Unit-2: Software Project Scheduling

Software project scheduling is a project planning step that determines when and how tasks and resources are allocated. Software project scheduling is a process of creating a timeline or a plan for the development of software. It involves identifying the tasks that need to be completed, estimating the time required for each task, and determining the order in which the tasks should be performed.

It is essential for ensuring that projects are completed on time and within budget. Software project scheduling software is a tool that helps you to plan, execute, and monitor all aspects of a project within its lifecycle. It allows you to develop a detailed schedule and assign tasks to team members.

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.
6. Plan the beginning and ending dates for different activities.
7. Determine the critical path. A critical way is the group of activities that decide the duration of the project.

Activity planning is a process that involves identifying and defining the tasks that need to be accomplished to achieve a specific goal.

Objectives Of Activity Planning

The objective of software project planning is to provide a framework that enables the manager to make reasonable estimates of resources, cost, and schedule.

1. **Feasibility assessment**: - Is the project possible within required timescales and resource constraints?
2. **Resource Allocation**: - What are the most effective ways of allocating resources to the project. When should the resources be available.
3. **Detailed Costing**: - How much will the project cost and when is that expenditure likely to take place?
4. **Motivation**: - Providing targets and being seen to monitor achievement against targets is an effective way of motivating staff.
5. **Co-ordination**: - When do the staff in different departments need to be available to work on a particular project.

Monitoring and controlling happens throughout the project to check if we are deviating from the plan or if any mistakes are happening. In the closing phase, we hand over the project to the client and close the project.

The following are a few characteristics of a project life cycle:

➤ Risks are higher when the project starts and they decrease as the project moves further.
➤ Staff requirements are low at the beginning of the project and are at a maximum during the execution phase, and then they may decrease.
➤ The cost of changes is lowest at the beginning of the project and it starts increasing as the project moves further.
➤ Stakeholder influence is higher at the beginning of the project and it starts decreasing as the project moves further.
➤ Most of the money and time are spent while carrying out the project work.

Product Life Cycle

The product life cycle describes the period of time over which an item is developed, brought to market and eventually removed from the market. The cycle is broken into four stages: introduction, growth, maturity and decline. The idea of the product life cycle is used in marketing to decide when it is appropriate to advertise, reduce prices, explore new markets or create new packaging.
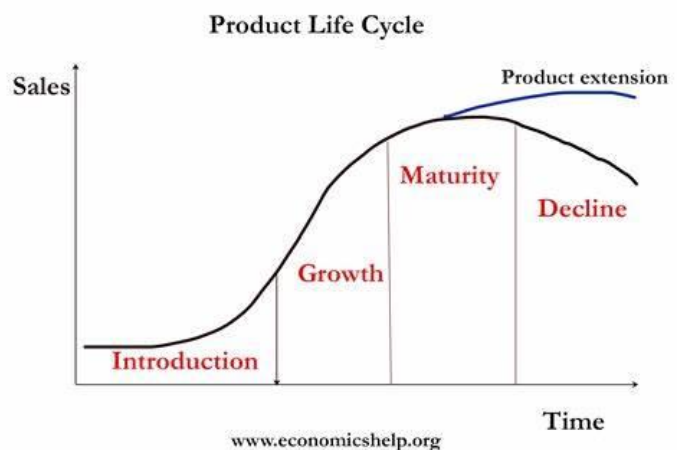
1. **Introduction Stage** – This stage of the cycle could be the most expensive for a company launching a new product. The size of the market for the product is small, which means sales are low, although they will be increasing. On the other hand, the cost of things like research and development, consumer testing, and the marketing needed to launch the product can be very high, especially if it's a competitive sector.

2. **Growth Stage** – The growth stage is typically characterized by a strong growth in sales and profits, and because the company can start to benefit from economies of scale in production, the profit margins, as well as the overall amount of profit, will increase. This makes it possible for

businesses to invest more money in the promotional activity to maximize the potential of this growth stage.

3. **Maturity Stage** – During the maturity stage, the product is established and the aim for the manufacturer is now to maintain the market share they have built up. This is probably the most competitive time for most products and businesses need to invest wisely in any marketing they undertake. They also need to consider any product modifications or improvements to the production process which might give them a competitive advantage.

4. **Decline Stage** – Eventually, the market for a product will start to shrink, and this is what's known as the decline stage. This shrinkage could be due to the market becoming saturated (i.e. all the customers who will buy the product have already purchased it), or because the consumers are switching to a different type of product. While this decline may be inevitable, it may still be possible for companies to make some profit by switching to less-expensive production methods and cheaper markets.

Essential elements for project planning:

1. **Aim of project**: What do we want to produce.
2. **Outputs:** What do we actually need to get there?
3. **Quality criteria**: What is the quality of the output? We need the completed output to be a certain quality and we need to define what that quality is (we define it using the SMART **Principle:** Specific, Measurable, Achievable, Realistic, Timely)
4. **Resources:** Includes staff time, particular knowledge or skill sets, money, time.
5. **Management structure:** How are we going to manage the work.
6. **Milestones:** A defined milestone will help to identify when each selection is completed.
7. **Tolerances:** How far can we let the project stay from the defined targets before sounding the alarm?
8. **Dependencies:** Understanding dependencies will help understand the impact of changes in any part of the project.
9. **Risks:** What could happen that may affect our ability to deliver the project on time?
10. **Scheduling:** There may be no perfect schedule; schedule is not engraved on stone. One should expect changes.

What Is a Project Plan?

A project plan is a series of **formal documents that define the execution and control stages of a project**. The plan includes considerations for **risk**

management, resource management and communications, while also addressing scope, cost and schedule baselines. Project planning software is used by project managers to ensure that their plans are thorough and robust.

Project Planning

Project planning is a procedural step in project management, where required documentation is created to ensure successful project completion. Documentation includes all actions required to define, prepare, integrate and coordinate additional plans. The project plan clearly defines how the project is executed, monitored, controlled and closed. Project planning is never truly finished until a project is completed.

A well-prepared plan should address and consequently answer the following questions:

Why? -This question is about the reasons why a project is sponsored and the problem it addresses.

What? -This question is about the work that is to be done to deliver products/results, etc. and deliverables themselves.

Who? - This is about involved people, their roles and responsibilities as well as the way they are supposed to be organized.

When? - This is about project's schedule/timeline.

Step in Project Planning Process

- ☞ Step 0: Select project
- ☞ Step 1: Identify project scope and objectives
- ☞ Step 2: Identify project infrastructure
- ☞ Step 3: Analyze project characteristics
- ☞ Step 4: Identify project products and activities
- ☞ Step 5: Estimate effort for each activity
- ☞ Step 6: Identify activity risks
- ☞ Step 7: Allocate resources
- ☞ Step 8: Review/publicize plan
- ☞ Step 9: Execute plan
- ☞ Step 10: Execute lower levels of planning
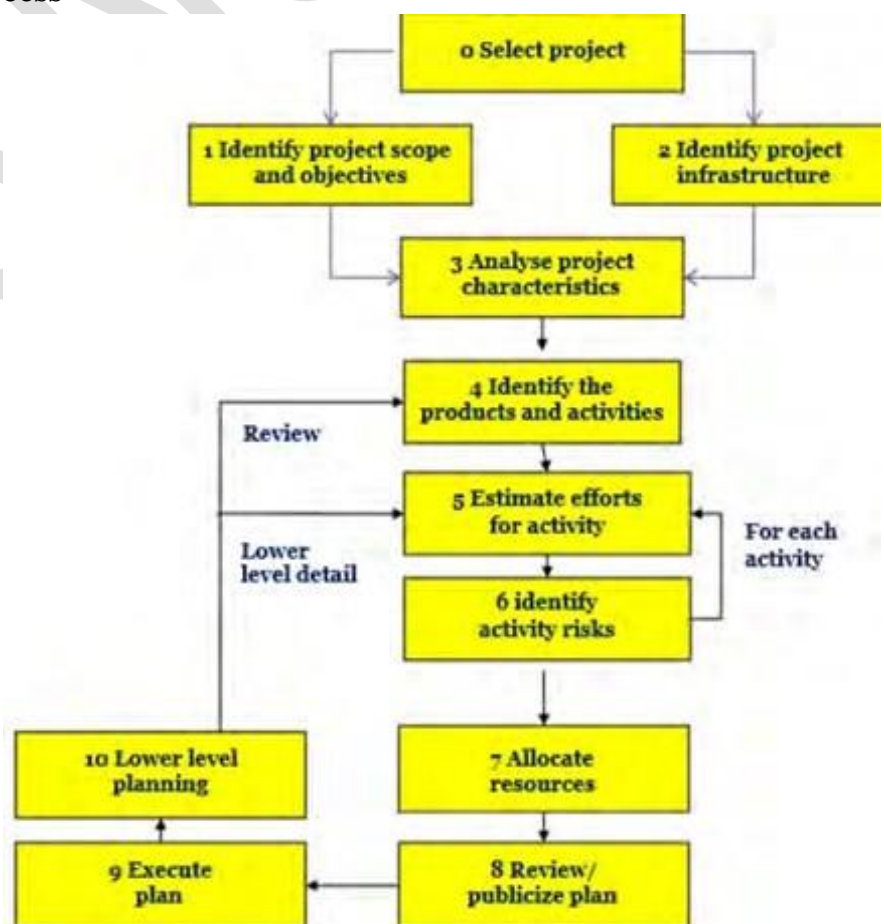
Planning Process

1. **Identify and Meet Stakeholder:** The stakeholders might include the project manager, the customer, or the team. The first step is to identify and meet the stakeholders to discuss their expectations and establish the project scope.
2. **Define Scope:** Project scope involves determining a list of specific project goals, deliverables, budgets, and deadlines. Project scope helps in establishing boundaries of the project and responsibilities of each team member.
3. **Set and Prioritize Objectives:** The objectives are set and prioritized once the expectations of stakeholders become certain. More exquisite detail to initial ideas is given, which serves as a reference point throughout the project.
4. **Determine Deliverables:** Deliverables are the reason why the projects are created. It is one of the most critical steps of the project planning to determine what these deliverables will be and how they will be delivered in time.
5. **Create a Project Schedule:** The project schedule outlines when different tasks of a project are supposed to begin and end. The project schedule helps measure the project progress and set up progress reports.
6. **Risk Analysis:** Identifying risks and considering how to deal with them is an essential step in project planning. Specific steps to prevent risks from happening or limiting their impact should be considered.
7. **Set Progress Guidelines:** There must be a communication plan to update the stakeholders regarding the project progress. This can be done monthly, weekly, or daily so that all involved members can monitor the progress.

Types of Project Plan:
1. **Quality plan:** Describes the quality procedures and standards that will be used in a project.
2. **Validation plan:** Describe the approach, resources and schedule used for system validation.
3. **Configuration management plan:** Describes the configuration management procedures and structures to be used.
4. **Maintenance plan:** Predicts the maintenance requirements of the system, maintenance costs and effort required.
5. **Staff development plan**: Describes how the skills and experience of the project team members will be developed.

Work Breakdown Structure:

Breaking work into smaller tasks is a common productivity technique used to make the work more manageable and approachable. For projects, the Work Breakdown Structure (WBS) is the tool that utilizes this technique and is one of the most important project management documents. It singlehandedly integrates scope, cost and schedule baselines ensuring that project plans are in alignment.

The Project Management Institute (PMI) Project Management Book of Knowledge (PMBOK) defines the Work Breakdown Structure as a *"deliverable oriented hierarchical decomposition of the work to be executed by the project team."* There are two types of WBS:

1. Deliverable-Based and
2. Phase-Based.

The most common and preferred approach is the Deliverable-Based approach. The main difference between the two approaches are the Elements identified in the first Level of the WBS.

Deliverable-Based Work Breakdown Structure

A Deliverable-Based Work Breakdown Structure clearly demonstrates the relationship between the project deliverables (i.e., products, services or results) and the scope (i.e., work to be executed). A deliverable-based WBS first breaks down the project into all the major areas of the project scope as control accounts and then divides those into project deliverables and work packages. Here's an example of a deliverable-based WBS.
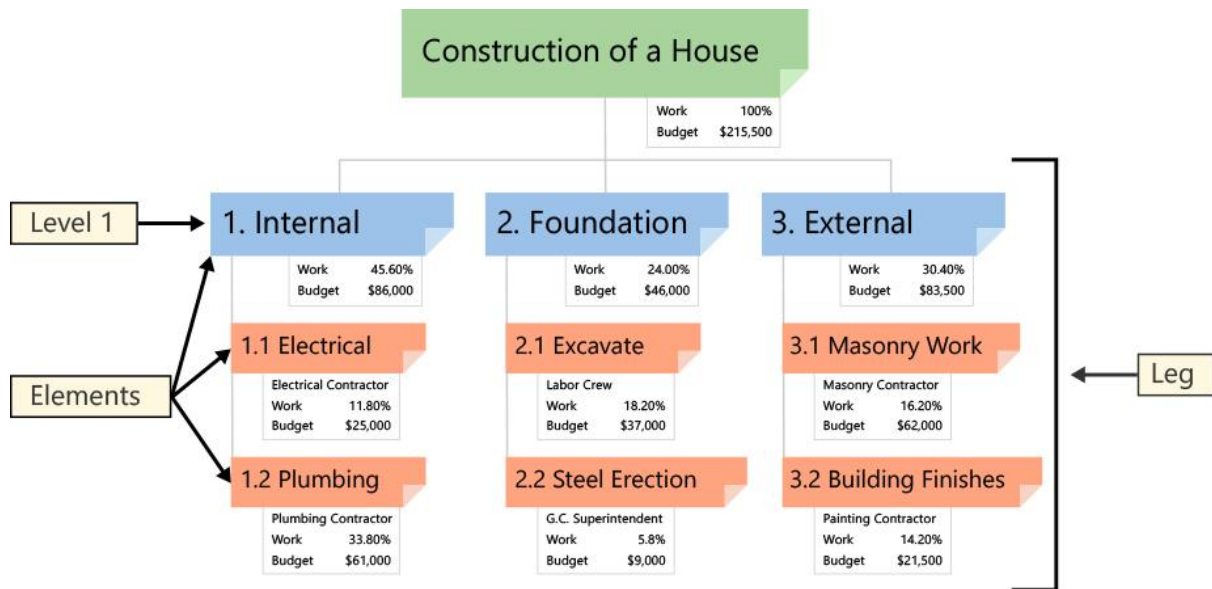
Phase-Based Work Breakdown Structure

The phase-based WBS displays the final deliverable on top, with the WBS levels below showing the five phases of a project (initiation, planning, execution, control and closeout). Just as in the deliverable-based WBS, the project phases are divided into project deliverables and work packages. Our previous graphic in the "Work Breakdown Structure Example" section contained a phase-based WBS example.
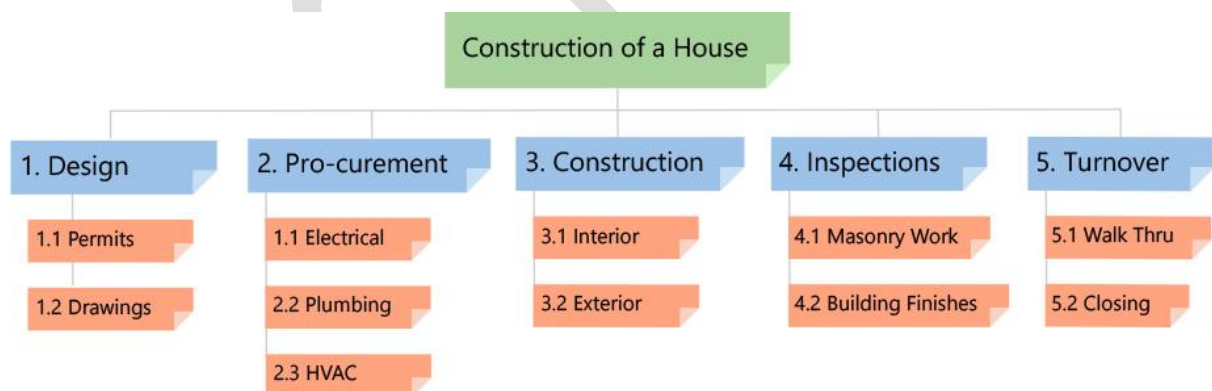
Network planning model:

Network analysis is a technique of planning, scheduling and controlling of a large and complex project comprising various activities. Network technique provides a rational approach to the planning and controlling of construction works. The application of such techniques is inevitable when there is a constraint on resources and a need for higher productivity. The two commonly used network techniques are Critical Path Method (CPM) and Programme Evaluation and Review Technique (PERT).

Critical path method:

The critical path method (CPM) is a step-by-step project management technique for process planning that defines critical and non-critical tasks with the goal of preventing project schedule problems and process bottlenecks. CPM is ideally suited to projects consisting of numerous activities that interact in a complex manner.

The critical path method is thse piece of the project management plan that identifies the steps that must be completed -- the critical path. CPM also provides insight into ancillary activities that support the outputs and deliverables needed for other critical path activities and parallel critical paths that are linked to the primary critical path. These are all important to keeping a project on schedule and budget and reaching its goals.

Ans. Do CPM (Critical Path Method) analysis and identify the critical path.

Activity	Predecessor	Duration (in months)
A	—	5
B	A	4
C	A	5
D	B	6
E	C	3
F	D,E	4

a) A → C → E → F
b) A → B → D → F
c) A → B → E → F
d) A → C → D → F

ES	D	EF
	A	
LS	SL	LF

$$SL = LF - EF$$
$$LS = LF - D$$

Start → A → B

A box: | 0 | 5 | 5 | / A / | 0 | 0 | 5 |

B box: | 5 | 4 | 9 | / B / | 5 | 0 | 9 |

D box: | 9 | 6 | 15 | / D / | 9 | 0 | 15 |

C box: | 5 | 5 | 10 | / C / | 7 | 2 | 12 |

E box: | 10 | 3 | 13 | / E / | 12 | 2 | 15 |

F box: | 15 | 4 | 19 | / F / | 15 | 0 | 19 |

F → Finish