

Project Management IT124P Module 2.3

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Project Schedule Management



| Project Schedule Management

❑ Project schedule management, simply defines, involves the processes required to ensure timely completion of a project.

❑ Six main processes involved:

1. **Planning schedule management** involves determining the policies, procedures and documentation that will be used for planning, executing and controlling the project schedule.

| Project Schedule Management

Six main processes involved:

- 2. Defining activities** involves identifying the specify activities that the project team members and stakeholders must perform to produce the project deliverables.

An activity or task is an element of work normally found on the work breakdown structure (WBS) that has expected duration, cost, and resource requirements.

- 3. Sequencing activities** involves identifying and documenting the relationships between project activities. Requirements, a resource breakdown structure, and project documents updates.

| Project Schedule Management

Six main processes involved:

4. **Estimating activity** durations involves estimating the number of work periods that are needed to complete individual activities.
5. **Developing the schedule** involves analyzing activity sequences, resource requirements, and activity duration estimates to create the project schedule.
6. **Controlling the schedule** involves controlling and managing changes to the project schedule.

Project Schedule Management Overview

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| Defining Activities

- ❑ Project schedules grow out of the basic documents that initiate a project.
 - The project charter includes start and end dates and budget information.
 - The scope statement and WBS help define what will be done.
- ❑ An activity list is a tabulation of activities to be included on a project schedule.
- ❑ Activity attributes provide more information about each activity, such as predecessors, successors, logical relationships, leads and lags, resource requirements, constraints, imposed dates, and assumptions related to the activity.
- ❑ A milestone is a significant event that normally has no duration.

| Defining Activities

- ❑ Results in the project team developing a more detailed WBS and supporting explanations
- ❑ Ensures that the project team has complete understanding of all the work they must do as part of the project scope
- ❑ Results in supporting detail to document important product information as well as assumptions and constraints related to specific activities

| Sequencing Activities

- ❑ Involves reviewing activities and determining dependencies

Dependency

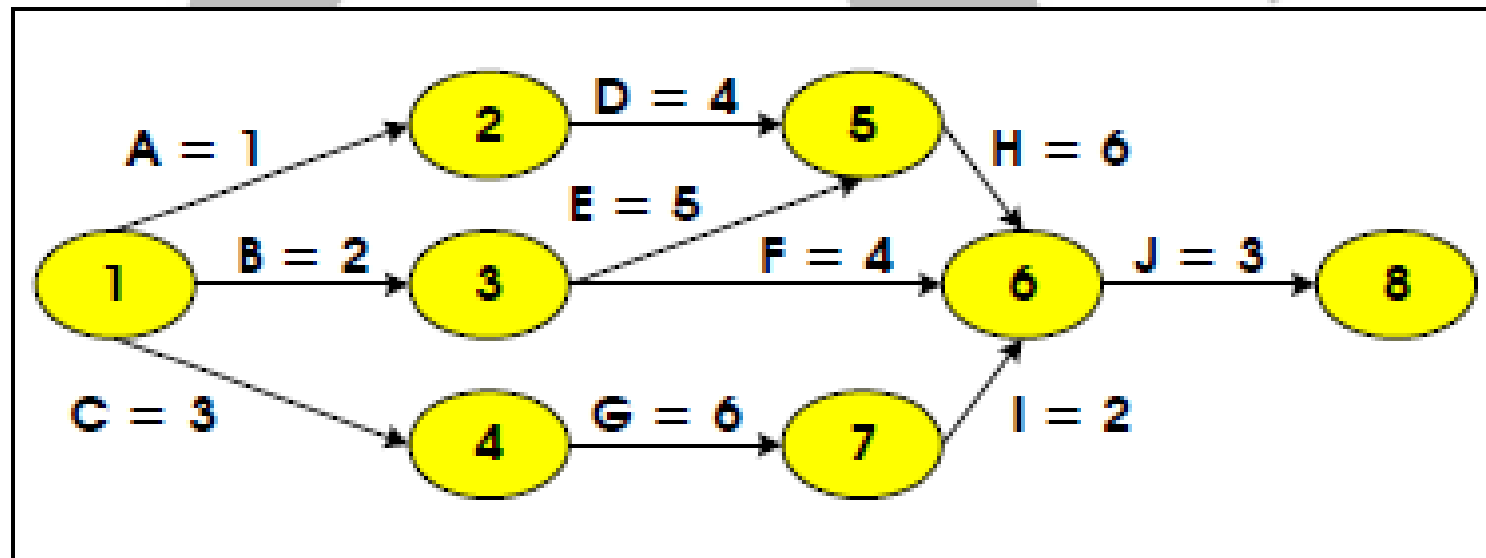
- ❑ Also called *relationship*, shows the sequencing of project activities or tasks

Reasons for creating dependencies:

- ❑ *Mandatory dependencies are inherent in the nature of the work being done on a project.*
- ❑ *Discretionary dependencies are defined by the project team.*
- ❑ *External dependencies involve relationships between project and non-project activities.*

Network Diagrams

- ❑ The preferred technique for showing activity sequencing
- ❑ Schematic display of the logical relationships among, or sequencing of, project activities
- ❑ Uses the activity-on-arrow (AOA) or the arrow diagramming method (ADM)



Sample Activity-on-Arrow (AOA) Network Diagram

Network Diagrams

Steps in creating an AOA network diagram:

1. Find all of the activities that start at Node 1. Draw their finish nodes, and draw arrows between Node 1 and each of those finish nodes. Put the activity letter or name on the associated arrow. Be sure to put arrowheads on all arrows to signify the direction of the relationships.
2. Continue drawing the network diagram, working from left to right. Look for bursts and merges.

Network Diagrams

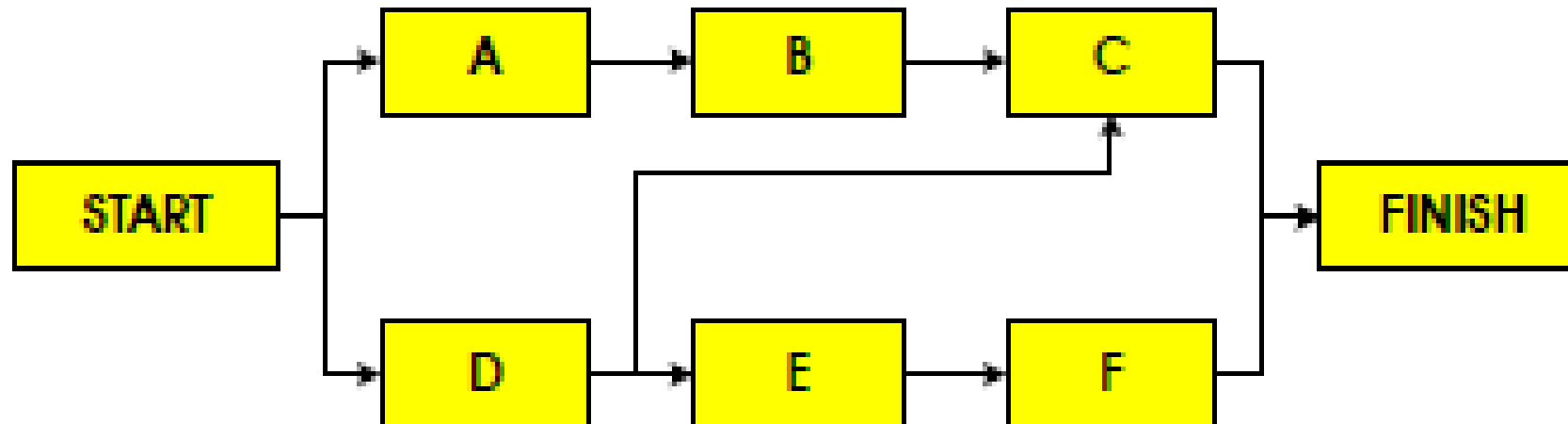
Steps in creating an AOA network diagram:

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

Network Diagrams

Precedence Diagramming Method (PDM)

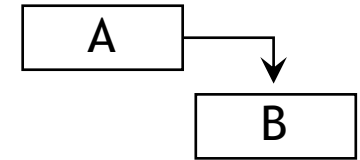
- ❑ network diagramming technique in which boxes represent activities
- ❑ particularly useful for visualizing certain types of time relationships



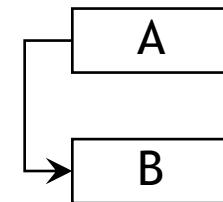
Network Diagrams

Types of dependencies between activities:

❑ **Finish-to-start:** a relationship where the “from” activity must finish before the “to” activity can start.



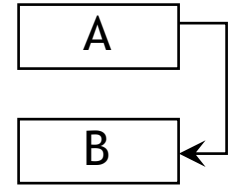
❑ **Start-to-start:** a relationship in which the “from” activity cannot start until the “to” activity can start.



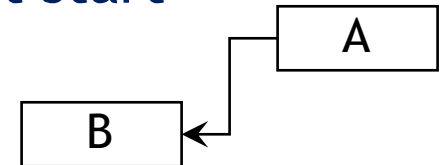
Network Diagrams

Types of dependencies between activities:

❑ **Finish-to-finish:** a relationship where the “from” activity must finish before the “to” activity can finish.



❑ **Start-to-finish:** a relationship where the “from” activity must start before the “to” activity can finish.



| Estimating Activity Resource

- ❑ Before estimating activity durations, you must have a good idea of the quantity and type of resources that will be assigned to each activity.
- ❑ Important issues to consider in estimating resources:
 - How difficult will it be to complete specific activities on this project?
 - What is the organization's history in doing similar activities?
 - Are the required resources available?

| Estimating Activity Resource

- ❑ Inputs include project's activity list, activity attributes, project management plan, enterprise environmental factors, organizational process assets, and resource availability information
- ❑ Outputs include list of activity resource requirements, a resource breakdown structure, change requests, and updates to activity attributes and resource calendars

| Estimating Activity Duration

- ❑ Duration includes the actual amount of time worked on an activity plus elapsed time
- ❑ People doing the work should help create estimates, and an expert should review them
- ❑ Inputs include:
 - Enterprise environmental factors
 - Organizational process assets
 - Project scope statement
 - Activity list and attributes
 - Activity resource requirements
 - Resource calendars
 - Project management plan

| Estimating Activity Duration

- ❑ Outputs include updates to the activity attributes and duration estimates for each activity
- ❑ Instead of providing activity estimates as a discrete number, such as four weeks, it's often helpful to create a **three-point estimate**

Schedule Development

- ❑ Uses results of the other time management processes to determine the start and end dates of the project.
- ❑ Ultimate goal is to create a realistic project schedule that provides a basis for monitoring project progress for the time dimension of the project.
- ❑ Important tools and techniques include Gantt charts, critical path analysis, critical chain scheduling, and PERT analysis.

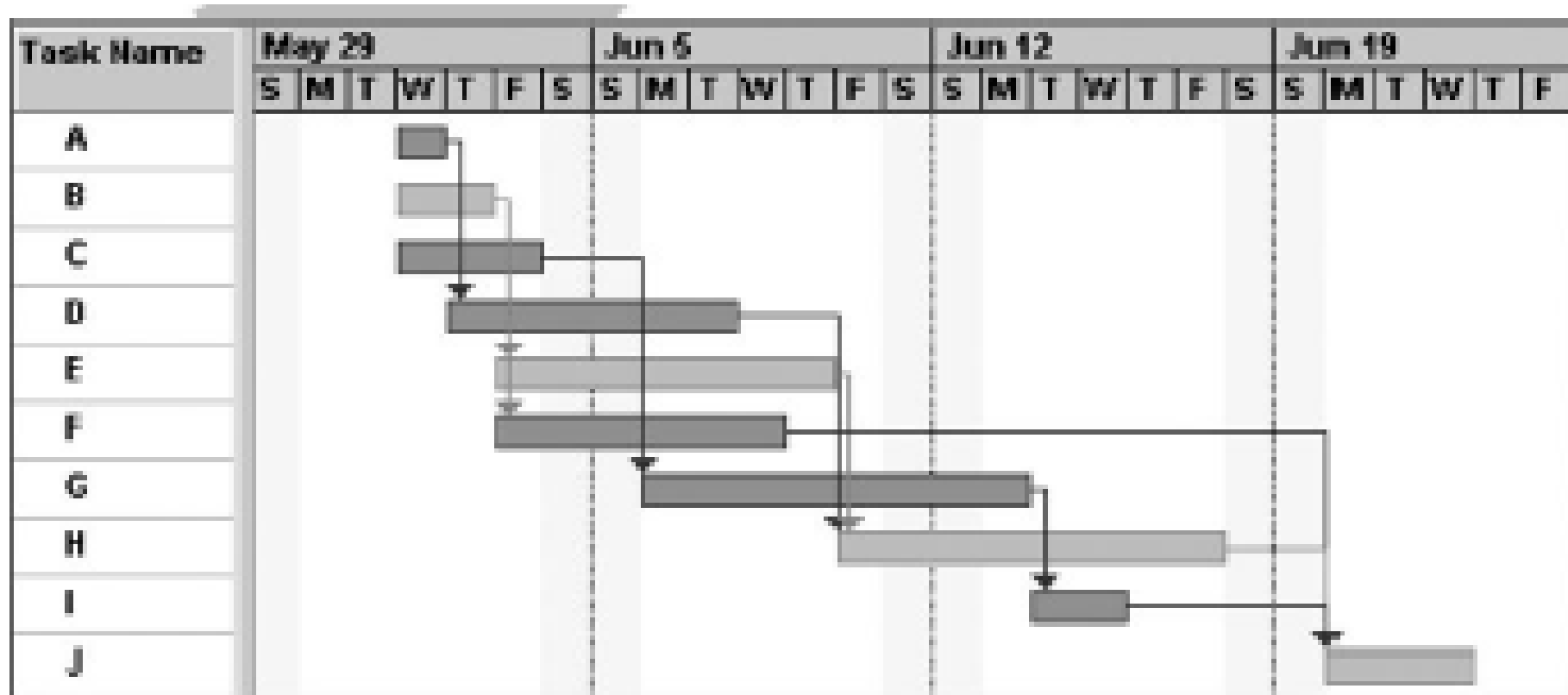
| Gantt Charts

- ❑ 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 used:

- ❑ The black diamond symbol represents a *milestone*
- ❑ The thick black bars with arrows at the beginning and end represent summary tasks
- ❑ The light gray horizontal bars
- ❑ Arrows connecting these symbols show relationships or dependencies between tasks

Gantt Charts



Gantt Charts

SMART Criteria

- ❑ Guidelines suggesting that milestones should be **specific, measurable, attainable, realistic, and time-framed**

Tracking Gantt Chart

- ❑ Compares planned and actual project schedule information
- ❑ Includes columns labeled “Start” and “Finish” to represent actual start and finish dates for each task, as well as columns labeled “Baseline Start” and “Baseline Finish” to represent planned start and finish dates for each task

Critical Path Method

- ❑ Also called *critical path analysis*
- ❑ Project network analysis technique used to predict total project duration
- ❑ Helps you combat project schedule overruns

Critical path

- ❑ Series of activities that determine the earliest time by which the project can be completed
- ❑ The longest path through the network diagram and has the least amount of slack or float

Slack or float

- ❑ The amount of time an activity may be delayed without delaying a succeeding activity or the project finish date

Critical Path Method

To calculate for the critical path:

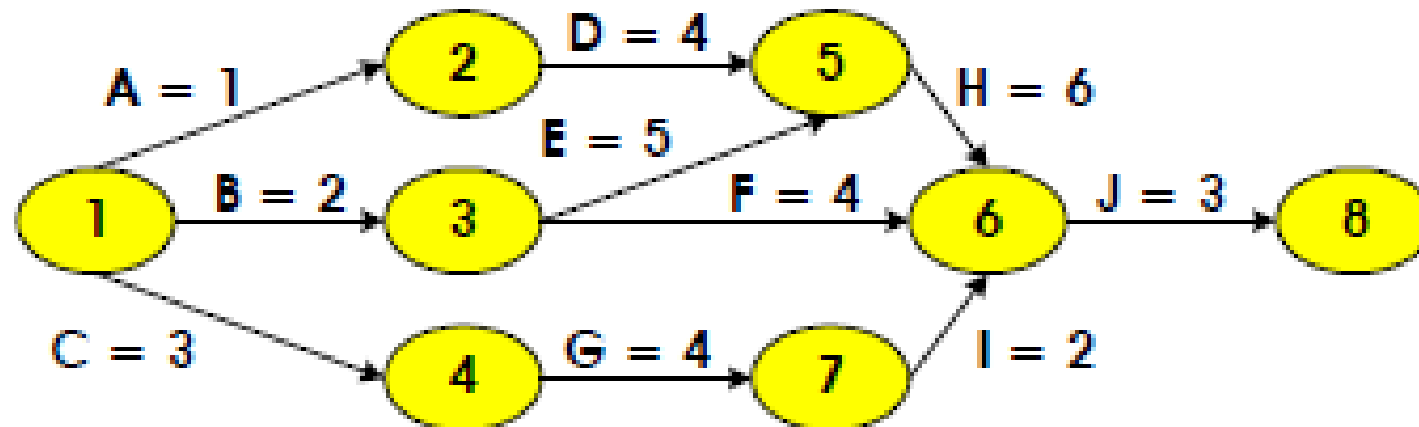
- Develop a good network diagram.
- Add the duration estimates for all activities on each path through the network diagram.
- The longest path is the critical path.
- If one or more of the activities on the critical path takes longer than planned, the whole project schedule will slip unless the project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

Critical Path Method

Note: Assume all duration 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.



Critical Chain Scheduling

- ❑ A method of scheduling that takes limited resources into account when creating a project schedule and includes buffers to protect the project completion date

Theory of Constraints

- ❑ Based on the fact that, like a chain with its weakest link, any complex system at any point in time often has only one aspect or constraint that limits its ability to achieve more of its goal

Multitasking

- ❑ occurs when a resource works on more than one task at a time
- ❑ often involves wasted setup time, which increases total durations

Program Evaluation and Review Technique (PERT)

- ❑ network analysis technique used to estimate project duration when there is a high degree of uncertainty about the individual activity duration estimates
- ❑ applies the critical path method to a weighted average duration estimate
- ❑ uses **probabilistic time estimates** - duration estimates based on using optimistic, most likely, and pessimistic estimates of activity durations - instead of one specific or discrete duration estimate

Program Evaluation and Review Technique (PERT)

- ❑ based on a project network diagram, normally the PDM method
- ❑ uses the formula:

$$\text{PERT weighted average} = \frac{\text{optimistic time} + 4 \times \text{most likely time} + \text{pessimistic time}}{6}$$

Schedule Control

□Goals:

- Know the status of the schedule
- Influence factors that cause schedule changes
- Determine that the schedule has changed
- Manage changes when they occur

□Tools and techniques:

- Progress reports
- A schedule change control system
- Project management software, including schedule comparison charts
- Variance analysis
- Performance management