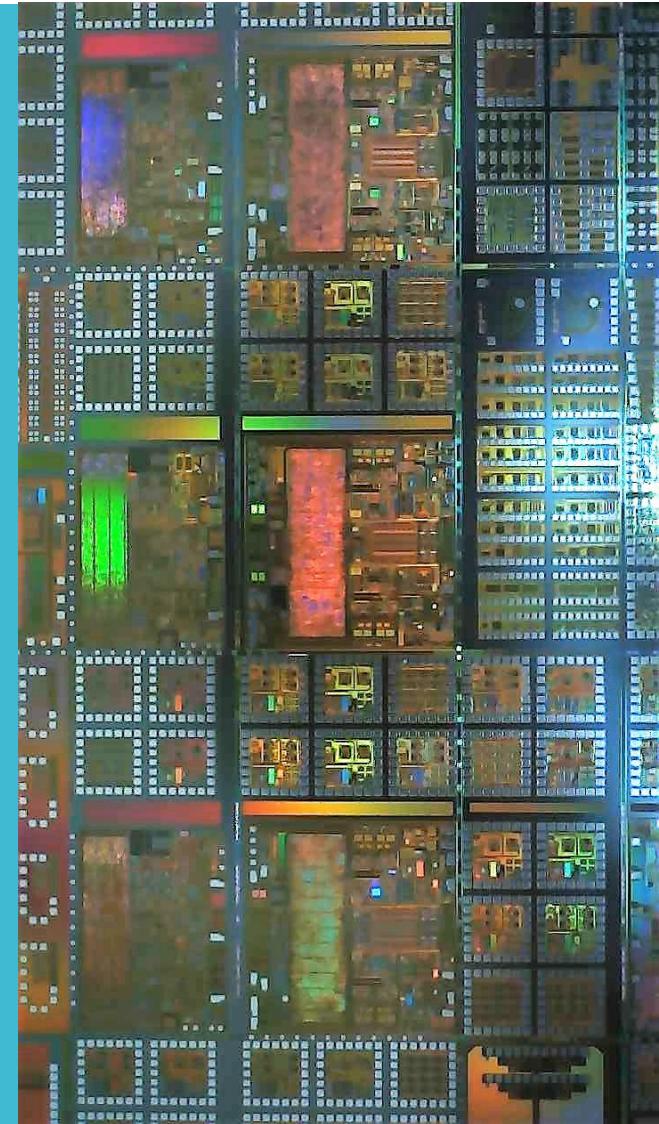


# Class 5: Schedule Management – Part I

## Agenda:

- Time Management
- PMI Time Management Framework
- Tools
- Best Practices
- Time Robbers
- Wrap-up.



# Course Overview

(15 minutes)

Class 1

Introduction &  
Foundations

Class 2

Project Life cycle

Class 3

Risk Management

Class 4

Quality Management

Class 5

Scheduling Part I

Class 6

Scheduling Part II

Class 7

Special Assignment

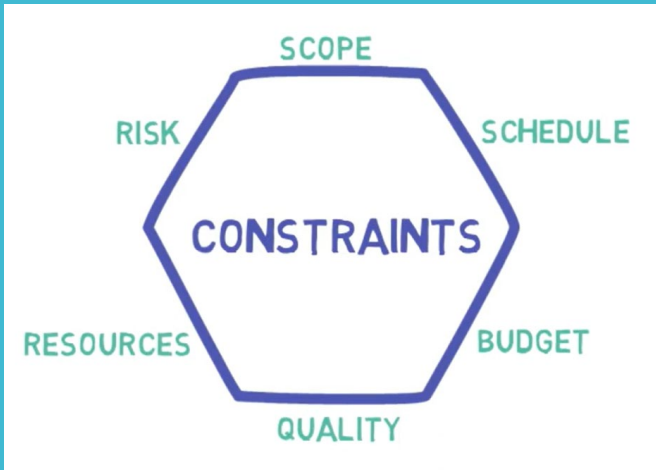
Class 8

Open discussion  
with Industry expert

# Process Group and Knowledge Area Mapping

Knowledge Areas	Project Management Process Groups © WWW.PM2.BIZ				
	Initiating	Planning	Executing	Monitoring and Controlling	Closing
<b>4. Project Integration Management</b>	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work 4.4 Manage Project Knowledge	4.5 Monitor and Control Project Work 4.6 Perform Integrated Change Control	4.7 Close Project or Phase
<b>5. Project Scope Management</b>		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
<b>6. Project Schedule Management</b>		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Durations 6.5 Develop Schedule		6.6 Control Schedule	
<b>7. Project Cost Management</b>		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
<b>8. Project Quality Management</b>		8.1 Plan Quality Management	8.2 Manage Quality	8.3 Control Quality	
<b>9. Project Resource Management</b>		9.1 Plan Resource Management 9.2 Estimate Activity Resources	9.3 Acquire Resources 9.4 Develop Team 9.5 Manage Team	9.6 Control Resources	
<b>10. Project Communications Management</b>		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Monitor Communications	
<b>11. Project Risk Management</b> © WWW.PM2.BIZ		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses	11.6 Implement Risk Responses	11.7 Monitor Risks	
<b>12. Project Procurement Management</b>		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	
<b>13. Project Stakeholder Management</b>	13.1 Identify Stakeholders	13.2 Plan Stakeholder Engagement	13.3 Manage Stakeholder Engagement	13.4 Monitor Stakeholder Engagement	

# Project Plan



## Project Plan

Think of the project plan as the master **blueprint that outlines how you'll execute, monitor, control, and close your project**. This document is much more than just a schedule; it encompasses numerous components to ensure project success.

Key Components of a Project Plan (not exhaustive):

- **Project Scope Statement:** Defines the boundaries of what the project will and will not deliver.
- **Project Schedule:** it outlines the timeline for all project activities.
- **Project Budget:** A detailed estimate of all project costs.
- **Quality Management Plan:** Specifies the quality standards for project deliverables and the processes for ensuring those standards are met.
- **Resource Plan:** Identifies the types and quantities of resources needed for each project activity.
- **Risk Management Plan:** Outlines the processes for identifying, analyzing, responding to, and monitoring project risks.
- **Communication Plan:** Defines how project information will be shared with stakeholders
- **Procurement Plan (if applicable):** Details how the project team will acquire goods and services from external vendors.

# Project Time Management

## Project Time Management

**Schedule Management** is the process of defining project tasks and their durations, dependencies, and assigned resources to complete the project within a designated time frame. It also includes monitoring and reporting on the schedule to ensure the project is delivered on time.

**Importance** of Time Management in project success

- Ensures project deliverables are met on schedule
- Helps in efficient resource allocation
- Reduces costs associated with delays
- Increases stakeholder satisfaction
- Improves overall project performance and success rates

Poor project time management is one of the most common  
obstacles to project success

(i.e., cost overruns, missed deadlines, stakeholder dissatisfaction, etc.)

# Project Time Management

## PMI Time Management framework

1. Plan Schedule Management
  2. Activity Definition
  3. Activity Sequencing
  4. Estimate Activity Resources
  5. Estimate Activity Duration
  6. Project Schedule Development
  7. Schedule Control
- Sometimes these estimation activities are grouped as one.



# Project Time Management

1. Plan Schedule Management
2. Activity Definition
3. Activity Sequencing
4. Estimate Activity Resources
5. Estimate Activity Duration
6. Project Schedule Development
7. Schedule Control

## 1. Plan Schedule Management

Defining how the program schedule will be managed, including methodology, tools, and resources.

- Provides guidance and direction on how the project schedule will be managed throughout the project.
- Establish rules and procedures for:
  - Planning,
  - Executing
  - Controlling the project schedule.
- Specify objectives,
- Define deliverables,
- Set due dates,
- Choose software for monitoring and controlling the schedule.
- Etc.



# Project Time Management

1. Plan Schedule Management
2. Activity Definition
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## 2. Activity Definition.

Identifying and documenting the specific actions to be performed to produce the program deliverables.

What:	Documenting the activities resulting from the lowest level of the project work breakdown structure (WBS) and assigning an owner to each.
When:	Project planning.
Results:	Clear descriptions of all identified project work and delegation of responsibilities.

### Tools:

- Work Breakdown structure (WBS)
- Milestones identification
  - Release or Delivery dates
  - Reporting deadlines
  - Release or Delivery dates



# Project Time Management

1. Plan Schedule Management
2. Activity Definition
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## What is the Work Breakdown Structure?

The PMBOK defines the work-breakdown structure (aka **WBS**) as:

- A hierarchical decomposition of the total scope of work to be carried out by the project team to accomplish the project objectives and create the required deliverables.

### Key Points of a WBS:

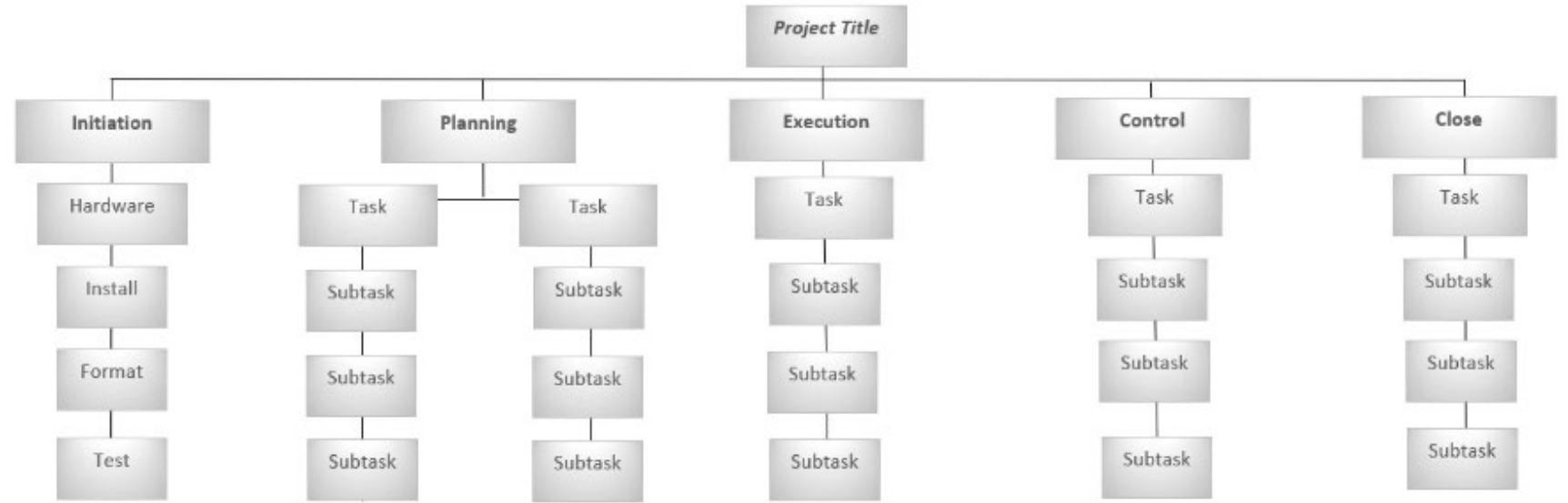
- Hierarchical Structure: Think of it like a family tree for your project, with the main objective at the top and smaller tasks branching out below.
- Deliverable Focused: The WBS centers around the final products or outcomes of the project, not the individual tasks.
- Clear Task Definition: Each element in the WBS should have a clear description of what needs to be accomplished.

**MUTUALLY  
EXCLUSIVE  
COMPLETELY  
EXHAUSTIVE**

# Project Time Management

1. Plan Schedule Management
2. Activity Definition
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7. Schedule Control

## What is the Work Breakdown Structure?



### How to create WBS in 6 steps:

1. Define the project scope, goals and objectives
2. Identify project Phases
3. List Project Deliverables
4. Set WBS levels
5. Create Work Packages (activities).

Take deliverables and think about which activities are necessary to get there.

6. Choose task Owners.

# Project Time Management

1. Plan Schedule Management
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## 3. Activity Sequencing

Determining dependencies between activities and creating a logical work breakdown structure (WBS).

- Determines the logical relationships between activities
- Uses techniques as Precedence Diagramming Method (PDM):
  - Finish to Start (FS) – is the most common.
  - Finish to Finish (FF)
  - Start to Start (SS)
  - Start to Finish (SF) – not recommended as it may be confusing.

**Formula: XZ**

**X need to happen on predecessor task in order to allow Z to happen in current task**

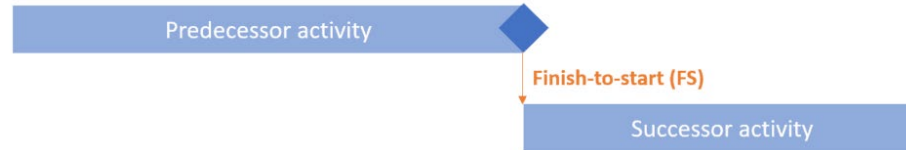
- Finish to Start (FS) – predecessor needs to finish so current task can start.
- Finish to Finish (FF) – predecessor has to finish so that current task can finish
- Start to Start (SS) – predecessor has to start to allow current task to start
- Start to Finish (SF) – predecessor has to start to allow current task to finish.

# Project Time Management

1. Plan Schedule Management
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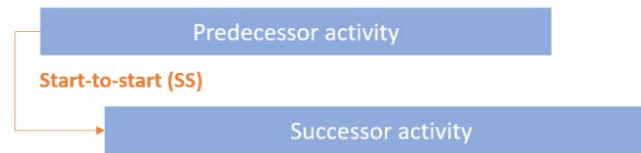
## 3. Activity Sequencing

Finish-to-Start (FS)



after finishing writing the script for a TV episode, filming can begin.

Start-to-Start (SS)



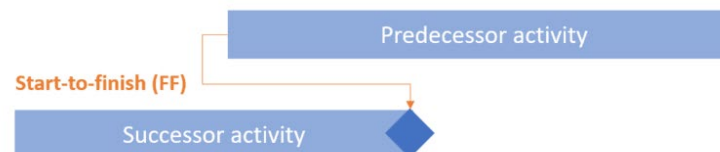
only once the lecturer begins speaking, students can begin taking notes.

Finish-to-Finish (FF)



upon completing the experiment, its documentation can be completed.

Start-to-Finish (SF)

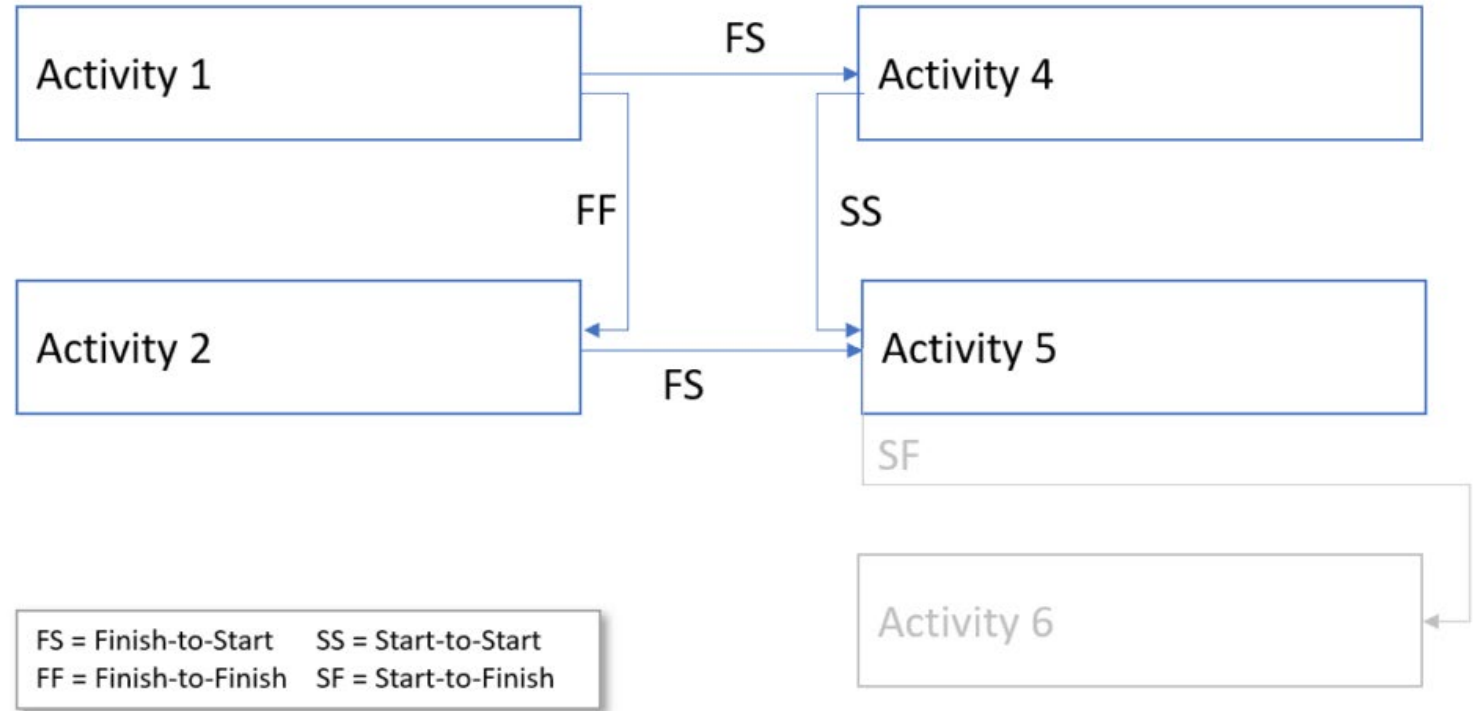


DON'T USE

# Project Time Management

1. Plan Schedule Management
2. Activity Definition
3. Activity Sequencing
4. Estimate Activity Resources
5. Estimate Activity Duration
6. Project Schedule Development
7. Schedule Control

## 3. Activity Sequencing



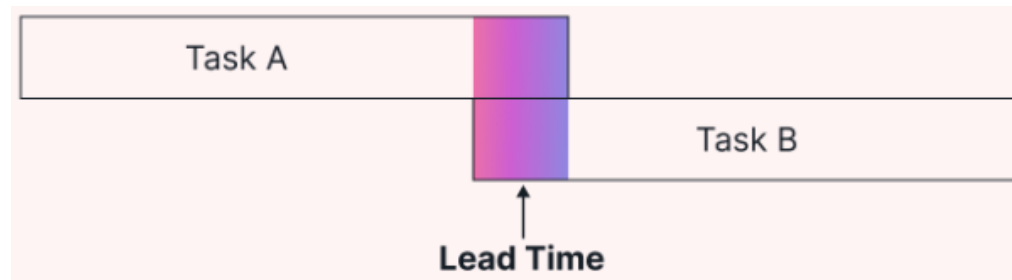
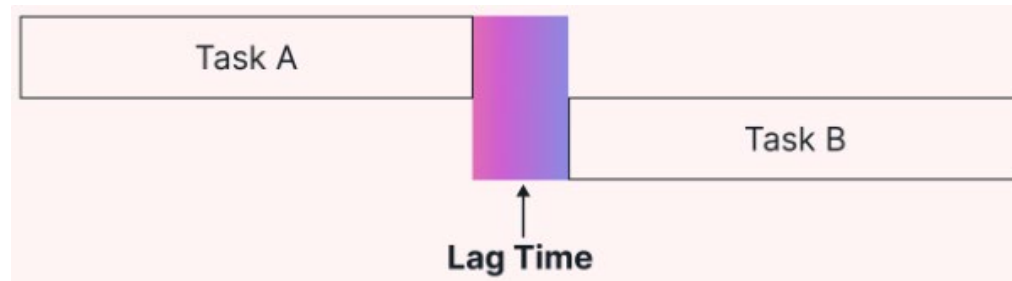
# Project Time Management

1. Plan Schedule Management
2. Activity Definition
3. Activity Sequencing
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7. Schedule Control

## 3. Activity Sequencing

Apply **Leads** and **Lags**

- A lag is a delay in the successor activity (i.e. KO FS + 3W)
- A lead is an anticipation of the successor activity (i.e. KO FS - 1W). It may be considered a negative lag.



# Project Time Management

1. Plan Schedule Management
2. Activity Definition
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5. Estimate Activity Duration
6. Project Schedule Development
7. Schedule Control

## 3. Activity Sequencing.

		Duration	Start Date	Due Date	Predecessors
		①			②
83	[-] Safety at Kickoff	71d	15-Jul-2024	21-Oct-2024	
84	Development Interface Agreement (DI)	12w	15-Jul-2024	4-Oct-2024	79
85	Safety Case (Team Competency Tab)	1w	15-Jul-2024	19-Jul-2024	79
86	Confirmation Review - Safety Plan	1w	15-Jul-2024	19-Jul-2024	79
87	Safety Manual at Kickoff (AoU, Top-Le	2w	14-Aug-2024	27-Aug-2024	81
88	Hardware Safety Requirement (HSR) :	2w	10-Sep-2024	23-Sep-2024	101FF +1w
89	Verification Review - Safety Requirem	2w	24-Sep-2024	7-Oct-2024	88
90	Pre-Silicon Verification Plan of HSRs (:	2w	24-Sep-2024	7-Oct-2024	88
91	DFMEA at Kick Off (ASIL-Ready, ASIL-	2w	24-Sep-2024	7-Oct-2024	81, 88
92	FTA at Kick Off (ASIL B-D)	2w	8-Oct-2024	21-Oct-2024	91
93	DFA at Kick Off (ASIL-Ready, ASIL-Co	2w	24-Sep-2024	7-Oct-2024	81, 88
94	Configuration Management Plan	1w	8-Oct-2024	14-Oct-2024	95
95	Assessment at Kick Off (ASIL C-D)	2w	24-Sep-2024	7-Oct-2024	89SS
96	Audit at Kick Off (ASIL-Compliant)	2w	24-Sep-2024	7-Oct-2024	95SS
97	Hardware Element Evaluation Plan (A:	0	7-Oct-2024	7-Oct-2024	91, 93
98	Safety Software Tools Record Log	1w	8-Oct-2024	14-Oct-2024	95





# Assignment 1: Define predecessors

(15 minutes)

# Project Time Management

- 1. Plan Schedule Management
- 2. Activity Definition
- 3. Activity Sequencing
- 4. Estimate Activity Resources
- 5. Estimate Activity Duration
- 6. Project Schedule Development
- 7. Schedule Control

## 3. Activity Sequencing.

Technical dependencies	Logical relationship
The technical design of module B cannot finish until the technical design of module A has been completed.	
The technical designs of module A must be completed before module A development can start.	
The technical designs of module B must be completed before module B development can start.	
The development of module B can only be started when the development of module A has been started.	
The development of feature F cannot be finished before the development of module B has started	

# Project Time Management

1. Plan Schedule Management
2. Activity Definition
3. Activity Sequencing
4. Estimate Activity Resources
5. Estimate Activity Duration
6. Project Schedule Development
7. Schedule Control

## 3. Activity Sequencing.

Technical dependencies	Logical relationship
The technical design of module B cannot finish until the technical design of module A has been completed.	Activity (1) is predecessor of activity (2) in a finish-to-finish (FF) dependency
The technical designs of module A must be completed before module A development can start.	Activity (1) is predecessor of activity (3) in a finish-to-start (FS) relationship
The technical designs of module B must be completed before module B development can start.	Activity (2) is predecessor of activity (4) in a finish-to-start (FS) relationship
The development of module B can only be started when the development of module A has been started.	Activity (3) is predecessor of activity (4) in a start-to-start (SS) relationship
The development of feature F cannot be finished before the development of module B has started	Activity (5) is a successor of activity (4) and in a start-to-finish (SF) relationship

# Project Time Management

1. Plan Schedule Management
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3. Activity Sequencing
4. Estimate Activity Resources
5. Estimate Activity Duration
6. Project Schedule Development
7. Schedule Control

## 4. Estimate Activity Resources

Is the process of estimating the **quantities** of material, people, equipment or supplies required to perform each activity.

Ensure that workloads are balanced! To avoid resources to be **overstretched** or **overstressed**



# Project Time Management

1. Plan Schedule Management
2. Activity Definition
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4. Estimate Activity Resources
5. Estimate Activity Duration
6. Project Schedule Development
7. Schedule Control

## 5. Estimate Activity Duration

Estimating the time required for each activity, considering resources, potential risks and dependencies.

- Produces activity duration estimates and basis of estimates
- Considers historical data, expert judgment, and resource capabilities
- Uses techniques like Three-Point Estimating (PERT)
- Consider contingency for tasks delays.

### How Can Activity Durations Be Shortened?

- Narrowing the scope of the work of an activity,
- Increasing the amount or number of resources for that activity, and
- Increasing the efficiency of the work.
- *Activity scope of work must be clearly defined*
- *Ensure that the task responsible is not using too much contingency buffer.*
- *Ensure that everyone is using the same units of time.*

# Project Time Management

1. Plan Schedule Management
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5. Estimate Activity Duration
6. Project Schedule Development
7. Schedule Control

## 5. Estimate Activity Duration

- **Working days:** refer to the days in a week when regular business operations occur.
- **Calendar days:** To count calendar days, all consecutive days are simply added together, regardless of whether they fall on a working day or not.

### Why we use working days?

- Provide flexibility in scheduling where possible to accommodate diverse employee needs, promote work-life balance, and enhance employee satisfaction and retention.

### Other ways of measuring amount of work:

- **"Man-weeks"** is a unit of measurement used in project management to estimate the amount of work required to complete a task or project. It represents the effort of one person working for one week.

### For example:

- 1 man-week is equal to one person working for 5 working days (assuming a standard work week).
- 2 man-weeks could mean one person working for 10 working days, or two people working for 5 working days each.

# Project Time Management

1. Plan Schedule Management
2. Activity Definition
3. Activity Sequencing
4. Estimate Activity Resources
5. Estimate Activity Duration
6. Project Schedule Development
7. Schedule Control

## 6. Schedule Development.

Analyzing activity sequences, durations, and resource constraints to create the program schedule.

- Involve key stakeholders in major scheduling decisions
- Set realistic expectations from the project onset
- Build buffer time into the schedule for high-risk activities
- Add calendar constraints (public and company holidays)
- Consider Resource constraints (staff holidays & HW / assets delivery schedule)
- **Try to overlap (parallelize) activities!!**

### Tools:

- **Gantt Charts:** Visual representation of the program schedule, showing activity durations, dependencies, and progress.
- **Program Evaluation and Review Technique (PERT):** Similar to CPM but incorporates uncertainty in activity durations.
- **Resource Leveling:** Adjusting the schedule to address resource constraints and optimize resource utilization.
- **Schedule Compression:** Techniques like crashing (adding resources) or fast-tracking (overlapping activities) to shorten the schedule.

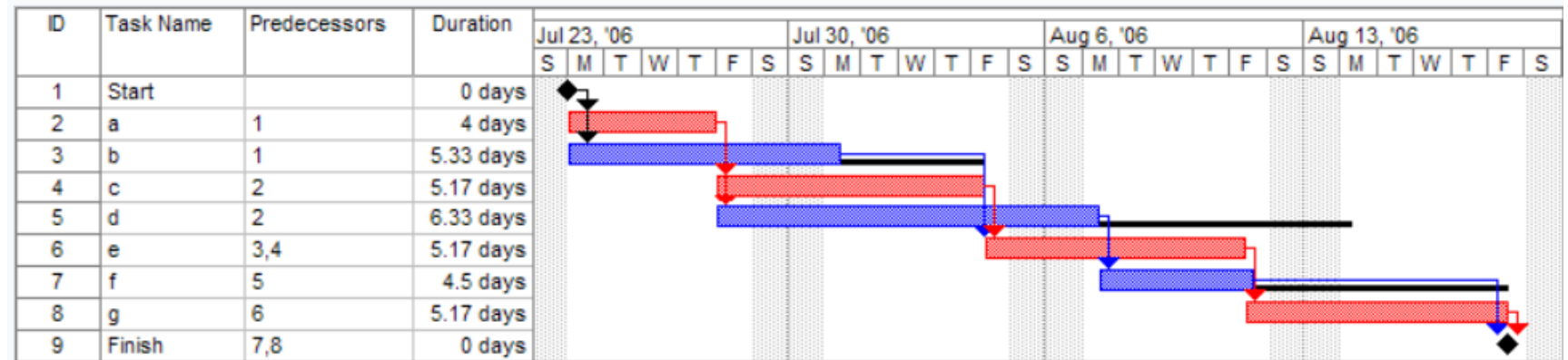


# Project Time Management

1. Plan Schedule Management
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5. Estimate Activity Duration
6. Project Schedule Development
7. Schedule Control

## Gantt Charts

Visually represents the timeline of project tasks and their dependencies, allowing you to monitor task progress, identify bottlenecks, and manage your project schedule efficiently.



A Gantt chart created using [Microsoft Project](#). Note (1) the **critical path** is in red, (2) the **slack** is the black lines connected to non-critical activities, (3) since Saturday and Sunday are not work days and are excluded from the schedule, some bars on the Gantt chart are longer if they cut through a weekend.

# Project Time Management

1. Plan Schedule Management
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5. Estimate Activity Duration
6. Project Schedule Development
7. Schedule Control

## PERT

**Program evaluation and review technique (PERT)** is used to get accurate time estimates for complicated projects. It uses an algorithm to calculate the estimated duration for unpredictable activities.

The main difference between PERT and CPM lies in their approach for time estimation. While CPM focuses on one-time estimates, PERT uses three-point estimates for every duration:

- **Most likely duration:** All other things being equal, this is the best estimate for your tasks or projects.
- **Pessimistic estimate:** The longest time you think a task will take.
- **Optimistic estimate:** The fastest duration of a specific task or project.

Based on these estimates, you can forecast an average duration for the whole project.

# Project Time Management

1. Plan Schedule Management
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6. Project Schedule Development
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## PERT Example

Task	Optimistic (O)	Most Likely (M)	Pessimistic (P)
Task A	2 Wks	4 Wks	5 Wks
Task B	1 Wks	2 Wks	3 Wks
Task C	2 Wks	3 Wks	4 Wks
Task B	3 Wks	5 Wks	8 Wks
Completion	8 Wks	14 Wks	20 Wks

Example of the three-time estimates

**Formula:  $(P+4M+O)/6$**

**Example:  $(8 + 4(14)+20)/6 = 14 \text{ Weeks}$**

# Project Time Management

1. Plan Schedule Management
2. Activity Definition
3. Activity Sequencing
4. Estimate Activity Resources
5. Estimate Activity Duration
6. Project Schedule Development
7. **Schedule Control**

## 7. Schedule Monitor & Control.

Is the process of monitoring the status of the project progress and manage changes of the schedule **baseline**.

1. Check Schedule deviations.
2. Check impact of deviations
  - are they on critical path?
  - Check Out of boundaries conditions.
3. Consider mitigation plans:
  - What-If scenario analysis
  - Can additional resources be used?
  - Can tasks be reassigned or rescheduled?

### Change Management:

Making sure that any modifications to the schedule are reviewed, approved, and communicated to the team and the rest of your project stakeholders.

### Tools:

- **Gantt Charts:** Visual representation of the program schedule, showing activity durations, dependencies, and progress.
- **Critical Path Method (CPM):** Identifying the longest sequence of activities that determines the program's minimum completion time.

# Project Time Management

1. Plan Schedule Management
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5. Estimate Activity Duration
6. Project Schedule Development
7. **Schedule Control**

## Critical Path Method (CPM)

- The critical path is the longest sequence of tasks that must be completed to execute a project.
- The tasks on the critical path are called critical activities because if they're delayed, the whole project completion will be delayed. To find the critical path, project managers use the critical path method (CPM).

### **Benefits:**

- Identify critical activities which must be completed on time and require close supervision.
- Find out which project tasks can be delayed without affecting the project schedule by calculating slack for each task.
- Identify task dependencies, resource constraints and project risks.
- Prioritize tasks and create realistic project schedules.
- Reduce project life cycle focusing on critical path.

# Critical Path Method (CPM)

[illegible]

# Project Time Management

1. Plan Schedule Management
2. Activity Definition
3. Activity Sequencing
4. Estimate Activity Resources
5. Estimate Activity Duration
6. Project Schedule Development
7. **Schedule Control**

## Float (aka Slack)

### What is float?

- **“Float”** in project management means the amount of time that a task or a project takes without causing a delay in the project’s overall completion. It represents the flexibility or “buffer” available for a specific task within the project schedule.
- Some people reserve **float** to mean how long you can over-run a task without implications.
- And they use **slack** to refer to how long you can delay the start of a task without implications.

### Types of float:

- **Free float:** The amount of time that a scheduled activity can be delayed without affecting the start of successor activities - aka **task float** or **activity float**
- **Total float:** The amount of time that a scheduled activity can be delayed without affecting the end of the project - aka **project float**.

Total Float	Free Float
It affects the project schedule.	It affects only the next activities.
It is calculated based on the critical path.	It is calculated based on succeeding activities.
Activities on the critical path will have zero total float.	Activities on the critical path can have a free float.
It provides a high-level view of schedule flexibility.	It provides a local view of task flexibility.
It belongs to the project.	It belongs to individual activities.



# Project Time Management

1. Plan Schedule Management
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7. **Schedule Control**

## Float (aka Slack)

- Earliest Start (ES)
- Earliest Finish (EF)
- Latest Start (LS)
- Latest Finish (LF)

$$\text{Total Float} = \text{LF} - \text{EF} \quad \text{or} \quad \text{LS} - \text{ES}$$

*( Both of these formulas will give you the task's total float. )*

$$\text{Free Float} = \text{ES}_{\text{of the Next Activity}} - \text{EF}_{\text{of the Current Activity.}}$$

### Importance of Float in Project Management

- Flexibility and Buffering
- Risk Management
- Resource Allocation
- Schedule Optimization
- Critical Path Identification
- Project Monitoring and Control

# Best Practices

## **Set clear and realistic deadlines**

- Ensure deadlines are achievable and well-communicated
- Break larger deadlines into smaller, manageable milestones

## **Prioritize tasks effectively**

- Use techniques like the Eisenhower Matrix to prioritize tasks
- Focus on high-impact, urgent tasks first

## **Regularly update and review the project schedule**

- Conduct regular schedule reviews and updates
- Use techniques like Rolling Wave Planning for long-term projects}

## **Manage scope to prevent time overruns**

- Implement strong change control processes
- Assess impact of scope changes on the project timeline

# Time Robbers

1. Vague goals and objectives
2. Poorly done jobs, that need to be redone.
3. Indecision or delaying decisions and Rush into decisions
4. Poor communication Channels.
5. Uncontrolled meetings or too many meetings.
6. Changes without direct notification/explanation
7. Waiting for people
8. Failure to delegate (or unwise delegation)
9. Lack of information in a ready to use format.
10. Day-to-day administration.
11. Shifting priorities
12. Lack of adequate project management
13. Desire for perfection.



# Q&A and Discussion

This section is dedicated to addressing your questions, sharing real-world examples, and discussing case studies related to risk management in project environments.