d) Average manning is the average number of persons required per month in the project

$$M \ (SEL) = \frac{96P-M}{15M} = 6.4 Persons$$

$$M \ (W\text{-}F) = \frac{96P-M}{13M} = 7.4 Persons$$