Chapter 3
Managing Systems Projects
Systems Analysis and Design 10th Edition

Chapter 3
Managing Systems Projects
Chapter Objectives

- Explain project planning, scheduling, monitoring, and reporting
- Draw a project triangle that shows the relationship among project cost, scope, and time
- Describe work breakdown structures, task patterns, and critical path analysis
- Explain techniques for estimating task completion times and costs
Chapter Objectives (Cont.)

- Describe various scheduling tools, including Gantt charts and PERT/CPM charts
- Analyze task dependencies, durations, start dates, and end dates
- Describe project management software and how it can assist you
- Discuss the importance of managing project risks
- Understand why projects sometimes fail
Building construction and system development projects both need careful management and monitoring.
Overview of Project Management

● **What Shapes a Project?**
  - Successful projects must be completed on time, within budget, meet requirements, and satisfy users

● **What Is a Project Triangle**
  - Cost, scope, time
  - Usually one of these is fixed
    - A budget cast in stone
    - An inflexible scope
    - A schedule fixed by factors beyond the firm’s control
The sign at this tells a familiar story.
If you can't get everything you want, you have to make choices.
A typical project triangle includes cost, scope and time.

- If an extremely time-critical project starts to slip
  - Trim some features
  - Seek approval for a budget increase
What Does a Project Manager Do?

- Good leadership is essential

**Project planning**
- Identify all project tasks and estimate the completion time and cost of each

**Project scheduling**
- Create a specific timetable that shows tasks, task dependencies, and critical tasks that might delay the project
What Does a Project Manager Do? (Cont.)

- **Project monitoring**
  - Guiding, supervising, and coordinating the project team’s workload
- **Project reporting**
  - Create regular progress reports to management, users, and the project team itself

*FIGURE 3-5* A typical project triangle includes cost, scope, and time
Project Planning and Scheduling

• Steps:
  – Step1: Create a work breakdown structure
  – Step2: Identify task patterns
  – Step3: calculate the projects' critical path
Step 1: Create a Work Breakdown Structure

What Is a Gantt Chart?
- Developed by mechanical engineer and management consultant Henry L. Gantt almost 100 years ago
- Shows planned and actual progress on a project
- Time usually displayed on horizontal axis
- Tasks shown on vertical axis
Step 1: Create a Work Breakdown Structure (Cont.)

FIGURE 3-6 In this Gantt chart, notice the yellow bars that show the percentage of task completion.
Step 1: Create a Work Breakdown Structure (Cont.)

What Is a PERT/CPM Chart?

- Program Evaluation Review Technique (PERT)
  - Developed by the U.S. Navy to manage complex projects
- Critical Path Method (CPM)
  - Similar to PERT, developed by private industry
  - Most analysts call both a PERT Chart
Step 1: Create a Work Breakdown Structure (Cont.)

Which is better: Gantt vs. PERT

- Gantt offers a valuable snapshot view of the project
- PERT is more useful for scheduling, monitoring, and controlling the actual work
  - PERT displays complex task patterns and relationships
  - PERT chart boxes can provide more detailed information
Step 1: Create a Work Breakdown Structure (Cont.)

FIGURE 3-7 The top screen shows a Gantt chart with six tasks. The PERT chart in the bottom screen displays an easy-to-follow task pattern for the same project. When the user mouses over the summary box for Task 5, the details become visible
Step 1: Create a Work Breakdown Structure (Cont.)

- Identifying Tasks in a Work Breakdown Structure (WBS)
  - WBS must clearly identify each task and include an estimated duration
  - A task, or activity, is any work that has a beginning and an end and requires the use of company resources such as people, time, or money
  - Tasks are basic units of work that the project manager plans, schedules, and monitors — so they should be relatively small and manageable
Step 1: Create a Work Breakdown Structure (Cont.)

FIGURE 3-8 Using a questionnaire requires a series of tasks and events to track the progress. The illustration shows the relationship between the tasks and the events, or milestones, that mark the beginning and end of each task.

Event/Milestone: a recognizable reference point that you can use to monitor progress.
Step 1: Create a Work Breakdown Structure (Cont.)

- **Listing the Tasks**
  - List all tasks
  - Put tasks in order
  - Add a description
  - Decide how long each task takes
  - Decide which tasks must go first

<table>
<thead>
<tr>
<th>Task No.</th>
<th>Description</th>
<th>Duration (Days)</th>
<th>Predecessor Tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reserve the meeting room</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Order the marketing materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Brief the managers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Send out customer e-mails</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Burn sample DVDs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Load the new software</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Do a dress rehearsal</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**FIGURE 3-10** In this table, columns have been added for task number, description, duration, and predecessor tasks, which must be completed before another task can start.
Step 1: Create a Work Breakdown Structure (Cont.)

- **Estimating Task Duration**
  - Tasks can be hours, days, or weeks
  - If tasks uses days, the units of measurement are called person-days
  - A person-day represents the work that one person can complete in one day
Step 1: Create a Work Breakdown Structure (Cont.)

- **Factors Affecting Duration**
  - **Project Size**
    - Must identify all project tasks, from initial fact-finding to system implementation
    - How much time will be needed to perform each task?
    - Allow time for meetings, project reviews, training, and any other factors that could affect the productivity of the development team
  - **Human Resources**
    - Assemble and guide a development team that has the skill and experience to handle the project
    - Turnover, job vacancies, and escalating salaries in the technology sector
Step 1: Create a Work Breakdown Structure (Cont.)

- **Experience with Similar Projects**
  - Develop time and cost estimates based on the resources used for similar, previously developed information systems
  - Use experience from projects that were developed in a different environment

- **Constraints**
  - Constraints are conditions, restrictions, or requirement that the system must satisfy
  - Define system requirements that can be achieved realistically within the required constraints
Step 1: Create a Work Breakdown Structure (Cont.)

Displaying the Work Breakdown Structure

<table>
<thead>
<tr>
<th>Task No.</th>
<th>Description</th>
<th>Duration (Days)</th>
<th>Predecessor Tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reserve the meeting room</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Order the marketing materials</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Brief the managers</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Send out customer e-mails</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Burn sample DVDs</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Load the new software</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Do a dress rehearsal</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

FIGURE 3-11 Task durations have been added, and the WBS is complete except for predecessor task information. The predecessor tasks will determine task patterns and sequence of performance.

FIGURE 3-12 This Microsoft Project screen displays the same WBS, including task number, task name, duration, and predecessor tasks.
Step 2: Identify Task Patterns

● What Are Task Patterns
  - Tasks depend on each other and must be performed in a sequence
  - Involve dependent tasks, multiple successor tasks, and multiple predecessor tasks

● How Do I Use Task Boxes to Create a Model?
  - Each section of the task box contains important information about the task, including the task name, task ID, task duration, start day/date, and finish day/date
Step 2: Identify Task Patterns

- **Task Name**
  - Should be brief and descriptive

- **Task ID**
  - Can be a number or code that provides unique identification

- **Task Duration**
  - Amount of time it will take to complete a task

- **Start Day / Date**
  - The start day/date is the time that a task is scheduled to begin

- **Finish Day / Date**
  - The finish day/date is the time that a task is scheduled to be completed
Step 2: Identify Task Patterns (Cont.)

What Are the Main Types of Task Patterns?

- **Dependent Tasks**
  - When tasks must be completed one after another
  - Called dependent tasks because one depends on the other
  - Similar to a relay race

Figure 3-15 This example of a dependent task shows that the finish time of Task 1, Day 5, controls the start date of Task 2, which is Day 6
What Are the Main Types of Task Patterns? (cont.)

- **Multiple Successor Tasks**
  - When several tasks can start at the same time
  - Each is called a concurrent task
  - Often, two or more concurrent tasks depend on a single prior task, which is called a predecessor task

**FIGURE 3-16** This example of multiple successor tasks shows that the finish time for Task 1 determines the start time for both Tasks 2 and 3
Multiple Predecessor Tasks

- When a task requires two or more prior tasks to be completed before it can start.

**FIGURE 3-17** This example of multiple predecessor tasks shows that the start time for a successor task must be the latest (largest) finish time for any of its preceding tasks. In the example shown, Task 1 ends on Day 15, while Task 2 ends on Day 5, so Task 1 controls the start time for Task 3.
How Do I Identify Task Patterns?

- Words like *then*, *when*, or *and* are action words that signal a sequence of events
  - *Do Task 1, then do Task 2*
    - Describes dependent tasks that must be completed one after the other
  - *When Task 2 is finished, start two tasks*
    - Task 3 and Task 4 describes multiple successor tasks that can both start as soon as Task 2 is finished
  - *When Tasks 5 and 6 are done, start Task 7*
    - Indicates that Task 7 is a multiple predecessor task because it can’t start until two or more previous tasks all are completed
Step 2: Identify Task Patterns (Cont.)

How Do I Work With Complex Task Patterns?
- Study the facts very carefully to understand the logic and sequence
- Schedule will be wrong if task patterns are incorrect

FIGURE 3-18
Dependent tasks

FIGURE 3-19
Dependent tasks and multiple successor tasks

FIGURE 3-20
Dependent tasks, multiple successor tasks, and multiple predecessor tasks
Step 3: Calculate the Critical Path

What is a Critical Path?

- A series of tasks which, if delayed, would affect the completion date of the overall project
- If any task on the critical path falls behind schedule, the entire project will be delayed
Step 3: Calculate the Critical Path (Cont.)

How Do I Calculate the Critical Path?
- Review patterns, determine start and finish dates, which will determine the critical path

FIGURE 3-21 Example of a PERT/CPM chart with five tasks. Task 2 is a dependent task that has multiple successor tasks. Task 5 has multiple predecessor tasks. In this figure, the analyst has arranged the tasks and entered task names, IDs, and durations.
Step 3: Calculate the Critical Path (Cont.)

FIGURE 3-22 Now the analyst has entered the start and finish times, using the rules explained in this section. Notice that the overall project has a duration of 95 days.
Project Monitoring and Control

- **Monitoring and Control Techniques**
  - Structured walkthrough
    - A review of a project team member's work by other members of the team

- **Maintaining a Schedule**
  - Most projects tune into some problems or delays
    - Anticipate problems
    - Avoid them
    - Minimize their impact
    - Identify potential solutions
    - Select the best way to solve the problem
  - The better the original plan, the easier it will be to control
    - If clear, verifiable milestones exist, it will be simple to determine if and when those targets are achieved
Reporting

- **Project Status Meetings**
  - Schedule regular meetings to update the team and discuss project status, issues, problems, and opportunities
**Reporting (Cont.)**

- **Project Status Reports**
  - Reports can be verbal but are usually written
  - Gantt charts are often included to show project status graphically
  - Handling potential problems can be difficult
    - An overly cautious project manager who alerts management to every potential snag and slight delay will lose credibility over a period of time, and management might ignore potentially serious situations
    - A project manager who tries to handle all situations single-handedly and does not alert management until a problem is serious leaves little time to react or devise a solution
Project Management Examples

Example of a work breakdown structure with 11 tasks, together with their descriptions, durations, and predecessor tasks.

<table>
<thead>
<tr>
<th>Task No.</th>
<th>Description</th>
<th>Duration (Days)</th>
<th>Predecessor Tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Develop Plan</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Assign Tasks</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Obtain Hardware</td>
<td>17</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Programming</td>
<td>70</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Install Hardware</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>Program Test</td>
<td>30</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>Write User Manual</td>
<td>25</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>Convert Files</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>9</td>
<td>System Test</td>
<td>25</td>
<td>6</td>
</tr>
<tr>
<td>10</td>
<td>User Training</td>
<td>20</td>
<td>7, 8</td>
</tr>
<tr>
<td>11</td>
<td>User Test</td>
<td>25</td>
<td>9, 10</td>
</tr>
</tbody>
</table>
Project Management Examples
(Cont.)

- PERT/CPM Example
  - **STEP 1: DISPLAY THE TASKS AND TASK PATTERNS**
    - Identify the tasks, determine task dependencies, and enter the task name, ID, and duration.
  - **STEP 2: ENTER START AND FINISH TIMES**
    - Enter the start and finish times
STEP 1: DISPLAY THE TASKS AND TASK PATTERNS

FIGURE 3-26 To transform a task list into a PERT/CPM chart, you first enter the task name, ID, duration, and predecessors for each task. Notice that this example includes dependent tasks, tasks with multiple successors, and tasks with multiple predecessors.
Project Management Examples

(Cont.)

**STEP 2: ENTER START AND FINISH TIMES**

**FIGURE 3-27** To complete the PERT/CPM chart, you apply the guidelines explained in this section. For example, Task 1 has a one-day duration, so you enter the start and finish for Task 1 as Day 1. Then you enter Day 2 as the start for successor Tasks 2 and 3.
Project Management Software

- **Microsoft Project** is a full-featured program that holds the dominant share of the market
  - Gantt chart
    - As you enter the tasks, the program automatically performs the calculations, detects the task patterns, and creates a Gantt chart
  - Network diagram
    - View is similar to a PERT Chart
  - Calendar view
    - View is similar to a PERT chart as an overlay on a calendar

- **GanttProject** is a free, open source program
FIGURE 3-30 Notice how each view displays the project and highlights the critical path. If you were the project manager on September 25, what would be your primary concern?
Project Management Software
(Cont.)

FIGURE 3-30  Notice how each view displays the project and highlights the critical path. If you were the project manager on September 25, what would be your primary concern?
FIGURE 3-30 Notice how each view displays the project and highlights the critical path. If you were the project manager on September 25, what would be your primary concern?
Risk Management

Steps in Risk Management

- Develop a risk management plan
  - Review of the project’s scope, stakeholders, budget, schedule, and any other internal or external factors that might affect the project
  - Define project roles and responsibilities, risk management methods and procedures, categories of risks, and contingency plans
Steps in Risk Management (Cont.)

- Identify the risks
  - List each risk and assess the likelihood that it could affect the project

- Analyze the risks
  - This typically is a two-step process
    - Qualitative risk analysis evaluates each risk by estimating the probability that it will occur and the degree of impact
    - Quantitative risk analysis is to understand the actual impact in terms of dollars, time, project scope, or quality
FIGURE 3-33 You can use a Microsoft Excel XY chart type to display a risk matrix that shows risk probability and potential impact.
Risk Management Software

- Assigns specific dates as constraints
- Aligns task dependencies
- Notes external factors that might affect a task
- Tracks progress
- Displays tasks that are behind schedule
- Links risks with specific tasks and projects
- Specifies probability and impact
- Assigns ownership
- Tracks progress to manage projects more efficiently
FIGURE 3-34
Intaver Institute offers an add-on risk management package for Microsoft Project.
Managing for Success

- **Business Issues**
  - Every system is to provide a solution to a business problem or opportunity
  - If a system does not do this, it is a failure

- **Budget Issues**
  - Unrealistic estimates that are too optimistic or based on incomplete information
  - Failure to develop an accurate forecast that considers all costs over the life of the project
  - Poor monitoring of progress and slow response to early warning signs of problems
  - Schedule delays due to factors that were not foreseen
  - Human resource issues, including turnover, inadequate training, and motivation
Managing for Success (Cont.)

- **Schedule Issues**
  - Problems with timetables and project milestones can indicate a failure to recognize task dependencies, confusion between effort and progress, poor monitoring and control methods, personality conflicts among team members, or turnover of project personnel.
  - The failure of an IT project also can be caused by poor project management techniques.
Project managers must be alert, technically competent, and highly resourceful. They also must be good communicators with strong human resource skills.

When problems occur, the project manager’s ability to handle the situation becomes the critical factor.

The Bottom Line
Chapter Summary

● Project management is the process of planning, scheduling, monitoring, and reporting on the development of an information system.
● A successful project must be completed on time, within budget, and deliver a quality product that satisfies users and meets requirements.
● A project triangle shows three legs: project cost, scope, and time. A project manager must find the best balance among these elements because a change in any leg of the triangle will affect the other two legs.
Chapter Summary (Cont.)

- Planning, scheduling, monitoring, and reporting all take place within a larger project development framework, which includes three key steps: creating a work breakdown structure, identifying task patterns, and calculating the critical path.
- Task patterns establish the sequence of work in a project.
- A critical path is a series of tasks that, if delayed, would affect the completion date of the overall project.
Chapter Summary (Cont.)

- A Gantt chart is a horizontal bar chart that represents the project schedule with time on the horizontal axis and tasks arranged vertically.
- A PERT/CPM chart shows the project as a network diagram with tasks connected by arrows.
- Most project managers use powerful software such as Microsoft Project to plan, schedule, and monitor projects.