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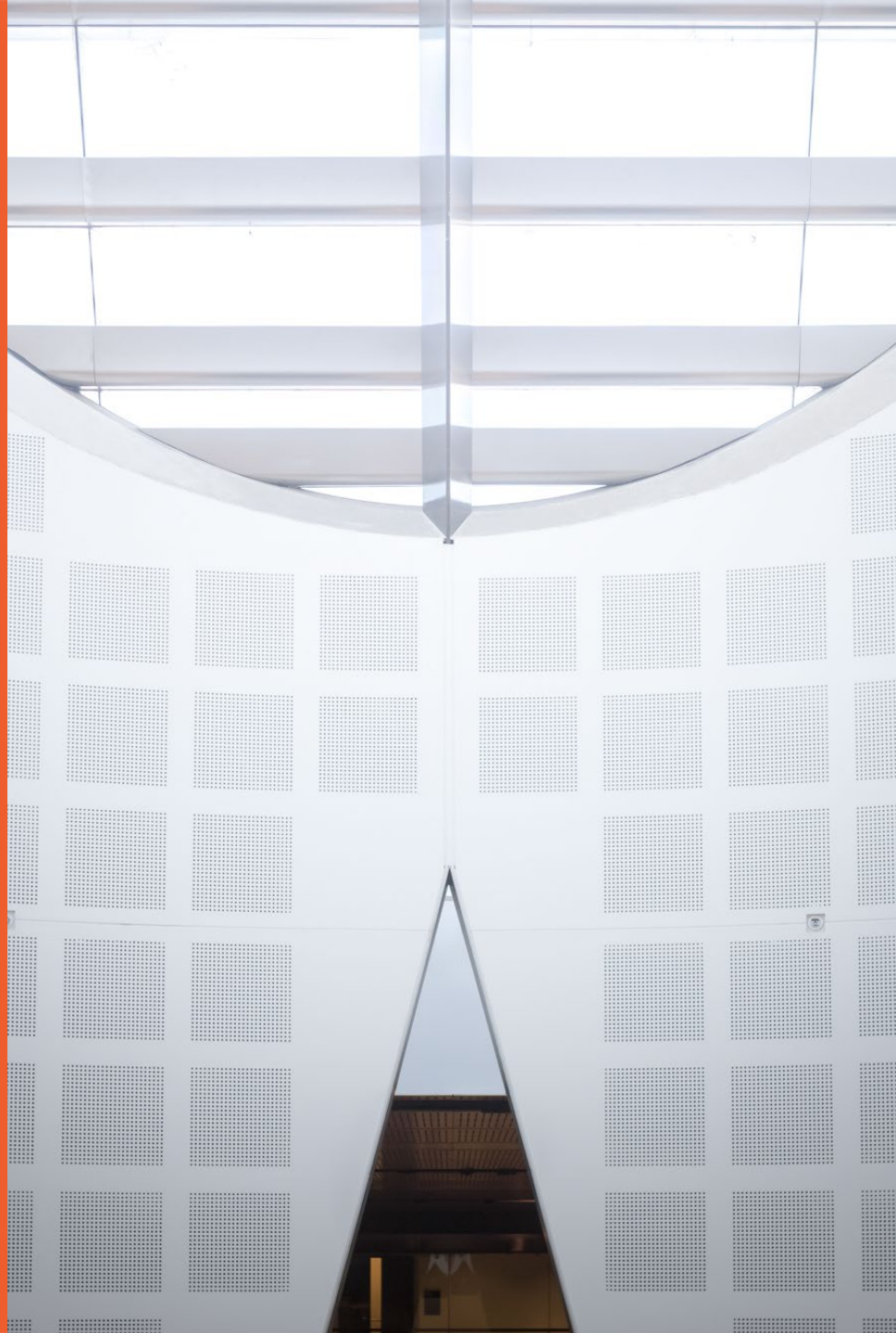
Computing 3 Management

Lecture 3
Managing IT Project: Time

Semester 1, 2021
Dr Rabiul Hasan



THE UNIVERSITY OF SYDNEY

Source:
Schwalbe, K, Information Technology Project Management (9th Edition). Cengage Learning, 2019

Recapture From Lecture 2

We discussed **Managing IT Project Scope**:

- Goal, objectives, deliverables, and scope
- Processes of project scope management
- Collecting requirements
- Creating WBS
- Validating and controlling project scope

What Will We Do Today ?

- Lecture
  - -Time Management
  - - Network Diagram
  - - CPM
  - - PERT

- Class activities
  - - Critical Thinking / Problem Solving
  - - Tools to use: https://padlet.com
    https://answergarden.ch

- Assessment
  - - Test: ?
  - - Assignment: ?
- Tutorial Updates: ? Start working on your project
- Announcement (if any):

Learning Objectives

- Discuss the importance and processes of project time management

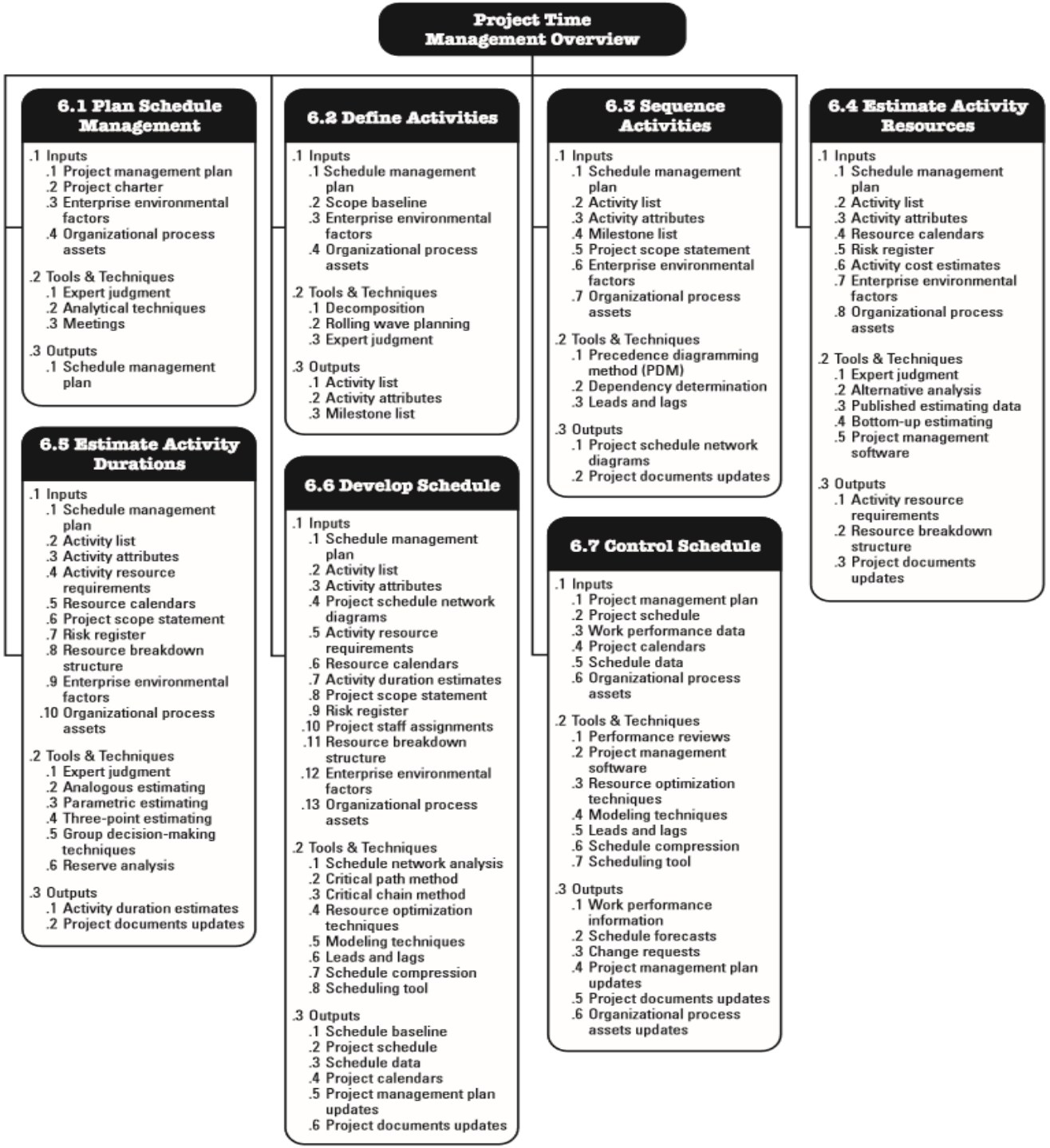
- Describe how IT project managers use network diagrams and dependencies to assist in activity sequencing
- Explain how various tools and techniques help project managers perform activity duration estimates

- Discuss Gantt chart for planning and controlling project schedule
- Describe how the Program Evaluation and Review Technique (PERT) affect schedule development

Why Project Time Management ?

- Delivering project on time as one of biggest challenges in IT project.
- Time has the least amount of flexibility; it passes no matter what happens on a project
- Schedule issues are the main reason for conflicts on projects, especially during the second half of projects

Project Time Management Overview



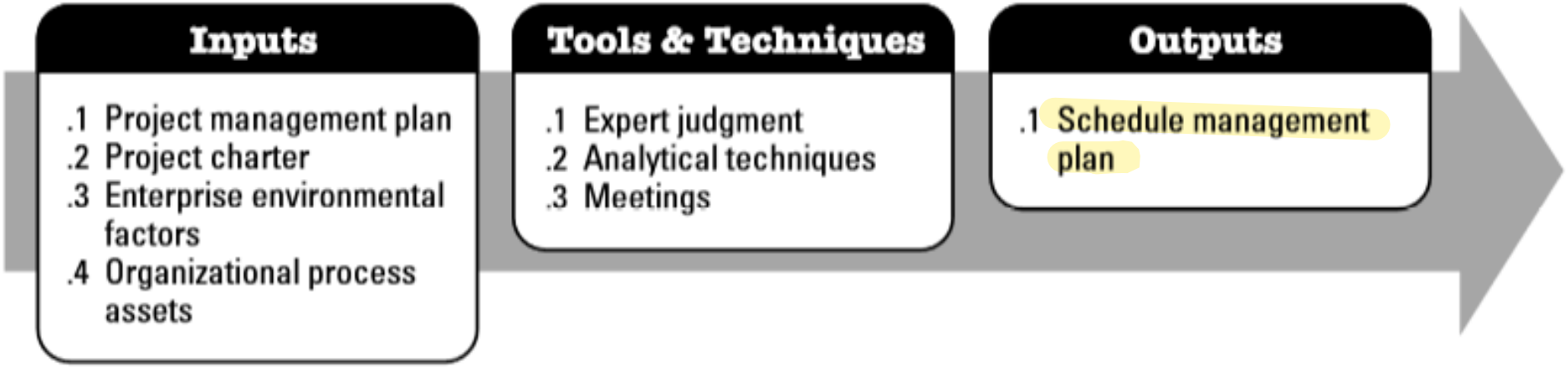
Project Time Management Processes

- **Plan schedule management:** determining the policies, procedures, and documentation that will be used for planning, executing, and controlling the project schedule
- **Define activities:** identifying the specific activities that the project team members and stakeholders must perform to produce the project deliverables

- **Sequence activities:** identifying and documenting the relationships between project activities
- **Estimate activity resources:** estimating how many resources a project team should use to perform project activities

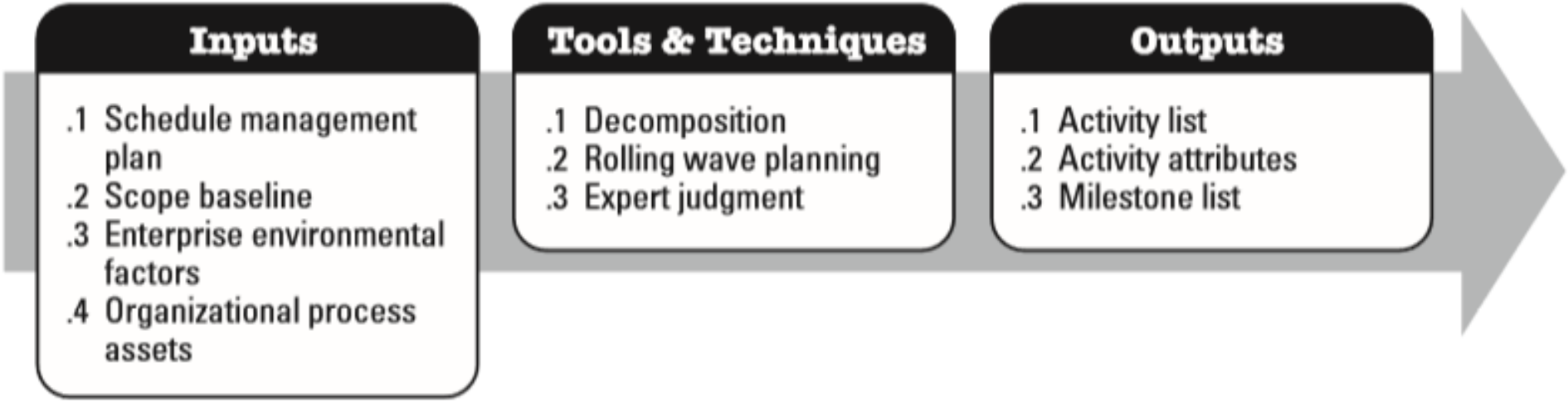
- **Estimate activity durations:** estimating the number of work periods that are needed to complete individual activities
- **Develop the schedule:** analyzing activity sequences, activity resource estimates, and activity duration estimates to create the project schedule
- **Control the schedule:** controlling and managing changes to the project schedule

Process 1: Plan Schedule Management



Process 2: Defining Activities

- An **activity** or **task** is an element of work normally found on the work breakdown structure (WBS) that has an expected duration, a cost, and resource requirements
- Activity definition involves developing a more detailed WBS and supporting explanations to understand all the work to be done so you can develop realistic cost and duration estimates



Activity Lists and Attributes

- An **activity list** is a tabulation of activities to be included on a project schedule that includes
  - the activity name
  - an activity identifier or number
  - a brief description of the activity

- **Activity attributes** provide more information such as predecessors, successors, logical relationships, leads and lags, resource requirements, constraints, imposed dates, and assumptions related to the activity

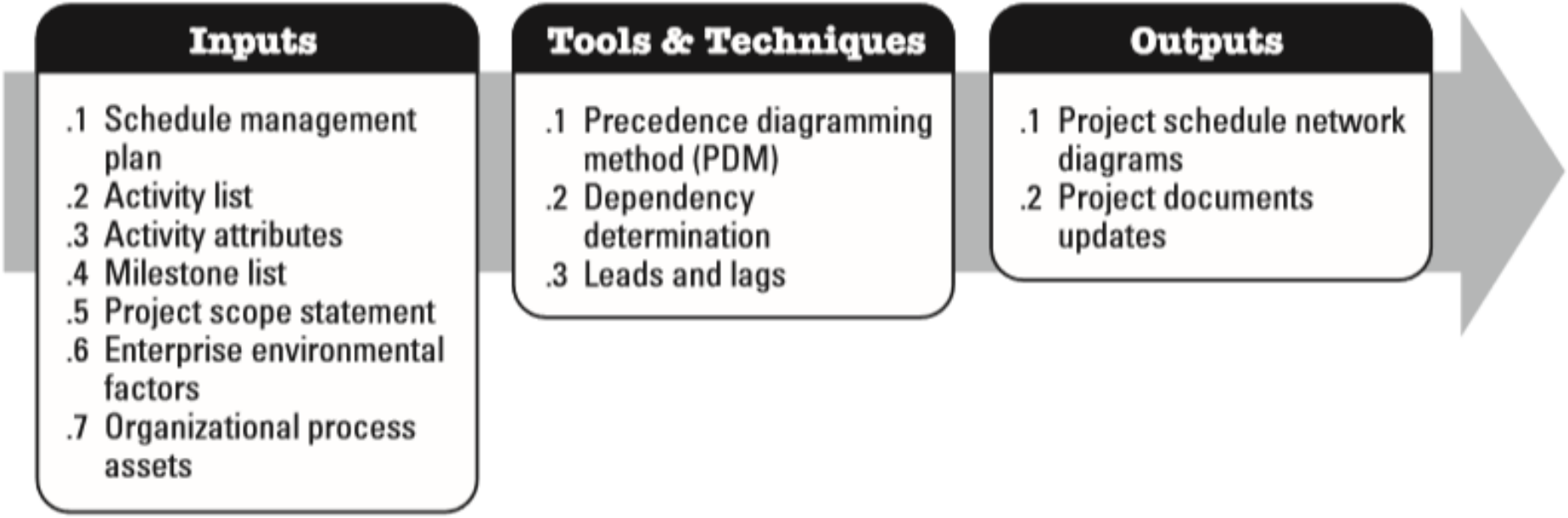
Milestones

- A **milestone** is a significant event in a project that occurs at a point in time.
- It often takes several activities and a lot of tasks to complete a milestone
- They're useful tools for setting schedule goals and monitoring progress

- Any example of a milestone?

Process 3: Sequencing Activities

- Involves reviewing activities and determining tasks dependencies
- You must determine dependencies in order to use critical path analysis



Three types of Dependencies

- **Mandatory dependencies:** essential in the nature of the work being performed on a project, sometimes referred to as hard logic

- **Discretionary dependencies:** defined by the project team, sometimes referred to as soft logic and should be used with care since they may limit later scheduling options

- **External dependencies:** involve relationships between project and non-project activities

Network Diagrams

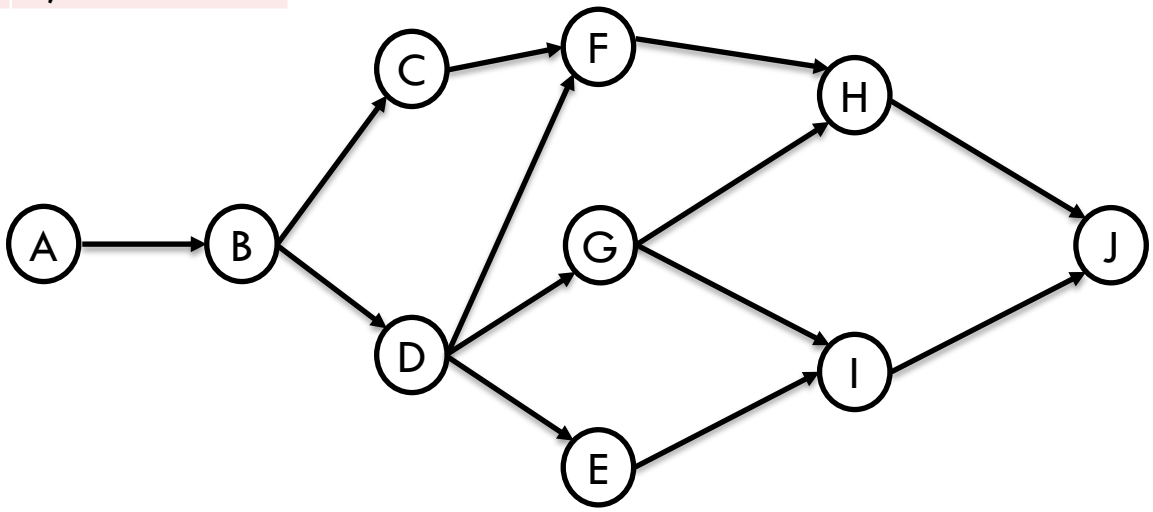
- Network diagrams are the preferred technique for showing activity sequencing
- A **network diagram** is a graphic display of the logical relationships among, or sequencing of, project activities

Network Diagram for a Project

- Activity On the Node (AON)
- Activity-On-Arrow (AOA)
- Precedence Diagramming Method (PDM)

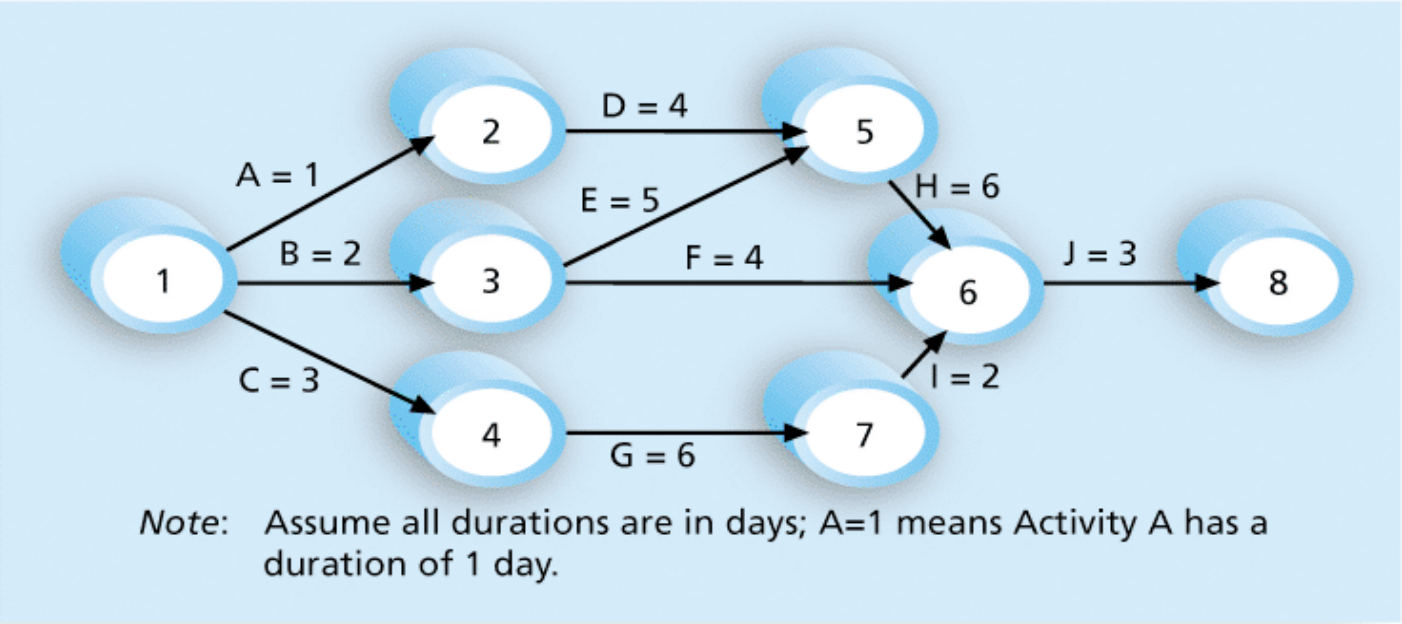
Activity On the Node (AON) Network Diagram

Activity	Estimated Duration	Predecessor
A	5	None
B	4	A
C	5	B
D	6	B
E	7	D
F	3	C,D
G	6	D
H	7	F,G
I	8	E,G
J	3	H,I



Activity-On-Arrow (AOA)

- Activities are represented by arrows
- Nodes or circles are the starting and ending points of activities
- Can only show finish-to-start dependencies



Note: Assume all durations are in days; A=1 means Activity A has a duration of 1 day.

Process for Creating AOA Diagrams

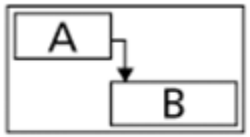
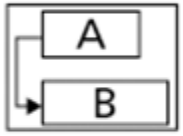
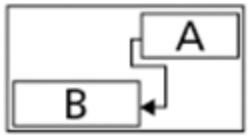
1. Find all the activities that start at node 1. Draw their finish nodes and draw arrows between node 1 and those finish nodes. Put the activity letter or name and duration estimate on the associated arrow
2. Continue drawing the network diagram, working from left to right. Look for bursts and merges. **Bursts** occur when a single node is followed by two or more activities. A **merge** occurs when two or more nodes precede a single node

3. Continue drawing the project network diagram until all activities are included on the diagram that have dependencies
4. As a rule of thumb, all arrowheads should face toward the right, and no arrows should cross on an AOA network diagram

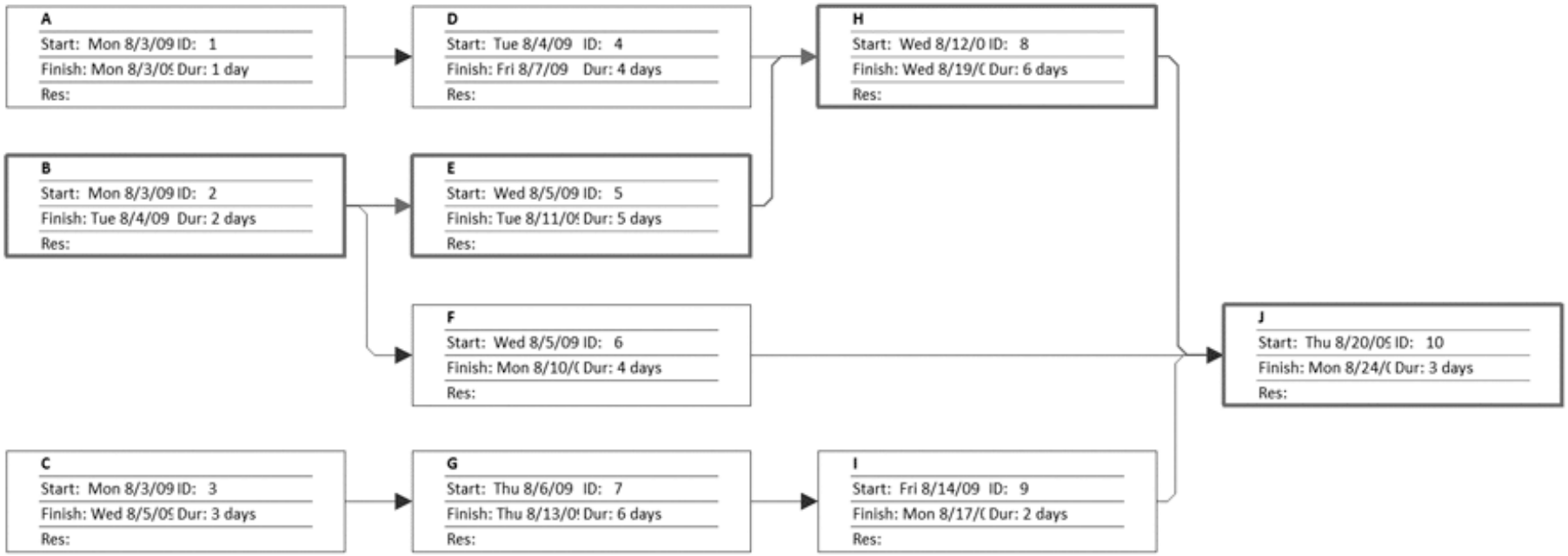
Precedence Diagramming Method (PDM)

- Activities are represented by boxes
- Arrows show relationships between activities
- More popular than AOA and used by project management software
- Better at showing different types of dependencies

PDM – Task Dependency Types

Task dependency	Example	Description
Finish-to-start (FS)		Task (B) cannot start until task (A) finishes.
Start-to-start (SS)		Task (B) cannot start until task (A) starts.
Finish-to-finish (FF)		Task (B) cannot finish until task (A) finishes.
Start-to-finish (SF)		Task (B) cannot finish until task (A) starts.

PDM Network Diagram – Example



Process 4: Estimating Activity Resources

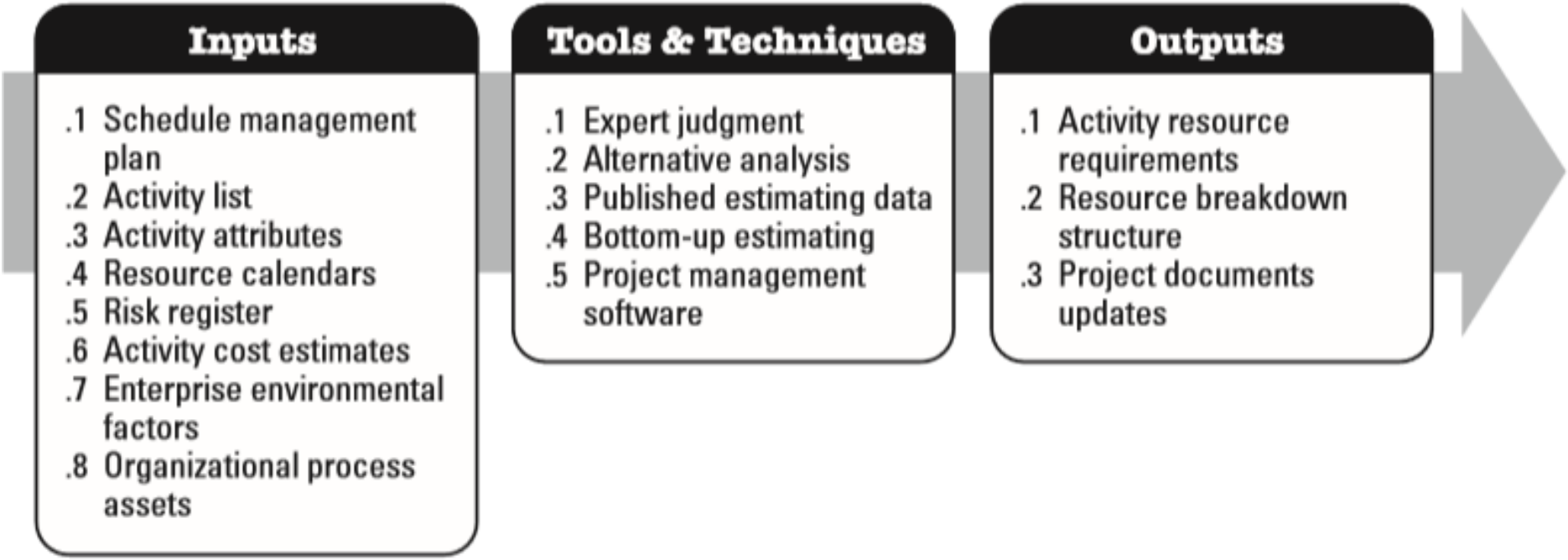
- Before estimating activity durations, you must have a good idea of the quantity and type of resources that will be assigned to each activity; **resources are people, equipment, and materials**

- Consider important issues in estimating resources
  - How difficult will it be to do specific activities on this project?
  - What is the organization's history in doing similar activities?
  - Are the required resources available?

- A **resource breakdown structure** is a hierarchical structure that identifies the project's resources by category and type

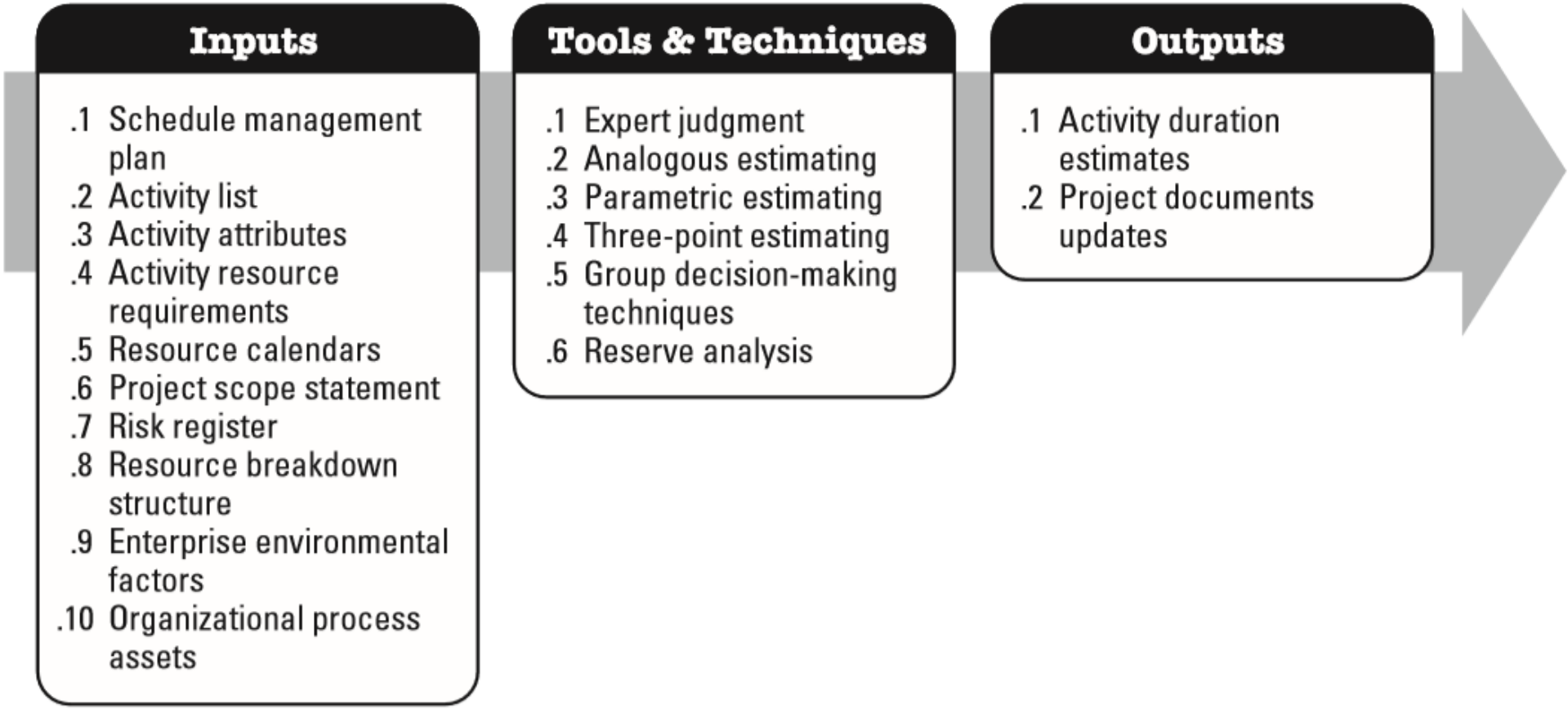
Estimating Activity Resources

- Estimate Activity Resources is the process of estimating the type and quantities of material, human resources, equipment, or supplies required to perform each activity.



Process 5: Estimating Activity Duration

- **Duration** includes the actual amount of **time worked** on an activity *plus* elapsed time
- **Effort** is the **number of workdays or work hours** required to complete a task
- Effort does not normally equal duration

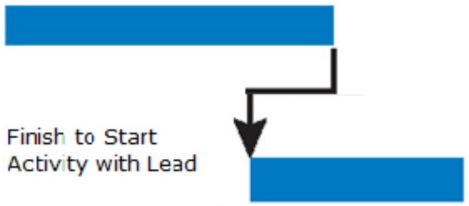


Three-Point Estimates

- Instead of providing activity estimates as a discrete number, such as four weeks, it's often helpful to create a **three-point estimate**
  - an estimate that includes an optimistic, most likely, and pessimistic estimate, such as three weeks for the optimistic, four weeks for the most likely, and five weeks for the pessimistic estimate
- Three-point estimates are needed for PERT analysis.

Lead Time and Lag Time

- **Lead:** When the first activity is still running and second activity starts, this is called Lead. The balance of time for the first activity is known as Lead Time. Lead Time is the overlap between the first and second activity.

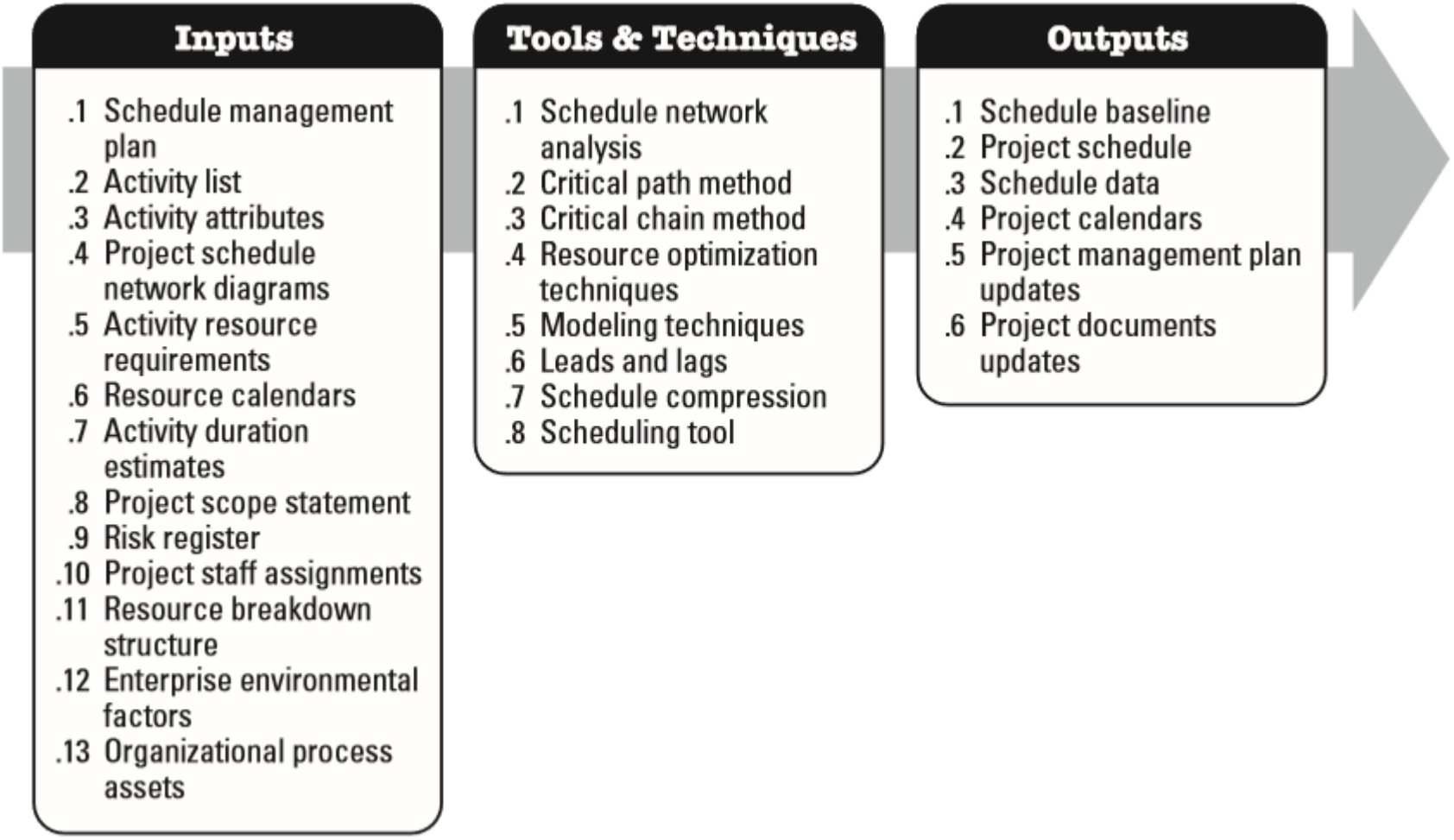


- **Lag:** When the first activity completes, if there is then a delay or wait period before the second activity starts, this is called lag and the delay is known as the Lag Time. Lag Time is the delay between the first and second activity.

https://pmstudycircle.com/2013/02/lead-time-and-lag-time-in-project-scheduling-network-diagram/

Process 6: Developing the Schedule

- Ultimate goal is to create a realistic project schedule that provides a basis for monitoring project progress for the time dimension of the project.

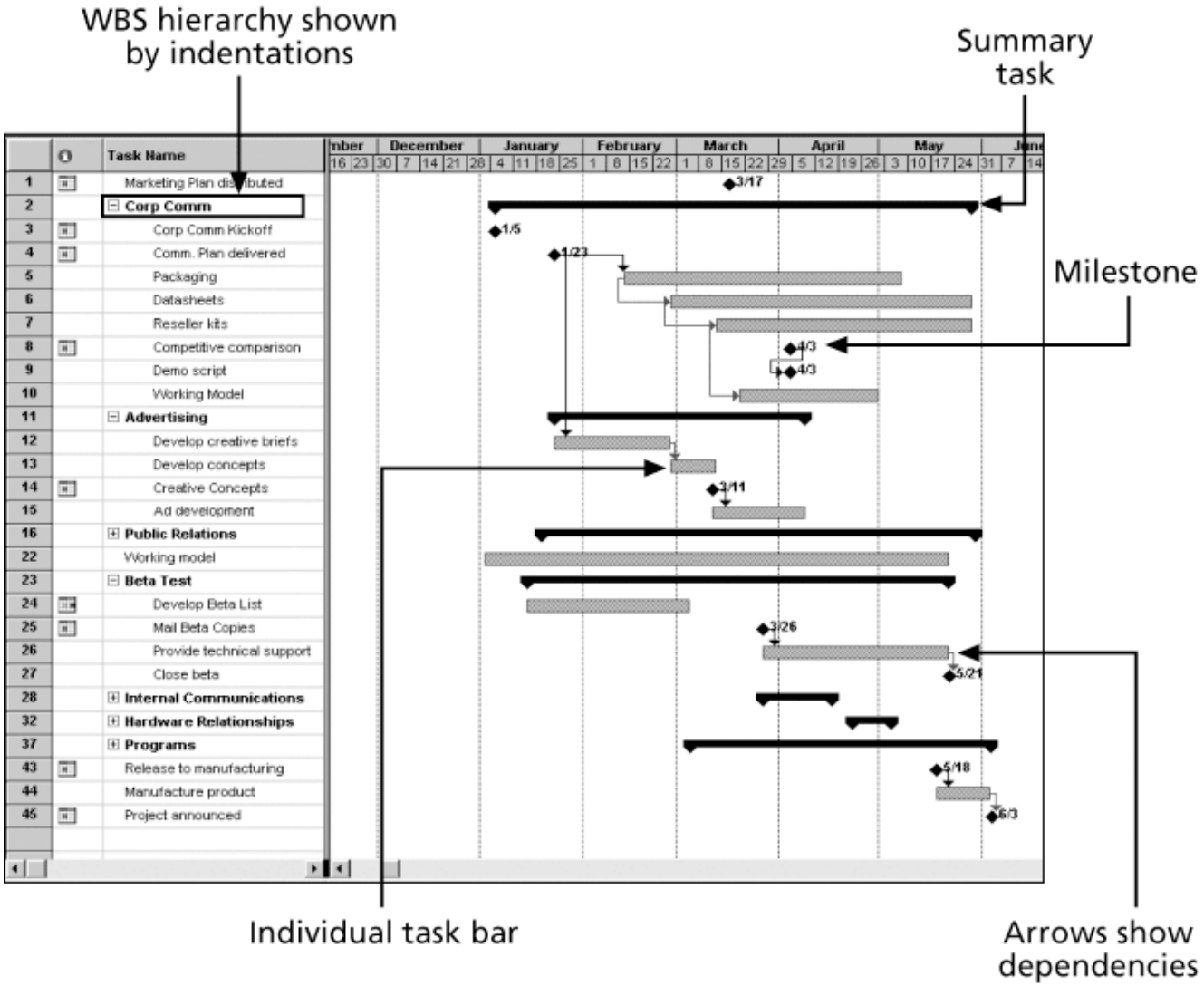


Gantt Charts

- **Gantt charts** provide a standard format for displaying project schedule information by listing project activities and their corresponding start and finish dates in a calendar format

- Symbols include:
  - A black diamond: a milestones
  - Thick black bars: summary tasks
  - Lighter horizontal bars: durations of tasks
  - Arrows: dependencies between tasks

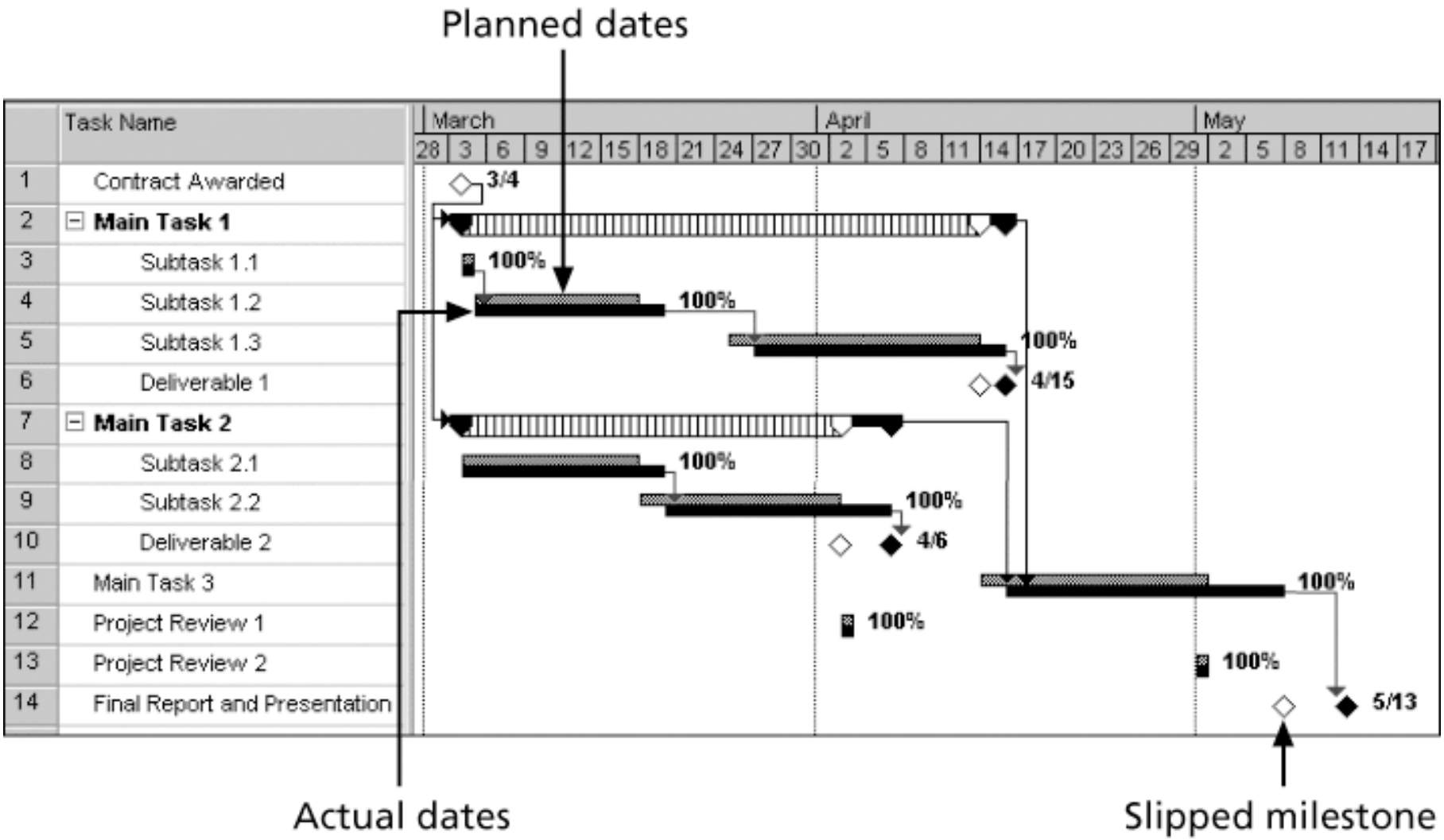
Gantt Chart for Software Launch Project



Adding Milestones to Gantt Charts

- Many people like to focus on meeting milestones, especially for large projects
- Milestones emphasize important events or accomplishments on projects
- Normally create milestone by entering tasks with a zero duration, or you can mark any task as a milestone

Sample Tracking Gantt Chart



Critical Path Method (CPM)

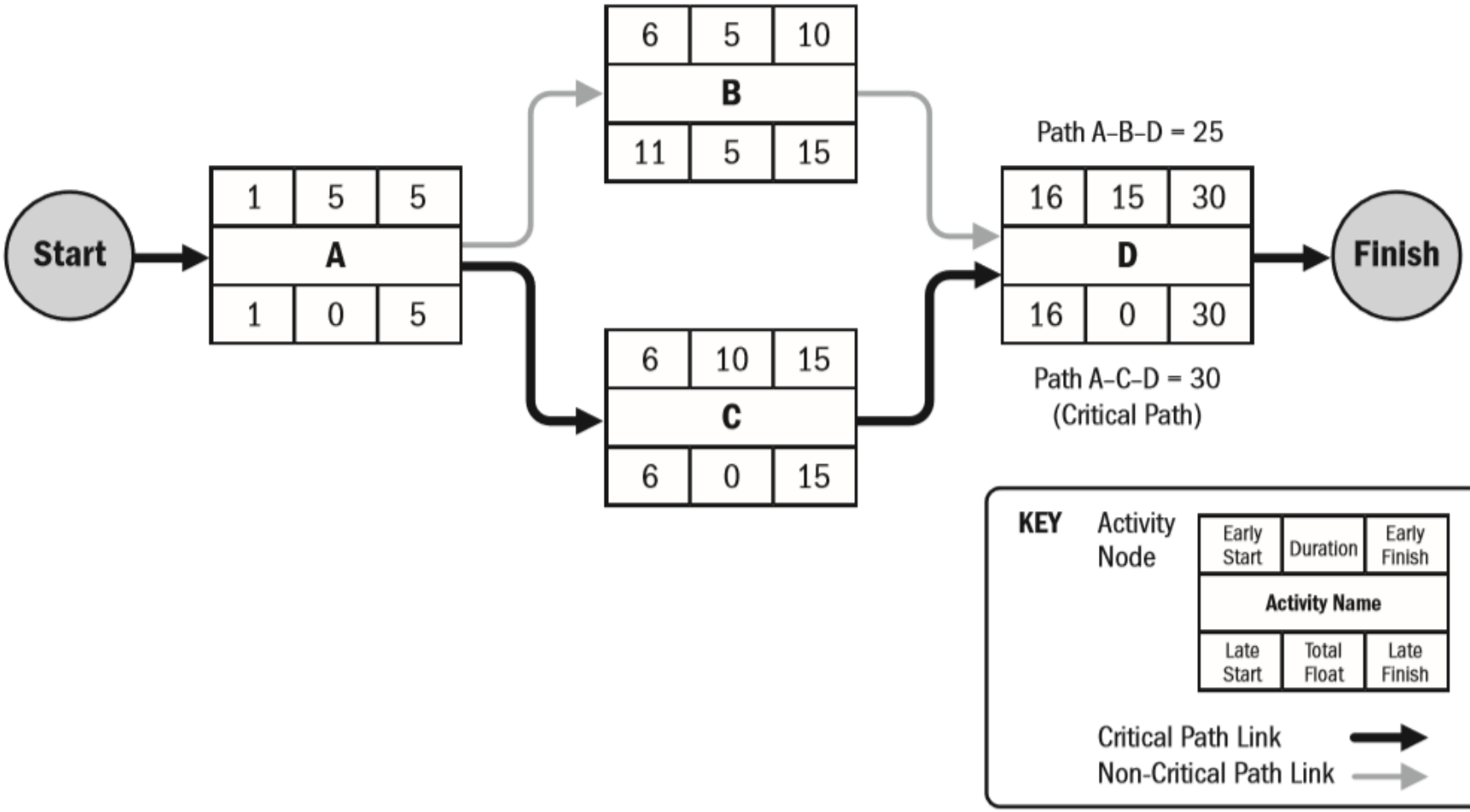
- CPM is a network diagramming technique used to predict total project duration
- A **critical path** for a project is the series of activities that determines the *earliest time* by which the project can be completed

- The critical path is the *longest path* through the network diagram and has the least amount of slack or float
- **Slack** or **float** is the amount of time an activity may be delayed without delaying a succeeding activity or the project finish date

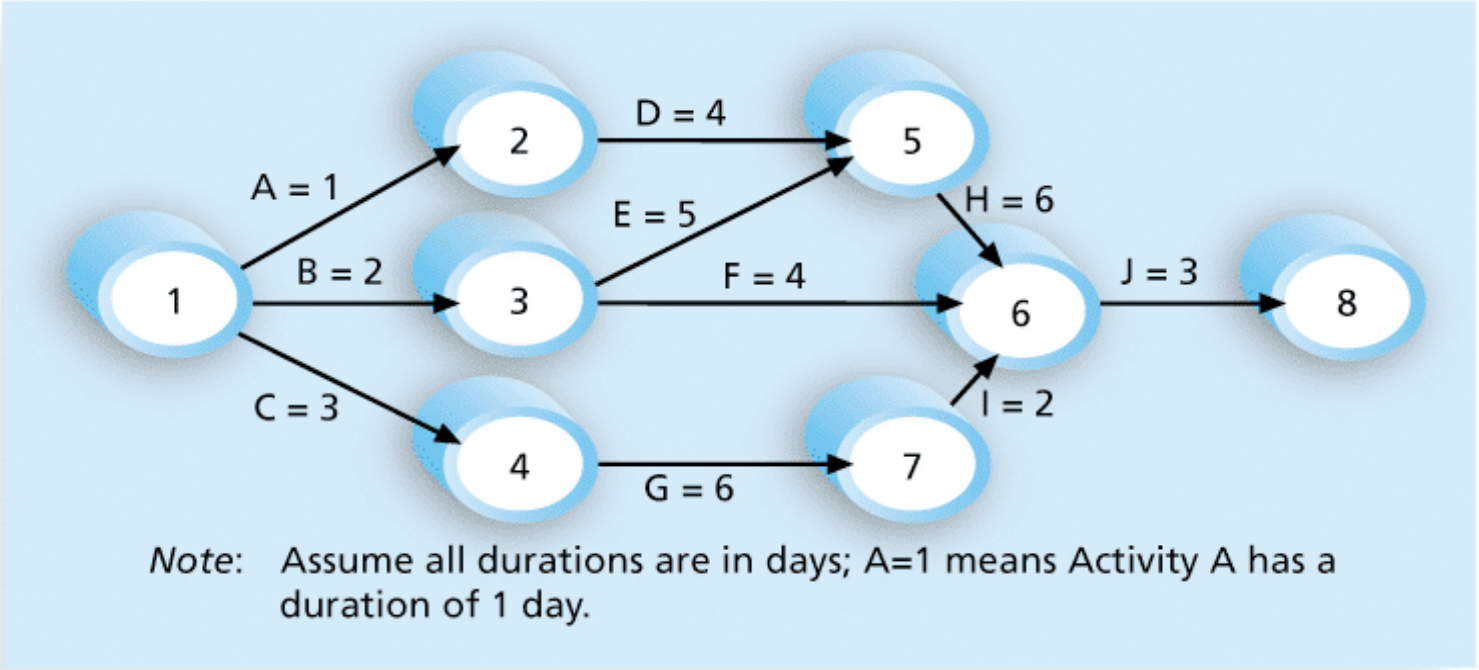
Calculating the Critical Path

- Develop a good network diagram
- Add the duration estimates for all activities on each path through the network diagram
- The longest path is the critical path
- If one or more of the activities on the critical path takes longer than planned, the whole project schedule will slip *unless* the project manager takes corrective action

Calculate Critical Path – Example

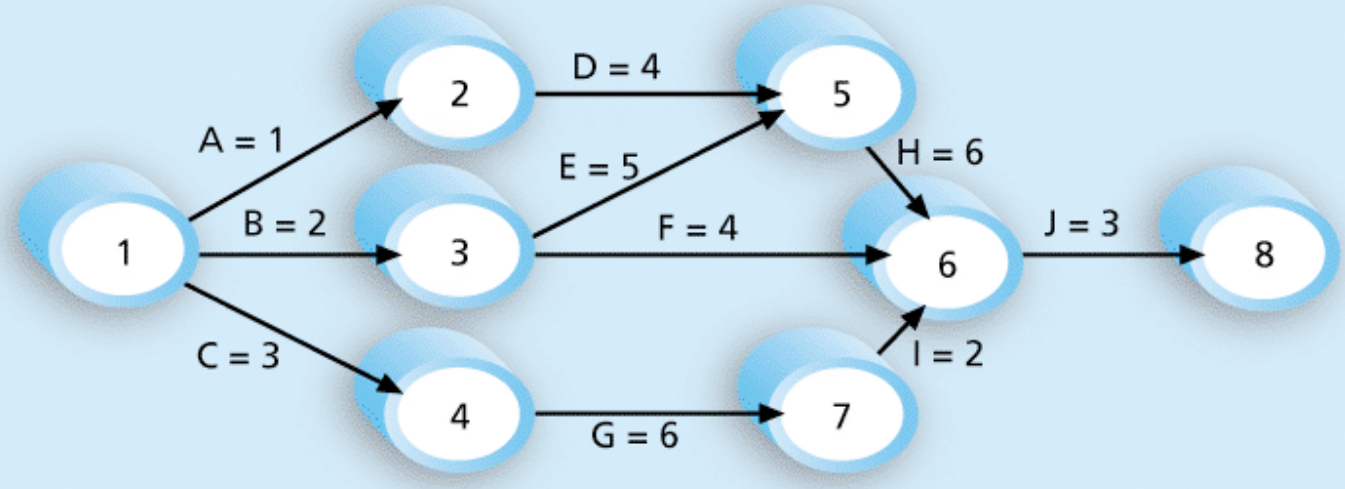


Class Exercise 1: Calculate Critical Path



- Identify the number of paths available to complete the project?
- Which path is the Critical Path?
- Using the critical path, how long will it take to complete the project?
- What is the earliest time to complete the project?
- Any advantages/disadvantages of using CPM in project ?

Class Exercise 1: Solution



Note: Assume all durations are in days.

Path 1:	A-D-H-J	Length = 1+4+6+3 = 14 days
Path 2:	B-E-H-J	Length = 2+5+6+3 = 16 days
Path 3:	B-F-J	Length = 2+4+3 = 9 days
Path 4:	C-G-I-J	Length = 3+6+2+3 = 14 days

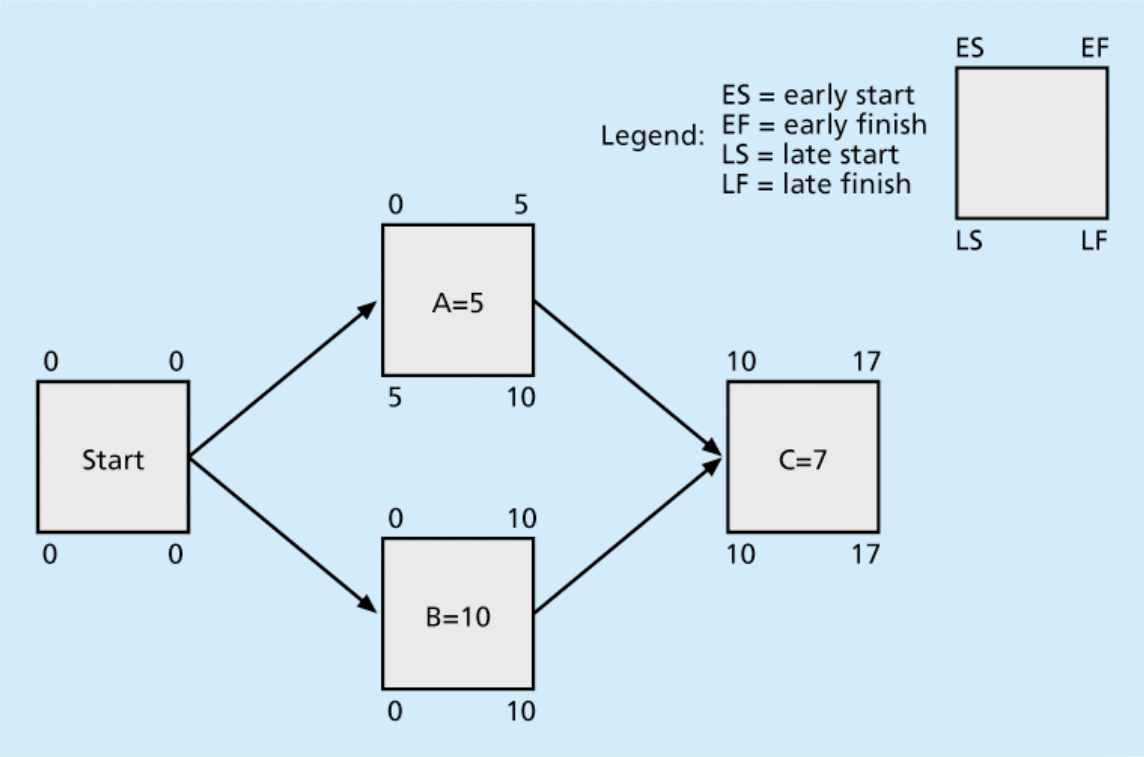
Since the critical path is the longest path through the network diagram, Path 2, B-E-H-J, is the critical path for Project X.

Critical Path

- The critical path is *not* the one with all the critical activities; it only accounts for time
- There can be more than one critical path if the lengths of two or more paths are the same
- The critical path can change as the project progresses

Calculating Early and Late Start and Finish Times

- A **forward pass** through the network diagram determines the early start and finish dates
- A **backward pass** determines the late start and finish dates



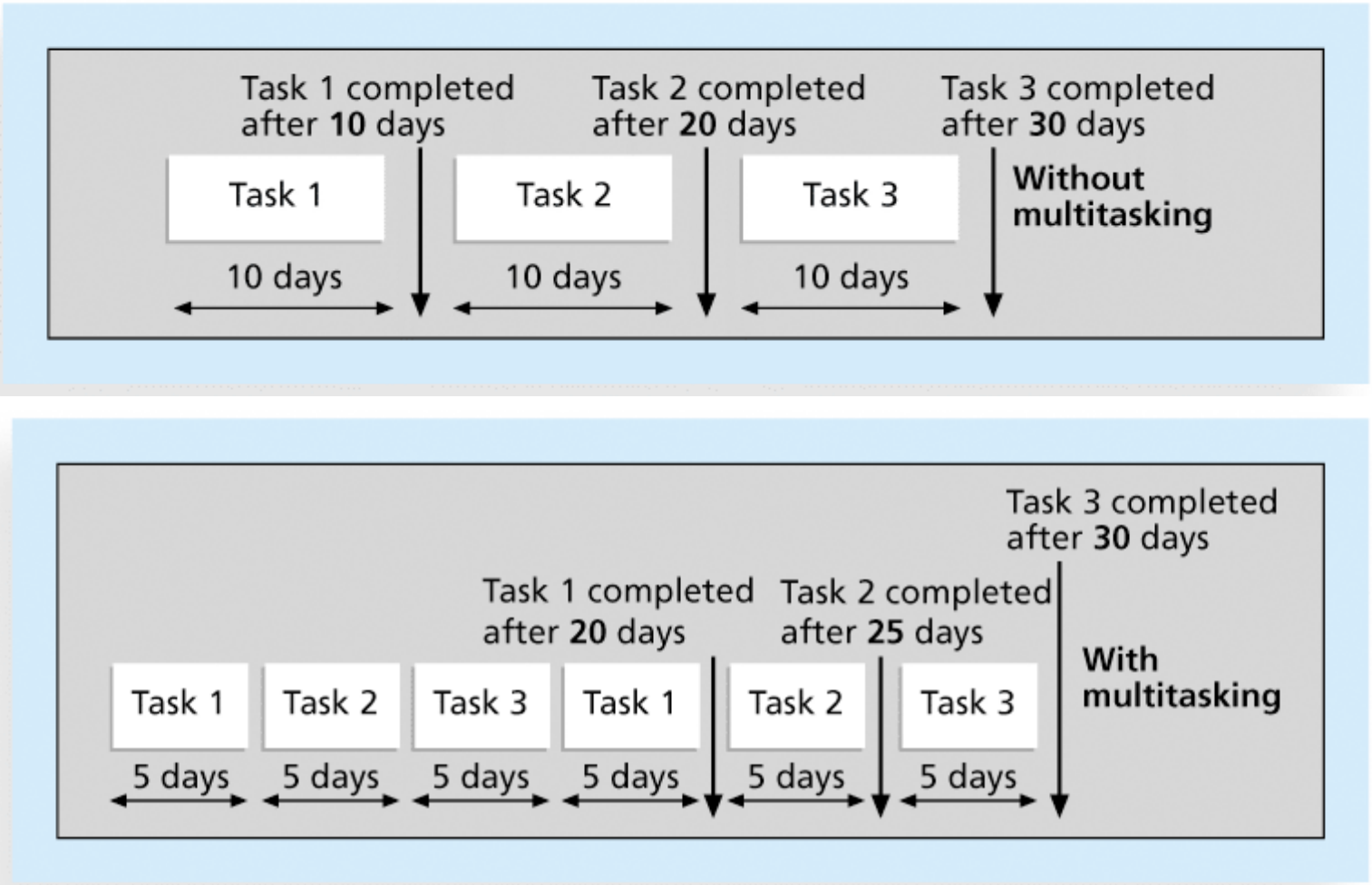
Shortening a Project Schedule

- Shortening durations of critical activities/tasks by **adding more resources or changing their scope**
- **Crashing** activities by obtaining the greatest amount of schedule compression for the least incremental cost
- **Fast tracking** activities by doing them in parallel or overlapping them

Critical Chain Scheduling

- **Critical chain scheduling**
  - a method of scheduling that considers limited resources when creating a project schedule and includes buffers to protect the project completion date
- Attempts to minimize **multitasking**
  - when a resource works on more than one task at a time

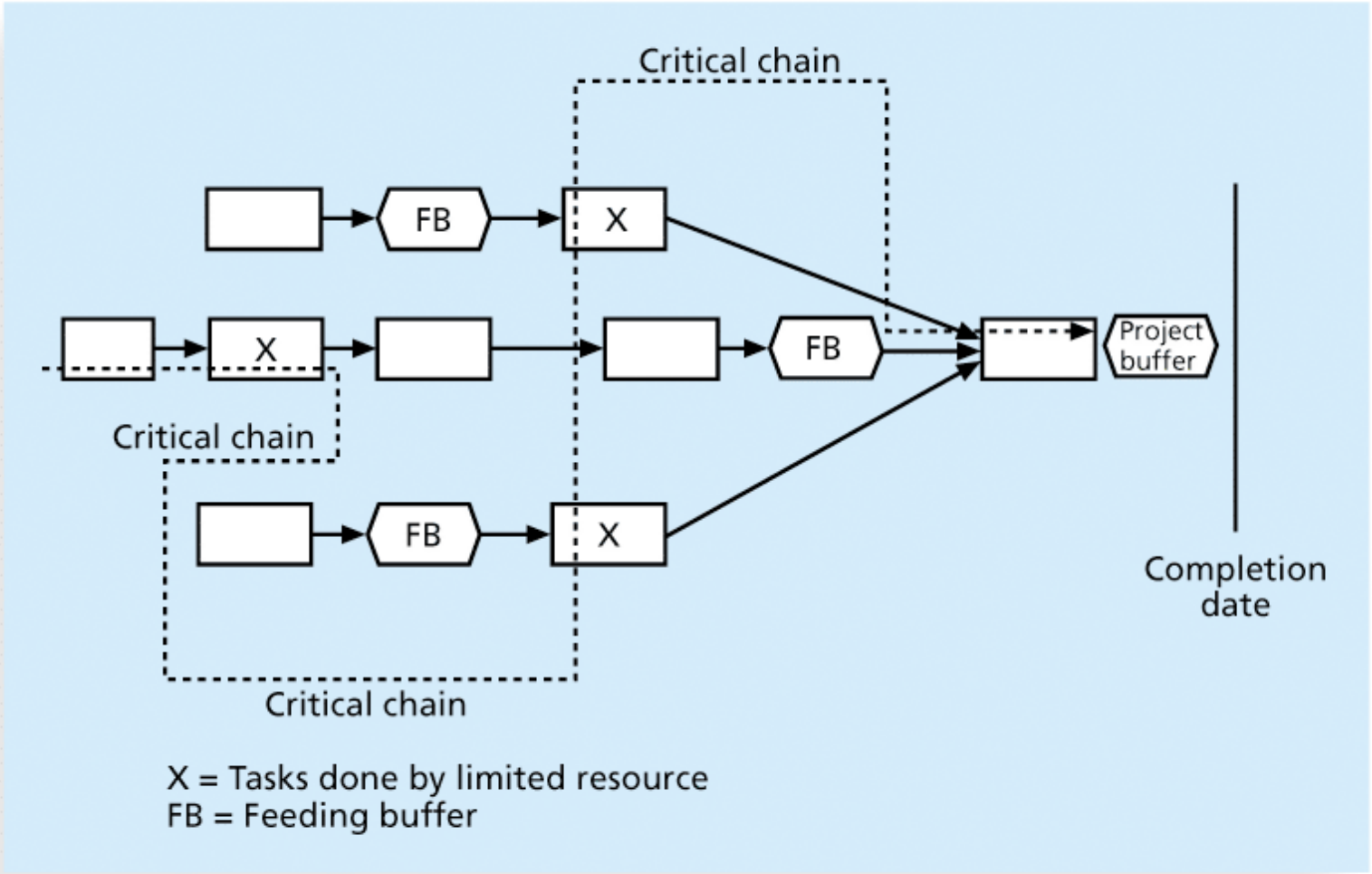
Would You Do Multitasking in IT Project Management?



Buffers and Critical Chain

- A **buffer** is additional time to complete a task
- In traditional estimates, people often add a buffer to each task and use it if it's needed or not
- **Critical chain scheduling** removes buffers from individual tasks and instead creates
  - a **project buffer** or additional time added before the project's due date
  - **feeding buffers** or additional time added before tasks on the critical path

Example of Critical Chain Scheduling



Program Evaluation and Review Technique (PERT)

- **PERT** is a network analysis technique used to estimate project duration when there is a high degree of uncertainty about the individual activity duration estimates

- PERT uses **probabilistic time estimates**
  - duration estimates based on using optimistic, most likely, and pessimistic estimates of activity durations, or a three-point estimate

PERT Formula and Example

- PERT weighted average =

$$\frac{\text{optimistic time} + 4\text{X most likely time} + \text{pessimistic time}}{6}$$

- Short form of the formula: Expected E = (O+4M+P)/6

PERT Example 1

- Example:

PERT weighted average =

$$\frac{8 \text{ workdays} + 4 \times 10 \text{ workdays} + 24 \text{ workdays}}{6} = \textbf{12 days}$$

where optimistic time= 8 days

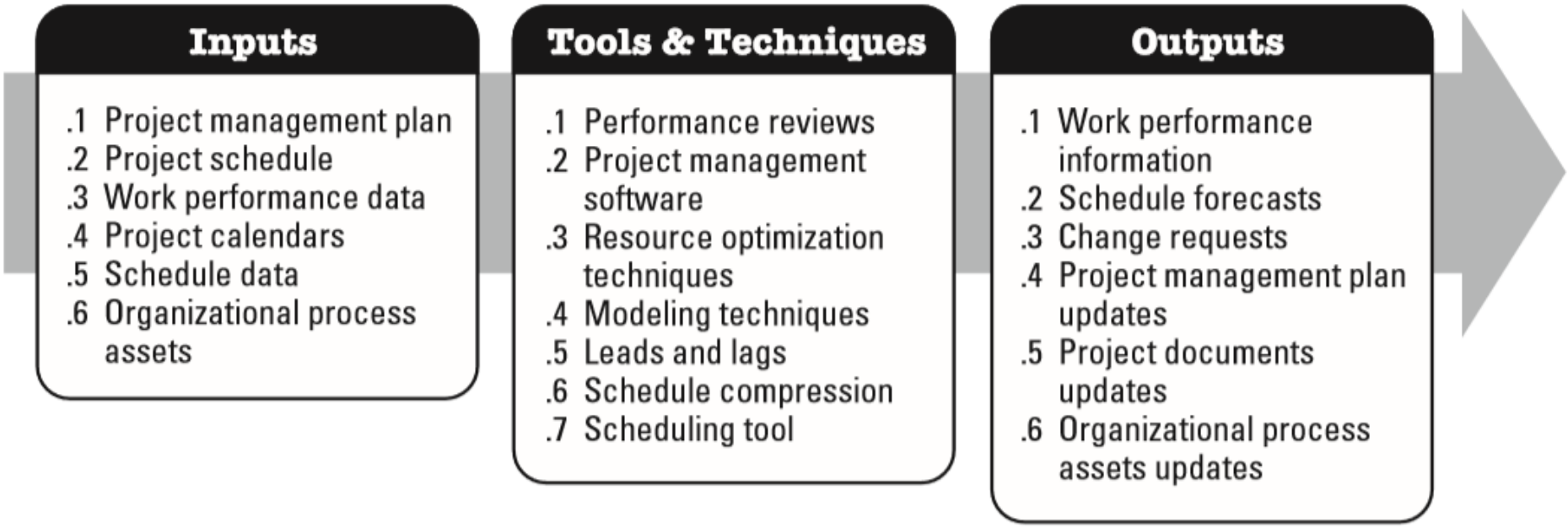
most likely time = **10 days,** and

pessimistic time = 24 days

Therefore, you'd use **12 days** on the network diagram instead of 10 when using PERT for the above example

Process 7: Control Schedule

- Control Schedule is the process of monitoring the status of project activities to update project progress and manage changes to the schedule baseline to achieve the plan.



Control Schedule– Suggestions

- Perform reality checks on schedules
- Allow for contingencies
- Don't plan for everyone to work at 100% capacity all the time
- Hold progress meetings with stakeholders and be clear and honest in communicating schedule issues

Reality Checks on Scheduling

- First review the draft schedule or estimated completion date in the project charter
- Prepare a more detailed schedule with the project team
- Make sure the schedule is realistic and followed
- Alert top management well in advance if there are schedule problems

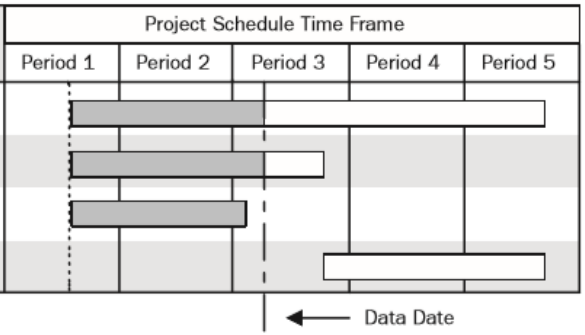
Summary Schedule

&

Detailed Schedule

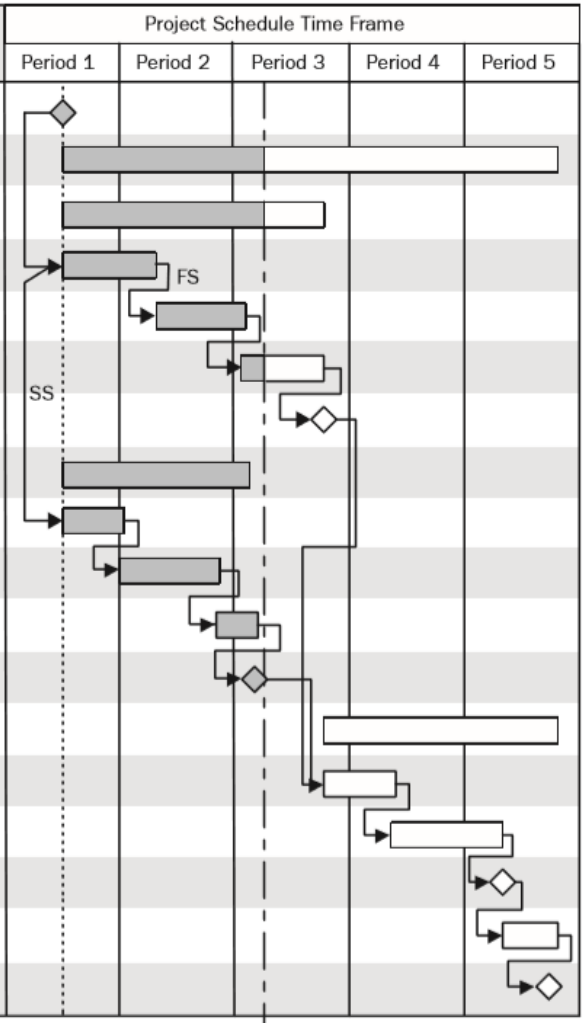
Summary Schedule

Activity Identifier	Activity Description	Calendar units
1.1	Develop and Deliver New Product Z	120
1.1.1	Work Package 1: Component 1	67
1.1.2	Work Package 2: Component 2	53
1.1.3	Work Package 3: Integrated Components 1 and 2	53



Detailed Schedule

Activity Identifier	Activity Description	Calendar units
1.1.MB	Begin New Product Z	0
1.1	Develop and Deliver Product Z	120
1.1.1	Work Package 1: Component 1	67
1.1.1.D	Design Component 1	20
1.1.1.B	Build Component 1	33
1.1.1.T	Test Component 1	14
1.1.1.M1	Complete Component 1	0
1.1.2	Work Package 2: Component 2	53
1.1.2.D	Design Component 2	14
1.1.2.B	Build Component 2	28
1.1.2.T	Test Component 2	11
1.1.2.M1	Complete Component 2	0
1.1.3	Work Package 3: Integrated Components 1 and 2	53
1.1.3.G	Integrate Components 1 and 2 as Product Z	14
1.1.3.T	Complete Integration of Components 1 and 2	32
1.1.3.M1	Test Integrated Components as Product Z	0
1.1.3.P	Deliver Product Z	7
1.1.3.MF	Finish New Product Z	0



Discussion on group projects

- Project groups finalised on Canvas.
- Project selection strategy

Others:

- Access to lecture recording
- Access to tutorial practices

Discussion on group projects

4.5. MARKING CRITERIA

Assessment Element	Sub-Elements	Weight
1. Project Charter	• Project details (Brief background and objectives) • Project deliverables • Project cost (Total cost) • Project time (Total time) • Roles and responsibilities of each student	**/10**
2. Scope	• Project scope statement • Milestones	**/10**
3. Literature Review	• Appropriate literature selection • Identification of knowledge gaps • Analysis and consolidation • Summary of literature review • Citation (appropriate, extensive use)	**/15**
4. Work Breakdown Structure *(3 level)*	• Work Packages/ Activities/Tasks • Provide a brief description of each of the activities	**/10**
5. Project Schedule/Time Modeling	• Detailed schedule (Gantt chart) • Proper sequencing and task Dependencies	**/10**
6. Cost Modeling	• Detailed budget table • Identify cost types and briefly describe them • Direct or indirect project costs • Detailed cost baseline	**/10**
7. Communication	• Communication plan	**/10**
8. Quality Management	• Quality management plan	**/10**
9. Risk Management	• A brief risk register, see the example provided on Canvas	**/10**
10. Reflections of leadership practices on teamwork	• Briefly describe how each member played a leadership role in the teamwork. Provide 1-2 sentences from each team member while keeping them anonymous (e.g., member A, member B, etc.).	**/5**
	Total	**/100**

Lecture Summary

- Project time management is often cited as the main source of conflict on projects, and most IT projects exceed time estimates
- Project Time Management processes include
  - Plan schedule management
  - Define activities
  - Sequence activities
  - Estimate activity resources
  - Estimate activity durations
  - Develop schedule
  - Control schedule