

# PM Centers USA<sup>®</sup>

## The Plan's Journey From Scope to WBS to Schedule

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IT LIG



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# Presenter

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## Business Analysis Practice Director



**Rick Clare**  
CBAP, PMP, OCP, CSM

# Introduction

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- The Journey of the Plan
- The Business Case
- Requirements and Scope
- Work Breakdown Structure
- Estimation
- The Project Schedule

# This Presentation

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This presentation is about the path that is taken as the project plan moves from its initial Scope, found in the Business Case, to a completed Project Schedule.

# The Journey of the Plan

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Business Case

Requirements

Project Scope

WBS

Schedule

# The Business Case

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- Vehicle for getting the project approved
- Contains Hi-level Scope information
- Contains some Requirements
- May contain information on:
  - Cost
  - Resources
  - Schedule

Strategic  
Estimate

# Project Requirements

- Determine **why** and **what** the stakeholder needs the project to accomplish
- Elicit and Document those requirements
- Project success *absolutely* starts here

**Requirements = why/what**



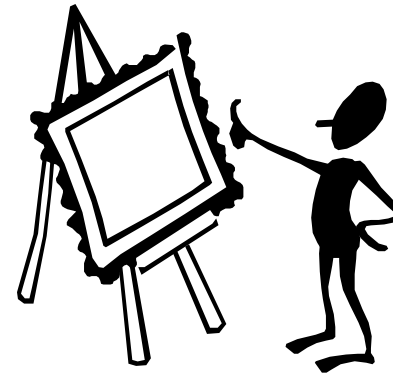
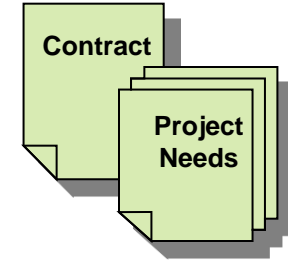
**Project Plan = how**





# Capturing the Requirements

- What do client documents tell us ?
- What are people telling us ?
  - In agreement with the documents
  - In conflict with the documents
  - Going beyond the documents
- Includes:
  - Elicitation
  - Analysis of the information
  - Documentation



# Elicitation Techniques

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- Interviews
- Focus Groups
- Facilitated Workshops
- Brainstorming
- Document Analysis
- Interface Analysis
- Questionnaires & Surveys
- Observation
- Prototyping

**USE A BA!**

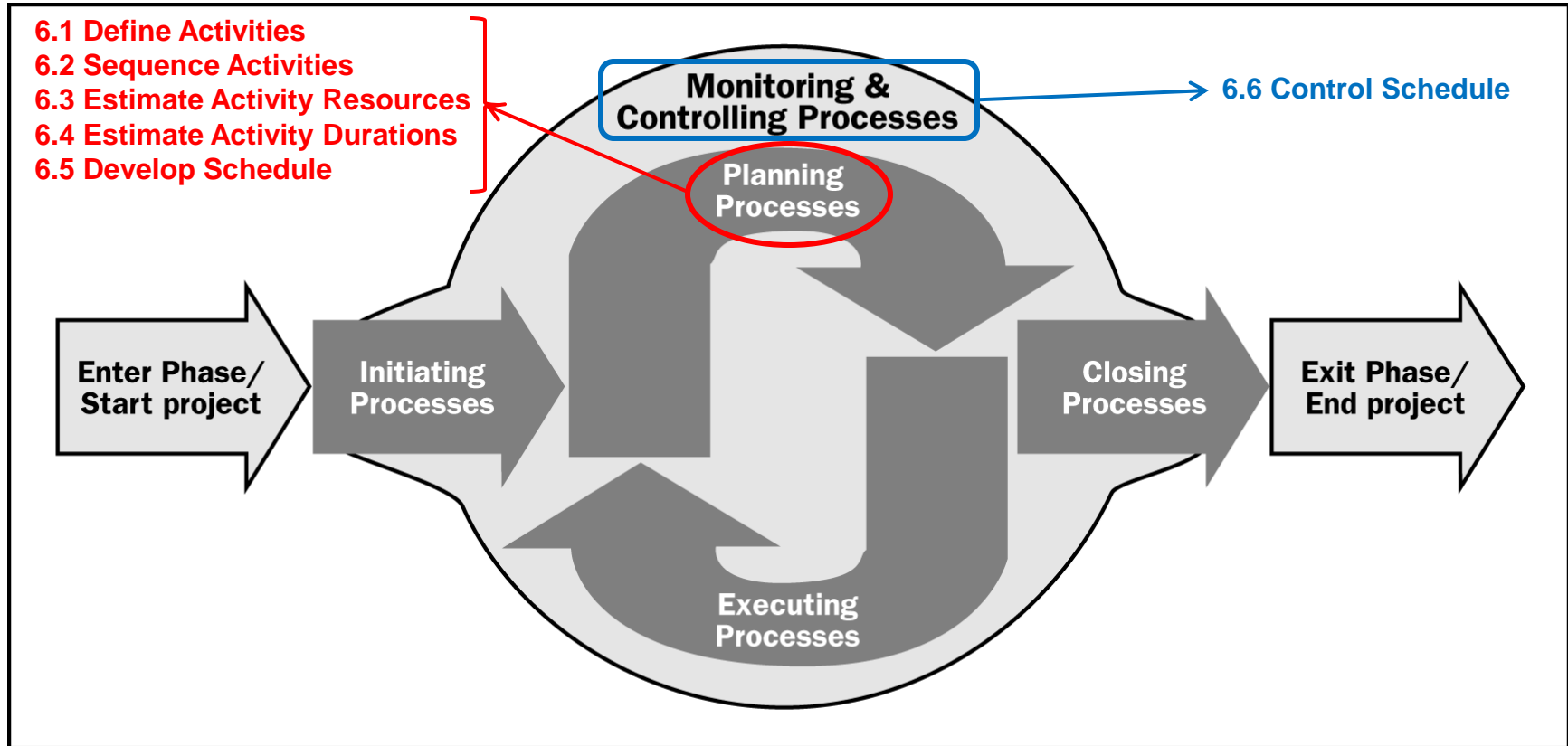
# Requirements and Scope

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- Requirements start in the Business Case
- Requirements Elicitation and Analysis are steps in the plan's journey

**Complete Requirements are needed for the complete Scope!**

# Process Groups



## Project Management Process Groups

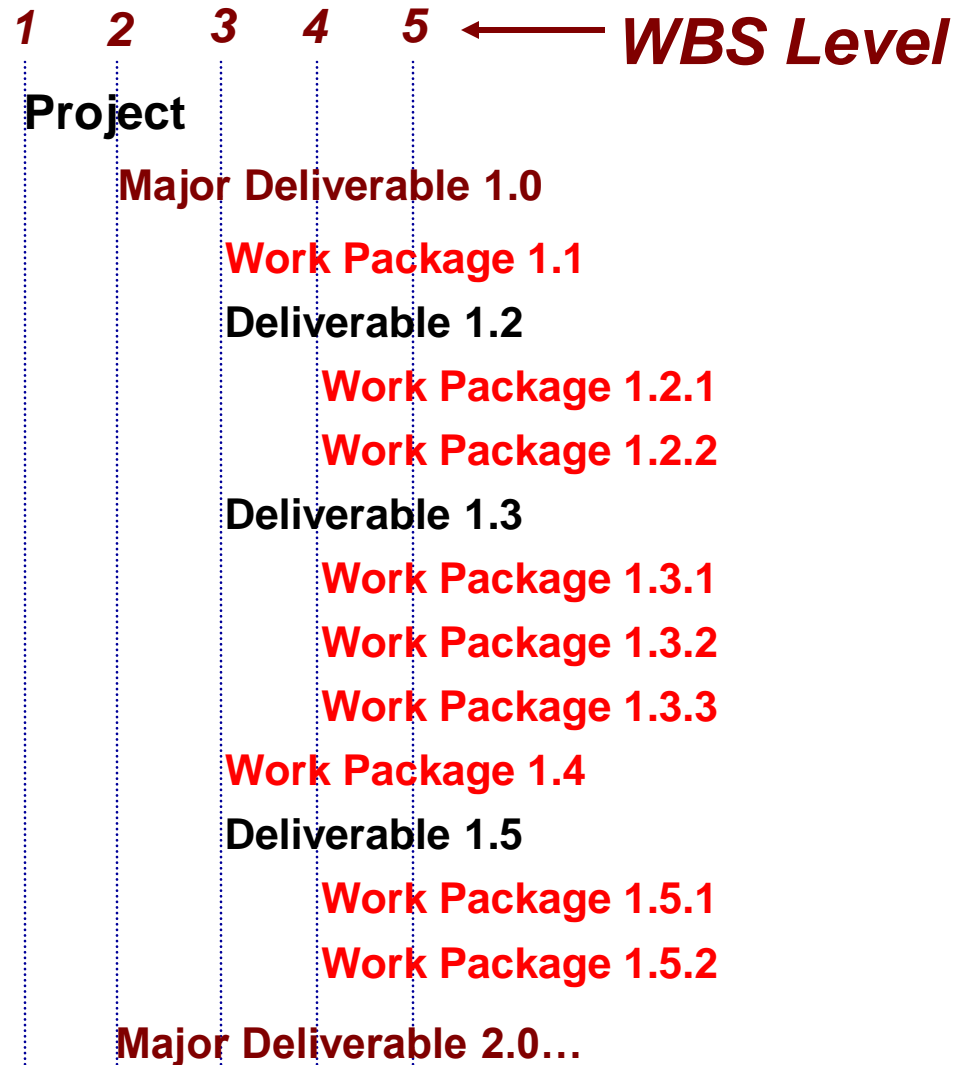
Project Management Institute, A Guide to the Project Management Body of Knowledge, (*PMBOK® Guide*)  
 – Fourth Edition, Project Management Institute, Inc., 2008, Figure 3-1, Page 40

# Work Breakdown Structure

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- **WBS:** A deliverable-oriented grouping of project elements which organizes and defines the total scope of the project
- Each descending level represents an increasingly detailed definition of a project element (products or services)
- Relates the project elements to each other and the end product or service
- Cost and duration estimates are normally done at the lowest level of each branch of the WBS – the Work Package

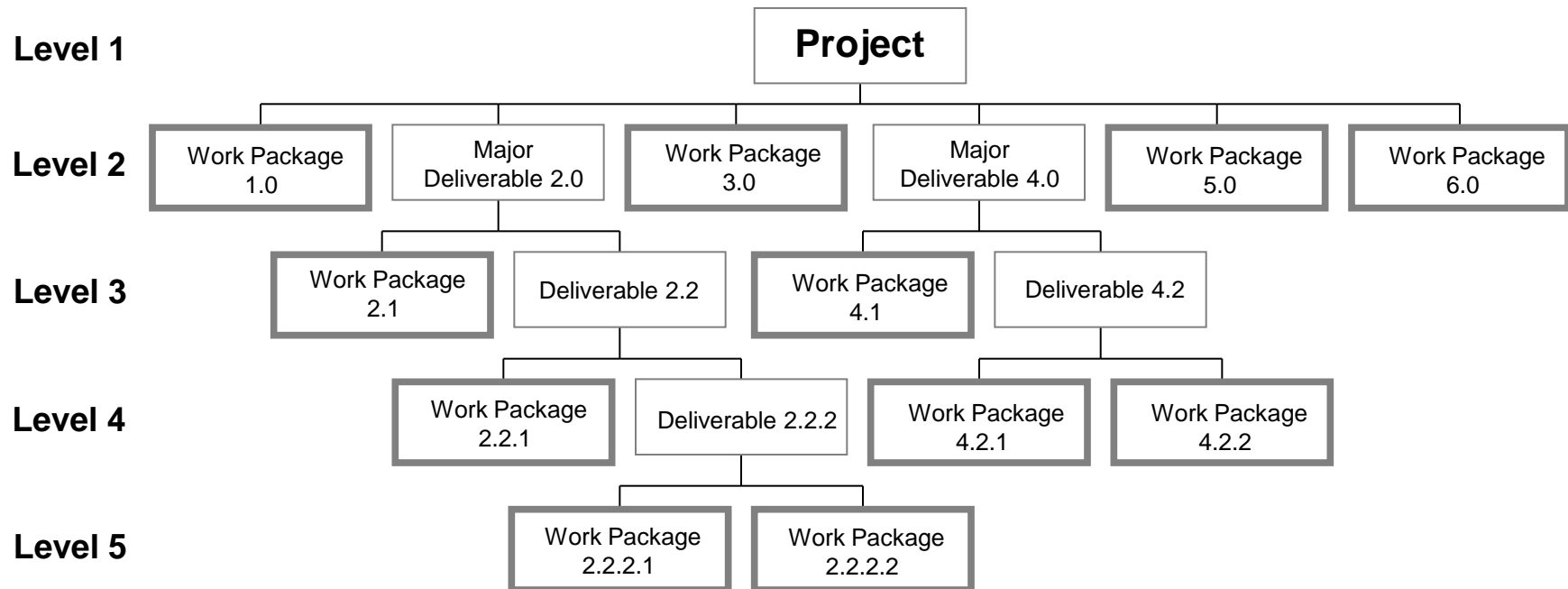
# Tabular WBS



## Key Points

- Program would be level 0
- Work Packages can be at any level below 1 – typically at level 3 or lower
- When sub-dividing, should be at least two lower items

# Graphical WBS



# WBS and Activities

- Major Deliverables
  - Deliverables
  - Work Package Deliverables
    - Activities
    - Sub-Activities
- } WBS

**NOTE:** Can be more than 1 level of deliverables

## Schedule

*Defined as “tasks” in most scheduling software packages*

- WBS deliverables are nouns (*such as Prototype*)
- **Activities are active verb-noun combinations (*such as Prepare Database Design Document*)**



# Define Activities

- Define Activities:** The process of identifying the specific actions to be performed to produce the project deliverables
 

\* PMBOK® Guide Glossary, page 424
- Reminder:** the project deliverables are listed in the WBS!
- Work Packages are typically decomposed into smaller components called **activities** that represent the work necessary to complete the work package

Define Activities
<p><b>Inputs</b></p> <ul style="list-style-type: none"> <li>Scope baseline</li> <li>Enterprise environmental factors</li> <li>Organizational process assets</li> </ul>
<p><b>Tools and Techniques</b></p> <ul style="list-style-type: none"> <li>Decomposition</li> <li>Rolling wave planning</li> <li>Templates</li> <li>Expert judgment</li> </ul>
<p><b>Outputs</b></p> <ul style="list-style-type: none"> <li>Activity list</li> <li>Activity attributes</li> <li>Milestone list</li> </ul>
PMBOK® Guide, Figure 6.1, page 131

# Work Package Decomposition...

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## ...Into Activities

- **Decomposition** is the subdividing of the project work packages into smaller, more manageable components called activities
- Guidelines for decomposing work packages:
  - 8/80 “rule” (we like 20/80)
  - Able to be estimated
  - Only one individual is responsible for the activity
  - Additional levels (sub-activities) can be used if necessary – but be careful of over planning!

# Tips for Activities Creation

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- For each Work Package in the WBS, develop the list of activities that when completed will result in the deliverable
- Schedule activities should be written as an active verb-noun combination
- Use **Rolling Wave Planning** – work to be accomplished in the near term is planned in detail (with activities) while work *far in the future* is at a relatively high level of the WBS (no activities)

# Example Project Task (Activity) List

<u>ID</u>	<u>Task Name</u>
1	<b>Project Start</b>
2	<b>Project Management</b>
3	Develop Project Plan
4	Conduct Status Meetings
5	Develop Lessons Learned
6	<b>Documentation</b>
7	<b>Functional Specs</b>
8	Develop Functional Specs
9	Review/Approve Functional Specs
10	<b>Technical Specs</b>
11	Develop Hardware Specs
12	Develop Software. Specs
13	Review/Approve Tech. Specs
14	<b>Test Procedures</b>
15	Develop Acceptance Test Procedures
16	Review/Approve Test Procedures
17	<b>User Manual</b>

<u>ID</u>	<u>Task Name</u>
18	<b>Procurement</b>
19	Solicit Hardware/Software Bids
20	Select Hardware/Software Vendor
21	Procure Hardware/Software
22	<b>System Design</b>
23	Code Screens/Reports
24	Code DB System
25	Code User Interfaces
26	<b>Testing</b>
27	Conduct Acceptance Test
28	Correct Deficiencies
29	Retest
30	Obtain Customer Acceptance
31	<b>Turnover</b>
32	Train Users
33	Complete Documentation
34	<b>Finish</b>

# Sequence Activities

**Sequence Activities:** The process of identifying and documenting relationships among the project activities

\* PMBOK® Guide Glossary, page 441

Activities must be logically sequenced with proper relationships, as well as leads and lags, to support the development of a realistic and achievable project schedule

## Sequence Activities

### Inputs

- Activity list
- Activity attributes
- Milestone list
- Project scope statement
- Organizational process assets

### Tools and Techniques

- Precedence diagramming Method (PDM)
- Dependency determination
- Applying leads and lags
- Schedule network templates

### Outputs

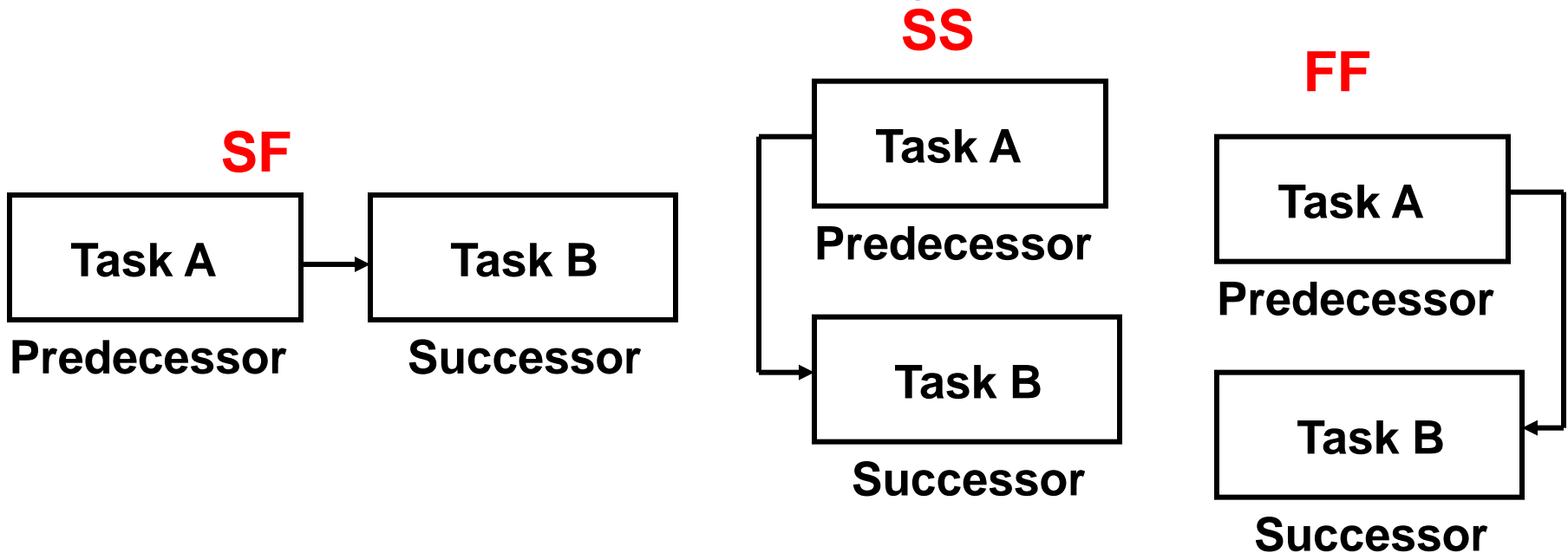
- Project schedule network diagrams
- Project document updates

• PMBOK® Guide, Figure 6.1, page 131

# Sequence Activities Terms

**Predecessor(s):** The tasks that determines when the logical successor can begin or end

**Successor(s):** Task(s) that follow a predecessor task as determined by their logical relationship



# Estimate Activity Resources

## Estimate Activity Resources:

The process of estimating the type and quantities of material, people, equipment or supplies required to perform each activity

\*This definition is taken from the Glossary of the Project Management Institute, A Guide to the Project Management Body of Knowledge, (*PMBOK® Guide*) – Fourth Edition, Project Management Institute, Inc., 2008, page 426

### Estimate Activity Resources

#### Inputs

- Activity list
- Activity attributes
- Resource calendars
- Enterprise environmental factors
- Organizational process assets

#### Tools and Techniques

- Expert judgment
- Alternatives analysis
- Published estimating data
- Bottom-up estimating
- Project management software

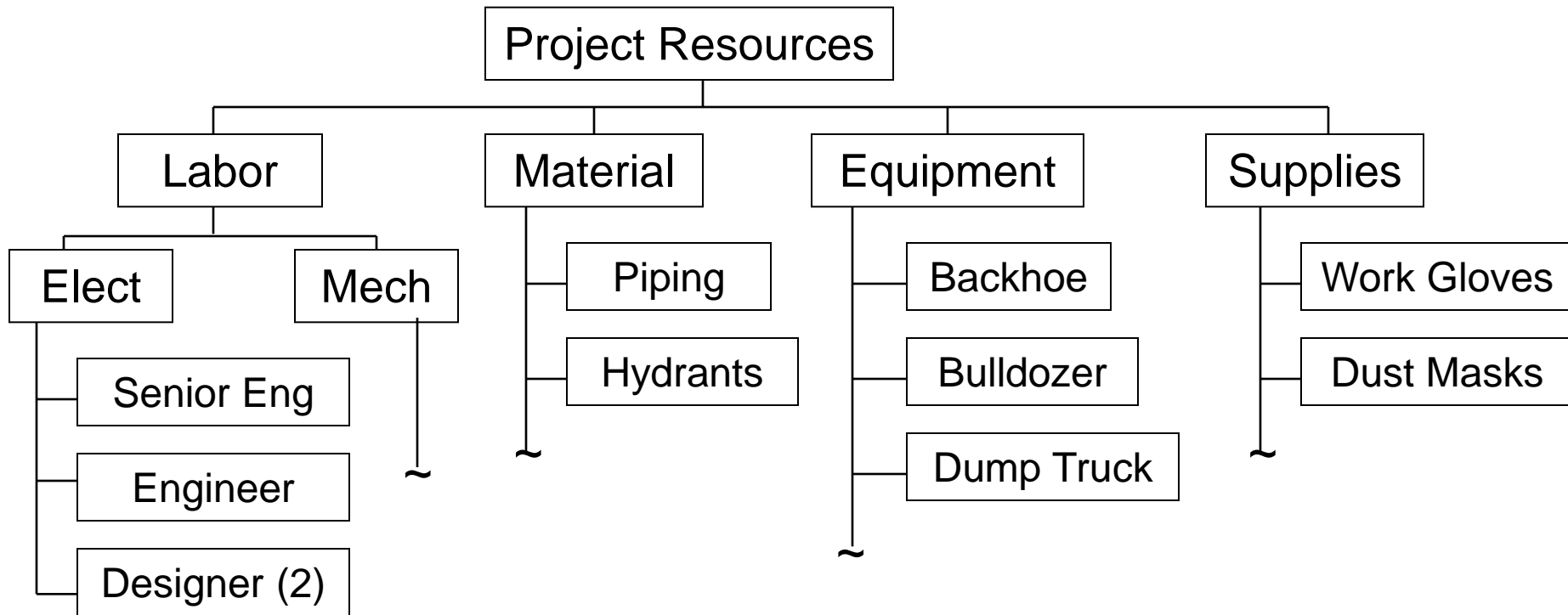
#### Outputs

- Activity resource requirements
- Resource breakdown structure
- Project document updates

*PMBOK® Guide*, Figure 6.1, page 131

# Resource Breakdown Structure

- Output for Estimate Activity Resources
- Hierarchical structure of the identified resources by resource category and resource type





# Estimate Activity Durations

## Estimate Activity Durations:

The process of approximating the number of work periods needed to complete individual activities with estimated resources

*\* PMBOK® Guide Glossary, page 426*

The duration estimate is progressively elaborated, and the process considers the quality and availability of the input data

**May Be The Hardest Thing**

### Estimate Activity Durations

#### Inputs

- Activity list
- Activity attributes
- Activity resource requirements
- Resource calendars
- Project scope statement
- Enterprise environmental factors
- Organizational process assets

#### Tools and Techniques

- Expert judgment
- Analogous estimating
- Parametric estimating
- Three-point estimates
- Reserve analysis

#### Outputs

- Activity duration estimates
- Project document updates

*• PMBOK® Guide, Figure 6.1, page 131*

# Bottom Up Estimating

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- The initial Project estimates, done to support the Business Case, are often done from the top down, adding details to a budget or a schedule that were approved by the selection committee
- Subsequent estimates should be done from the bottom up, however!
- This will result in the “truth” and we must be prepared to educate senior management on why this replaces their original estimate

# Analogous Estimating

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- Estimating technique using the duration (and/or other parameter values) from a previous, similar activity as the basis for estimating the duration for an activity
- Based on previous activities which are similar in fact and not just appearance to the present activities, and...
- Are made by individuals having the needed expertise

# Parametric Estimating

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- Uses statistical relationship between historical data and other variables
- Uses quantitative estimates that are made using the quantities to be performed (e.g., number of drawings, cubic feet of concrete, etc.) and measures of productivity (e.g., hours/drawing, cubic feet of concrete/hour, etc.) to determine durations
- They are often based on industry developed and accepted standards

# Three-Point Estimates

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**PERT** duration estimates use statistically weighted averages (type of three-point estimate):

$$t_E = \frac{t_O + 4(t_M) + t_P}{6}$$

**Where:**

$t_O$  = Optimistic Time if all goes right

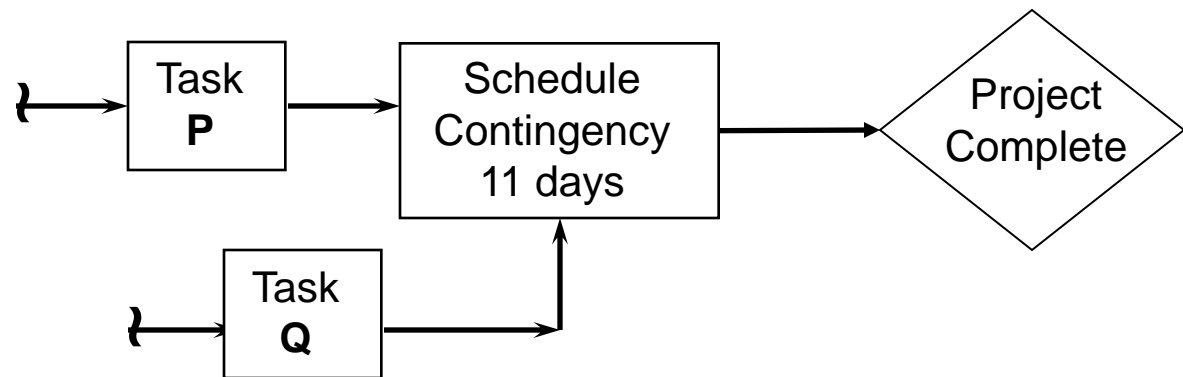
$t_M$  = Most Likely Time based on overall knowledge

$t_P$  = Pessimistic Time if everything goes wrong

$t_E$  = Expected Time duration

# Contingency Planning

- Buffers added to the activity duration, or elsewhere in the schedule, as recognition of schedule risk
- Such reserve time should be documented along with other data and assumptions as often it may be reduced or eliminated if the risk does not occur



**This is Risk Planning!**

# Rules for Estimating

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- Use the most accurate method available
- Communicate the level of precision needed
- Ensure control systems reflect the level of precision
- Involve the project team

**The biggest problem with estimating is when someone other than the actual team does it**

- Assess the environment
- Base estimates on history (when possible)
- Use standards (when available)
- Do not back into estimates
- **Do not pad estimates, use Contingency!**

# Develop Schedule

**Develop Schedule:** The process of analyzing activity sequences, durations, resource requirements, and schedule constraints to create the project schedule

\* PMBOK® Guide Glossary, page 425

- Iterative process to determine planned start & finish dates for project activities
- Schedule development continues throughout the project and may require that duration and resource estimates be reviewed and revised to reflect changes

## Develop Schedule

### Inputs

Activity list  
 Activity attributes  
 Project schedule network diagrams  
 Activity resource requirements  
 Resource calendars  
 Activity duration estimates  
 Project scope statement  
 Enterprise environmental factors  
 Organizational process assets

### Tools and Techniques

Schedule network analysis  
 Critical path method  
 Critical chain method  
 Resource leveling  
 What-if scenario analysis  
 Adjusting leads and lags  
 Schedule compression  
 Scheduling tool

### Outputs

Project schedule  
 Schedule baseline  
 Schedule data  
 Project document updates

PMBOK® Guide, Figure 6.1, page 131



# Schedule Techniques

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- **Schedule Network Analysis:** analytical techniques to calculate the early and late dates for project activities that generate the project schedule using Critical Path Method, Critical Chain Method, What-if Analysis, Resource Leveling, etc
- **Critical Path Method:** Calculates the theoretical early start and finish dates, and the late start and finish dates, for all activities

## Schedule Techniques (cont.)

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- **Critical Chain Method:** schedule network analysis technique that takes into account resources and considers bottlenecks for solution
- **Resource Leveling:** used when resources are over-allocated – often causes the original critical path to change
- **Simulation:** (what-if analysis) - calculating multiple project durations with different activity assumptions using Monte Carlo analysis or modeling

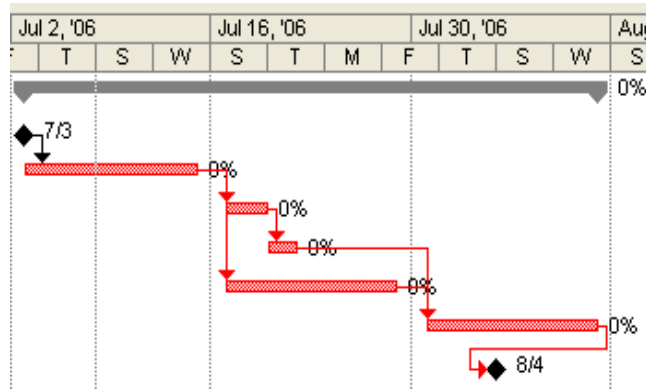
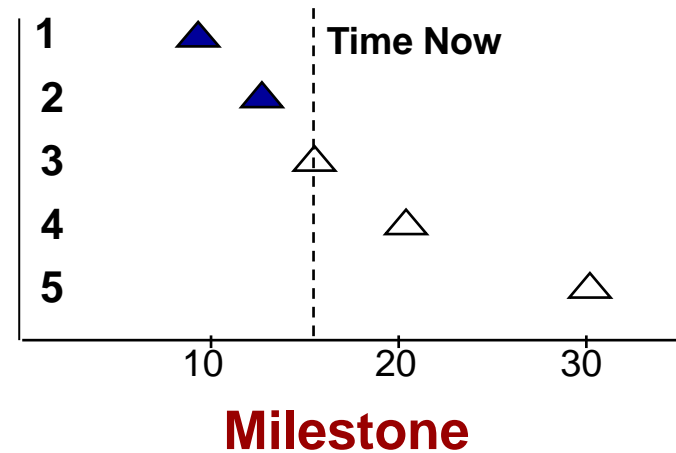
# Schedule Techniques (cont.)

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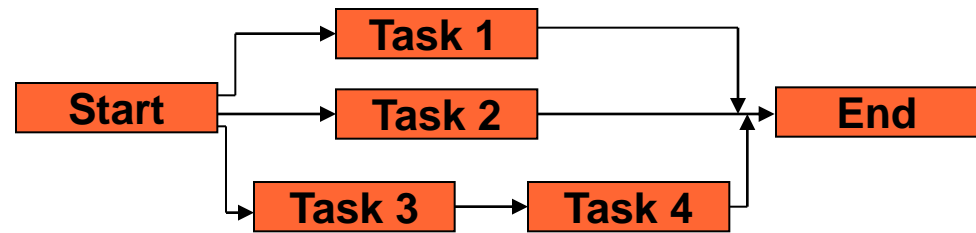
- **Schedule Compression** refers to the analysis done by the project team to find ways to shorten the project schedule without changing the scope
- Two techniques are commonly used:
  - **Crashing:** Cost and schedule tradeoffs to find the greatest compression for the least incremental cost – usually this means adding resources
  - **Fast Tracking:** Overlapping or paralleling activities that are normally done in series

# Schedule Display Types

1. Milestone Charts
2. Gantt Charts
3. Network Diagrams



**Gantt (Bar) Chart**



**Network Diagram**

# Milestone Chart

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## Advantages:

- Good summary indication of project schedule
- Useful for management reviews and presentations
- On large projects, minimizes the number of pages necessary to display the entire schedule

## Disadvantages:

- Does not show any project details

# Gantt Chart

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## Advantages:

- Good picture of project at all WBS levels
- Easy to prepare for small or medium-size projects
- Easy to update
- Shows progress using colored-in bars
- Good communication tool for reporting status

## Disadvantages:

- Does not show relationships between tasks easily except for small, simple projects

# Network Diagram

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## Advantages:

- Shows relationships and dependencies between activities
- Analyzes and highlights critical activities
- Determines project completion date
- Enables “What If” analysis

## Disadvantages:

- Time consuming and costly, especially on large projects

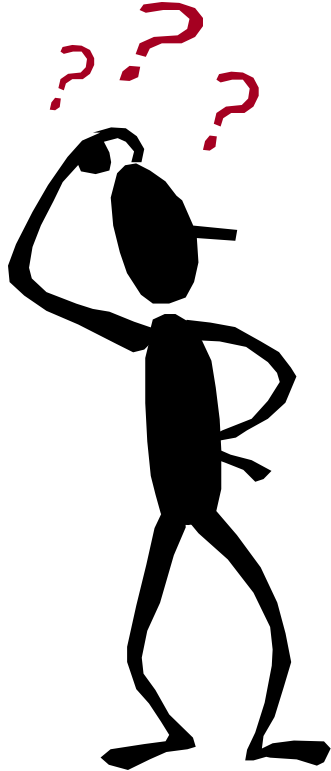
# Review

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- The Journey of the Plan
- The Business Case
- Requirements and Scope
- Work Breakdown Structure
- Estimation
- The Project Schedule



# Questions?



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