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SAD, Software Quality Assurance and Testing

Sr. No.	Topics	Detail	Mark	Min. Lect.
4	<i>Project Economics</i>	<ul style="list-style-type: none"> • Concept of Project Management • Project Costing based on metrics • Empirical Project Estimation Techniques • Decomposition Techniques • Algorithmic Methods • Automated Estimation Tools 		5
	<i>Project scheduling and tracking</i>	<ul style="list-style-type: none"> ➤ Concept of project scheduling ➤ tracking ➤ Effort estimation techniques ➤ Timeline Chart ➤ Pert Chart ➤ Monitoring and control progress 		6



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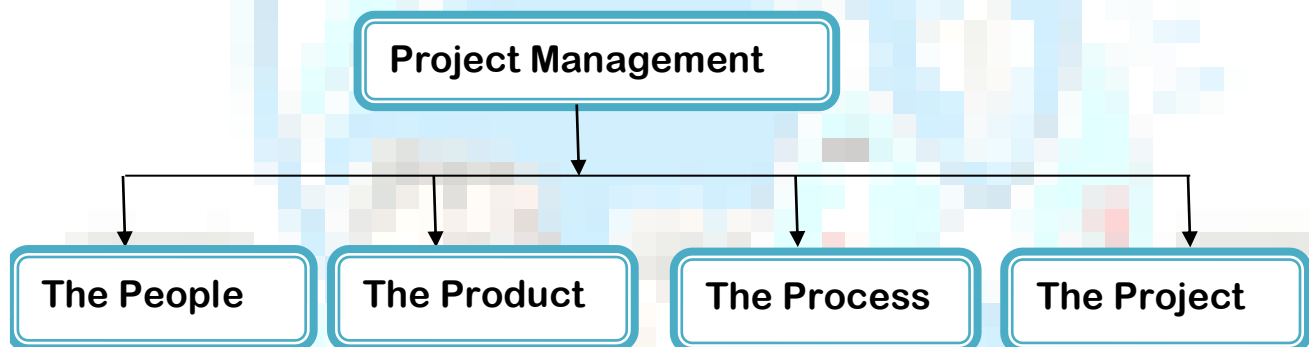


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UNIT-4 (PART - 1)

PROJECT ECONOMICS

➤ **Topic : Project Management (4 P's) (5 MARKS)(IMP)**



- Effective software project management focuses on the **four P's: people, product, process, and project.**
- The order is not arbitrary. The manager who forgets that software engineering work is an intensely human endeavor will never have success in project management.
- A manager who fails to encourage comprehensive customer communication early in the evolution of a project risks building an elegant solution for the wrong problem.
- The manager who pays little attention to the process runs the risk of inserting competent technical methods and tools into a vacuum.
- The manager who embarks without a solid project plan jeopardizes the success of the product.

1 The People



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- The cultivation of motivated, highly skilled software people has been discussed since the 1960. In fact, the "people factor" is so important that the Software Engineering institute has developed a people management capability maturity model (PM-CMM), "to enhance the readiness of software organizations to undertake increasingly complex applications by helping to attract, grow, motivate, deploy, and retain the talent needed to improve their software development capability".
- The people management maturity model defines the following key practice areas for software people: recruiting, selection, performance management, training, compensation, career development, organization and work design, and team/culture development.
- Organizations that achieve high levels of maturity in the people management area have a higher likelihood of implementing effective software engineering practices.
- The PM-CMM is a companion to the software capability maturity model that guides organizations in the creation of a mature software process. Issues associated with people management and structure for software projects are considered later in this chapter.



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2 The Product

- Before a project can be planned, product objectives and scope should be established, alternative solutions should be considered, and technical and management constraints should be identified.
- Without this information, it is impossible to define reasonable (and accurate) estimates of the cost, an effective assessment of risk, a realistic breakdown of project tasks, or a manageable project schedule that provides a meaningful indication of progress.
- The software developer and customer must meet to define product objectives and scope.
- In many cases, this activity begins as part of the system engineering or business process engineering and continues as the first step in software requirements analysis.
- Objectives identify the overall goals for the product.(from the customer's point of view) without considering how these goals will be achieved. Scope identifies the primary data, functions and behaviors that characterize the product, and more important, attempts to bound these Characteristics in a quantitative manner.
- Once the product objectives and scope are understood, alternative solutions are considered. Although very little detail is discussed, the alternatives enable managers and practitioners to select a "best" approach, given the constraints imposed by delivery deadlines, budgetary restrictions, personnel availability, technical interfaces, and other factors.

3 The Process

- A software process provides the framework from which a comprehensive plan for software Development can be established. A small number of frame work activities are applicable to all software projects, Regardless of their size or complexity.
- A number of different task sets-tasks, milestones, work products and quality assurance points-enable the framework activities to be adapted to the characteristics of the software project and the requirements of the project team.



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- Finally, umbrella activities-such as software quality assurance, software configuration management, and measurement-overlay the process model. Umbrella activities are independent of any one framework activity and occur throughout the process.

4 The Project

- We conduct planned and controlled software projects for one primary reason-it is the only known way to manage complexity. And yet, we still struggle.
- In 1998, industry data indicated that 26 percent of software projects failed outright and 46 percent experienced cost and schedule overruns.
- Although the success rate for software projects has improved somewhat, our project failure rate remains higher than it should be. In order to avoid project failure, a software project manager and the software engineers who build the product must avoid a set of common warning signs, understand the critical success factors that lead to good project management, and develop a commonsense approach for planning, monitoring and controlling the project.

➤ SUMMARY:-

➤ Project Management (4 P's)

- Project management focuses on the **four P's**:
 - **people**
 - **product**
 - **process**
 - **project**
- The order is not arbitrary.
- The manager who pays little attention to the process runs the risk of inserting competent technical methods and tools into a vacuum.

1 The People

- The "people factor" is so important that the Software Engineering institute has developed a people management capability maturity model (PM-CMM).



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- The people management maturity model defines the following key practice areas for software people:
 - Recruiting
 - Selection
 - Performance management
 - Training
 - Compensation
 - Career development
 - Organization and work design
 - Team/culture development.

2 The Product

- Before a project can be planned, product objectives and scope should be established, alternative solutions should be considered and technical and management constraints should be identified.
- Without this information, it is impossible to define reasonable (and accurate) estimates of the cost.
- The software developer and customer must meet to define product objectives and scope.
- Once the product objectives and scope are understood, alternative solutions are considered.

3 The Process

- A software process provides the framework from which a comprehensive plan for software Development can be established.
- A small number of frame work activities are applicable to all software projects, Regardless of their size or complexity.

4 The Project

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NO.	QUESTION	ANSWER
1.	Project Management (4 P's)	People, product, process, and project.
2.	PM-CMM	people management capability maturity

➤ Topic : Project Cost Estimating (3 MARKS)

Project Cost Estimating



John Reel [REE99] defines ten signs



Software people don't understand their customer's needs, The product scope is poorly defined, Changes are managed poorly, The chosen technology changes, Business needs changed or are ill-defined, Deadlines are unrealistic, Users are resistant, Sponsorship is lost or was never properly obtained, The project team lacks people with appropriate skills, Managers [and practitioners] avoid best practices and lessons learned

- In order to manage a successful software project, we must understand what can go wrong (so that problems can be avoided) and how to do it right. In an excellent paper on software projects, John Reel [REE99] defines ten signs that indicate that an information systems project.



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1. Software people don't understand their customer's needs.
 2. The product scope is poorly defined.
 3. Changes are managed poorly.
 4. The chosen technology changes.
 5. Business needs changed or are ill-defined.
 6. Deadlines are unrealistic.
 7. Users are resistant.
 8. Sponsorship is lost or was never properly obtained
 9. The project team lacks people with appropriate skills.
 10. Managers [and practitioners] avoid best practices and lessons learned.
- The following are the points of software project.
 - For many development projects, the bulk of project costs are tied to staffing. In this case, the best way to estimate project cost is to prepare a detailed project schedule using Microsoft Project (or a similar tool), and to use the resource management features of that software to identify the types, quantities, and phasing of different types of labor.
 - Project cost estimating is usually performed by summing estimates for individual project elements into a project total. The pieces can vary in size and number from a few large chunks of a project with known costs to hundreds or thousands of discrete tasks or individual work packages.
 - Sometimes project cost goals are a forced-fit to the amount of money available in the budget. This will require the project manager to initiate a cost estimate to find out if the project is feasible. Adjustments in scope may be needed so the project can survive.
 - "Design-to-Cost" is a process where cost goals for development, acquisition, or operations and maintenance are used as design parameters, along with technical performance, in the systems design trade-off process. In cases where the absolute value of a dollar threshold needs to be contained, the project definition, conceptual



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design, and development can address performance trade-offs to fit the project within a predetermined cost envelope.

- "Cost as the Independent Variable" is an affordability based method for planning project scope. It starts with a fixed budget and works backwards, through an iterative process of prioritizing and selecting requirements, to arrive at a project scope achievable within budget constraints.
- Costs can usually be estimated with acceptable accuracy by using relevant historical cost data, a well constructed and documented estimating methodology, and a good understanding of the work content to be performed. This approach involves putting as much detail into understanding the tasks as possible and generating assumptions with whatever shreds of knowledge may be available.
- In order to manage a successful software project, we must understand what can go wrong (so that problems can be avoided) and how to do it right. In an excellent paper on software projects, John Reel [REE99] defines ten signs that indicate that an information

Systems project:

1. Software people don't understand their customer's needs.
2. The product scope is poorly defined.
3. Changes are managed poorly.
4. The chosen technology changes.
5. Business needs change [or is ill-defined].
6. Deadlines are unrealistic.
7. Users are resistant.
8. Sponsorship is lost [or was never properly obtained].
9. The project team lacks people with appropriate skills.
10. Managers [and practitioners] avoid best practices and lessons learned.

1. Start on the right foot.-



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- This is accomplished by working hard (very hard) to understand the problem that is to be solved and then setting realistic objects and expectations for everyone who will be involved in the project. It is reinforced by building the right team (Section 3.2.3) and giving the team the autonomy, authority, and technology needed to do the job.

2. Maintain momentum:-

- Many projects get off to a good start and then slowly disintegrate. To maintain momentum, the project manager must provide incentives to keep turnover of personnel to an absolute minimum, the team should emphasize quality in every task it performs, and senior management should do everything possible to stay out of the team's way.⁷

3. Track progress:-

- For a software project, progress is tracked as work products (e.g., specifications, source code, sets of test cases) are produced and approved (using formal technical reviews) as part of a quality assurance activity. In addition, software process and project measures can be collected and used to assess progress against averages developed for the software development organization.

4. Make smart decisions:-

- In essence, the decisions of the project manager and the software team should be to "keep it simple." Whenever possible, decide to use commercial off-the-shelf software or existing software components, decide to avoid custom interfaces when standard approaches are available, decide to identify and then avoid obvious risks, and decide to allocate more time than you think is needed to complex or risky tasks (you'll need every minute).

5. Conduct a postmortem analysis:-

- Establish a consistent mechanism for extracting lessons learned for each project. Evaluate the planned and actual schedules, collect and analyze software project metrics, get feedback from team members and customers, and record findings in written form.



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➤ SUMMARY:-

- In an excellent paper on software projects, John Reel [REE99] defines ten signs that indicate that an information systems project.
- For many development projects, the bulk of project costs are tied to staffing.
- In this case, the best way to estimate project cost is to prepare a detailed project schedule using Microsoft Project (or a similar tool), and to use the resource management features of that software.

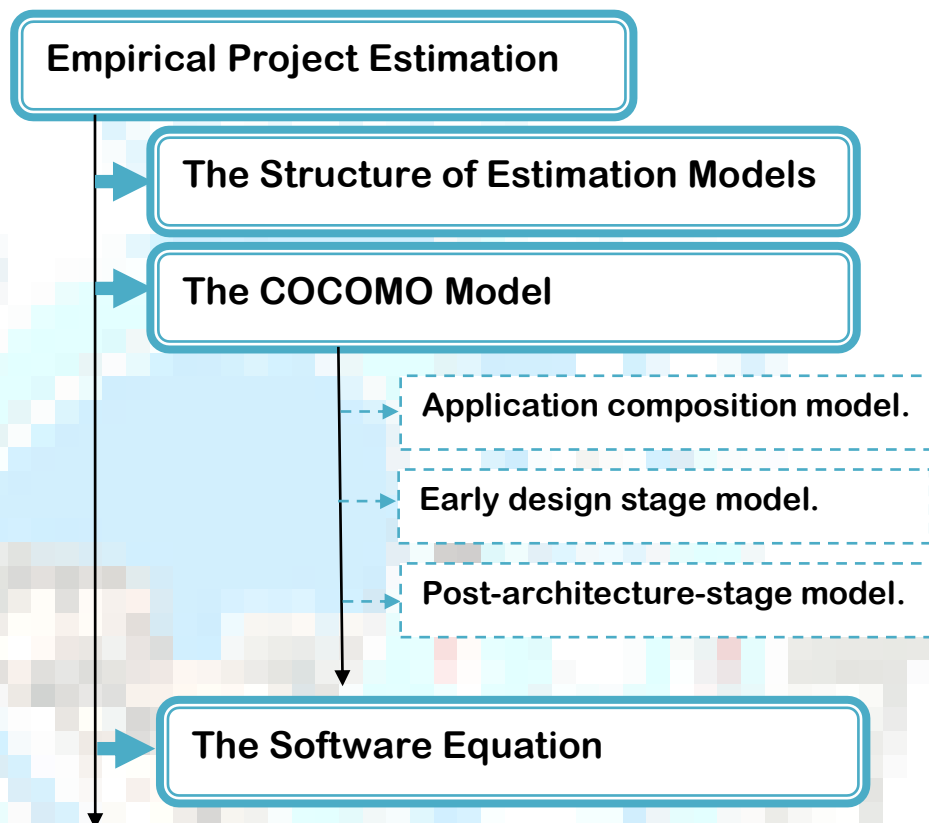
Systems project:

1. Software people don't understand their customer's needs.
2. The product scope is poorly defined.
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8. Sponsorship is lost [or was never properly obtained].
9. The project team lacks people with appropriate skills.
10. Managers [and practitioners] avoid best practices and lessons learned.

NO.	QUESTION	ANSWER
1.	Who is defines ten signs that indicate that an information systems project?	John Reel [REE99]
2.	the best way to estimate project cost is to prepare a detailed project schedule using_____	Microsoft Project
3.	_____ as the Independent Variable	Cost



➤ **Topic : Empirical Project Estimation (3 OR 5 MARKS)**



- Use one or more empirical models for software cost and effort estimation.
- Empirical estimation models can be used to complement decomposition techniques and offer a potentially valuable estimation approach in their own right. A model is based on experience (historical data) and takes the form
$$d = f(v_i)$$
- Where d is one of a number of estimated values (e.g., effort, cost, project duration) and v_i are selected independent parameters (e.g., estimated LOC or FP).
- An estimation model for computer software uses empirically derived formulas to predict effort as a function of LOC or FP.
- The empirical data that support most estimation models are derived from a limited sample of projects. For this reason, no estimation model is appropriate for all classes of software and in all development environments.



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(1) The Structure of Estimation Models

- A typical estimation model is derived using regression analysis on data collected from past software projects. The overall structure of such models takes the form
 - $E = A + B \times (ev)^C$ (5-2)
- where A, B, and C are empirically derived constants, E is effort in person-months, and ev is the estimation variable (either LOC or FP).

(2) The COCOMO Model (3 MARKS)(MIMP)

- CONstructive COSt MOdel. The original COCOMO model became one of the most widely used and discussed software cost estimation models in the industry. It has evolved into a more comprehensive estimation model, called COCOMO II.
- Like its predecessor, COCOMO II is actually a hierarchy of estimation models that address the following areas:
 - **Application composition model.**
 - Used during the early stages of software engineering, when prototyping of user interfaces, consideration of software and system interaction, assessment of performance, and evaluation of technology maturity are paramount.
 - **Early design stage model.**
 - Used once requirements have been stabilized and basic software architecture has been established.
 - **Post-architecture-stage model.**
 - Used during the construction of the software. Like all estimation models for software, the COCOMO II models require sizing information.
 - Three different sizing options are available as part of the model hierarchy:
 - object points, function points, and lines of source code.

(3) The Software Equation

- The software equation is a dynamic multivariable model that assumes a specific distribution of effort over the life of a software development project. The model has



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been derived from productivity data collected for over 4000 contemporary software projects.

- Overall process maturity and management practices
- The extent to which good software engineering practices are used
- The level of programming languages used
- The state of the software environment
- The skills and experience of the software team
- The complexity of the application

➤ **SUMMARY:-**

- Use one or more empirical models for software cost and effort estimation.
- Empirical estimation models can be used to complement decomposition techniques
- Offer a potentially valuable estimation approach in their own right.
- A model is based on experience (historical data) and takes the form
$$d = f(v_i)$$
- Where d is one of a number of estimated values (e.g., effort, cost, project duration) and v_i are selected independent parameters (e.g., estimated LOC or FP).
- An estimation model for computer software uses empirically derived formulas to predict effort as a function of LOC or FP.

(1) The Structure of Estimation Models

(2) The COCOMO Model

- COCOMO II is actually a hierarchy of estimation models that address the following areas:

- Application composition model.
- Early design stage model.
- Post-architecture-stage model.

(3) The Software Equation

NO.	QUESTION	ANSWER
1.	A model is based on experience_____.	historical data
2.	The Structure of Estimation Models.	$E = A + B \times (ev)C$ (5-2)
3.	estimation variable	LOC or FP



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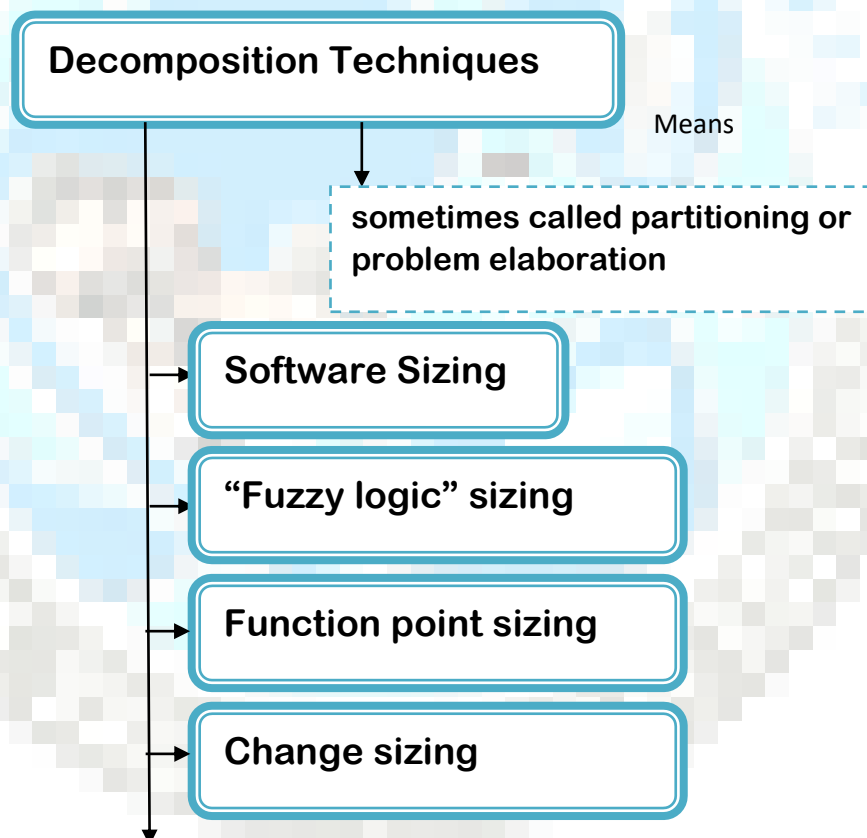
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4.	COCOMO Model	CONstructive COst Model
5.	What is Software Equation?	software equation is a dynamic multivariable models
6.	Which Technique use in Empirical estimation models?	Empirical estimation models can be used to complement decomposition techniques.
7.	Where d is one of a number of estimated?	effort, cost, project duration.

➤ Topic : Decomposition Techniques (3 OR 5 MARKS)



- Software project estimation is a form of problem solving, and in most cases, the problem to be solved is too complex to be considered in one piece. For



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this reason, we decompose the problem, recharacterizing it as a set of smaller problems.

- The decomposition approach was discussed from two different points of view: decomposition of the problem and decomposition of the process. Estimation uses one or both forms of partitioning. But before an estimate can be made, the project planner must understand the scope of the software to be built and generate an estimate of its “size.”

(1) Software Sizing

- a. The accuracy of a software project estimate is predicated on a number of things:
 - i. The degree to which the planner has properly estimated the size of the product to be built;
 - ii. The ability to translate the size estimate into human effort, calendar time, and dollars (a function of the availability of reliable software metrics from past projects);
 - iii. The degree to which the project plan reflects the abilities of the software team;
 - iv. The stability of product requirements and the environment that supports the software engineering effort.
- Estimation tools The “size” of software to be built can be estimated using a direct measure, LOC, or an indirect measure, FP.
- We consider the software sizing problem. Because a project estimate is only as good as the estimate of the size of the work to be accomplished, sizing represents the project planner’s first major challenge.

(2) “Fuzzy logic” sizing

- a. To apply this approach, the planner must identify the type of application. Although personal experience can be used, the planner should also have access to a historical database of projects so that estimates can be compared to actual experience.

(3) Function point sizing

- a. The planner develops estimates of the information domain characteristics Standard component sizing. Software is composed of a



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number of different “standard components” that are generic to a particular application area.

(4) Change sizing

- a. This approach is used when a project encompasses the use of existing software that must be modified in some way as part of a project. The planner estimates the number and type (e.g., reuse, adding code, changing code, deleting code) of modifications that must be accomplished.

➤ SUMMARY:-

- Problem decomposition, sometimes called *partitioning* or *problem elaboration*,
- Is an activity that sits at the core of software requirements analysis.
- During the scoping activity no attempt is made to fully decompose the problem.
- Two major areas:
 - The functionality that must be delivered
 - The process that will be used to deliver it.
- The project planner examines the statement of scope and extracts all important software functions. This process, called decomposition.
- DECOMPOSITION TECHNIQUES
 - (5) Software Sizing
 - (6) “Fuzzy logic” sizing
 - (7) Function point sizing
 - (8) Change sizing

NO.	QUESTION	ANSWER
1.	How Many applied major area in Decomposition Techniques?	1.the functionality that must be delivered 2. the process that will be used to deliver it
2.	How Many Decomposition Techniques?	1. Software sizing 2.”Fully logic” sizing 3.Function point sizing 4.Change sizing
3.	Problem decomposition, sometimes called.....	called partitioning or problem elaboration



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➤ Topic : Problem-Based Estimation (2 OR 3 MARKS)(IMP)

- Lines of code and function points were described as measures from which productivity metrics can be computed. LOC and FP data are used in two ways during software project estimation:
 - As an estimation variable to "size" each element of the software.
 - As baseline metrics collected from past projects and used in conjunction with estimation variables to develop cost and effort projections.
- The project planner begins with a bounded statement of software scope and from this statement attempts to decompose software into problem functions that can each be estimated individually.
- LOC or FP (the estimation variable) is then estimated for each function. Alternatively, the planner may choose another component for sizing such as classes or objects, changes, or business processes affected.

➤ An Example of LOC-Based Estimation (IMP)

- As an example of LOC and FP problem-based estimation techniques, let us consider a software package to be developed for a computer-aided design application for mechanical components.
- A review of the System Specification indicates that the software is to execute on an engineering workstation and must interface with various computer graphics peripherals including a mouse, digitizer, high resolution color display and laser printer.
- Using the System Specification as a guide, a preliminary statement of software scope can be developed.

Function	Estimated LOC
User interface and control facilities (UICF)	2,300
Two-dimensional geometric analysis (2DGA)	5,300
Three-dimensional geometric analysis (3DGA)	6,800
Database management (DBM)	3,350
Computer graphics display facilities (CGDF)	4,950
Peripheral control function (PCF)	2,100
Design analysis modules (DAM)	8,400
<i>Estimated lines of code</i>	<i>33,200</i>



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➤ An Example of FP-Based Estimation

- Decomposition for FP-based estimation focuses on information domain values rather than software functions. Referring to the function point calculation table presented in Figure 5.4, the project planner estimates inputs, outputs, inquiries, files, and external interfaces for the CAD software. For the purposes of this estimate, the complexity weighting factor is assumed to be average.

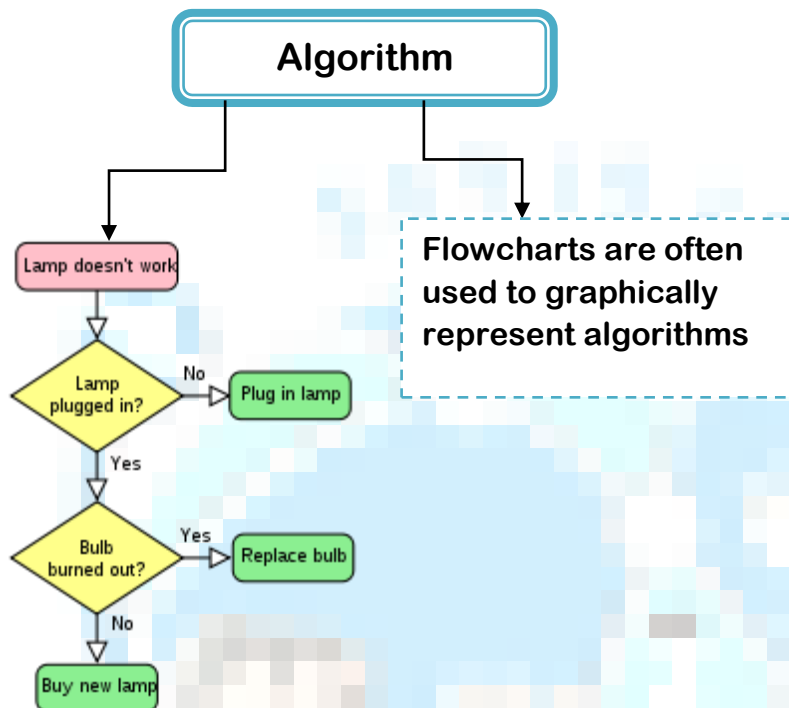
Information domain value	Opt.	Likely	Pess.	Est. count	Weight	FP count
Number of inputs	20	24	30	24	4	97
Number of outputs	12	15	22	16	5	78
Number of inquiries	16	22	28	22	5	88
Number of files	4	4	5	4	10	42
Number of external interfaces	2	2	3	2	7	15
Count total						320

➤ Process-Based Estimation

- The most common technique for estimating a project is to base the estimate on the process that will be used.
- That is, the process is decomposed into a relatively small set of tasks and the effort required to accomplish each task is estimated.
- Like the problem-based techniques, process-based estimation begins with a delineation of software functions obtained from the project scope.
- A series of software process activities must be performed for each function.



➤ **Topic: Algorithm Methods**



- This is an algorithm that tries to figure out why the lamp doesn't turn on and tries to fix it using the steps. Flowcharts are often used to graphically represent algorithms.
- In mathematics, computing, linguistics, and related subjects, an algorithm is an effective method for solving a problem using a finite sequence of instructions. Algorithms are used for calculation, data processing, and many other fields.
- Each algorithm is a list of well-defined instructions for completing a task. Starting from an initial state, the instructions describe a computation that proceeds through a well-defined series of successive states, eventually terminating in a final ending state.
- The transition from one state to the next is not necessarily deterministic; some algorithms, known as randomized algorithms, incorporate randomness.

➤ **SUMMARY:-**

- Lines of code and function points were described as measures from which productivity metrics can be computed.



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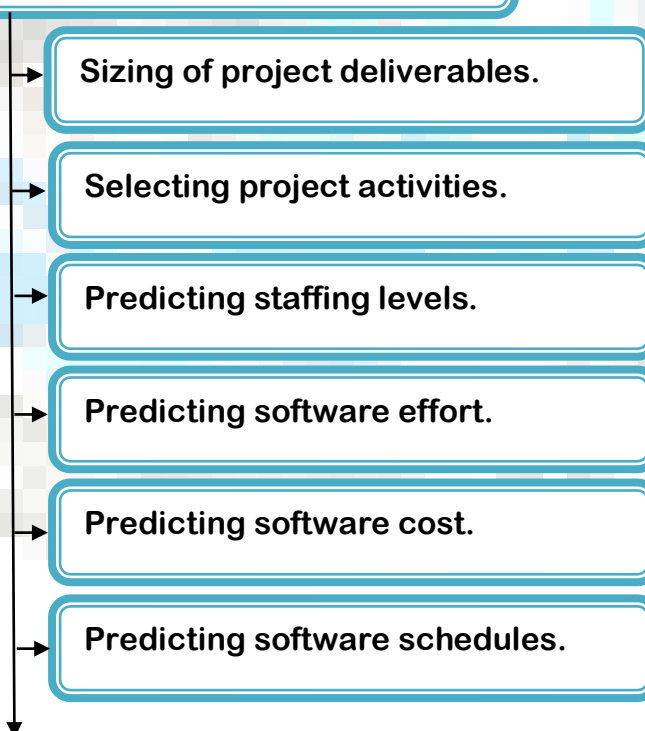
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- LOC and FP data are used in two ways during software project estimation:
 - As an estimation variable to "size" each element of the software.
 - As baseline metrics collected from past projects and used in conjunction with estimation variables to develop cost and effort projections.
 - LOC or FP (the estimation variable) is then estimated for each function.

NO.	QUESTION	ANSWER
1.	Algorithms	Flowcharts are often used to graphically represent algorithms.
2.	LOC	Lines of code
3.	FP	Function points

➤ Topic: AUTOMATED ESTIMATION TOOLS (3 MARKS)

AUTOMATED ESTIMATION TOOLS





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- The decomposition techniques and empirical estimation models described in the preceding sections are available as part of a wide variety of software tools. These automated estimation tools allow the planner to estimate cost and effort and to perform "what-if" analyses for important project variables such as delivery date or staffing. Although many automated estimation tools exist, all exhibit the same general characteristics and all perform the following six functions:

- 1. Sizing of project deliverables.** The "size" of one or more software workproducts is estimated. Work products include the external representation of software (e.g., screen, reports), the software itself, functionality delivered (e.g., function points), descriptive information (e.g. documents).
- 2. Selecting project activities.** The appropriate process framework is selected and the software engineering task set is specified.
- 3. Predicting staffing levels.** The number of people who will be available to do the work is specified. Because the relationship between people available and work (predicted effort) is highly nonlinear, this is an important input.
- 4. Predicting software effort.** Estimation tools use one or more models that relate the size of the project deliverables to the effort required to produce them.
- 5. Predicting software cost.** Given the results of step 4, costs can be computed by allocating labor rates to the project activities noted in step 2.
- 6. Predicting software schedules.** When effort, staffing level, and project activities are known, a draft schedule can be produced by allocating labor across software engineering activities based on recommended models for effort distribution.

➤ **SUMMARY:-**

- The decomposition techniques and empirical estimation models described in the preceding sections are available as part of a wide variety of software tools.
- These automated estimation tools allow the planner to estimate cost and effort and to perform "what-if" analyses for important project variables such as delivery date or staffing.
- Although many automated estimation tools exist, all exhibit the same general characteristics and all perform the following six functions:



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1. Sizing of project deliverables.
2. Selecting project activities.
3. Predicting staffing levels.
4. Predicting software effort.
5. Predicting software cost.
6. Predicting software schedules.

NO.	QUESTION	ANSWER
1.	What is Automated Estimation tool?	automated estimation tools allow the planner to estimate cost and effort and to perform "what-if" analyses for important project variables such as delivery date or staffing.



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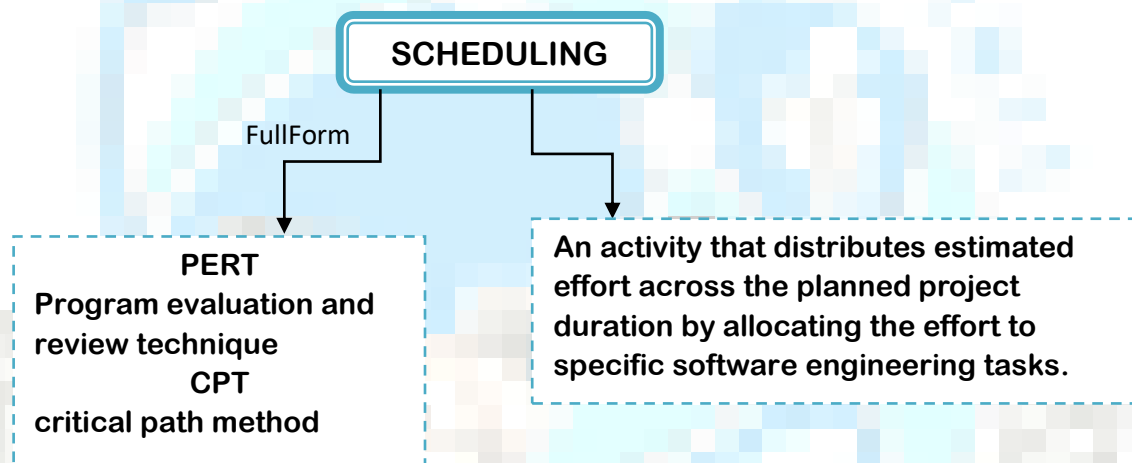


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UNIT-4 (PART - 2)

PROJECT SCHEDULING AND TRACKING

➤ Topic: SCHEDULING (2 OR 3 MARKS)



- *Software project scheduling* is an activity that distributes estimated effort across the planned project duration by allocating the effort to specific software engineering tasks.
- Scheduling of a software project does not differ greatly from scheduling of any multitask engineering effort. Therefore, generalized project scheduling tools and techniques can be applied with little modification to software projects.
- *Program evaluation and review technique* (PERT) and *critical path method* (CPM) are two project scheduling methods that can be applied to software development.
- Both techniques are driven by information already developed in earlier project planning activities:
 - Estimates of effort
 - A decomposition of the product function



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- The selection of the appropriate process model and task set
- Decomposition of tasks
 - Interdependencies among tasks may be defined using a task network. Tasks, sometimes called the project *work breakdown structure* (WBS), are defined for the product as a whole or for individual functions.
 - Both PERT and CPM provide quantitative tools that allow the software planner to
 - (1) determine the *critical path*—the chain of tasks that determines the duration of the project;
 - (2) establish “most likely” time estimates for individual tasks by applying statistical models; and
 - (3) Calculate “boundary times” that define a time “window” for a particular task.
 - Boundary time calculations can be very useful in software project scheduling. Slippage in the design of one function, for example, can retard further development of other functions.
 - Both PERT and CPM have been implemented in a wide variety of automated tools that are available for the personal computer. Such tools are easy to use and make the scheduling methods described previously available to every software project manager.

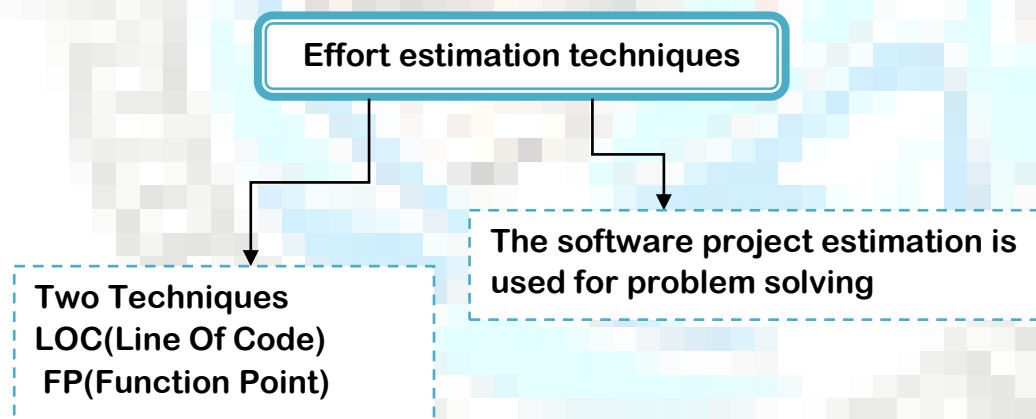
NO.	QUESTION	ANSWER
1.	PERT	Program evaluation and review technique
2.	CPM	critical path method
3.	WBS	the project work breakdown structure
4.	How Many Project Scheduling Method that can be applied to software development?	Program evaluation and review technique and critical path method.
5.	Tasks Sometimes Called....	the project work breakdown structure
6.	Boundry Time	that define a time "window" for a particular task
7.	the critical path	the chain of tasks that determines the duration of the project



➤ **Topic : TRACKING (2 OR 3 MARKS)**

- Although there are many reasons why software is delivered late, most can be traced to one or more of the following root causes:
 - An unrealistic deadline established by someone outside the software development group and forced on managers and practitioners within the group.
 - Changing customer requirements that are not reflected in schedule changes.
 - An honest underestimate of the amount of effort and/or the number of resources that will be required to do the job.
 - Predictable and/or unpredictable risks that were not considered when the project commenced.
 - Technical difficulties that could not have been foreseen in advance.
 - Human difficulties that could not have been foreseen in advance.
 - Miscommunication among project staff that results in delays.
 - A failure by project management to recognize that the project is falling behind schedule and a lack of action to correct the problem.

➤ **Topic : Effort estimation techniques**



- The software project estimation is used for problem solving. It solves the problem, of cost, the number of effort, the amount of time for the software project.
- To solve a project is very complex task.
- So it will divide into sub task which is known as decomposition.



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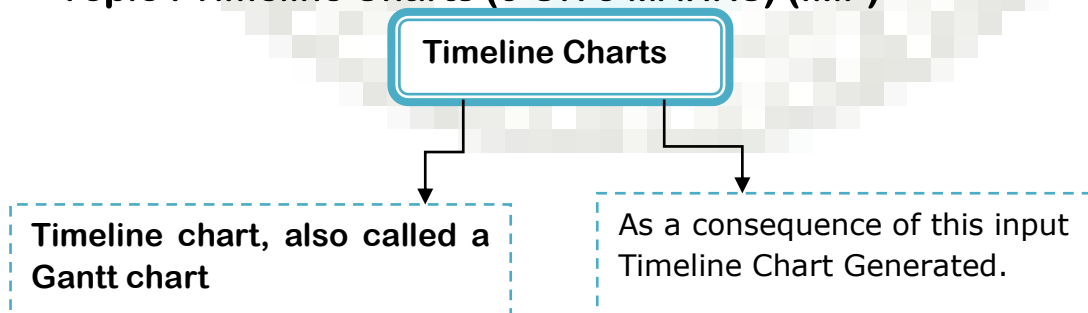


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- The software cost and effort estimation will never be the perfect but it is based on many variables, technical, environmental, human can effort the software effort, cost and development process.
- Project estimation is a series of systematic steps that provides estimation with Acceptable risk.
- To achieve reliable cost and effort estimation a number of option arise which are as under.
 - Delay estimation until let in the project.
 - Base estimates on similar project that have already been completed.
 - Use the decomposition technique to generate project cost and effort estimates.
 - Use different software models for software cost and effort estimation.
- The software will be developed in the mind of user.
- So, the development team will ask the opinions of different sources during the development process.
- LOC and FP are used for estimation techniques.
- The project planner can use LOC and FP data for software project estimation.
- LOC stands for Line Of Code and FP stands for Function Point.

NO.	QUESTION	ANSWER
1.	What is Effort Estimation?	The software project estimation is used for problem solving
2.	LOC	Line Of Code
3.	FP	Function Point

➤ Topic : Timeline Charts (3 OR 5 MARKS) (IMP)





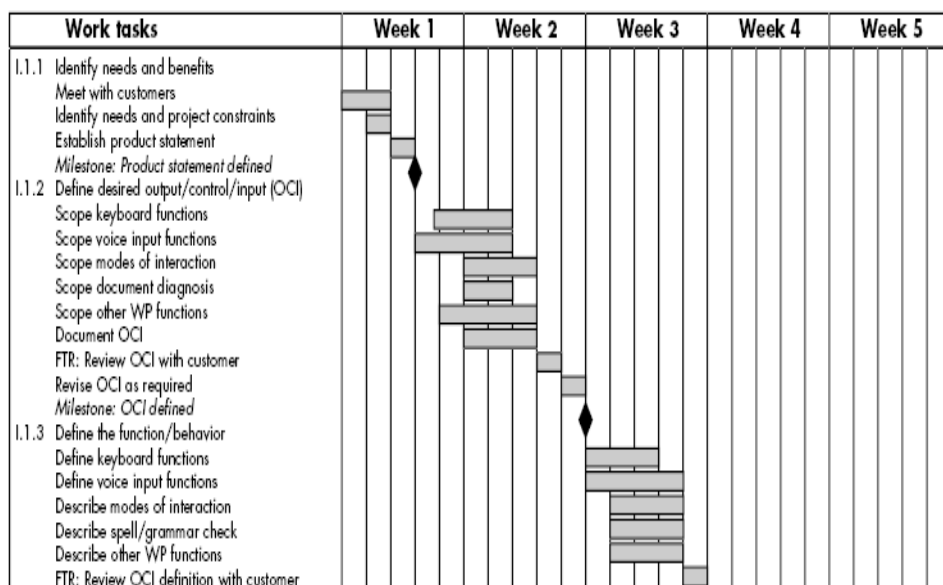
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- When creating a software project schedule, the planner begins with a set of tasks (the work breakdown structure).
- If automated tools are used, the work breakdown is input as a task network or task outline. Effort, duration, and start date are then input for each task. In addition, tasks may be assigned to specific individuals.
- As a consequence of this input, **a *timeline chart*, also called a *Gantt chart*, is generated.**
- A timeline chart can be developed for the entire project. Alternatively, separate charts can be developed for each project function or for each individual working on the project.
- **All project tasks (for concept scoping) are listed in the left-hand column. The horizontal bars indicate the duration of each task.**
- When multiple bars occur at the same time on the calendar, task concurrency is implied.
- The diamonds indicate milestones.
- Once the information necessary for the generation of a timeline chart has been input, the majority of software project scheduling tools produce *project tables*—a tabular listing of all project tasks, their planned and actual start- and end-dates, and a variety of related information. Used in conjunction with the timeline chart, project tables enable the project manager to track progress.



➤ Tracking the Schedule



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- The project schedule provides a road map for a software project manager. If it has been properly developed, the project schedule defines the tasks and milestones that must be tracked and controlled as the project proceeds. Tracking can be accomplished in a number of different ways:
 - Conducting periodic project status meetings in which each team member reports progress and problems.
 - Evaluating the results of all reviews conducted throughout the software engineering process.
 - Determining whether formal project milestones (the diamonds shown in Figure 7.4) have been accomplished by the scheduled date.
 - Comparing actual start-date to planned start-date for each project task listed in the resource table (Figure 7.5).
 - Meeting informally with practitioners to obtain their subjective assessment of progress to date and problems on the horizon.
 - Using earned value analysis (Section 7.8) to assess progress quantitatively. In reality, all of these tracking techniques are used by experienced project managers.

NO.	QUESTION	ANSWER
1.	WBS	the work breakdown structure
2.	Timeline Chart also called.....	Gantt Chart
3.	Timeline Chart can be Developed...	Entire Project
4.	Separate chart can be Developed...	For each project function.

➤ **Topic : PERT chart (Program Evaluation Review Technique) (3 OR 5 MARKS) (IMP)**



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PERT Charts

PERT:-Program Evaluation Review Technique

CPM: - Critical Path Method

A PERT chart is a project management tool used to schedule, organize, and coordinate tasks within a project.

- A PERT chart is a project management tool used to schedule, organize, and coordinate tasks within a project.
- PERT stands for *Program Evaluation Review Technique*, a methodology developed by the U.S. Navy in the 1950s to manage the Polaris submarine missile program.
- A similar methodology, the *Critical Path Method* (CPM) was developed for project management in the private sector at about the same time.

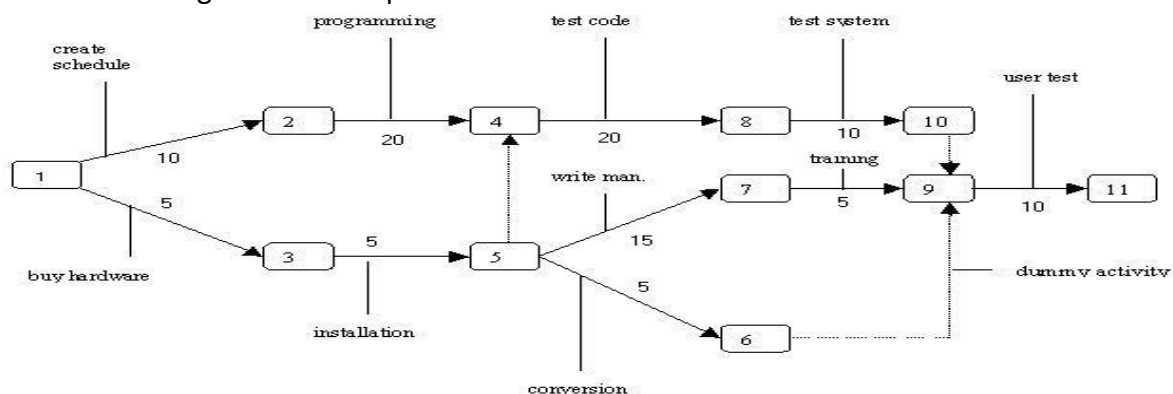


Fig. 1:
PERT Chart

- * Numbered rectangles are nodes and represent events or milestones.
- * Directional arrows represent dependent tasks that must be completed sequentially.
- * Diverging arrow directions (e.g. 1-2 & 1-3) indicate possibly concurrent tasks
- * Dotted lines indicate dependent tasks that do not require resources.

- A PERT chart presents a graphic illustration of a project as a network diagram consisting of numbered *nodes* (either circles or rectangles) representing events, or milestones in the project linked by labelled *vectors* (directional lines) representing tasks in the project.



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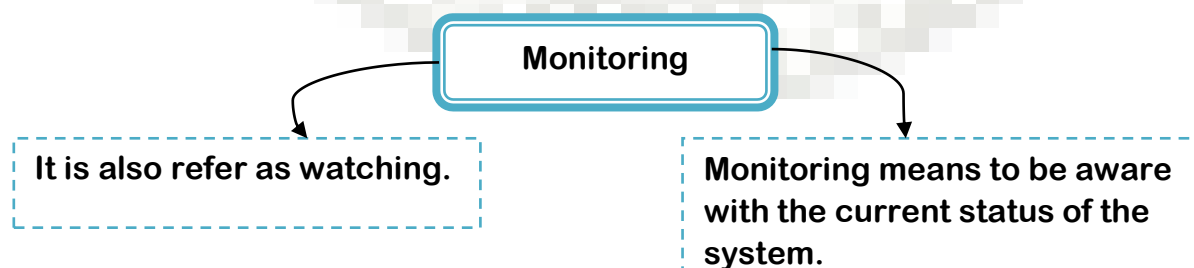


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- The direction of the arrows on the lines indicates the sequence of tasks. In the diagram, for example, the tasks between nodes 1, 2, 4, 8, and 10 must be completed in sequence. These are called *dependent* or *serial* tasks.
- The tasks between nodes 1 and 2, and nodes 1 and 3 are not dependent on the completion of one to start the other and can be undertaken simultaneously. These tasks are called *parallel* or *concurrent* tasks.
- Tasks that must be completed in sequence but that don't require resources or completion time are considered to have *event dependency*. These are represented by dotted lines with arrows and are called *dummy activities*.
- For example, the dashed arrow linking nodes 6 and 9 indicates that the system files must be converted before the user test can take place, but that the resources and time required to prepare for the user test (writing the user manual and user training) are on another path.
- Numbers on the opposite sides of the vectors indicate the time allotted for the task.
- The PERT chart is sometimes preferred over the [Gantt chart](#), another popular project management charting method, because it clearly illustrates task dependencies.
- On the other hand, the PERT chart can be much more difficult to interpret, especially on complex projects. Frequently, project managers use both techniques.

NO.	QUESTION	ANSWER
1.	PERT	Program Evaluation Review Technique.
2.	CPM	Critical Path Method .
3.	Nodes	either circles or rectangles
4.	The PERT chart is sometimes preferred over the	Gantt Chart

➤ Topic : Monitoring and control progress





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- Monitoring means to be aware with the current status of the system.
- It is also refer as watching.
- When working on the product or documentation at that time staff members should aware with the project process environment.
- It provides stability to the project.
- The software will be developed with the end user mind and developed by software team.
- So the monitoring and controlling is requiring during the development process.

➤ Different monitor methods: -

1. Computer monitor is a device that displays images or symbols generated by computers.
2. Monitor synchronization is an approach where two or more computer task use to share a resource.
3. Machine code monitor software allows users to view or change the memory location or computers.
4. Virtual machine monitor is software which creates virtual computer platform that allows multiple systems to run simultaneously (TURN BY TURN).
5. Risk monitoring is a project tracking activity which is performed for the following reason.
 - a. To reduce the effect of risk.
 - b. To perform the steps define for the risk and checked that they are properly applied or not
 - c. To collect the information that can be used for future risk.

NO.	QUESTION	ANSWER
1.	What is Monitoring?	Monitoring means to be aware with the current status of the system.
2.	Monitoring also called?	It is also refer as watching