

# **Introduction to Project Management**

## **Chapter 7 Managing Project Resources**

*Information Systems Project Management: A Process and Team Approach, 1e*  
*Fuller/Valacich/George*

## A diagram illustrating the components of Project Resources. A large light blue octagon contains a central illustration of four people working together around a computer monitor, with various icons like a briefcase, a lightbulb, and a document floating around them. Surrounding this central illustration are five white rectangular boxes, each containing a resource category: 'Materials' at the top, 'Personnel' at the top right, 'Technology' at the bottom right, 'Money' at the bottom left, and 'Space' at the middle left. The entire octagon is labeled 'Project Resources' at the bottom center.

# Human Resources

- Project stakeholders:
  - Customers
  - Project team members
  - Support staff
    - Systems analyst
    - System developers
  - Project suppliers and vendors
  - End users
- Selected by:
  - Availability
  - Skill set
  - Cost

# Motorola Solutions

## Global Development Issues and Solution Strategies

Category name	issue	Liaisons	Communication	Architectural principles	Incremental integration	Rational task assignment	Common tools	Common work products	Contracts	Centralized bug reporting	Experience	Don't impose process	Complete life cycle
Loss of communication richness	Physical distance	X	X			X	X						
	Time zone disparity	X	X	X	X	X	X						
	Domain expertise	X	X	X		X					X		
Coordination break down	Architecture	X	X	X	X	X							X
	Software integration	X	X	X	X	X							X
	Software conf. mngt.						X	X					
Geographical dispersion	Vendor support		X						X	X	X		
	Governmental issues										X		
Loss of "teamness"	Development process	X	X		X		X	X			X	X	X
Cultural differences	Local impression of remote terms	X	X								X		

# Capital Resources

- Tools and Infrastructure
  - Hardware
  - Software
  - Computing environment
- Available within or through external third parties

# Project Management Office (PMO)

- Group dedicated to providing support and expertise on project management functions and activities

# Opportunity Cost

- The measure of the alternative opportunities foregone in the choice of one good or activity over others

# Managing Project Resources

- Project resource availability and selection will impact other project areas:
  - Schedule
  - Cost
  - Quality
  - Risk



# What Defines a Successful Project?

- On time
- Within budget
- Meets stakeholders expectations

*Resource selection and management  
impacts all three*

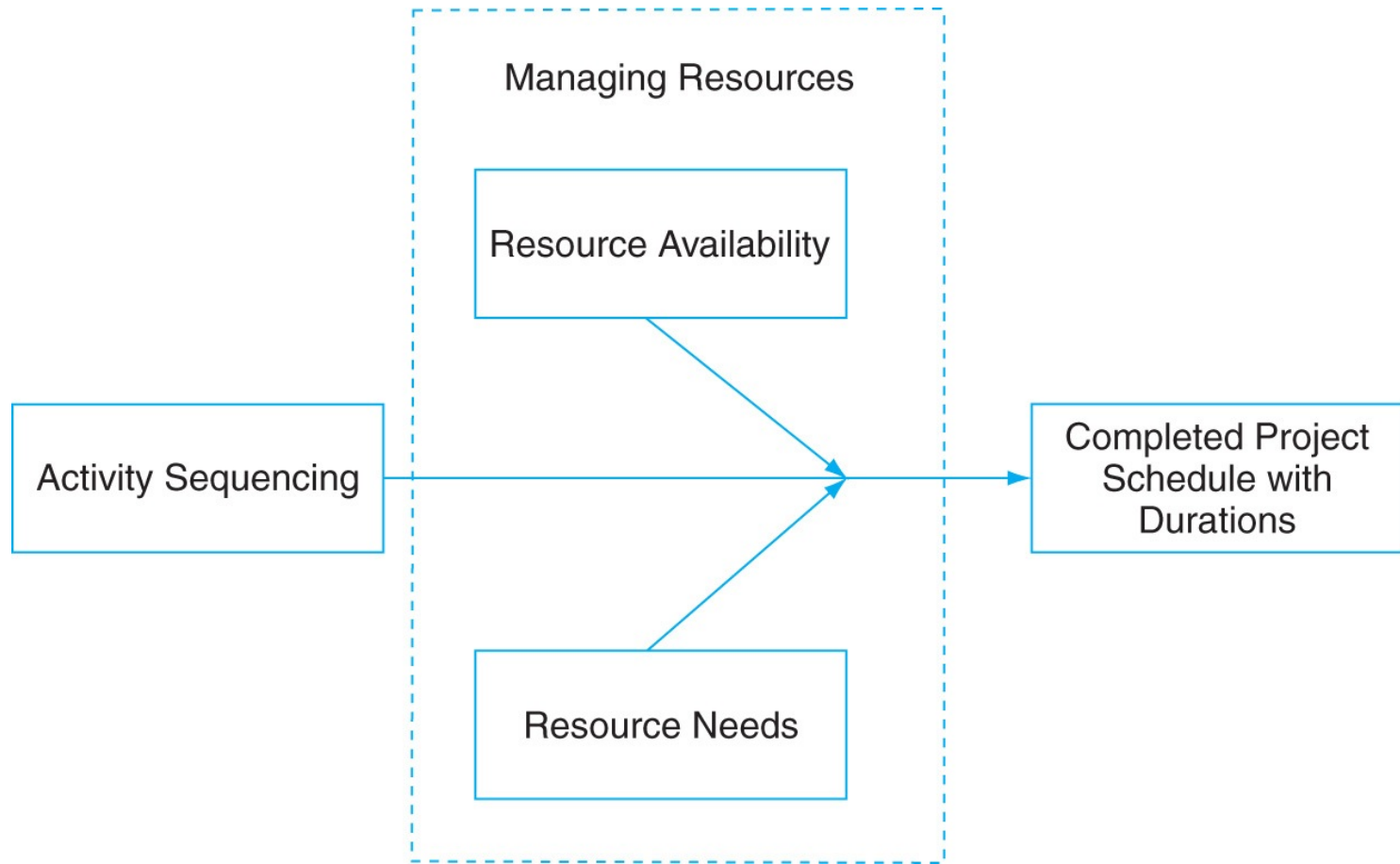
# Resource Management

- Involved in all project management stages
  - Initiation
    - What type of project to pursue
  - Planning
    - Allocation & scheduling of resources
  - Execution
    - Possible resource reallocation may be required
  - Control
    - Potential project changes may occur requiring action
  - Close-out
    - Release of resources and/or termination of contracts

# Duration and Effort

- Duration: time that elapses between the start and finish of an activity, including any interruptions (holidays; weekends; sickness; etc.)
- Effort: actual time required to perform an activity excluding interruptions

# Resource Management



# Resource Management Techniques

- Activity resource estimating
  - Identifies what resources are required for each activity
- Activity duration estimating
  - Determines time required of resource to perform specific activity
- Schedule development

# Activity Resource Estimating


## Inputs

- .1 Enterprise environmental factors
- .2 Organizational process assets
- .3 Activity list
- .4 Activity attributes
- .5 Resource availability
- .6 Project management plan

## Tools & Techniques

- .1 Expert judgment
- .2 Alternatives analysis
- .3 Published estimating data
- .4 Project management software
- .5 Bottom-up estimating

## Outputs

- .1 Activity resource requirements
  - .2 Activity attributes (updates)
  - .3 Resource breakdown structure
  - .4 Resource calendar (updates)
  - .5 Requested changes
- 

# Activity Resource Estimating

- Inputs
  - Enterprise environmental factors
  - Process assets
  - Outputs from prior project planning stages
  - Project management plan

# Resource Estimation Techniques & Tools

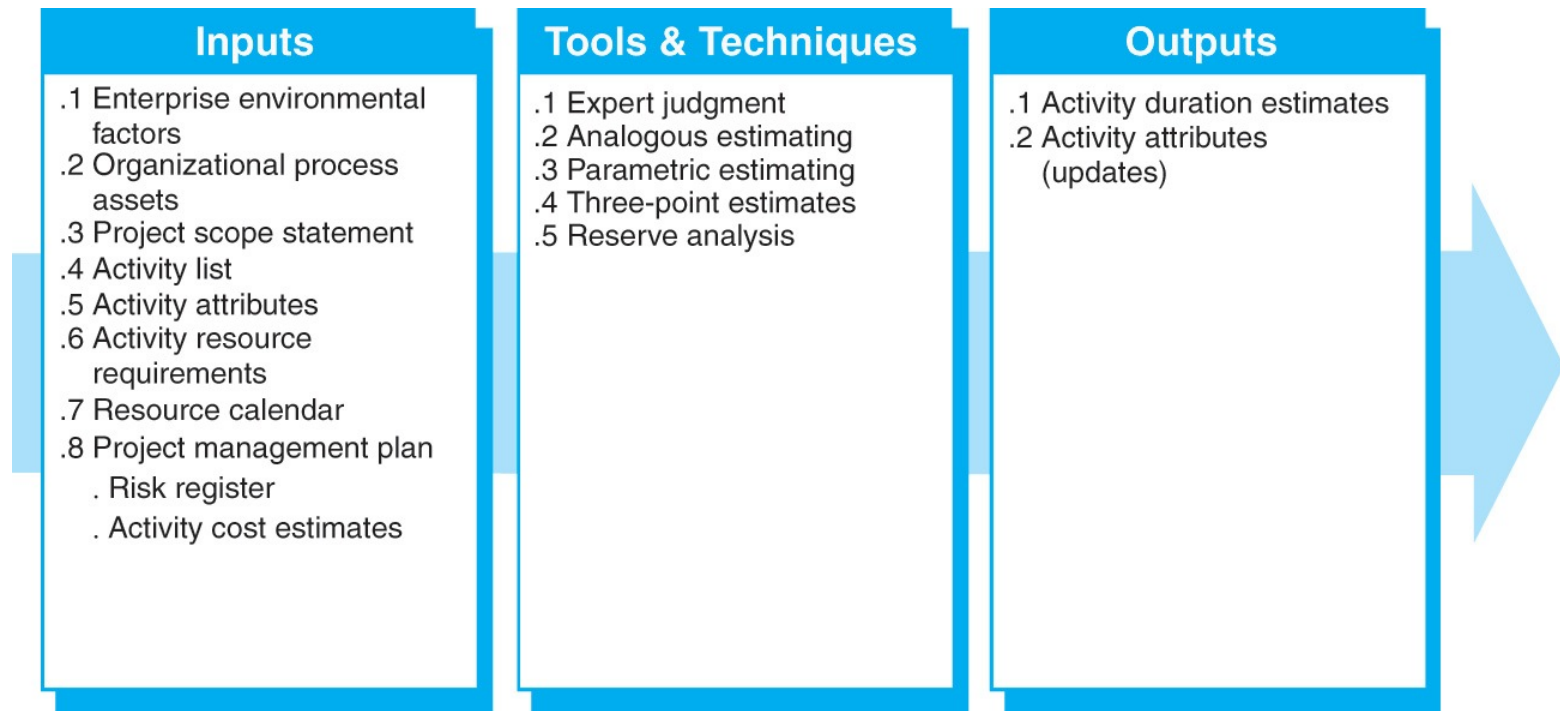
- Multiple techniques should be applied
- Choices:
  - Expert judgment and past performance data
  - Estimation data available from market research firms
  - Alternative analysis processes
  - Bottom-up estimating
  - Brainstorming
  - Mind mapping
- MS Project – “Resource Sheet”



# Resource Estimation Outputs

- Resource requirements
  - Types
  - Quantities required
- Resource breakdown structure (RBS)
  - Illustrates required resources by type or category in hierarchical format
- Resource calendar
  - Displays availability for specific resource

# Required Inputs, Tools and Techniques Used, and Resulting Outputs During Activity Duration Estimating



# Activity Duration Estimating

- Project scope and resource information used to determine duration estimation for each activity
- Inputs:
  - Activity list
  - Activity attributes
  - Activity cost estimates
  - Resource requirements
  - Resource calendar
  - Project scope statement
  - Enterprise environmental factors
  - Organizational process assets
  - Risk register

# Duration Estimating Techniques

- Expert judgment
- Analogous estimating
- Quantitatively based estimates
  - Parametric
  - Three-Point
- Reserve time

# Duration Estimation Outputs

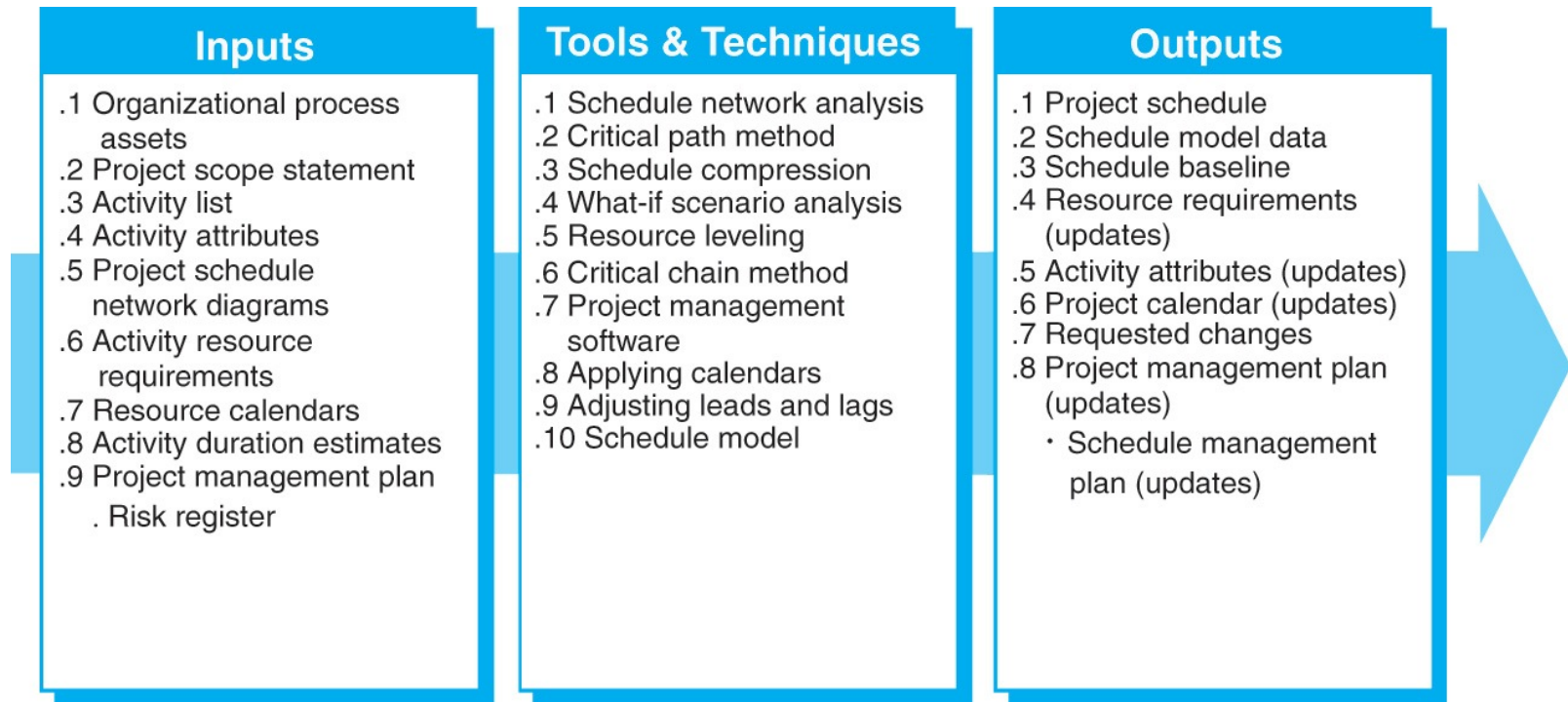
- Updated activity attributes
- Updated activity estimates – Gantt chart
  - Fixed point – July 15th
  - Range estimates – 6 months +/- 2 weeks
  - Three-Point
    - Optimistic
    - Pessimistic
    - Most likely

# Schedule Development

- Establishment of start and stop dates for project activities

Project schedule = activity duration estimates +  
activity sequences

# Required Inputs, Tools and Techniques Used, and Resulting Outputs During Schedule Development



# Schedule Development Inputs

- Organizational process assets
  - Project calendar
- Project scope statement
  - Imposed dates and milestones
- Project network diagrams
- Activity list, attributes, duration estimates and resource requirements
- Resource calendars
- Risk register

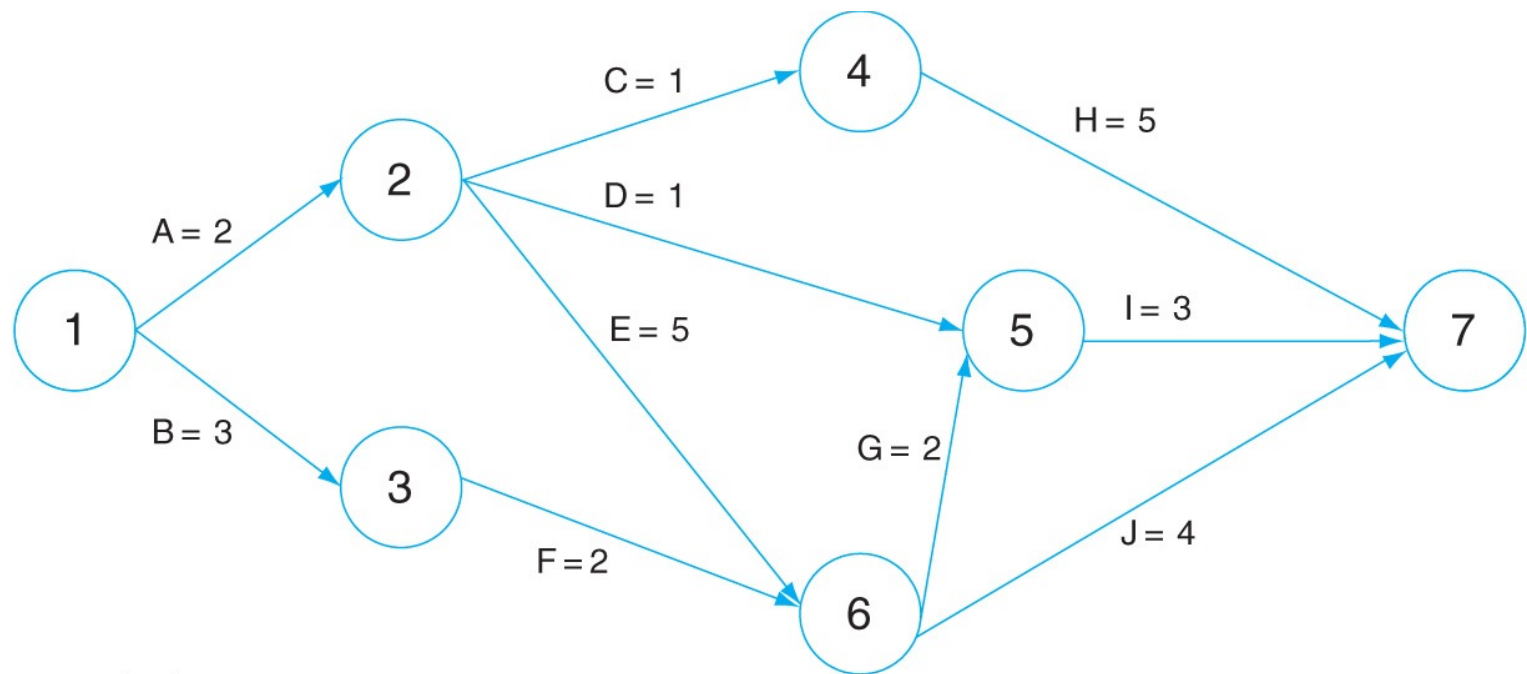


# Schedule Development Techniques

- May include:
  - Schedule network analysis
    - Time scheduling of project activities based on resource availability and constraint considerations
  - Critical Path Method (CPM)
    - Identification of specific activities within a path or sequence that cannot be delayed without delaying the finish time for the entire project
    - Used to assign a deterministic start and stop date for each activity

# Schedule Development Techniques (cont.)

## Critical Path Illustration



All durations are in days.

Path 1	A, C, H	Length = $2+1+5 = 8$ days
Path 2	A, D, I	Length = $2+1+3 = 6$ days
<b>Path 3</b>	<b>A, E, G, I</b>	<b>Length = <math>2+5+2+3 = 12</math> days</b>
Path 4	A, E, J	Length = $2+5+4 = 11$ days
Path 5	B, F, G, I	Length = $3+2+2+3 = 10$ days
Path 6	B, F, J	Length = $3+2+4 = 9$ days

The critical path is the longest path through the network diagram. In this case, Path 3, A-E-G-I, is the longest path so it is the critical path for this project.

# Schedule Development Techniques (cont.)

## Float/Slack

- Used to determine the late and early project completion dates
- Free float/slack
  - Time an activity can be delayed without affecting *the following activity*
  - Non-critical paths will always contain a positive free float
- Total float/slack
  - Time an activity can be delayed without affecting *the project's completion date*
  - Critical path always contains zero or negative total float
- Determined by the calculations of forward and backward passes

# Schedule Development Techniques (cont.)

## Free & Total Slack

The screenshot shows the Microsoft Project - WINXPDEP interface. The Gantt Chart view is active, and the Task Usage table is displayed. The table has columns for Task Name, Start, Finish, Late Start, Late Finish, Free Slack, and Total Slack. A red circle highlights the 'Free Slack' and 'Total Slack' columns.

Task Name	Start	Finish	Late Start	Late Finish	Free Slack	Total Slack
Deploy development solution	Mon 1/17/05	Mon 1/17/05	Mon 1/17/05	Mon 1/17/05	0 days	0 days
- Perform Full-Cycle Risk Assessment	Mon 1/17/05	Wed 1/26/05	Mon 1/17/05	Wed 1/26/05	0 days	0 days
Document lessons learned	Mon 1/17/05	Thu 1/20/05	Mon 1/17/05	Thu 1/20/05	0 days	0 days
Document modifications	Thu 1/20/05	Mon 1/24/05	Thu 1/20/05	Mon 1/24/05	0 days	0 days
Address reading	Mon 1/24/05	Wed 1/26/05	Mon 1/24/05	Wed 1/26/05	0 days	0 days
Perform full-cycle	Wed 1/26/05	Wed 1/26/05	Wed 1/26/05	Wed 1/26/05	0 days	0 days
POC complete	Wed 1/26/05	Wed 1/26/05	Wed 1/26/05	Wed 1/26/05	0 days	0 days
- Pilot	Wed 1/26/05	Wed 4/13/05	Wed 1/26/05	Wed 4/13/05	0 days	0 days
- Planning	Wed 1/26/05	Tue 3/1/05	Wed 1/26/05	Tue 3/1/05	0 days	0 days
Identify pilot	Wed 1/26/05	Tue 2/1/05	Wed 1/26/05	Tue 2/1/05	0 days	0 days
Identify pilot	Tue 2/1/05	Thu 2/3/05	Wed 2/16/05	Fri 2/18/05	0 days	11 days
Document r	Thu 2/3/05	Mon 2/7/05	Fri 2/18/05	Tue 2/22/05	0 days	11 days
Develop co	Mon 2/7/05	Mon 2/14/05	Tue 2/22/05	Tue 3/1/05	11 days	11 days
Develop the	Tue 2/1/05	Fri 2/4/05	Thu 2/24/05	Tue 3/1/05	17 days	17 days
Develop the	Tue 2/1/05	Mon 2/7/05	Wed 2/23/05	Tue 3/1/05	16 days	16 days
Ensure POC	Tue 2/1/05	Thu 2/3/05	Tue 2/1/05	Thu 2/3/05	0 days	0 days
- Develop th	Thu 2/23/05	Thu 2/23/05	Thu 2/23/05	Tue 3/1/05	0 days	0 days
Identify t	Thu 2/23/05	Mon 2/7/05	Fri 2/25/05	Tue 3/1/05	16 days	16 days
Identify l	Thu 2/23/05	Tue 2/8/05	Thu 2/24/05	Tue 3/1/05	15 days	15 days
Identify t	Thu 2/23/05	Fri 2/4/05	Thu 2/3/05	Fri 2/4/05	0 days	0 days
Docume	Fri 2/4/05	Wed 2/9/05	Fri 2/4/05	Wed 2/9/05	0 days	0 days
Docume	Wed 2/9/05	Fri 2/11/05	Wed 2/9/05	Fri 2/11/05	0 days	0 days
Docume	Fri 2/11/05	Tue 2/15/05	Fri 2/11/05	Tue 2/15/05	0 days	0 days
Docume	Tue 2/15/05	Fri 2/18/05	Tue 2/15/05	Fri 2/18/05	0 days	0 days
Docume	Fri 2/18/05	Wed 2/23/05	Fri 2/18/05	Wed 2/23/05	0 days	0 days
Develop	Wed 2/23/05	Wed 2/23/05	Wed 2/23/05	Wed 2/23/05	0 days	0 days
Identify know	Wed 2/23/05	Fri 2/25/05	Wed 2/23/05	Fri 2/25/05	0 days	0 days
Develop roll	Fri 2/25/05	Tue 3/1/05	Fri 2/25/05	Tue 3/1/05	0 days	0 days

# Schedule Development Techniques (cont.)

- Program Evaluation and Review Technique (PERT)
  - Uses probabilistic time estimates to determine activity duration
  - Sometimes referred to as Activity-On-Arrow Network Diagram

# Schedule Development Techniques (cont.)

## PERT

PERT weighted average formula:

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

### Example:

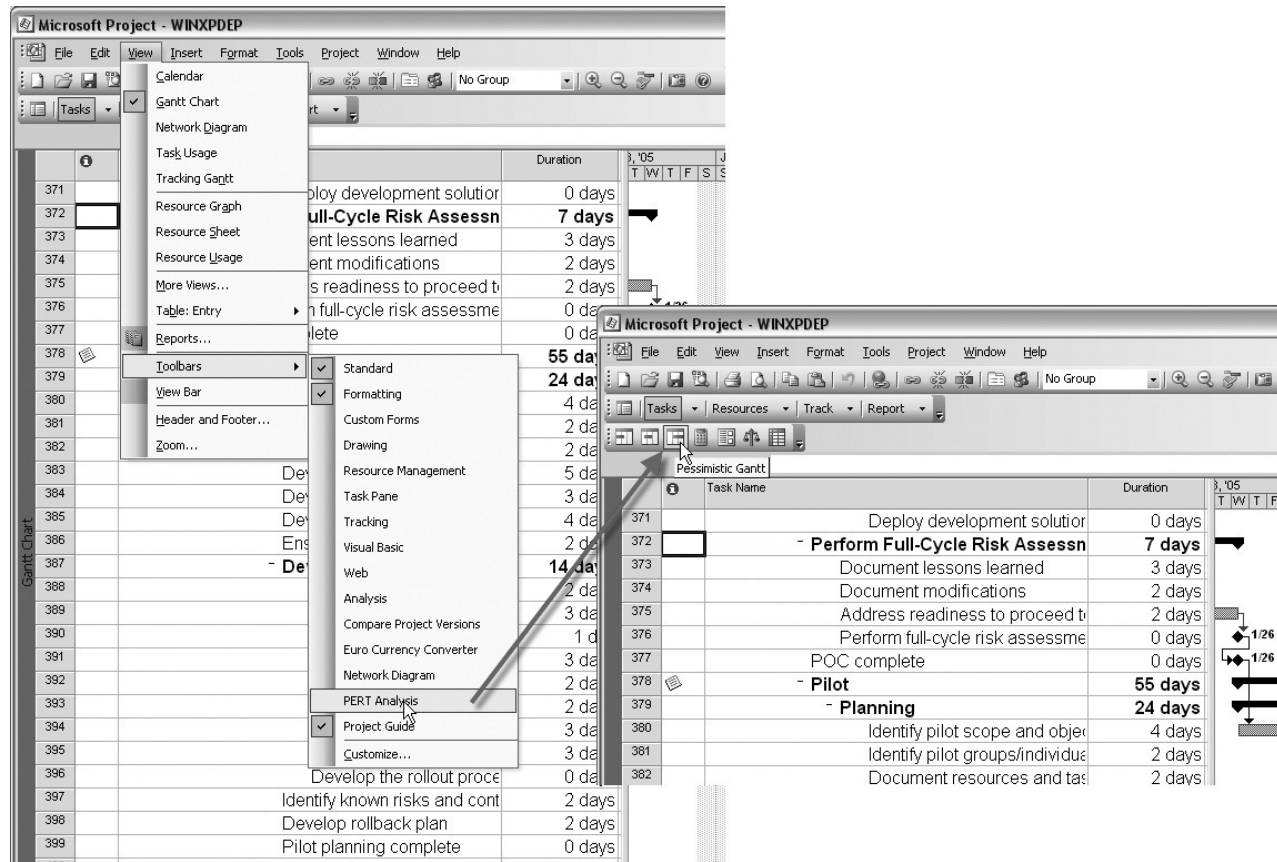
PERT weighted average =

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

where 8 = optimistic time,  
10 = most likely time,  
and 24 = pessimistic time

# Schedule Development Techniques (cont.)

## PERT Analysis in MS Project



# Schedule Development Techniques (cont.)

- Schedule compression
- What-if-scenario analysis
- Resource leveling
- Critical chain method



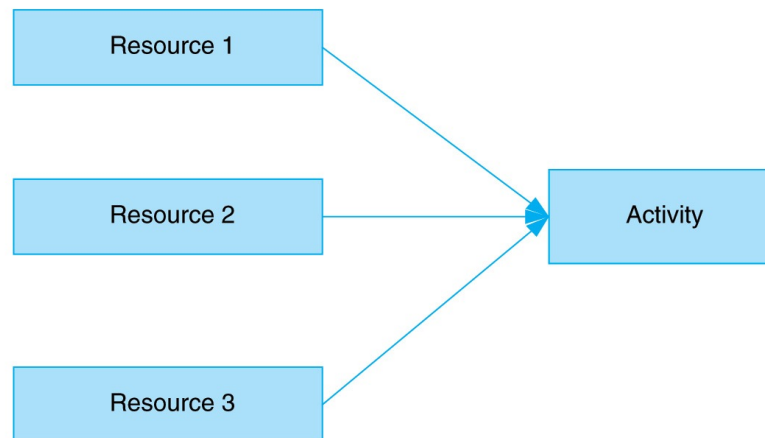
# Fast-Tracking and Crashing

ID	Task Name	Start	Finish	Duration	Oct 2004								
					14	15	16	17	18	19	20	21	22
1	Task 1	10/14/2004	10/15/2004	2d	■	■							
2	Task 2	10/18/2004	10/19/2004	2d					■	■			
3	Task 3	10/20/2004	10/21/2004	2d							■	■	

ID	Task Name	Start	Finish	Duration	Oct 2004								
					14	15	16	17	18	19	20	21	22
1	Task 1	10/14/2004	10/15/2004	2d	■	■							
2	Task 2	10/14/2004	10/15/2004	2d	■	■							
3	Task 3	10/14/2004	10/15/2004	2d	■	■							

Fast-tracking

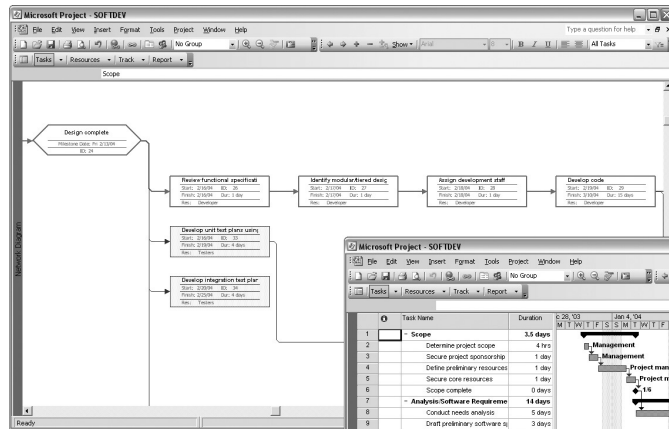
Crashing



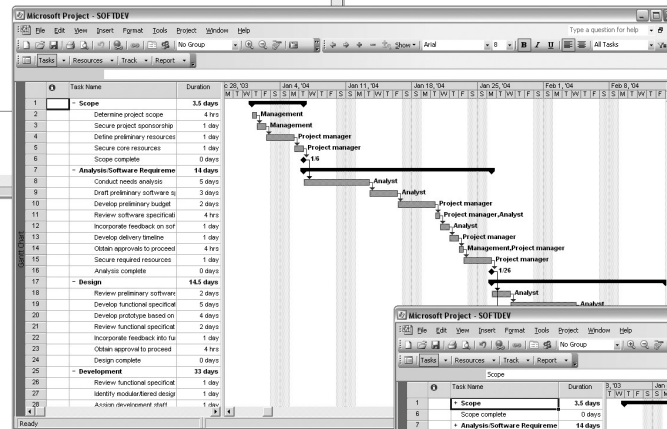
# Schedule Development Outputs

- Updates to the schedule model data
- Schedule baseline
- Activity list
- Activity attributes
- Project management plan
- Requested changes and recommended corrective actions
- Lessons learned

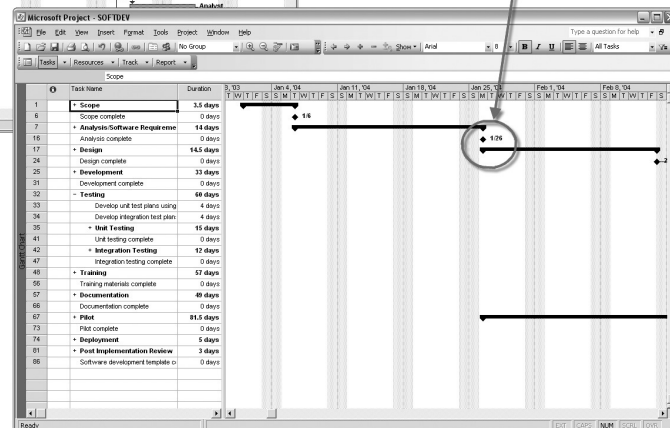
# Schedule Development Outputs



Panel A

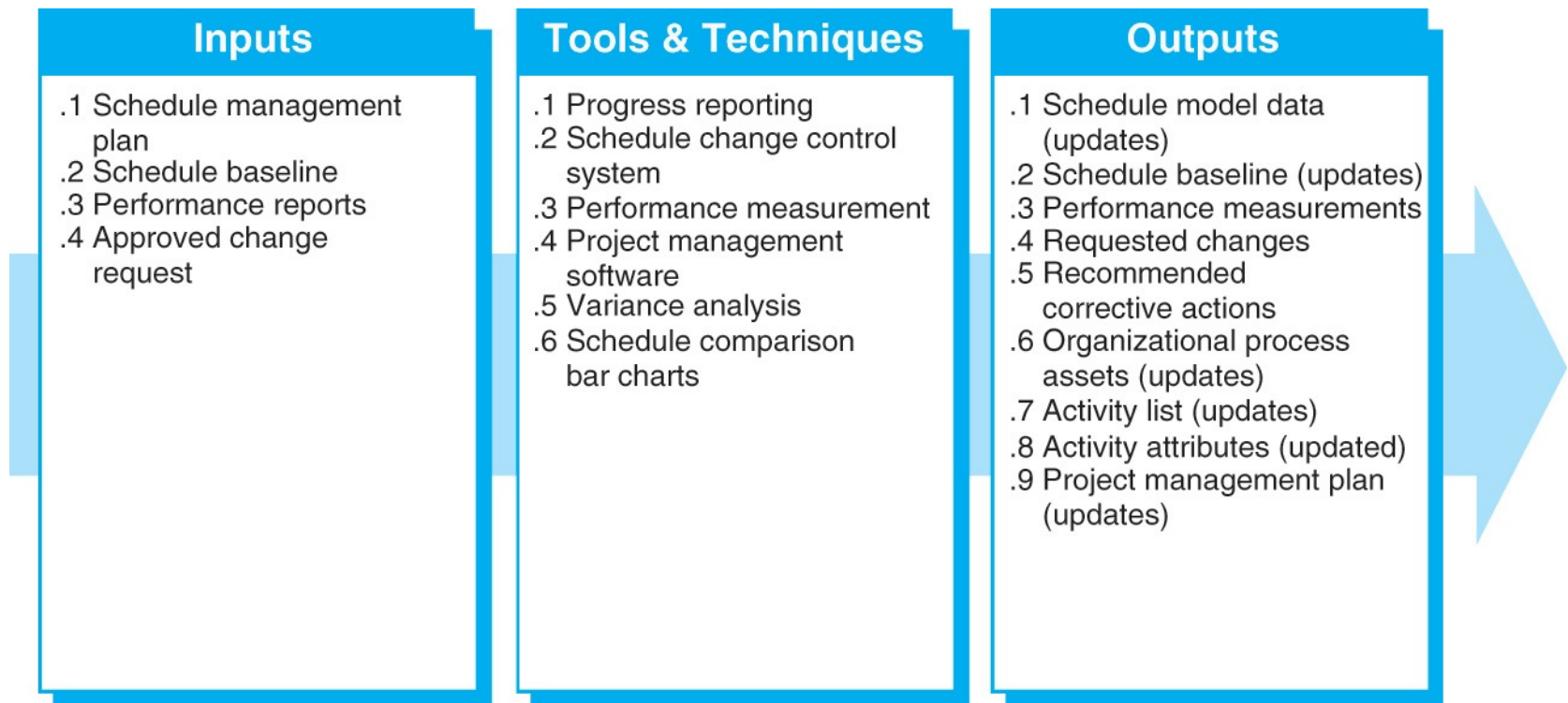


Panel B



Panel C

# Required Inputs, Tools and Techniques Used, and Resulting Outputs During Schedule Control



# Questions?

