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**Unit – 03: Software Planning**

- Major responsibilities of Software Project Manager.
- Important project parameters.
- Metrics for Size Estimation:
  - ➢ Line of Code (Loc),
  - ➢ Function Points(FP).
- Project Estimation Techniques-Using COCOMO Model.
- Risk management.

Questions to be discussed:

1. What are various activities during software project planning?
2. Explain the concept of function points. Why FPs are becoming acceptable in industry?
3. Discuss various types of COCOMO mode. Explain the phase wise distribution of effort.
4. What is meant by a code walk through? Explain with examples.
5. Suppose that a project was estimated to be 400 KLOC. Calculate the effort and development time for each of the three modes i.e. organic, semidetached and embedded.
6. What are risk management activity?

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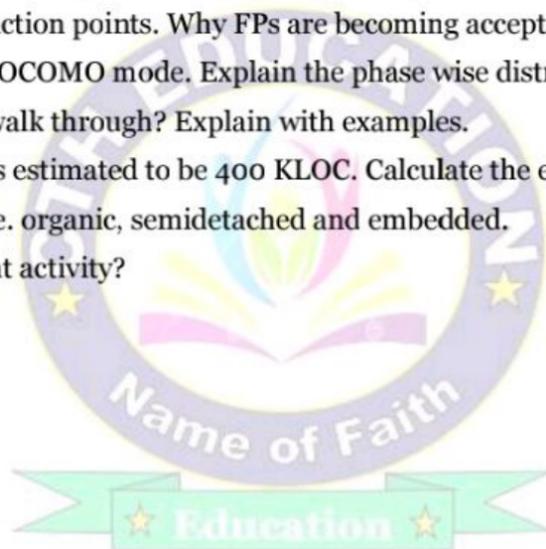
Major Responsibilities of a software Project Manager:

- A software project manager is the most important person inside a team who takes the overall responsibilities to manage the software projects.
- A project manager has to face many difficult situations to accomplish these works.
- The task of a project manager are classified into two major types:
  1. Project planning
  2. Project monitoring and control

Project planning:

- Project planning involves estimating several characteristics of a project and then planning the project activities based on these estimates made.

Project monitoring and control:

- The focus of project monitoring and control activities is to ensure that the software development proceeds as per plan.

Skill necessary for Managing Software Project:

Some necessary skills are required for Managing Software Project which are given below:

- Knowledge of project estimation techniques
- Good decision-making abilities at the right time
- Previous experience managing a similar types of projects
- Good communication skills to meet the customer satisfaction
- A project manager must encourage all the team members to successfully develop the product
- He must know the various type of risks that may occur and the solution to these problems

Important project parameters:

- Project Parameters are certain characteristics and features that can define a project or its aspects.
- Every project can be exhaustively defined with a help of these six parameters and all of them can be determined before the beginning of any project.
  1. Project scope – actual working content that a project embraces;
  2. Project time – duration of a project, and life-span of its results;
  3. Project integration – a variety and type of participation and collaboration that a project demands from different concerned groups;
  4. Project quality – specifications on project efficiency, capabilities and effectiveness of its results;
  5. Project risks – severity and probability of destructive influence that existing negative factors can put on a project execution;
  6. Project costs – determination of money that a project will most likely consume to be completed;

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What are various activities during software project planning?

- After the project has been defined and the project team has been appointed, you are ready to enter the second phase in the project management life cycle: the detailed project planning phase.
- Project planning is the second stage in the project management process.
- During this phase, the project manager creates a project plan, which maps out project requirements.
- The project planning phase includes:
  - ➢ Goals and project objectives
  - ➢ Success metrics
  - ➢ Stakeholders and roles
  - ➢ Scope and budget
  - ➢ Timeline and schedule
  - ➢ Communication plan

Metrics for project size estimation:

- Before discussing the available metrics to estimate the size of project, let us examine what does the term "project size" exactly mean.
- The size of a project is not the number of bytes neither is it the size of the executable code.
- The project size is the measure of the problem complexity in terms of the effort and time required to develop the product.
- Currently, two metrics are popularly being used to measure the project size:
  1. Lines of code(LOC)
  2. Function Points(FP).

Lines of code(LOC):

- LOC is the simplest among all metrics available to measure project size.
- This metric measures the size of a project by counting the number of source instruction in the program.
- While counting the number of lines, blank lines, comment lines and header lines are ignored.
- LOC was developed for line-oriented procedural languages, such as Fortran and Assembly.
- Most used metric in cost estimation and it is very easy in estimating the efforts.

Function point(FP):

- Function point metric was proposed by Albrecht in 1983.
- This metric overcomes many disadvantage of the LOC metric.
- Function point analysis is an effective method for measuring software size.
- By focusing on the features and functions that a user can access and use, this metric can accurately determine the complexity of an application.

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## Why FPs are becoming acceptable in industry?

- A FP is a unit of measurement to express the amount of business functionality.
- FPs measure software size.
- They are widely accepted as an industry standard due to:
    - ➤ User oriented
    - ➤ Language independent
    - ➤ Specification based and
    - ➤ Used in data processing features.

Differentiate between LOC and Function point:

Line of Code (LOC)	Function Point (FP)
LOC metric is based on analogy.	Function Point metric is specification-based.
LOC metric is dependent on language.	Function Point metric is language independent.
LOC metric is design-oriented.	Function Point metric is user-oriented.
It is changeable to FP (i.e, backfiring)	FP metric is extendible to Line of Code.
LOC is used for calculating the size of the computer program	Function Point is used for data processing systems
LOC is used for calculating and comparing the productivity of programmers.	Function Point can be used to portray the project time

What is Code Walkthrough?

- Code Walkthrough is a form of peer review in which a programmer leads the review process and the other team members ask questions and spot possible errors against development standards and other issues.
- The meeting is usually led by the author of the document under review and attended by other members of the team.
- Review sessions may be formal or informal.
- The main purpose of walkthrough is to enable learning about the content of the document under review to help team members gain an understanding of the content of the document and also to find defects.
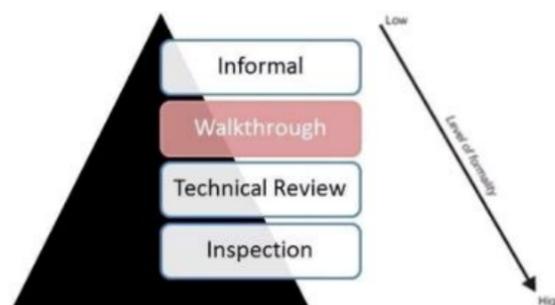
Project Estimation Techniques:

- Estimation of various project parameters is an important project planning activity.
- The different parameters of a project that need to be estimated include -
  - ➢ Project size
  - ➢ Effort required to complete the project
  - ➢ Project duration and
  - ➢ Project cost
- Accurate estimation of these parameters is important.
- The project estimation techniques are classified into three main categories:
  1. Empirical estimation techniques
  2. Heuristic techniques
  3. Analytical estimation techniques

Empirical estimation techniques:

- Empirical estimation techniques are based on making an educated guess of the project parameters.
- While using this technique, prior experience with development of similar products is helpful.
- Although empirical estimation techniques are based on common sense.
- There are two types of Empirical estimation techniques:
  1. Expert judgement
  2. Delphi techniques

Heuristic techniques:

- Heuristic word is derived from a Greek word that means "to discover".
- The heuristic technique is used for solving problems, learning, or discovery the practical methods which are used for achieving immediate goals.
- 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).

COCOMO Model:

- COCOMO stands for Constructive Cost Estimation Model.
- This model was proposed by Boehm in 1981.
- COCOMO prescribed a three stage process for project estimation.
- In the first stage, an initial estimation is arrived at.
- Over the next two stages, the initial stage is refined to arrive at more accurate estimate.
- COCOMO uses both single and multivariable estimation model at different stage of estimation.
- The three stage of COCOMO estimation techniques are:

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1. Organic
2. Semi-detached
3. Embedded

Organic:

- A software project is said to be an organic type if the team size required is adequately small.
- Here, the problem is well understood and has been solved in the past.
- The team members have a nominal experience regarding the problem.

Semi-detached:

- A software project is said to be a Semi-detached type if the vital characteristics such as team size, experience, and knowledge of the various programming environment lie in between that of organic and Embedded.
- Exp: Compilers or different Embedded Systems can be considered Semi-Detached types.

Embedded:

- A software project requiring the highest level of complexity, creativity, and experience requirement fall under this category.
- Such software 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.

Mode	Project Size	Nature of Project	Innovation	Deadline of the Project
Organic	2–50 KLOC	Small size project, experience developers. Exp: Pay roll, inventory project etc.	Little	Not tight
Semi-detached	50–300 KLOC	Medium size project, Medium size time, previous experience on similar project. Exp: Compiler, Editor, Database etc.	Medium	Medium
Embedded	Over 300 KLOC	Large project, Real time system, complex interface. Exp: ATM, Air traffic control etc.	Significant	Tight

What is person-month(PM)?

- Person-month is a popular unit for effort measurement.
- Because developers are assigned to a project for certain number of months.

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Estimation of development effort:

Organic	Effort $= 2.4(KLOC)^{1.05}$ PM
Semi-detached	Effort $= 3.0(KLOC)^{1.12}$ PM
Embedded	Effort $= 3.6(KLOC)^{1.20}$ PM

Analytical Estimation Technique:

- Analytical estimation is a type of technique that is used to measure work.
- In this technique, firstly the task is divided into its basic component.
- Second, if the standard time is available, then they are applied to the component of work.
- Third, if there is no such time available, then the work is estimated based on the experience of 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.

Risk Management:

- A risk is a probable problem- it might happen or it might not.
- There are main two characteristics of risk
- Uncertainty- the risk may or may not happen that means there are no 100% risks.
- loss – If the risk occurs in reality , undesirable result or losses will occur.
- Risk management is a sequence of steps that help a software team to understand , analyze and manage uncertainty.
- Risk management consists of
  - ➢ Risk Identification
  - ➢ Risk analysis
  - ➢ Risk Planning
  - ➢ Risk