

## Unit - III Software Project Management

### (#) Need of Software project management

Software Project management is a proper way of planning and leading software project. It is a part of project management in which software projects are planned, implemented, monitored and controlled.

• Software project management is essential for several reason

- ↳ Planning
- ↳ Resource management
- ↳ Risk management
- ↳ Quality control
- ↳ Communication
- ↳ Budget management

### Types

#### ① Conflict management

Conflict management is the process to restrict the negative features of conflict while increasing the positive features of conflict. The goal of conflict management is to improve learning and group result including efficiency or performance.

#### ② Risk management

Risk management is the analysis and identification of risk that is followed by synchronize and economical implementation of resource to minimize and operate

### ③ Requirement management

It is the process of analyzing, tracking and documenting requirement and then supervising change and communicating to stakeholder.

### ④ Change management

Change management is a systematic approach to dealing with the transition or transformation of an organization goal, process or technologies.

### ⑤ Software Configuration management

Software configuration management is the process of controlling and tracking changes in the software. It includes revision control and the inauguration of baseline.

### ⑥ Release management

Release management is the task of planning, controlling and scheduling the built-in deploying release. Release management ensure that the organization delivers new and enhanced service required by the customers.

### Software Project Management Complexities

Software Project management complexities refers to the various difficulties to manage a software project. It recognize in many different ways.

### Types of Complexity

↳ Time Management Complexity  
Complexities to estimate the duration of project. It also includes the complexities to make the schedule for different activities.

↳ Cost management complexities  
Estimating the total cost of the project is very difficult task.

↳ Quality management complexities  
The quality of the project must satisfy the customer's requirement. It must assure the requirement of customer.

↳ Risk management complexities  
Risk may occur during any phase of the project. Various difficulties may occur to identify these risk.

↳ Human Resource Complexity  
It includes all the difficulties regarding organizing, managing and leading project team.

↳ Deployment complexity  
A release candidate, or finalized code, has to be synchronized from one system to another.



### Advantages

- ↳ Improved software quality
- ↳ Better risk management
- ↳ Improved collaboration
- ↳ flexibility and adaptability
- ↳ Improved customer satisfaction

### Disadvantages

- ↳ Increased complexity
- ↳ Cost overruns
- ↳ Dependency on technologies
- ↳ Lack of creativity
- ↳ Resistance to change

### # Project Planning

- Project planning is the process of defining the objectives, scope and activities of a project to ensure its successful completion.
- It involves outlining the tasks, allocating resources, setting timeline and identifying potential risk.
- The goal of project planning is to create a structured approach that guides the project team in executing the project efficiently and effectively.

### Principal

- ↳ Planning is necessary
- ↳ Risk analysis
- ↳ Tracking of Project Plan
- ↳ Meet Quality Standard

### # Software Project Scheduling

- Software project scheduling is the process of creating a timeline for a software development project. It involves defining the sequence of task, estimating time required for each task and determining deadline for project.
- The goal of scheduling is to ensure that the project is completed on time, within budget.
- Effective scheduling helps in coordinating team effort, managing resource and tracking progress.
- To schedule the project plan, a software project manager wants to do following :-
  - ↳ Identify all function required to complete the project
  - ↳ Break down large function into small activities.
  - ↳ Determine the dependency among various activities.
  - ↳ Allocate resource to activities.
  - ↳ Plan the beginning and ending for different activities.
  - ↳ Determine the critical path.

## ④ Project Size Estimation

- It refers to the process of predicting the size and complexity of software project before it begins. The estimation is crucial for planning, resource allocation, budget and scheduling.
- The main goal is to provide an accurate estimation of the effort, time and resource required to complete a software project. This helps in managing expectation and ensuring that projects are delivered on-time and within budget.
- Accurate project size estimation is important for effective and efficient project planning, management and execution.

Various method for estimating project size are :-

### ① LOC (Lines of Code)

As the name suggest, LOC counts the total number of lines of source code in a project. The units of LOC are :-

- ↳ KLOC - Thousands lines of code
- ↳ NLOC - Non-comments lines of code
- ↳ KDSI - Thousands of delivered source instruction

- The size is estimated by comparing it with the existing system of the same kind. The expert use it to predict the required size of various component of software and then add them to get the total size.

- It's tough to estimate LOC by analyzing the problem definition. Only after the whole code has been developed can accurate LOC be estimated.

### Advantages

- ↳ Simple to use
- ↳ People throughout the world can utilize and accept it
- ↳ At project completion, LOC is easily quantified
- ↳ Estimation is closer to developer's perspective.

### Disadvantages

- ↳ Different programming language contain different lines of code
- ↳ No proper industry exist for this techniques
- ↳ Difficult to estimate at early stage of project.

### ② Numbers of Entities in ER diagram

ER model provide a static view of the project. It describes the entities and their relationship. The number of entities in ER model can be used to measure the estimation of size of project. The number of entities depends on size of project.

### Advantage

- ↳ Size estimation can be done during early stage
- ↳ No. of entities used is independent of technology used

### Disadvantage

- ↳ No fixed standard exist
- ↳ Less used in cost estimation model

### ③ DFD (Data Flow Diagram)

Data flow diagram represent the functional view of software. The model depicts the main function involved in the software and flow of data between them. Already existing process of similar types are studied and used to estimate the size of project.

#### Advantages

- ↳ Independent of programming language
- ↳ Major project can be divided into smaller project

#### Disadvantages

- ↳ Time taking } because studying similar types of process
- ↳ more efforts }

### ④ Function Point Analysis

In this method, the number and types of function supported by the software are utilized to find (FPC) function point count.

• The steps in function point analysis are:-

- ↳ Count the number of function of each proposed type
- ↳ Compute the unadjusted function point (UFP)
- ↳ find Total Degree of Influence (TDI)
- ↳ Compute Value Adjustment factor (VAF)
- ↳ find function Point Count (FPC)

formula to calculate Function Point Count (FPC)

$$FPC = UFP * VAF$$

#### Advantages

- ↳ Easily used in early stage of project planning
- ↳ Independent of programming language
- ↳ Used to compare different project

#### Disadvantage

- ↳ Not good for real time system and embedded system
- ↳ Cost estimation

#### Challenges in Project Size Estimation

- ↳ Unclear Requirement
- ↳ Lack of Historical data
- ↳ Interdependencies
- ↳ Productivity Variability
- ↳ Risks

#### Improving Accuracy in Project Size Estimation

- ↳ Define clear Requirement
- ↳ Use Historical data
- ↳ Use Estimation technique
- ↳ Break down the project
- ↳ Expert judgement



## Project Estimation technique

### ① Top-down estimate

A top-down estimating technique assign an overall time for the project and then breaks it down into work and tasks. It starts with high-level overview of project first estimate the overall effort and distribute it into various task.

### ② Bottom-Up Estimation

This method involves estimating the smallest component of project first. You calculate the effort for each task and then sum them to get the total project estimate.

### ③ Expert Judgement

This techniques relies on the experience and insights of experts who have previously worked on similar projects. Their opinion can provide valuable estimates based on past performance.

### ④ Three-point Estimation

This technique provides three estimates for each task

- ↳ The best case
- ↳ The worst case
- ↳ Most likely scenario

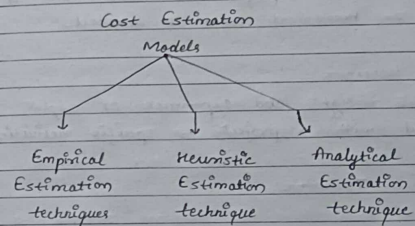
### ⑤ Use Case

This techniques estimate project size based on use case, which describe the interaction between user and the system.

## ⑧ Cost Estimation

- Cost estimation simply means a technique that is used to find out the cost estimates.
- Cost estimation model are some mathematical algorithm or parametric equation that are used to estimate the cost of product or a project.

Various techniques of Cost Estimation are :-



### ① Empirical Estimation Techniques

- 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 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 and assumption.
- It uses the size of software to estimate the effort.
- Some of the Empirical Estimation Techniques are :-

#### ↳ Delphi technique

Is a method used to gather expert opinion to predict the cost associated with a project or task. It is useful when uncertainty or historical data is limited.

#### ↳ Expert Judgement technique

Relies on the insight and experience of expert to determine the cost associated with a project or specific activities.

#### ② Heuristic Estimation Technique

- 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 problem, learning or discovery which are used for achieving immediate goals.
- These techniques are flexible and simple for taking quick decision through shortcuts and good enough calculation.

- Also used to increase or speed up the analysis and investment decision.
- The Popular heuristic technique is given by Constructive Cost Model (COCOMO).

#### ③ Analytical Estimation Technique

- Analytical Estimation technique is a type of technique that is used to measure work.
- In this technique, firstly the task is broken down into its basic operations or element for analyzing.
- Second, if standard time is available from other source, then these source are applied to each element or component of work.
- Third, if no standard time is available, then the work is estimated based on the experience of work.
- In this technique Result are derived by making certain assumption about the project.
- Halstead's Software is based on Analytical Estimation technique.

## # COCOMO Model (Constructive Cost Model)

- The Constructive Cost Model (COCOMO) is a software estimation model that helps predict the effort, cost and schedule required for a software development project.
- Developed by Barry Bohem in 1981.
- COCOMO uses a mathematical formula based on the size of software project, typically measured in lines of code (LOC).

Six phases of COCOMO Model are :-

- ① Planning and requirement  
Define the scope, objective and constraint of project. Outlines the schedule, resource and milestone.
- ② System design  
The high-level architecture of software system is created. Defines the system overall structure.
- ③ Detailed Design  
Create the detailed specification for each component of the system.
- ④ Implement Module Code and test  
This involves writing the actual source code for each module or component as defined in detailed design.

- ⑤ Integration and test  
Involves combining the individual modules into a complete system and ensure that they work together.

- ⑥ Cost Constructive Model  
It is widely used method for estimating the cost and effort required for software development project.

Types of Project in COCOMO Model

- ① Organic  
A software project is said to be organic type if the team size required is adequately small and the problem is well understood and has been solved in past generation and the team member have experience regarding the problem.
- ② Semi detached  
A software project is said to semi-detached type if the vital characteristics such as team size, experience and knowledge of various programming environment lie in between Organic and Embedded.
- ③ Embedded  
A software project requiring the highest level of complexity, creativity and experience requirement falls under this category. Requires a large team member than other two models.



### Importance of COCOMO Model

- ↳ Cost Estimation
- ↳ Resource management
- ↳ Project Planning
- ↳ Risk management
- ↳ Support for decision

### Advantages

- ↳ Systematic Cost Estimation
- ↳ Helps to estimate cost and effort
- ↳ Helps in high impact factor
- ↳ Helps to evaluate the feasibility of project

### Disadvantages

- ↳ Assume project size as main factor
- ↳ Does not count development team specific characteristics
- ↳ Not enough precise cost and effort estimate