Chapter 1: Introduction to Project Management

Information Technology Project Management, Sixth Edition

Note: See the text itself for full citations.

Learning Objectives

- Understand the growing need for better project management, especially for information technology projects
- Explain what a project is, provide examples of information technology projects, list various attributes of projects, and describe the triple constraint of projects
- Describe project management and discuss key elements of the project management framework, including project stakeholders, the project management knowledge areas, common tools and techniques, and project success

Learning Objectives (continued)

- Discuss the relationship between project, program, and portfolio management and the contributions they each make to enterprise success
- Understand the role of the project manager by describing what project managers do, what skills they need, and what the career field is like for information technology project managers
- Describe the project management profession, including its history, the role of professional organizations like the Project Management Institute (PMI), the importance of certification and ethics, and the advancement of project management software

Introduction (continued)

- Many organizations today have a new or renewed interest in project management
- Computer hardware, software, networks, and the use of interdisciplinary and global work teams have radically changed the work environment
- The world as a whole spends nearly $10 trillion of its $40.7 trillion gross product on projects of all kinds
- More than 16 million people regard project management as their profession

Project Management Statistics

- Total global spending on technology goods, services, and staff was projected to reach $2.4 trillion in 2008, an 8 percent increase from 2007
- In the U.S. the size of the IT workforce topped 4 million workers for the first time in 2008
- In 2007 the total compensation for the average senior project manager in U.S. dollars was $104,776 per year in the United States, $111,412 in Australia, and $120,364 in the United Kingdom
- The number of people earning their Project Management Professional (PMP) certification continues to increase

Motivation for Studying Information Technology (IT) Project Management

- IT Projects have a terrible track record, as described in the What Went Wrong?

- A 1995 Standish Group study (CHAOS) found that only 16.2% of IT projects were successful in meeting scope, time, and cost goals; over 31% of IT projects were canceled before completion
- A PricewaterhouseCoopers study found that overall, half of all projects fail and only 2.5% of corporations consistently meet their targets for scope, time, and cost goals for all types of project

Advantages of Using Formal Project Management

- Better control of financial, physical, and human resources
- Improved customer relations
- Shorter development times
- Lower costs
- Higher quality and increased reliability
- Higher profit margins
- Improved productivity
- Better internal coordination
- Higher worker morale

What Is a Project?

- A **project** is "a temporary endeavor undertaken to create a unique product, service, or result" (PMBOK® Guide, Fourth Edition, 2008, p. 5)
- Operations is work done to sustain the business
- Projects end when their objectives have been reached or the project has been terminated
- Projects can be large or small and take a short or long time to complete

Examples of IT Projects

- A technician replaces ten laptops for a small department
- A small software development team adds a new feature to an internal software application for the finance department
- A college campus upgrades its technology infrastructure to provide wireless Internet access across the whole campus
- A cross-functional task force in a company decides what Voice-over-Internet-Protocol (VoIP) system to purchase and how it will be implemented

Top Strategic Technologies for 2008 (Gartner)

- Green IT
- Unified communications
- Business process modeling
- Virtualization 2.0
- Social software

Media Snapshot: Where IT Matters

- In 2006, Baseline Magazine published “Where I.T. Matters: How 10 Technologies Transformed 10 Industries” as a retort to Nicholas Carr’s ideas (author of “IT Doesn’t Matter”)
  - VoIP has transformed the telecommunications industry and broadband Internet access
  - Global Positioning Systems (GPS) has changed the farming industry
  - Digital supply chain has changed the entertainment industry’s distribution system

Project Attributes

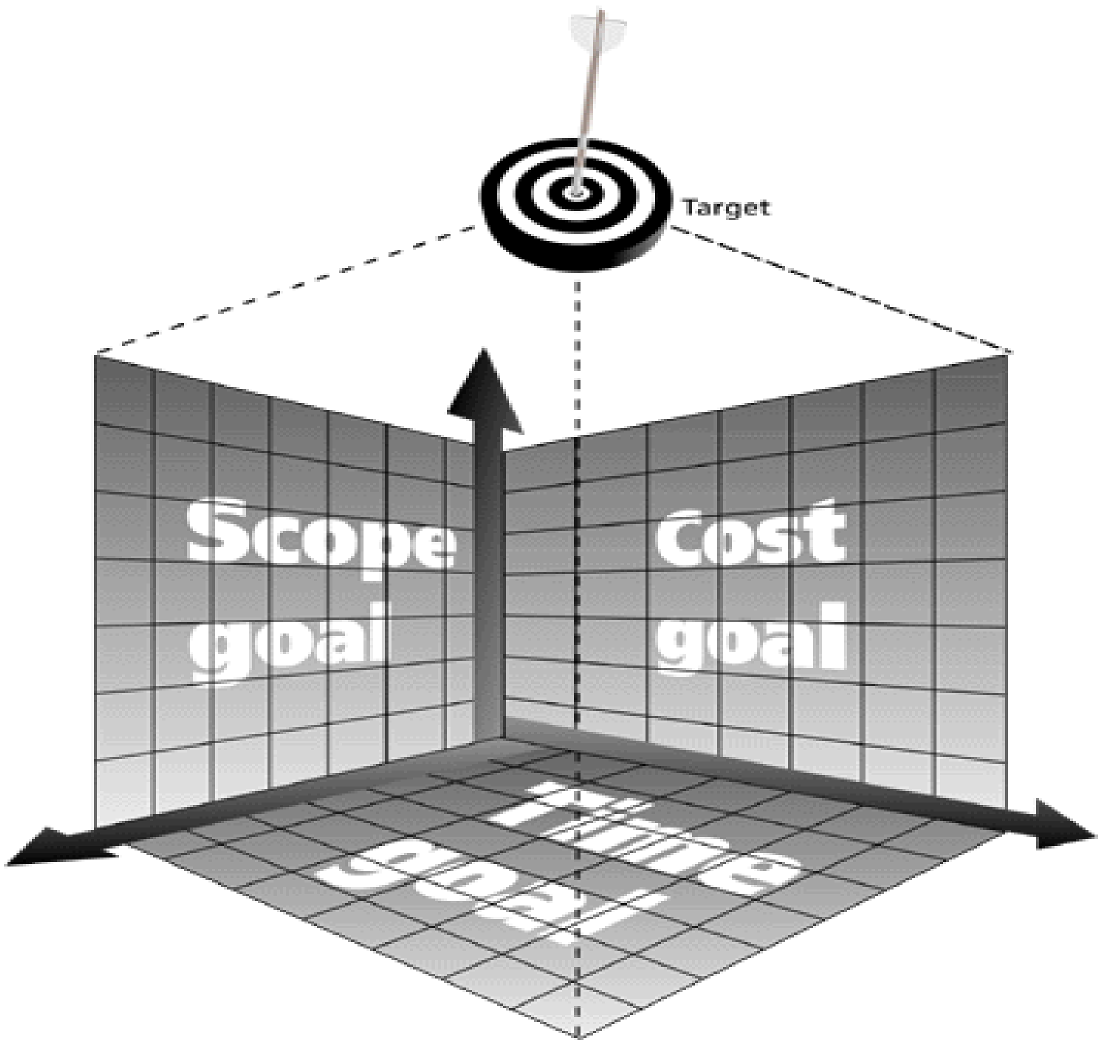
- A project:
  - Has a unique purpose
  - Is temporary
  - Is developed using progressive elaboration
  - Requires resources, often from various areas
  - Should have a primary customer or sponsor
    - The **project sponsor** usually provides the direction and funding for the project
  - Involves uncertainty

Project and Program Managers

- **Project managers** work with project sponsors, the project team, and other people involved in a project to meet project goals
- **Program**: group of related projects managed in a coordinated way to obtain benefits and control not available from managing them individually (PMBOK® Guide, Fourth Edition, 2008, p. 9)
- Program managers oversee programs; often act as bosses for project managers

Figure 1-1 The Triple Constraint of Project Management

Successful project management means meeting all three goals (scope, time, and cost) – and satisfying the project's sponsor!

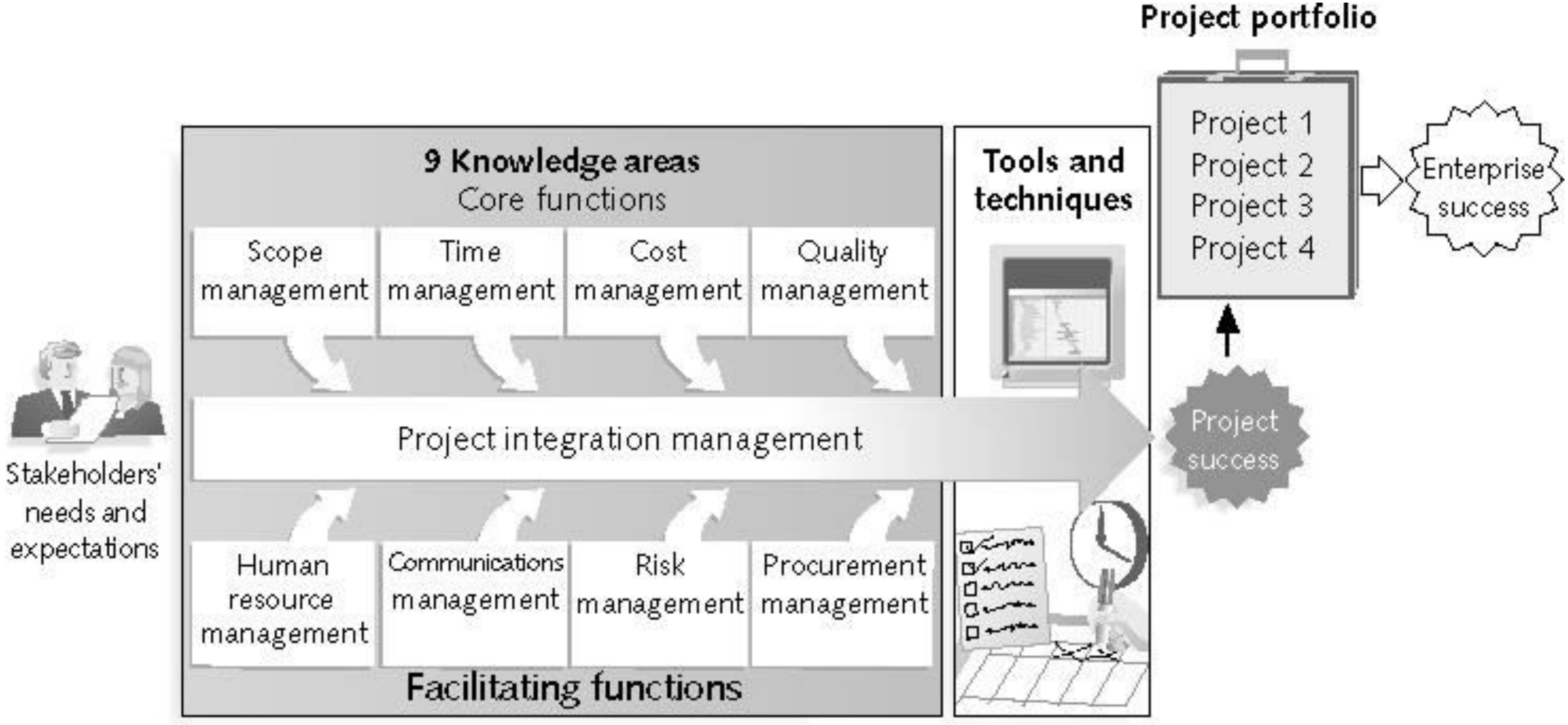


What is Project Management?

- **Project management** is "the application of knowledge, skills, tools and techniques to project activities to meet project requirements" (PMBOK® Guide, Fourth Edition, 2008, p. 6)

- Project managers strive to meet the **triple constraint** by balancing project scope, time, and cost goals

Figure 1-2 Project Management Framework



Project Stakeholders

- **Stakeholders** are the people involved in or affected by project activities
- Stakeholders include:
  - The project sponsor
  - The project manager
  - The project team
  - Support staff
  - Customers
  - Users
  - Suppliers
  - Opponents to the project

9 Project Management Knowledge Areas

- **Knowledge areas** describe the key competencies that project managers must develop
  - 4 core knowledge areas lead to specific project objectives (scope, time, cost, and quality)
  - 4 facilitating knowledge areas are the means through which the project objectives are achieved (human resources, communication, risk, and procurement management
  - 1 knowledge area (project integration management) affects and is affected by all of the other knowledge areas
  - All knowledge areas are important!

Project Management Tools and Techniques

- **Project management tools and techniques** assist project managers and their teams in various aspects of project management
- Some specific ones include:
  - Project charter, scope statement, and WBS (scope)
  - Gantt charts, network diagrams, critical path analysis, critical chain scheduling (time)
  - Cost estimates and earned value management (cost)
  - See Table 1-1 for many more

Super Tools

- "**Super tools**" are those tools that have high use and high potential for improving project success, such as:
  - Software for task scheduling (such as project management software)
  - Scope statements
  - Requirements analyses
  - Lessons-learned reports
- Tools already extensively used that have been found to improve project importance include:
  - Progress reports
  - Kick-off meetings
  - Gantt charts
  - Change requests

What Went Right? Improved Project Performance

The Standish Group's CHAOS studies show improvements in IT projects in the past decade:

- The number of successful IT projects has more than doubled, from 16 percent in 1994 to 35 percent in 2006
- The number of failed projects decreased from 31 percent in 1994 to 19 percent in 2006
- The United States spent more money on IT projects in 2006 than 1994 ($346 billion and $250 billion, respectively), but the amount of money wasted on challenged and failed projects was down to $53 billion in 2006 compared to $140 billion in 1994

Why the Improvements?

"The reasons for the increase in successful projects vary. First, the average cost of a project has been more than cut in half. Better tools have been created to monitor and control progress and **better skilled project managers with better management processes** are being used. The fact that there are processes is significant in itself."*

*Standish Group, "CHAOS 2001: A Recipe for Success" (2001).

Project Success

- There are several ways to define project success:
  - The project met scope, time, and cost goals
  - The project satisfied the customer/sponsor
  - The results of the project met its main objective, such as making or saving a certain amount of money, providing a good return on investment, or simply making the sponsors happy

Table 1-2: What Helps Projects Succeed?*

1. Executive support
2. User involvement
3. Experienced project manager
4. Clear business objectives
5. Minimized scope
6. Standard software infrastructure
7. Firm basic requirements
8. Formal methodology
9. Reliable estimates
10. Other criteria, such as small milestones, proper planning, competent staff, and ownership

*The Standish Group, "Extreme CHAOS," (2001).

What the Winners Do…

- Recent research findings show that companies that excel in project delivery capability:
  - Use an integrated project management toolbox (use standard/advanced PM tools, lots of templates)
  - Grow project leaders, emphasizing business and soft skills
  - Develop a streamlined project delivery process
  - Measure project health using metrics, like customer satisfaction or return on investment

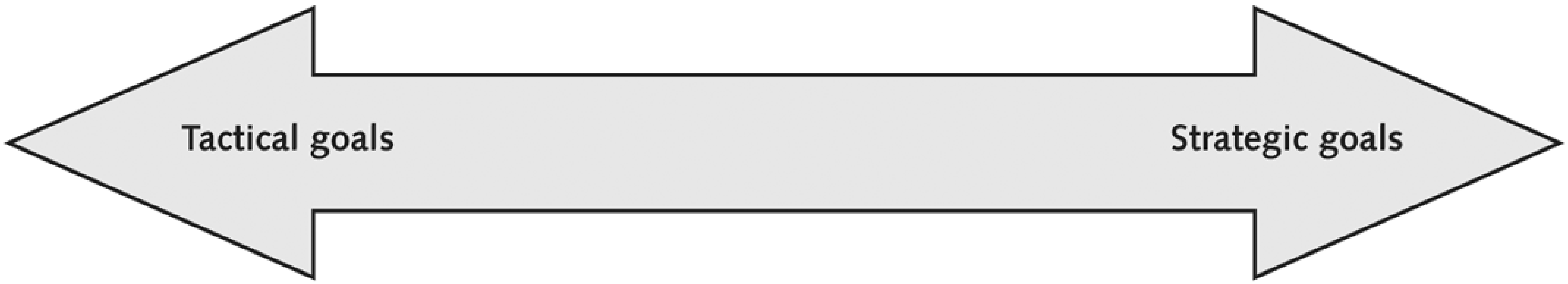
Program and Project Portfolio Management

- A **program** is "a group of related projects managed in a coordinated way to obtain benefits and control not available from managing them individually" (PMBOK® Guide, Fourth Edition, 2008, p. 9)
- A **program manager** provides leadership and direction for the project managers heading the projects within the program
- Examples of common programs in the IT field include infrastructure, applications development, and user support

Project Portfolio Management

- As part of **project portfolio management**, organizations group and manage projects and programs as a portfolio of investments that contribute to the entire enterprise's success
- Portfolio managers help their organizations make wise investment decisions by helping to select and analyze projects from a strategic perspective

Figure 1-3. *Project Management Compared to Project Portfolio Management*



Project management
- Are we carrying out projects well?
- Are projects on time and on budget?
- Do project stakeholders know what they should be doing?

Project portfolio management
- Are we working on the right projects?
- Are we investing in the right areas?
- Do we have the right resources to be competitive?

Best Practice

- A **best practice** is "an optimal way recognized by industry to achieve a stated goal or objective"*
- Robert Butrick *suggests that organizations* need to follow basic principles of project management, including these two mentioned earlier in this chapter:
  - Make sure your projects are driven by your strategy; be able to demonstrate how each project you undertake fits your business strategy, and screen out unwanted projects as soon as possible
  - Engage your stakeholders; ignoring stakeholders often leads to project failure; be sure to engage stakeholders at all stages of a project, and encourage teamwork and commitment at all times

*Project Management Institute, *Organizational Project Management Maturity Model (OPM3) Knowledge Foundation (2003), p. 13.*

Figure 1-4. Sample Project Portfolio Approach

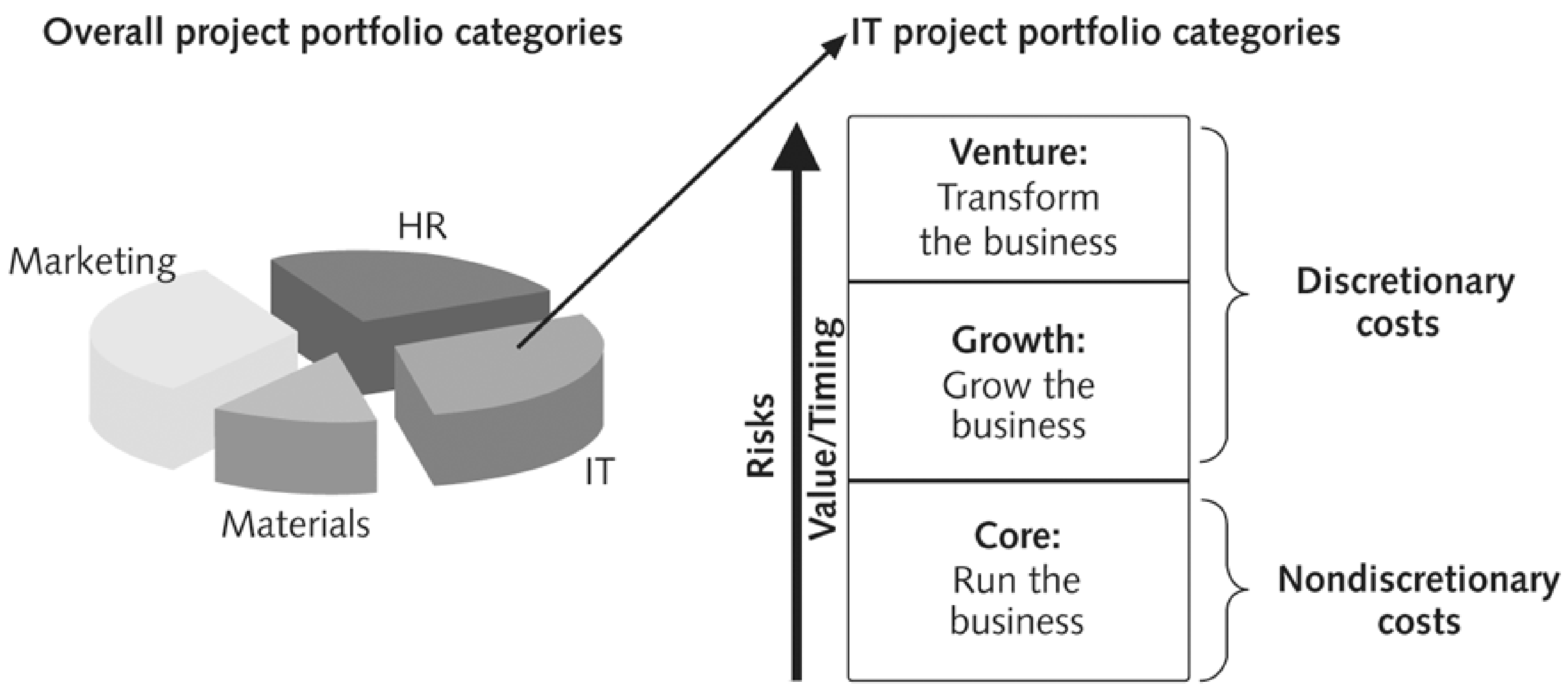
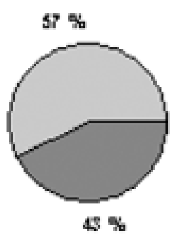


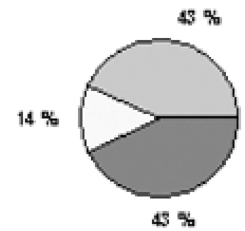
Figure 1-5. *Sample Project Portfolio Management Screen Showing Project Health*

PLANVIEW

Project Health (Effort Based)



Schedule Variance	Project Count
On Target	4
In Trouble	3



Cost Variance	Project Count
On Target	3
At Risk	1
In Trouble	3

Work Id	Project	% Complete	Schedule Variance	Cost Variance	Budget Variance	Risk Pct
0000051	Upgrade Sales Staff Laptop PC's	100.0 %	✓ 0.0	▲ -74.0	▲ -74.0	✓ -
CAW-035	CRM Website	75.8 %	✓ 8.0	✓ 18.0	✓ 18.0	● 39.7 %
CW-2002	MyMystic.com Customer Website	97.0 %	● -120.0	● -343.0	● -263.0	✓ -
PARMS-0	PARMS Implementation	50.4 %	● -440.0	● -192.0	✓ -8.0	✓ 3.9 %
POS-2002	PlanView and SAP Financial Integration	98.6 %	✓ 0.0	● -221.0	● -221.0	✓ -
SSR-012	Strategic Systems Review	0.0 %	✓ 0.0	✓ 0.0	▲ -72.0	▲ 15.9 %
TAU-2002	Tax Accounting Update 2002	24.9 %	● -119.0	✓ -15.0	✓ 33.0	✓ 0

Suggested Skills for Project Managers

- Project managers need a wide variety of skills
- They should:
  - Be comfortable with change
  - Understand the organizations they work in and with
  - Be able to lead teams to accomplish project goals

The Role of the Project Manager

- Job descriptions vary, but most include responsibilities like planning, scheduling, coordinating, and working with people to achieve project goals
- Remember that 97% of successful projects were led by experienced project managers, who can often help influence success factors

Suggested Skills for Project Managers

- The Project Management Body of Knowledge
- Application area knowledge, standards, and regulations
- Project environment knowledge
- General management knowledge and skills
- Soft skills or human relations skills

Table 1-3. Ten Most Important Skills and Competencies for Project Managers

1. People skills
2. Leadership
3. Listening
4. Integrity, ethical behavior, consistent
5. Strong at building trust
6. Verbal communication
7. Strong at building teams
8. Conflict resolution, conflict management
9. Critical thinking, problem solving
10. Understands, balances priorities

Different Skills Needed in Different Situations

- Large projects: leadership, relevant prior experience, planning, people skills, verbal communication, and team-building skills were most important
- High uncertainty projects: risk management, expectation management, leadership, people skills, and planning skills were most important
- Very novel projects: leadership, people skills, having vision and goals, self confidence, expectations management, and listening skills were most important

Importance of Leadership Skills

- Effective project managers provide leadership by example
- A **leader** focuses on long-term goals and big-picture objectives while inspiring people to reach those goals
- A **manager** deals with the day-to-day details of meeting specific goals
- Project managers often take on the role of both leader and manager

Careers for IT Project Managers

- In a 2006 survey by CIO.com, IT executives ranked the skills that would be the most in demand in the next two to five years
- Project/program management topped the list!

Table 1-4. Top IT Skills (partial list)

SKILL	PERCENTAGE OF RESPONDENTS
Project/program management	60%
Business process management	55%
Business analysis	53%
Application development	52%
Database management	49%
Security	42%
Enterprise architect	41%
Strategist/internal consultant	40%

The Project Management Profession

- The profession of project management is growing at a very rapid pace
- It is helpful to understand the history of the field, the role of professional societies like the Project Management Institute, and the growth in project management software

History of Project Management

- Some people argue that building the Egyptian pyramids was a project, as was building the Great Wall of China
- Most people consider the ***Manhattan Project*** to be the first project to use "modern" project management
- This three-year, $2 billion (in 1946 dollars) project had a separate project manager and a technical manager

Figure 1-6. Sample Gantt Chart Created with Project 2007

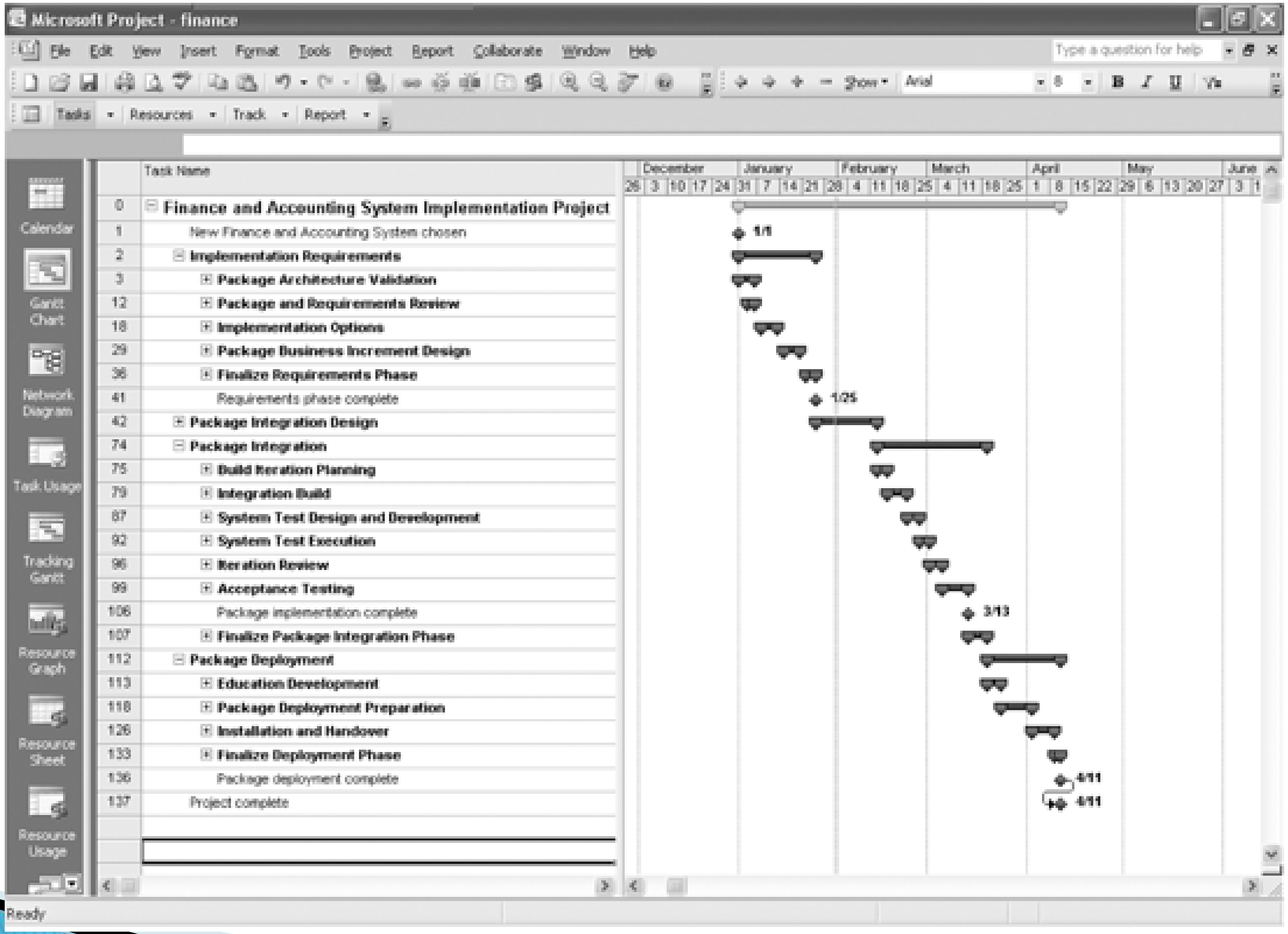
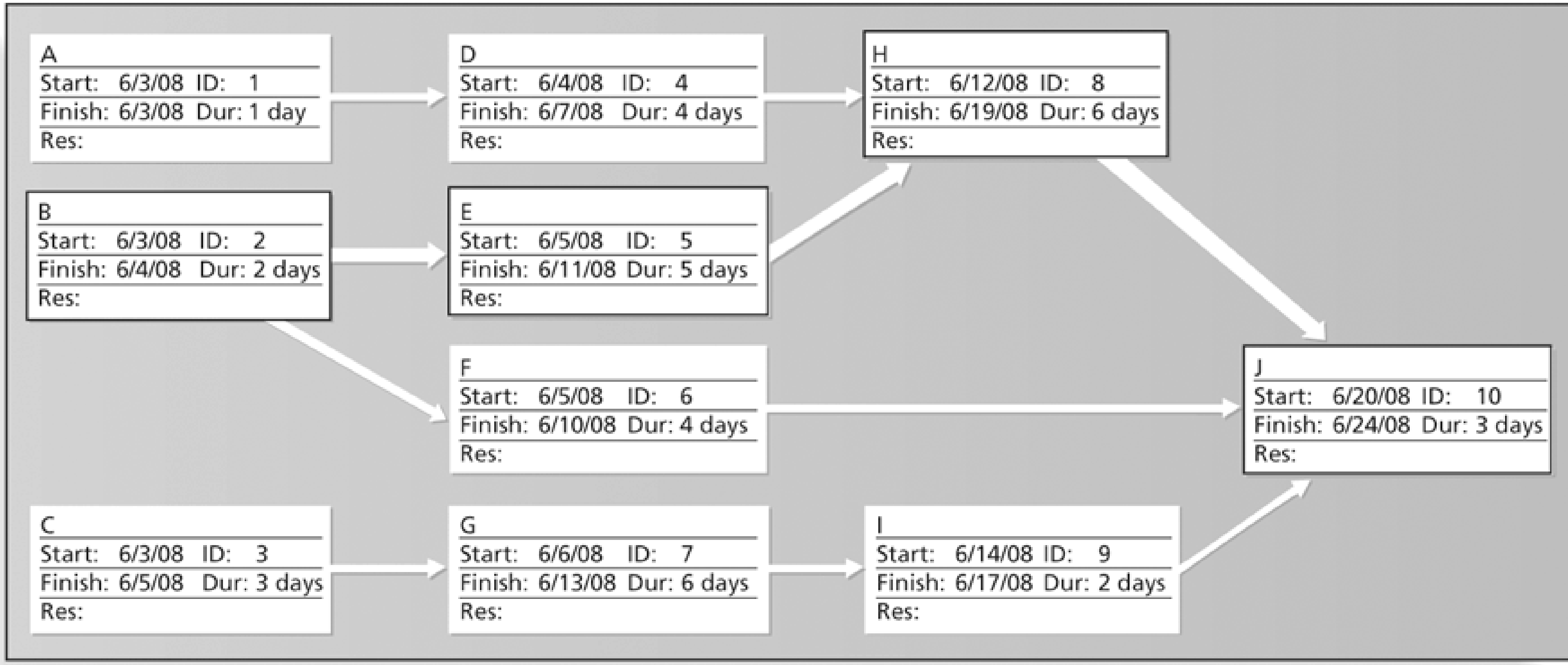


Figure 1-7. Sample Network Diagram in Microsoft Project



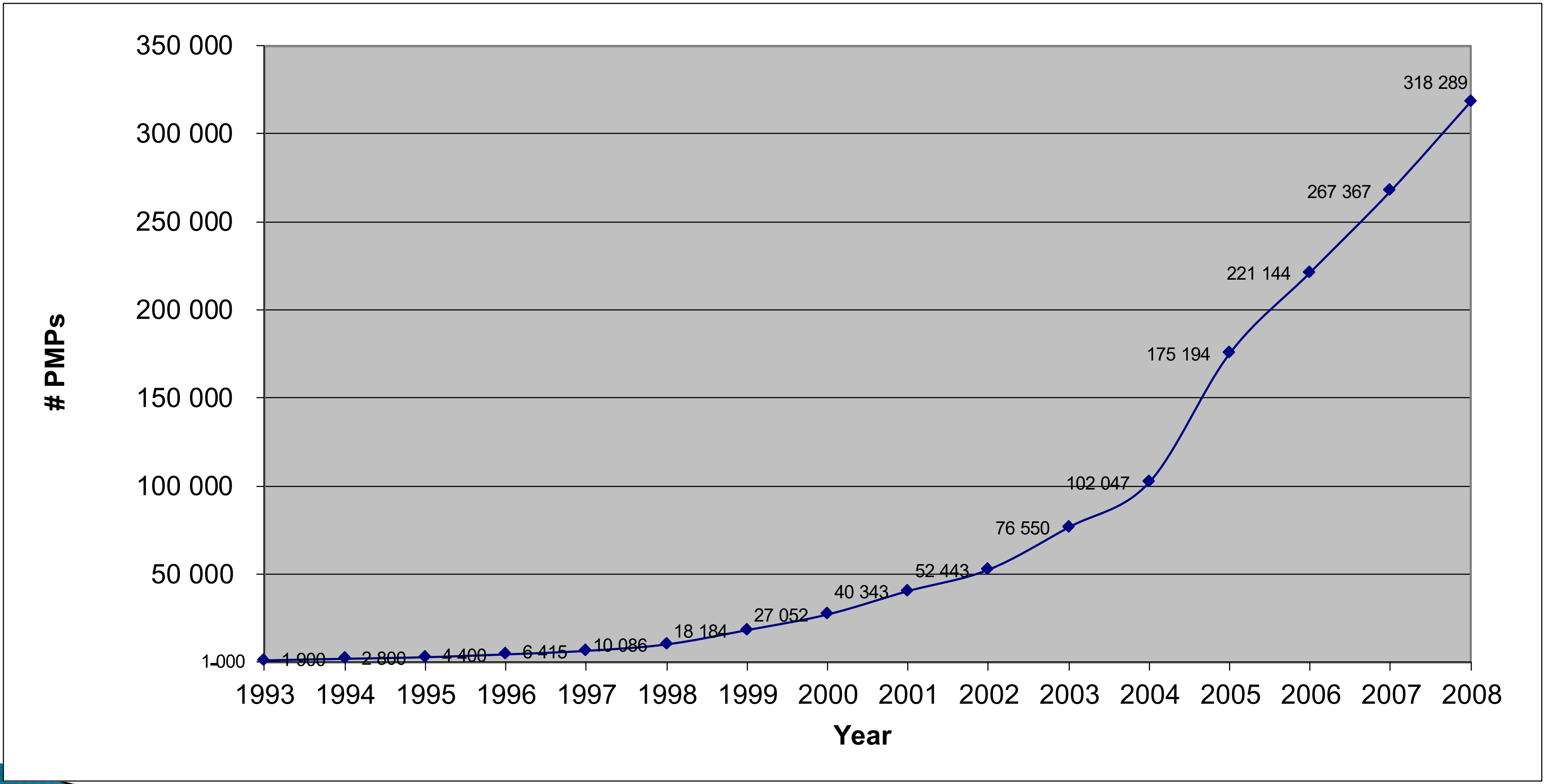
The Project Management Institute

- The Project Management Institute (PMI) is an international professional society for project managers founded in 1969
- PMI has continued to attract and retain members, reporting 277,221 members worldwide by August 31, 2008
- There are specific interest groups in many areas, like engineering, financial services, health care, IT, etc.
- Project management research and certification programs continue to grow
- Students can join PMI at a reduced fee (see www.pmi.org for details)

Project Management Certification

- PMI provides certification as a **Project Management Professional** (**PMP**)
- A PMP has documented sufficient project experience, agreed to follow a code of ethics, and passed the PMP exam
- The number of people earning PMP certification is increasing quickly
- PMI and other organizations offer additional certification programs (see Appendix B)

Figure 1-8. Growth in PMP Certification, 1993-2008



Ethics in Project Management

- **Ethics**, loosely defined, is a set of principles that guide our decision making based on personal values of what is “right” and “wrong”
- Project managers often face ethical dilemmas
- In order to earn PMP certification, applicants must agree to PMI’s Code of Ethics and Professional Conduct
- Several questions on the PMP exam are related to professional responsibility, including ethics

Project Management Software

- There are hundreds of different products to assist in performing project management
- Three main categories of tools:
  - Low-end tools: handle single or smaller projects well, cost under $200 per user
  - Midrange tools: handle multiple projects and users, cost $200-600 per user, Project 2007 most popular
  - High-end tools: also called enterprise project management software, often licensed on a per-user basis, like VPMi Enterprise Online (www.vcsonline.com) – see front cover for trial version information
- See the Project Management Center Web site or Top Ten Reviews for links to many companies that provide project management software

Chapter Summary

- A project is a temporary endeavor undertaken to create a unique product, service, or result
- Project management is the application of knowledge, skills, tools, and techniques to project activities to meet project requirements
- A program is a group of related projects managed in a coordinated way
- Project portfolio management involves organizing and managing projects and programs as a portfolio of investments
- Project managers play a key role in helping projects and organizations succeed
- The project management profession continues to grow and mature

Chapter 2: The Project Management and Information Technology Context

Information Technology Project Management, Sixth Edition

Note: See the text itself for full citations.

Learning Objectives

- Describe the systems view of project management and how it applies to information technology projects
- Understand organizations, including the four frames, organizational structures, and organizational culture
- Explain why stakeholder management and top management commitment are critical for a project's success

Learning Objectives (continued)

- Understand the concept of a project phase and the project life cycle and distinguish between project development and product development
- Discuss the unique attributes and diverse nature of information technology projects
- Describe recent trends affecting IT project management, including globalization, outsourcing, and virtual teams

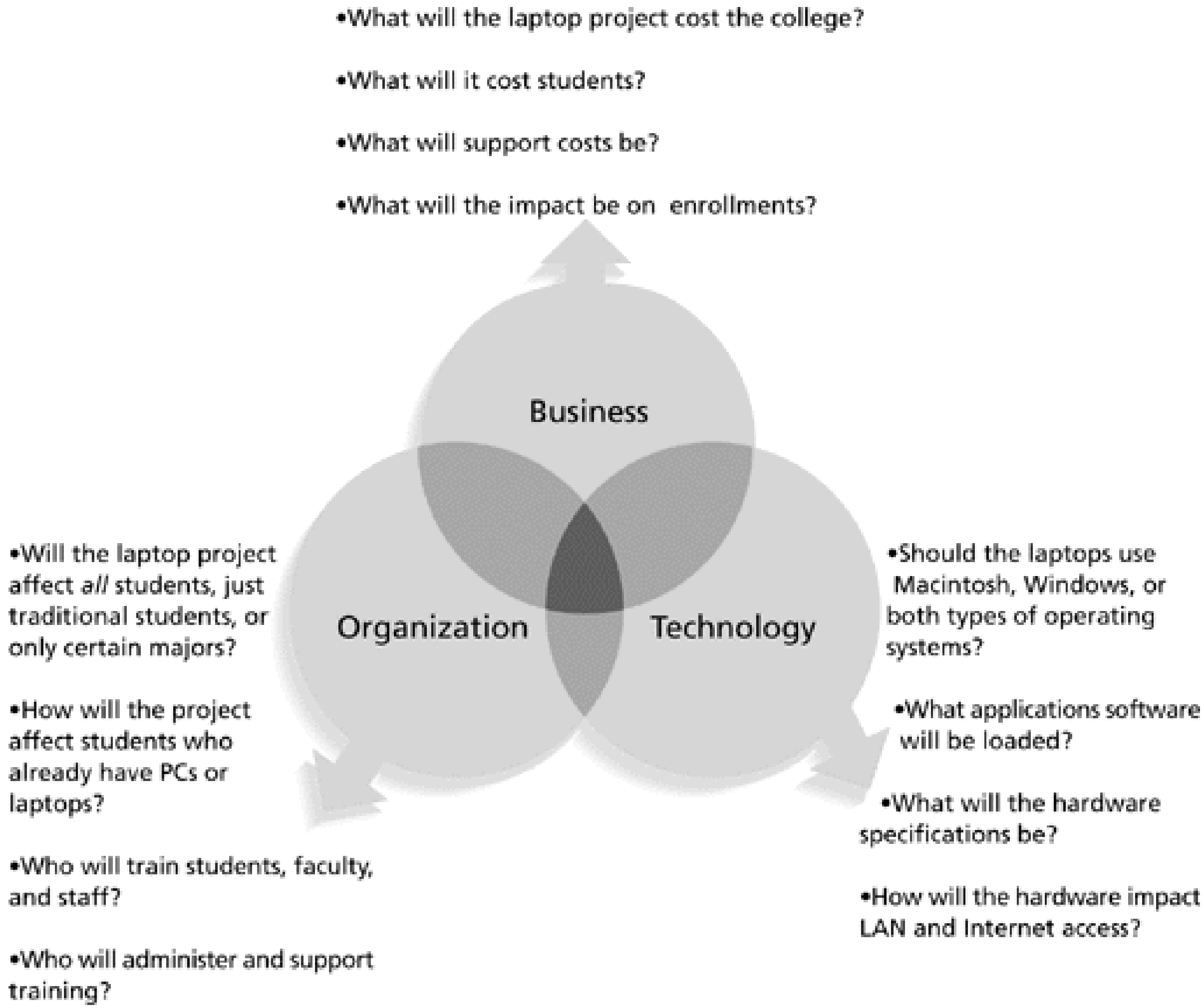
Projects Cannot Be Run in Isolation

- Projects must operate in a broad organizational environment
- Project managers need to use **systems thinking**:
  - Taking a holistic view of carrying out projects within the context of the organization
- Senior managers must make sure projects continue to support current business needs

A Systems View of Project Management

- A **systems approach** emerged in the 1950s to describe a more analytical approach to management and problem solving
- Three parts include:
  - **Systems philosophy**: an overall model for thinking about things as systems
  - **Systems analysis**: problem-solving approach
  - **Systems management**: address business, technological, and organizational issues before making changes to systems

Figure 2-1. Three Sphere Model for Systems Management



Understanding Organizations

Structural frame: Focuses on roles and responsibilities, coordination and control. Organization charts help define this frame.	**Human resources frame:** Focuses on providing harmony between needs of the organization and needs of people.
Political frame: Assumes organizations are coalitions composed of varied individuals and interest groups. Conflict and power are key issues.	**Symbolic frame:** Focuses on symbols and meanings related to events. Culture is important.

What Went Wrong?

Many enterprise resource planning (ERP) projects fail due to organizational issues, not technical issues. For example, Sobey's Canadian grocery store chain abandoned its two-year, $90 million ERP system due to organizational problems.

As Dalhousie University Associate Professor Sunny Marche states, "The problem of building an integrated system that can accommodate different people is a very serious challenge. You can't divorce technology from the sociocultural issues. They have an equal role." Sobey's ERP system shut down for five days, and employees were scrambling to stock potentially empty shelves in several stores for weeks. The system failure cost Sobey's more than $90 million and caused shareholders to take an 82-cent after-tax hit per share.*

*Hoare, Eva. "Software hardships," The Herald, Halifax, Nova Scotia (2001).

Organizational Structures

- 3 basic organization structures
  - **Functional**: functional managers report to the CEO
  - **Project**: program managers report to the CEO
  - **Matrix**: middle ground between functional and project structures; personnel often report to two or more bosses; structure can be weak, balanced, or strong matrix

Figure 2-2. Functional, Project, and Matrix Organizational Structures

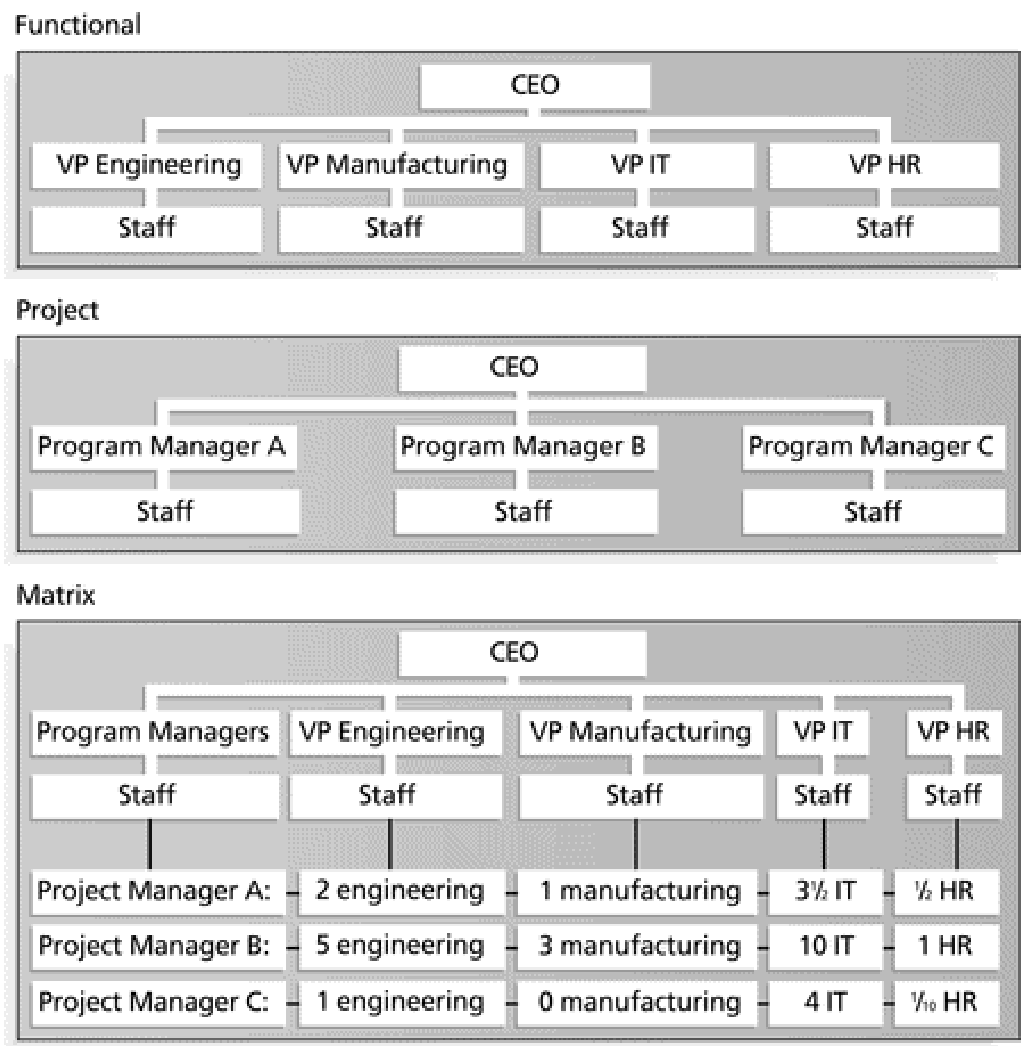


Table 2-1. Organizational Structure Influences on Projects

Project Characteristics	**Organizational Structure Type**				
	Functional	**Matrix**			**Project**
		Weak Matrix	***Balanced Matrix***	***Strong Matrix***	
Project manager's authority	Little or none	Limited	Low to Moderate	Moderate to high	High to almost total
Percent of performing organization's personnel assigned full-time to project work	Virtually none	0-25%	15-60%	50-95%	85-100%
Who controls the project budget	Functional manager	Functional manager	Mixed	Project manager	Project manager
Project manager's role	Part-time	Part-time	Full-time	Full-time	Full-time
Common title for project manager's role	Project Coordinator/ Project Leader	Project Coordinator/ Project Leader	Project Manager/ Project Officer	Project Manager/ Program Manager	Project Manager/ Program Manager
Project management administrative staff	Part-time	Part-time	Part-time	Full-time	Full-time

PMBOK® Guide, 2000, 19, and *PMBOK® Guide 2004*, 28.

Organizational Culture

- **Organizational culture** is a set of shared assumptions, values, and behaviors that characterize the functioning of an organization
- Many experts believe the underlying causes of many companies' problems are not the structure or staff, but the culture

Ten Characteristics of Organizational Culture

- Member identity*
- Group emphasis*
- People focus
- Unit integration*
- Control
- Risk tolerance*
- Reward criteria*
- Conflict tolerance*
- Means-ends orientation
- Open-systems focus*

*Project work is most successful in an organizational culture where these items are strong/high and other items are balanced

Stakeholder Management

- Project managers must take time to identify, understand, and manage relationships with all project stakeholders
- Using the four frames of organizations can help meet stakeholder needs and expectations
- Senior executives/top management are very important stakeholders

Media Snapshot

- The New York Times reported that the project to rebuild Ground Zero in New York City is having severe problems; imagine all of the stakeholders involved in this huge, highly emotional project
- A 34-page report describes the many challenges faced in the reconstruction of the former World Trade Center site nearly seven years after the terrorist attack of September 11, 2001
- The report identified the need for a steering to make final decisions on important matters

The Importance of Top Management Commitment

- People in top management positions are key stakeholders in projects
- A very important factor in helping project managers successfully lead projects is the level of commitment and support they receive from top management
- Without top management commitment, many projects will fail
- Some projects have a senior manager called a **champion** who acts as a key proponent for a project

How Top Management Can Help Project Managers

- Providing adequate resources
- Approving unique project needs in a timely manner
- Getting cooperation from other parts of the organization
- Mentoring and coaching on leadership issues

Best Practice

- **IT governance** addresses the authority and control for key IT activities in organizations, including IT infrastructure, IT use, and project management
- A lack of IT governance can be dangerous, as evidenced by three well-publicized IT project failures in Australia (Sydney Water's customer relationship management system, the Royal Melbourne Institute of Technology's academic management system, and One.Tel's billing system)

Need for Organizational Commitment to Information Technology (IT)

- If the organization has a negative attitude toward IT, it will be difficult for an IT project to succeed
- Having a Chief Information Officer (CIO) at a high level in the organization helps IT projects
- Assigning non-IT people to IT projects also encourages more commitment

Need for Organizational Standards

- Standards and guidelines help project managers be more effective
- Senior management can encourage:
  - The use of standard forms and software for project management
  - The development and use of guidelines for writing project plans or providing status information
  - The creation of a project management office or center of excellence

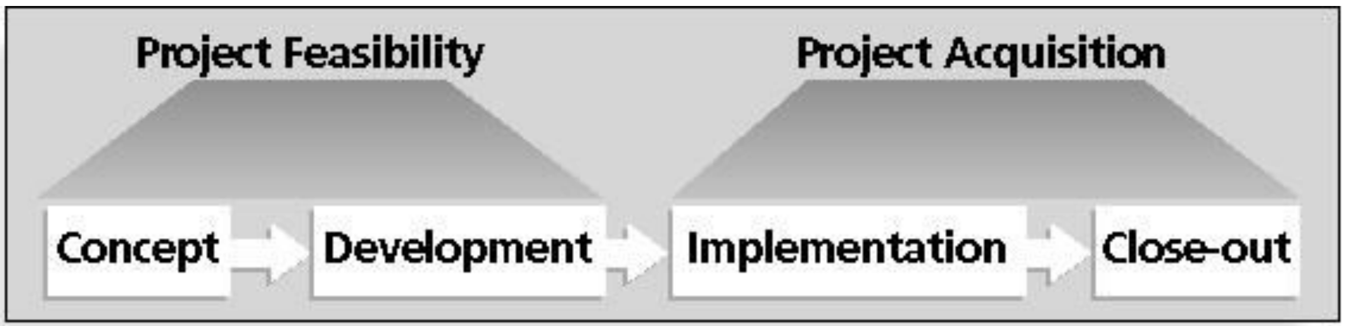
Project Phases and the Project Life Cycle

- A **project life cycle** is a collection of project phases that defines:
  - What work will be performed in each phase
  - What deliverables will be produced and when
  - Who is involved in each phase
  - How management will control and approve work produced in each phase
- A **deliverable** is a product or service produced or provided as part of a project

More on Project Phases

- In early phases of a project life cycle:
  - Resource needs are usually lowest
  - The level of uncertainty (risk) is highest
  - Project stakeholders have the greatest opportunity to influence the project
- In middle phases of a project life cycle:
  - The certainty of completing a project improves
  - More resources are needed
- The final phase of a project life cycle focuses on:
  - Ensuring that project requirements were met
  - The sponsor approves completion of the project

Figure 2-3. Phases of the Traditional Project Life Cycle



	Concept	Development	Implementation	Close-out
Sample deliverables for each phase	Business case	Project management plan	Last work package	Completed work
	Preliminary cost estimate	Budgetary cost estimate	Definitive cost estimate	Lessons learned
	2-level WBS	3+-level WBS	Performance reports	Customer acceptance

Product Life Cycles

- Products also have life cycles
- The **Systems Development Life Cycle (SDLC)** is a framework for describing the phases involved in developing and maintaining information systems
- Systems development projects can follow
  - **Predictive life cycle**: the scope of the project can be clearly articulated and the schedule and cost can be predicted
  - **Adaptive Software Development (ASD) life cycle**: requirements cannot be clearly expressed, projects are mission driven and component based, using time-based cycles to meet target dates

Predictive Life Cycle Models

- Waterfall model: has well-defined, linear stages of systems development and support
- Spiral model: shows that software is developed using an iterative or spiral approach rather than a linear approach
- Incremental build model: provides for progressive development of operational software
- Prototyping model: used for developing prototypes to clarify user requirements
- Rapid Application Development (RAD) model: used to produce systems quickly without sacrificing quality

Agile Software Development

- Agile software development has become popular to describe new approaches that focus on close collaboration between programming teams and business experts
- Visit www.agilealliance.org for information
- See the companion Web site for Suggested Readings

The Importance of Project Phases and Management Reviews

- A project should successfully pass through each of the project phases in order to continue on to the next
- Management reviews, also called **phase exits** or **kill points**, should occur after each phase to evaluate the project's progress, likely success, and continued compatibility with organizational goals

The Importance of Project Phases and Management Reviews

- Tom Walters' college should have done a study, sponsored by the college president, on increasing the use of technology
- At the end of the concept phase, the results would have been presented to the faculty and administration describing the different options for increasing the use of technology, an analysis of what competing colleges were doing and a survey of local stakeholder's opinions
- Based on those results, the college would have been able to decide whether to kill the project or continue to the next phase

What Went Right?

"The real improvement that I saw was in our ability to—in the words of Thomas Edison—know when to stop beating a dead horse.…Edison's key to success was that he failed fairly often; but as he said, he could recognize a dead horse before it started to smell...In information technology we ride dead horses—failing projects—a long time before we give up. But what we are seeing now is that we are able to get off them; able to reduce cost overrun and time overrun. That's where the major impact came on the success rate."*

Many organizations, like Huntington Bancshares, Inc., use an **executive steering committee** (senior executives from various parts of the organization) to help keep projects on track.

*Cabanis, Jeannette, "'A Major Impact': The Standish Group's Jim Johnson On Project Management and IT Project Success," PM Network, PMI, Sep.1998, p. 7

The Context of IT Projects

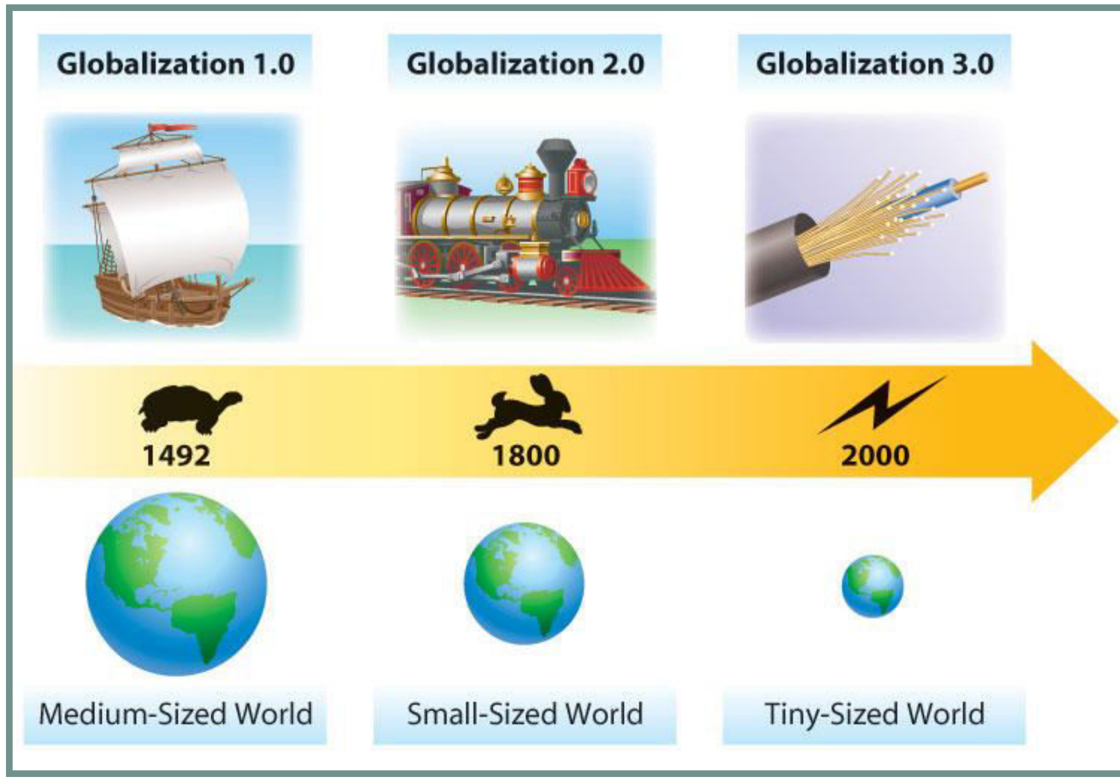
- IT projects can be very diverse in terms of size, complexity, products produced, application area, and resource requirements
- IT project team members often have diverse backgrounds and skill sets
- IT projects use diverse technologies that change rapidly; even within one technology area, people must be highly specialized

Recent Trends Affecting IT Project Management

- Thomas Friedman in “The World is Flat” describes the role technology has played in increasing globalization - a “flat” world where everyone is connected and the “playing field “ is level for many participants
- http://mitworld.mit.edu/video/266

Globalization

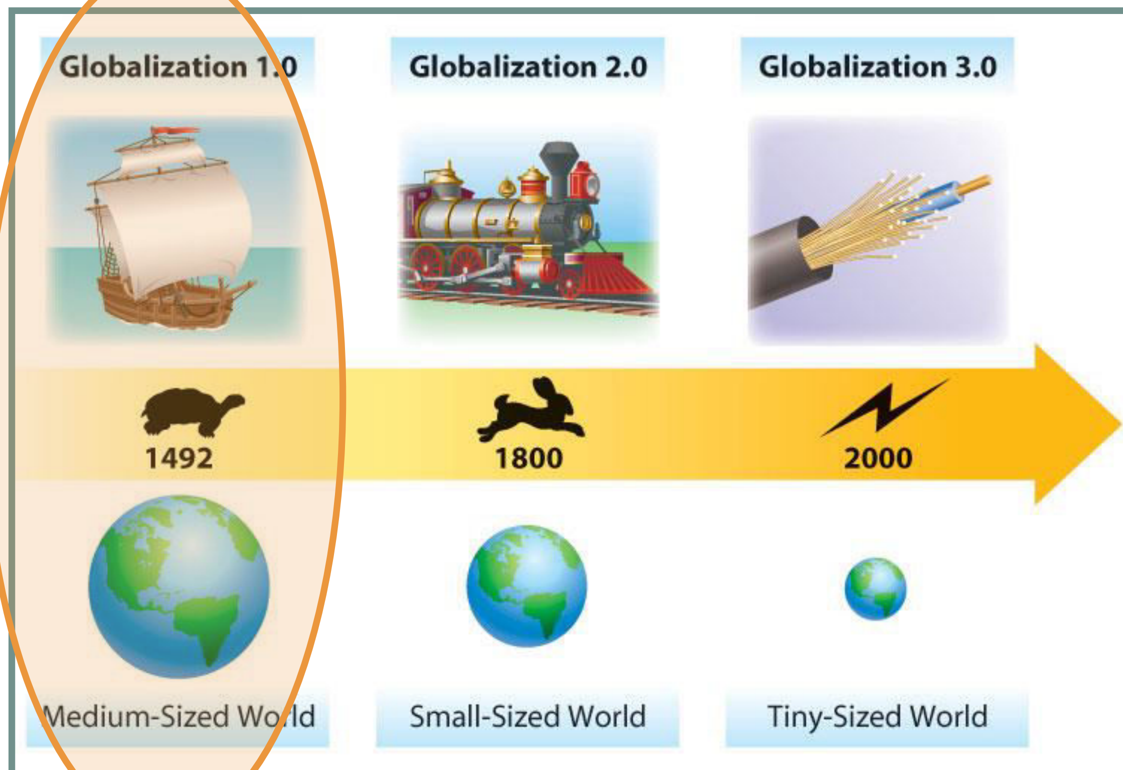
- Globalization created a new world characterized by:
  - Worldwide communication
  - Collaboration without barriers



Evolution of Globalization

- Mainly European countries are globalizing
- Power is the primary driver
- Industries changed
- Slow pace of change

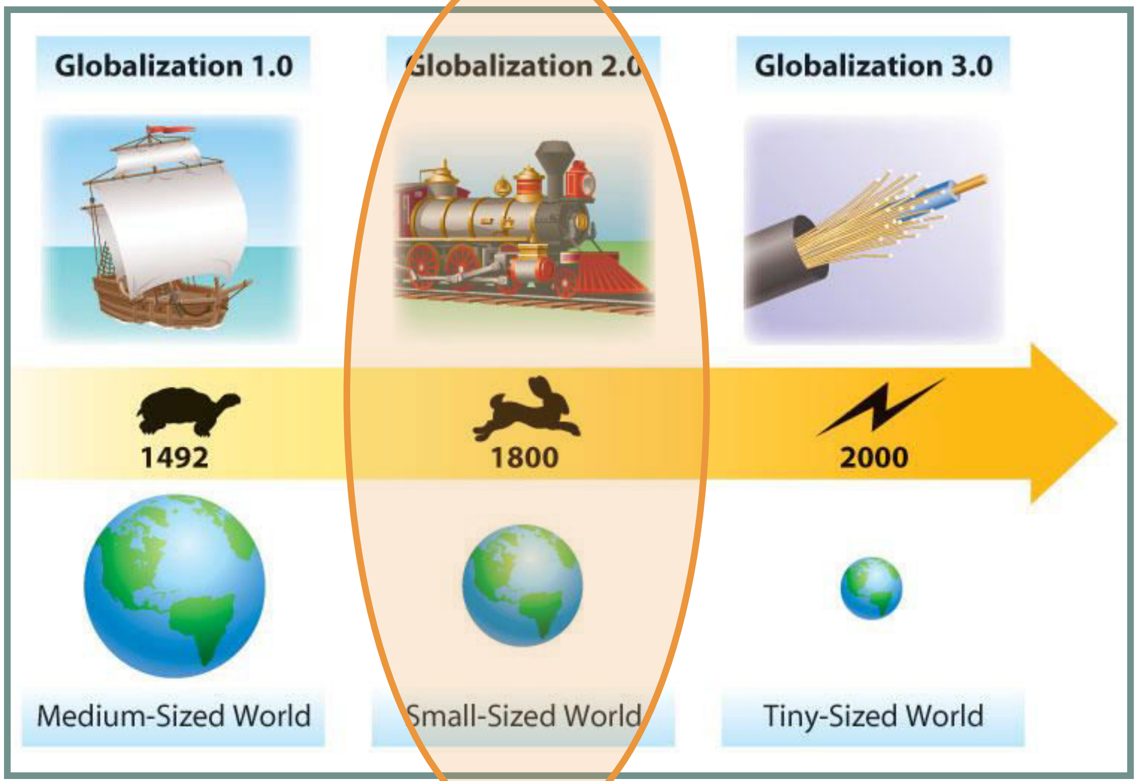
Globalization 1.0



Evolution of Globalization

- Companies are globalizing
- Reduction in transportation and telecom-munications costs
- Mainly Europe and America involved

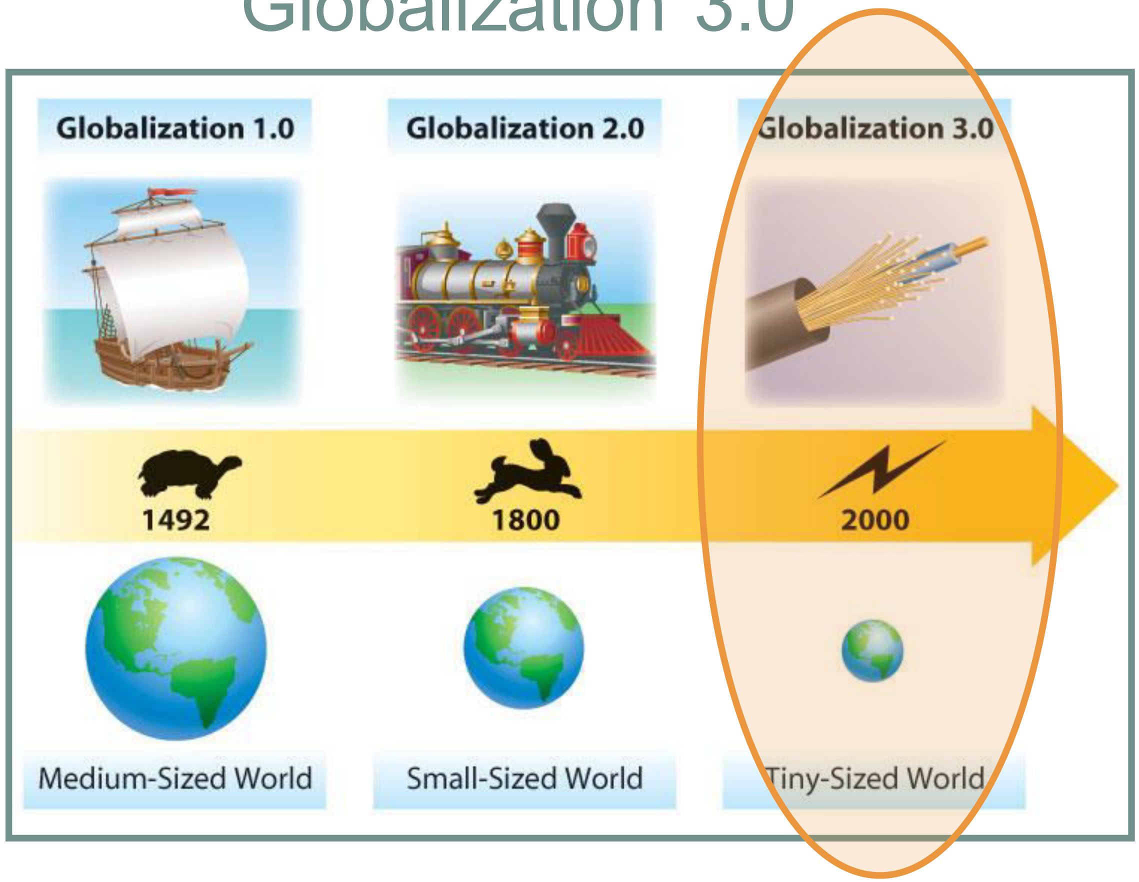
Globalization 2.0



Evolution of Globalization

Globalization 3.0

- Individuals and small groups are globalizing
- Faster pace of change
- Emergence of new industries



Evolution of Globalization: Summary

- *The World Is Flat* (Thomas L. Friedman)

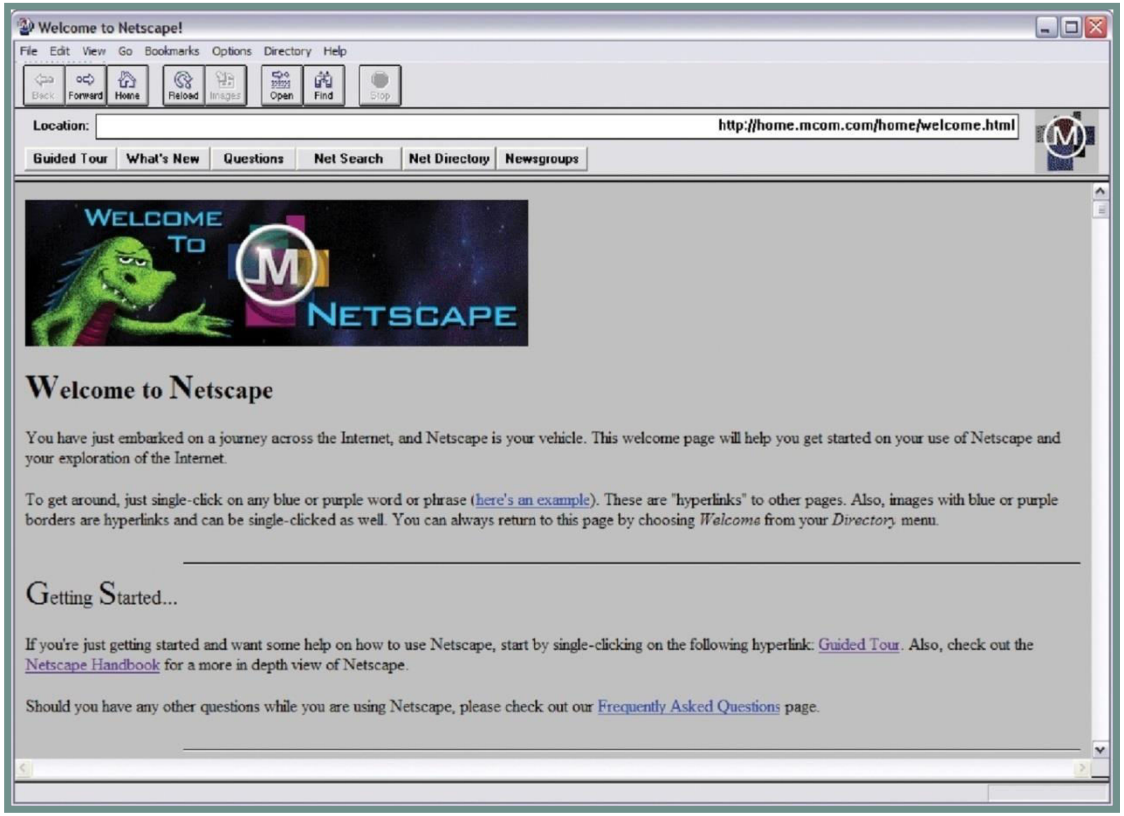
Globalization Phase	Time	Primary Entities Globalizing	Regions Globalizing
1.0	1492–1800	Countries	Europeans and Americans
2.0	1800–2000	Companies	Europeans and Americans
3.0	2000–now	Individuals and small groups	Worldwide

- "10 Enablers"
  - Key factors enabling Globalization 3.0

Enabler #1: The Fall of the Berlin Wall

- November 9, 1989
- Fall of communism
- People from the former communist countries gained more freedom

Enabler #2: Netscape Browser

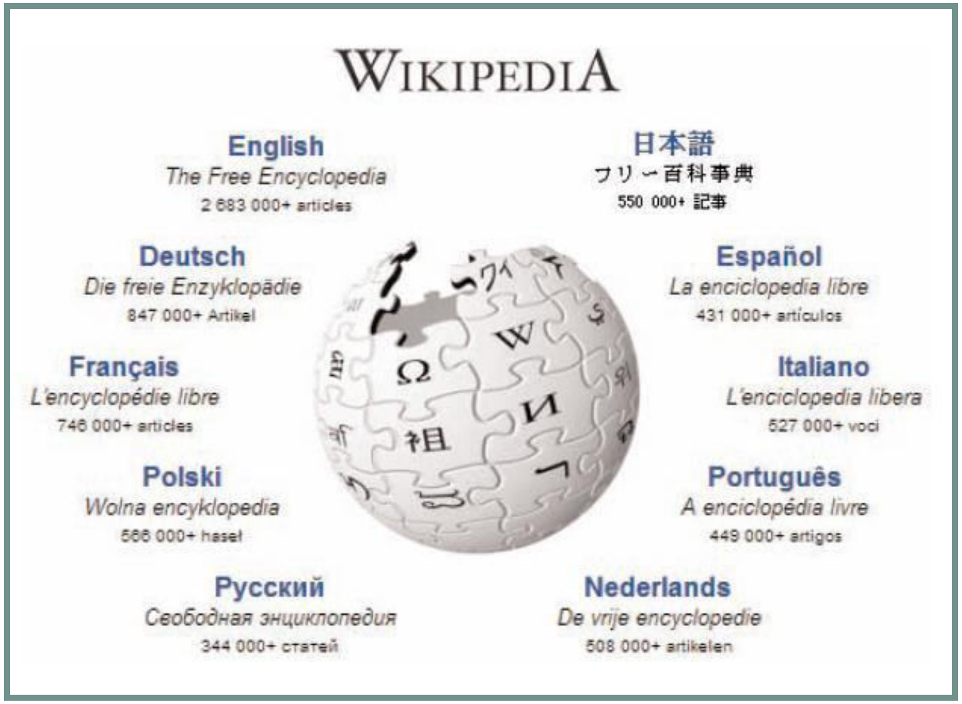


- August 9, 1995
- "Killer app"
- First mainstream browser
- Gave individuals access to the Internet & set standards

Enabler #3: Work Flow Software

- Applications that allow people worldwide to communicate
- XML: applications "talk" to each other
- New possibilities for information sharing
- Global currency to fuel commerce

Enabler #4: Uploading



- Individuals and companies actively participate in content generation on the Web
- Wikipedia a huge success

Enabler #5: Outsourcing

- Outsourcing companies profited from the drop in telecommuni-cations costs
- Companies can now use talented engineers from anywhere

Enabler #6: Offshoring

- Companies set up entire factories in countries such as China
  - Mass production
  - Low costs

Enabler #7: Supply Chaining

- Integration of retailers, suppliers, and customers
- Wal-Mart became an early leader
  - Use of RFID tags

Enabler #8: In-Sourcing

- Delegation of company's key operations to a subcontractor
  - Example: UPS provides complete supply chain solutions to companies

Enabler #9: In-Forming

- In-forming is to individuals what outsourcing, offshoring, and in-sourcing is to companies
- Individuals have access to massive amounts of information

Enabler #10: The Steroids

- Technologies that support different types of collaboration
  - Greater mobility
  - Triple convergence

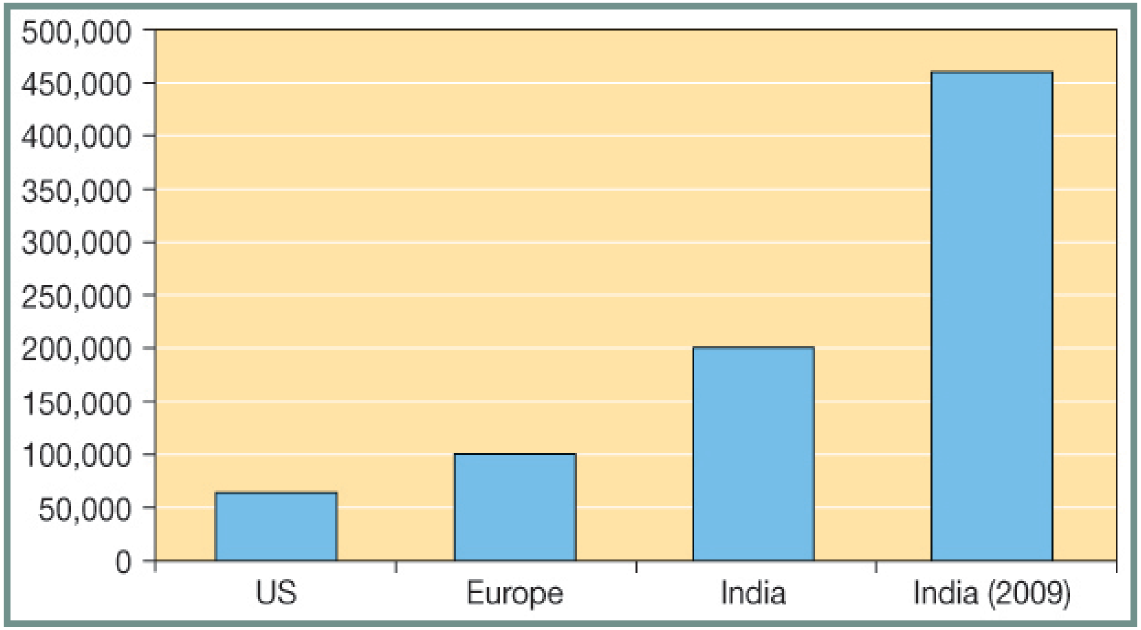
Opportunities for Operating in the Digital World

- Opportunities for reaching new markets
  - Former Eastern Bloc countries provide new opportunities for international companies to reach new customers

Opportunities for Operating in the Digital World

- Opportunities of a global workforce:
  - Low communications costs
  - Highly-skilled labor pool

Engineering Graduates in the United States, Europe, and India



Based on: Mallaby, 2006

Recent Trends Affecting IT Project Management

- Globalization: lower trade and political barriers and the digital revolution have made it possible to interact almost instantaneously with billions of other people across the planet
- Outsourcing: **outsourcing** is when an organization acquires goods and/or sources from an outside source; **offshoring** is sometimes used to describe outsourcing from another country
- Virtual teams: a **virtual team** is a group of individuals who work across time and space using communication technologies

Important Issues and Suggestions Related to Globalization

- Issues
  - Communications
  - Trust
  - Common work practices
  - Tools
- Suggestions
  - Employ greater project discipline
  - Think global but act local
  - Keep project momentum going
  - Use newer tools and technology

Outsourcing

- Organizations remain competitive by using outsourcing to their advantage, such as finding ways to reduce costs
- Their next challenge is to make strategic IT investments with outsourcing by improving their enterprise architecture to ensure that IT infrastructure and business processes are integrated and standardized
- Project managers should become more familiar with negotiating contracts and other outsourcing issues

Virtual Teams Advantages

- Increasing competiveness and responsiveness by having a team of workers available 24/7
- Lowering costs because many virtual workers do not require office space or support beyond their home offices
- Providing more expertise and flexibility by having team members from across the globe working any time of day or night
- Increasing the work/life balance for team members by eliminating fixed office hours and the need to travel to work

Virtual Team Disadvantages

- Isolating team members
- Increasing the potential for communications problems
- Reducing the ability for team members to network and transfer information informally
- Increasing the dependence on technology to accomplish work

Success Factors in Virtual Teams

- Team Processes
- Leadership style
- Trust and relationships
- Team member selection and role preferences
- Task-technology fit
- Cultural differences
- Computed-mediated communication
- Team life cycles
- Incentives
- Conflict management

Case Wrap-Up

- After numerous concerns raised at the faculty meeting, the president formed a committee to review the concept of requiring laptops for students
- The committee consisted of faculty, administrators and students
- The president questioned whether the laptop idea was a high priority issue for the college (symbolic frame)
- The committee was to recommend, in a month, either the creation of a formal project team to fully investigate the issue or to terminate the concept
- The committee's recommendation was to terminate the concept

Chapter 3: The Project Management Process Groups: A Case Study

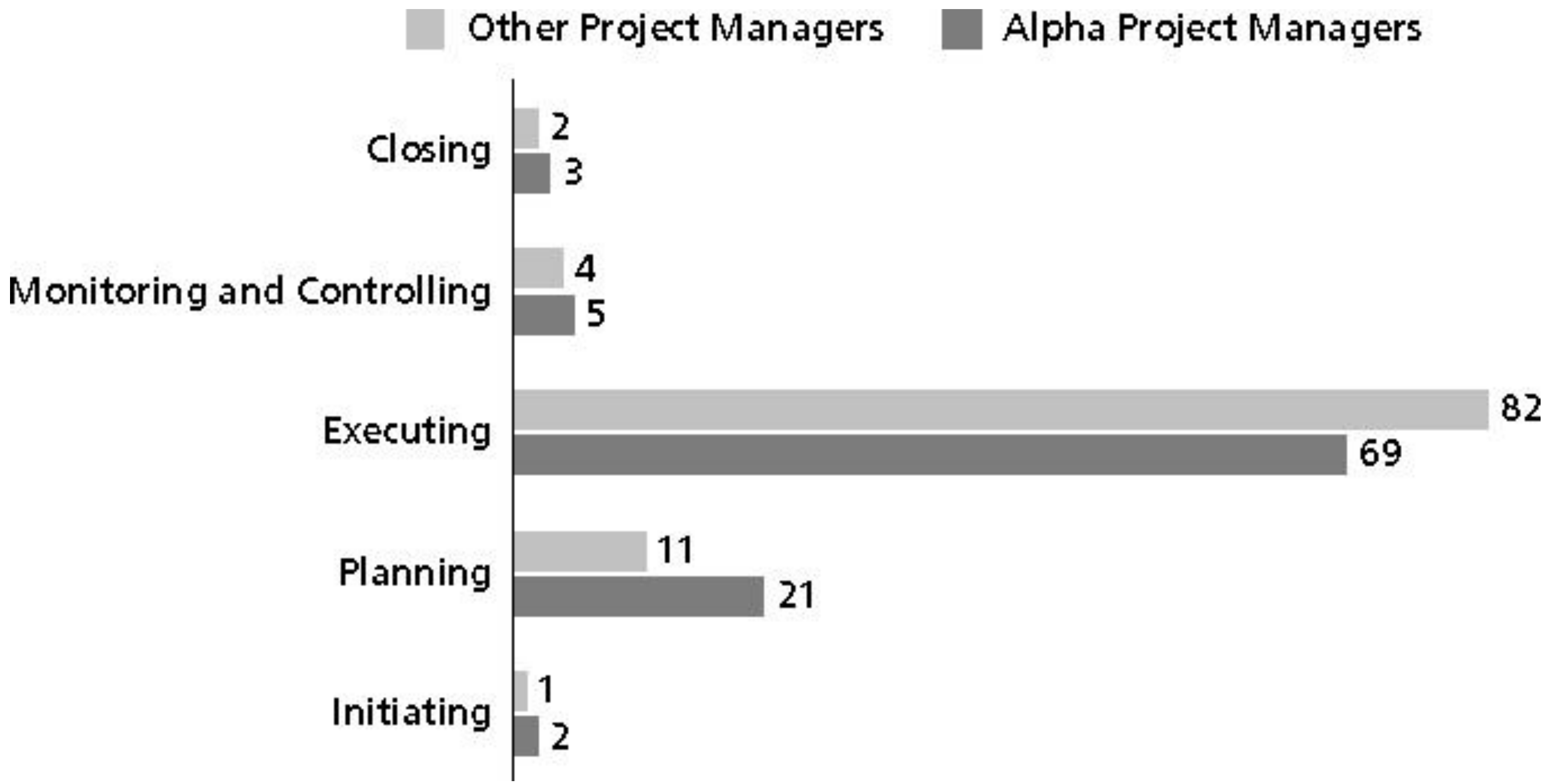
Information Technology Project Management, Sixth Edition

Note: See the text itself for full citations.

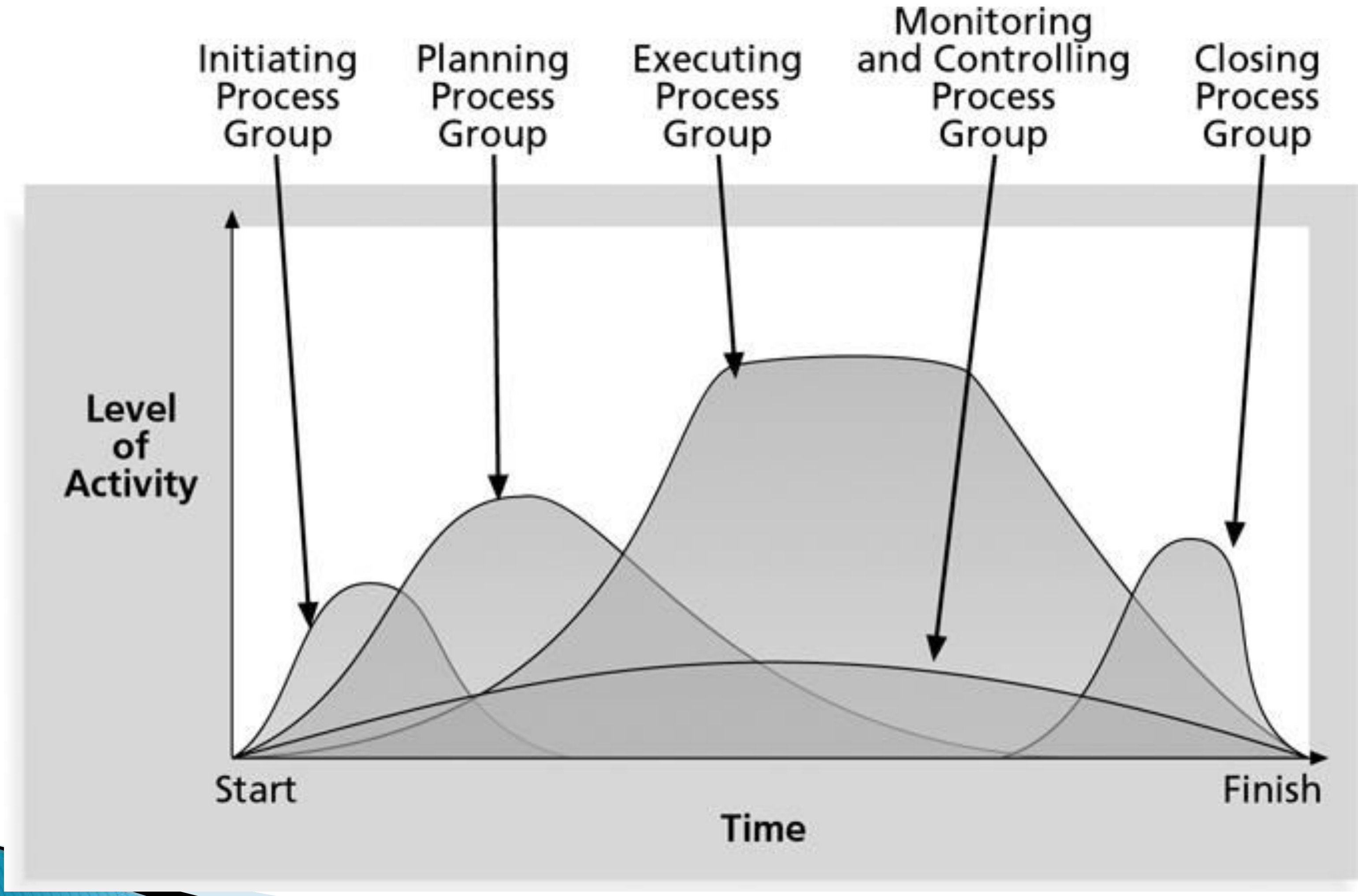
Project Management Process Groups

- A **process** is a series of actions directed toward a particular result
- Project management can be viewed as a number of interlinked processes
- The project management process groups include:
  - *Initiating processes*
    - Defining and authorizing a project or project phase
  - *Planning processes*
    - Devising and maintaining a workable scheme to ensure that the project addresses the organization's needs
  - *Executing processes*
    - Coordinating people and resources to carry out the various plans and produce the products, services or results of the project or phase
  - *Monitoring and controlling processes*
    - Regularly measuring and monitoring progress ro ensure that the project objectives are met
  - *Closing processes*
    - Formalizing acceptance of the project or phase, closing out contracts, documenting lessons learned

Figure 3-1. Percentage of Time Spent on Each Process Group



Level of Activity and Overlap of Process Groups Over Time



Project Management Process Groups

- Level of activity and length of each process group varies for every product
- On the average:
  - Executing process requires 50-60% of the resources and time
  - The planning process requires about 15-25%
  - The initiating and closing processes are usually the shortest and require the least amount of resources, usually 5 -10% each
  - Monitoring and controlling is done throughout the project and generally takes 5-15%

What Went Wrong?

- Philip A. Pell, PMP, commented on how the U.S. IRS needed to improve its project management process. “Pure and simple, good, methodology-centric, predictable, and repeatable project management is the SINGLE greatest factor in the success (or in this case failure) of any project… The project manager is ultimately responsible for the success or failure of the project.”*
- In 2006, the IRS lost more than $320 million due to a botched fraud-detection system project
- A 2008 U.S. Government Accountability Office (GAO) report stated that IRS had fixed just 29 of 98 information security weaknesses identified the previous year

*Comments posted on CIO Magazine Web site on article “For the IRS, There’s No EZ Fix,” (April 1, 2004).

Media Snapshot

- Just as information technology projects need to follow the project management process groups, so do other projects, such as the production of a movie.
- Processes involved in making movies might include screenwriting (initiating), producing (planning), acting and directing (executing), editing (monitoring and controlling), and releasing the movie to theaters (closing).
- Many people enjoy watching the extra features on a DVD that describe how these processes lead to the creation of a movie…
  - This acted "…not as promotional filler but as a serious and meticulously detailed examination of the entire filmmaking process."*
- Project managers in any field know how important it is to follow a good process.

*Jacks, Brian, "Lord of the Rings: The Two Towers Extended Edition (New Line)", Underground Online (accessed from *www.ugo.com* August 4, 2004).

Mapping the Process Groups to the Knowledge Areas

- You can map the main activities of each PM process group into the nine knowledge areas using the PMBOK® Guide 2008
- Note that there are activities from each knowledge area under the planning and monitoring and controlling process groups
- Two new processes were added in 2008: identify stakeholders and collect requirements

Table 3-1. Project Management Process Groups and Knowledge Area Mapping*

Knowledge Area	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring and Controlling	Closing
Project Integration Management	Develop project charter	Develop project management plan	Direct and manage project execution	Monitor and control project work, Perform integrated change control	Close project or phase
Project Scope Management		Collect requirements, Define scope, Create WBS		Verify scope, Control scope	
Project Time Management		Define activities, Sequence activities,		Control schedule	

*Source: PMBOK® Guide, Fourth Edition, 2008.

Table 3-1. (continued)

Knowledge Area	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring and Controlling	Closing
Project Time Management (continued)		Estimate activity resources, Estimate activity durations, Develop schedule			
Project Cost Management		Estimate costs, Determine budget		Control costs	
Project Quality Management		Plan quality	Perform quality assurance	Perform quality control	
Project Human Resource Management		Develop human resource plan	Acquire project team, Develop project team, Manage project team		

Table 3-1 (continued)

Knowledge Area	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring and Controlling	Closing
Project Communi-cations Management	Identify stake-holders	Plan communi-cations	Distribute information, Manage stakeholders expectations	Report performance	
Project Risk Management		Plan risk man-agement, Identi-fy risks, Perform qualitative risk analysis, Perform quantitative risk analysis, Plan risk responses		Monitor and control risks	
Project Procurement Management		Plan procurements	Conduct procurements	Administer procurements	Close procurements

Developing an IT Project Management Methodology

- Just as projects are unique, so are approaches to project management
- Many organizations develop their own project management methodologies, especially for IT projects
- A **methodology** describes *how* things should be done; a **standard** describes *what* should be done
- Blue Cross Blue Shield of Michigan implemented a SDLC for the entire organization but developers and PMs were often working on different IT projects in different ways
  - Deliverables were often missing or looked different from project to project
  - An IT project management methodology was developed using PMBOK as a guide

Developing an IT Project Management Methodology

- PRINCE2 –Projects IN Controlled Environments
- Agile methodologies
- Rational Unified Process (RUP) framework
- Six Sigma methodologies
- An IT project management methodology was developed using PMBOK as a guide

Developing an IT Project Management Methodology

- **PRINCE2** is a process-based method for effective **project management**.
  - **PRINCE2** is a de facto standard used extensively by the UK Government and is widely recognized and used in the private sector, both in the UK and internationally.
  - The method **PRINCE2** is in the public domain, offering non-proprietorial best practice guidance on **project management**.
  - The key features of PRINCE2 are:
    - Its focus on business justification
    - A defined organization structure for the project management team
    - Its product-based planning approach
    - Its emphasis on dividing the project into manageable and controllable stages
    - Its flexibility to be applied at a level appropriate to the project.

  http://www.prince2.com/

Developing an IT Project Management Methodology

- **Agile methodologies**
  - Form of adaptive software development
  - Iterative workflow and incremental delivery of software in short iterations
    - Extreme programming
    - SCRUM
    - Agile Unified Process
    - Dynamic Systems development Method

Developing an IT Project Management Methodology

- **RUP** http://www-01.ibm.com/software/awdtools/rup/
  - Iterative s/w development that focuses on team productivity and delivers s/w best practices to all team members
  - Created by the Rational Software Corporation, a division of IBM.
  - RUP is not a single concrete prescriptive process, but rather an adaptable process framework, intended to be tailored by the development organizations and software project teams that will select the elements of the process that are appropriate for their needs.

Developing an IT Project Management Methodology

- **Six Sigma**
  - DMAIC – Define, measure, analyze, improve and control
    - Used to improve an existing process
  - DMADV – Define, measure, analyze, design and verify
    - Used to create new products or process designs to achieve predictable, defect-free performance

What Went Right?

- AgênciaClick, an interactive advertising and online communications company based in São Paulo, Brazil, made PMI's list of outstanding organizations in project management in 2007
- Since 2002, the company saw revenues jump 132 percent, primarily due to their five-year emphasis on practicing good project management across the entire company
- Launched a PMO in 2002 based on the PMBOK Guide
- Developed a custom project tracking system to help calculate physical work progress each day and alert managers of any schedule or cost issues

Case Study: JWD Consulting's Project Management Intranet Site

- This case study provides an example of what's involved in initiating, planning, executing, controlling, and closing an IT project
- You can download templates for creating your own project management documents from the companion Web site for this text or the author's site
- Note: This case study provides a big picture view of managing a project; later chapters provide detailed information on each knowledge area

Project Pre-initiation

- It is good practice to lay the groundwork for a project before it officially starts
- Senior managers often perform several pre-initiation tasks, including the following:
  - Determine the scope, time, and cost constraints for the project
  - Identify the project sponsor
  - Select the project manager
  - Develop a business case for a project (see Table 3-2 for an example)
  - Meet with the project manager to review the process and expectations for managing the project
  - Determine if the project should be divided into two or more smaller projects

Project Initiation

- Initiating a project includes recognizing and starting a new project or project phase
- The main goal is to formally select and start off projects

TABLE 3-3 Project initiation knowledge areas, processes, and outputs

Knowledge Area	Initiating Process	Outputs
Project Integration Management	Develop project charter	Project charter
Project Communications Management	Identify stakeholders	Stakeholder register Stakeholder management strategy

Table 3-4. Stakeholder Register

Name	Position	Internal/ External	Project Role	Contact Information
Joe Fleming	CEO	Internal	Sponsor	joe_fleming@jwdconsulting.com
Erica Bell	PMO Director	Internal	Project manager	erica_bell@jwdconsulting.com
Michael Chen	Team member	Internal	Team member	michael_chen@jwdconsulting.com
Kim Phuong	Business analyst	External	Advisor	kim_phuong@client1.com
Louise Mills	PR Director	Internal	Advisor	louise_mills@jwdconsulting.com

Table 3-4. Stakeholder Management Strategy

Name	Level of Interest	Level of Influence	Potential Management Strategies
Joe Fleming	High	High	Joe likes to stay on top of key projects and make money. Have a lot of short, face-to-face meetings and focus on achieving the financial benefits of the project.
Louise Mills	Low	High	Louise has a lot of things on her plate, and she does not seem excited about this project. She may be looking at other job opportunities. Show her how this project will help the company and her resume.

Contents are often sensitive, so do not publish this document.

Project Charters and Kick-off Meetings

- See Table 3-6 for an example of a charter
- Charters are normally short and include key project information and stakeholder signatures
- It's good practice to hold a **kick-off meeting** at the beginning of a project so that stakeholders can meet each other, review the goals of the project, and discuss future plans

Figure 3-2. Kick-off Meeting Agenda

Kick-Off Meeting
[Date of Meeting]

Project Name: Project Management Intranet Site Project

Meeting Objective: Get the project off to an effective start by introducing key stakeholders, reviewing project goals, and discussing future plans

Agenda:

- Introductions of attendees
- Review of the project background
- Review of project-related documents (i.e., business case, project charter)
- Discussion of project organizational structure
- Discussion of project scope, time, and cost goals
- Discussion of other important topics
- List of action items from meeting

Action Item	Assigned To	Due Date

Date and time of next meeting:

Project Planning

- The main purpose of project planning is to *guide execution*
- Every knowledge area includes planning information (see Table 3-7 on pages 97-98)
- Key outputs included in the JWD project include:
  - A team contract
  - A project scope statement
  - A work breakdown structure (WBS)
  - A project schedule, in the form of a Gantt chart with all dependencies and resources entered
  - A list of prioritized risks (part of a risk register)
- See sample documents on pages 100-107

Figure 3-4. JWD Consulting Intranet Site Project Baseline Gantt Chart

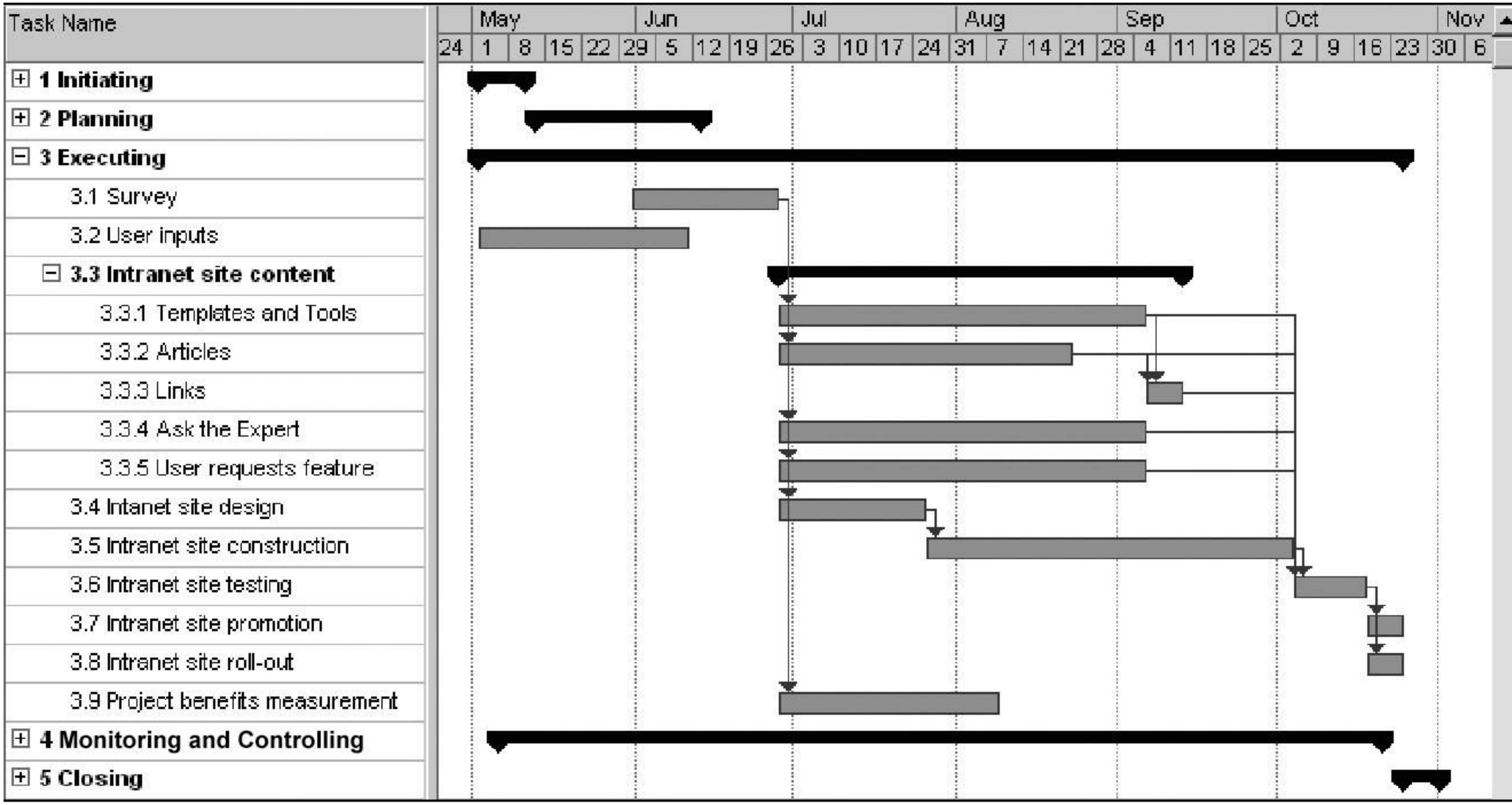


Table 3-10. List of Prioritized Risks

Ranking	Potential Risk
1	Lack of inputs from internal consultants
2	Lack of inputs from client representatives
3	Security of new system
4	Outsourcing/purchasing for the article retrieval and "Ask the Expert" features
5	Outsourcing/purchasing for processing online payment transactions
6	Organizing the templates and examples in a useful fashion
7	Providing an efficient search feature
8	Getting good feedback from Michael Chen and other senior consultants
9	Effectively promoting the new system
10	Realizing the benefits of the new system within one year

Project Executing

- Usually takes the most time and resources to perform project execution
- Project managers must use their leadership skills to handle the many challenges that occur during project execution
- Table 3-11 on p. 108 lists the executing processes and outputs; many project sponsors and customers focus on deliverables related to providing the products, services, or results desired from the project
- A milestone report (example on pp. 109-110) can help focus on completing major milestones

Part of Milestone Report (Table 3-12)

Milestone	Date	Status	Responsible	Issues/ Comments
Initiating				
Stakeholders identified	May 2	Completed	Erica and Joe	
Project charter signed	May 10	Completed	Erica	
Project kick-off meeting held	May 13	Completed	Erica	Went very well
Planning				
Team contract signed	May 13	Completed	Erica	
Scope statement completed	May 27	Completed	Erica	
WBS completed	May 31	Completed	Erica	
List of prioritized risks completed	June 3	Completed	Erica	Reviewed with sponsor and team
Schedule and cost baseline completed	June 13	Completed	Erica	
Executing				
Survey completed	June 28		Erica	Poor response so far!
Intranet site design completed	July 26		Kevin	

Best Practice

- One way to learn about best practices in project management is by studying recipients of PMI's Project of the Year award
- The Quartier international de Montreal (QIM), Montreal's international district, was a 66-acre urban revitalization project in the heart of downtown Montreal
- This $90 million, five-year project turned a once unpopular area into a thriving section of the city with a booming real estate market and has generated $770 million in related construction

Best Practice

- Divided work into packages that allowed for smaller-scale testing of management techniques and contract awards. Based on these experiences, managers could adjust future work segments and management styles accordingly
- Identified champions in each stakeholder group to help inspire others to achieve to project goals
- Implemented a web site dedicated to public concerns
- Two-day review meetings at the beginning of each project phase to discuss problems and develop solutions to prevent conflict

Project Monitoring and Controlling

- Involves measuring progress toward project objectives, monitoring deviation from the plan, and taking correction actions
- Affects all other process groups and occurs during all phases of the project life cycle
- Outputs include performance reports, change requests, and updates to various plans
- See Table 3-13

Project Closing

- Involves gaining stakeholder and customer acceptance of the final products and services
- Even if projects are not completed, they should be closed out to learn from the past
- Outputs include project archives and lessons learned, part of organizational process assets
- Most projects also include a final report and presentation to the sponsor/senior management

Templates

- Table 3-18 on pp. 118-121 lists the templates available on the companion Web site (www.cengage.com/mis/schwalbe) and the author's site (www.kathyschwalbe.com)

Chapter 4: Project Integration Management

Information Technology Project Management, Sixth Edition

Note: See the text itself for full citations.

The Key to Overall Project Success: Good Project Integration Management

- Project managers must coordinate all of the other knowledge areas throughout a project's life cycle
- Many new project managers have trouble looking at the "big picture" and want to focus on too many details (see opening case for a real example)
- Project integration management is *not* the same thing as software integration

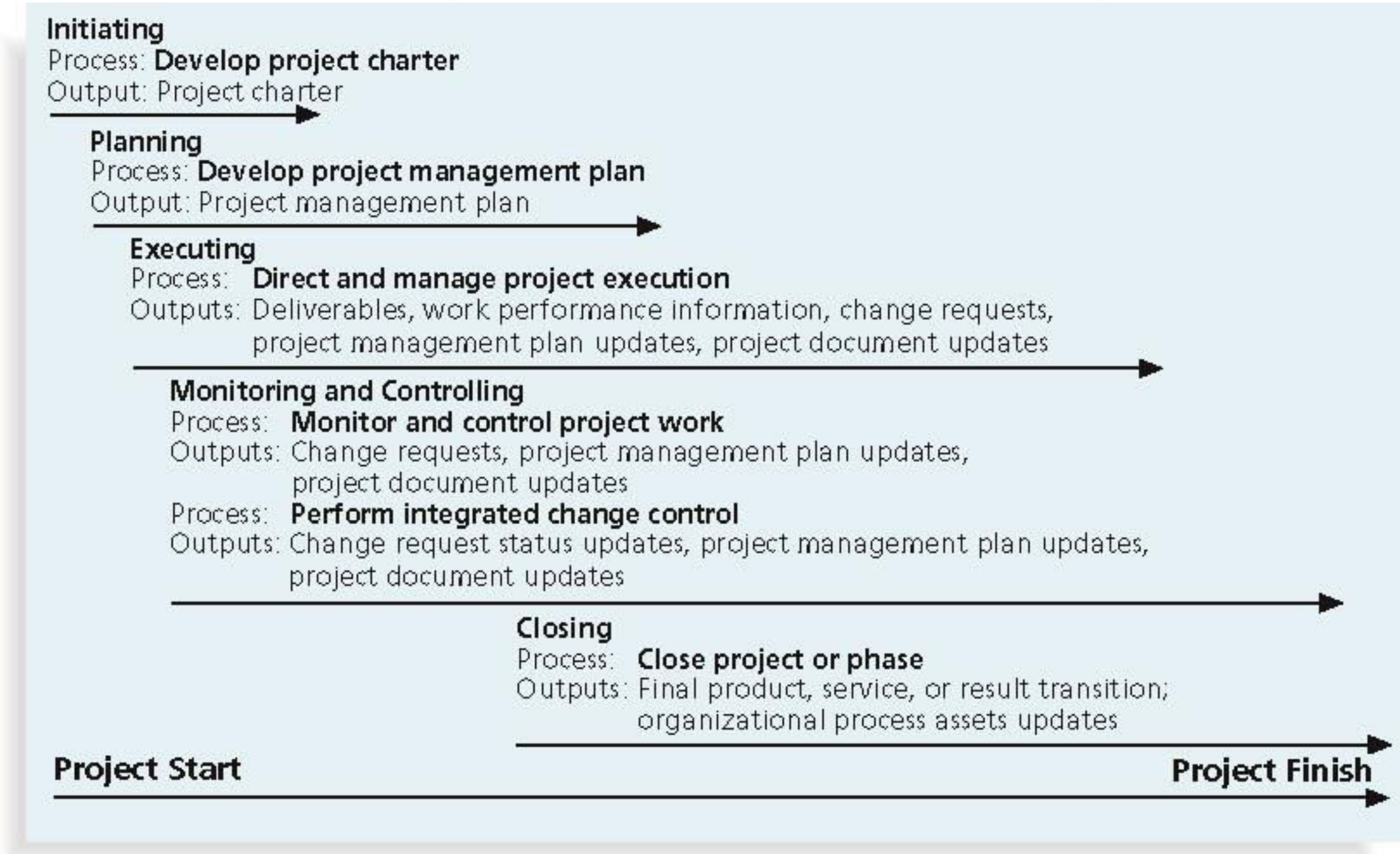
Project Integration Management Processes

- **Develop the project charter**: working with stakeholders to create the document that formally authorizes a project—the charter
- **Develop the preliminary project scope statement**: working with stakeholders, especially users of the project's products, services, or results, to develop the high-level scope requirements and create a preliminary project scope statement
- **Develop the project management plan**: coordinating all planning efforts to create a consistent, coherent document—the project management plan

Project Integration Management Processes

- **Direct and manage project execution**: carrying out the project management plan by performing the activities included in it
- **Monitor and control the project work**: overseeing project work to meet the performance objectives of the project
- **Perform integrated change control**: coordinating changes that affect the project's deliverables and organizational process assets
- **Close the project or phase**: finalizing all project activities to formally close the project or phase

Figure 4-1. Project Integration Management Summary



Project Integration Management Processes

- The project managers takes responsibility for
  - Coordinating all the people, plans and work required to complete a project
  - Focusing on the big picture and steering the project team toward successful completion
  - Making the final decisions when there are conflicts among project goals or people involved
  - Communicating key project information to top management

Project Integration Management Processes

- Good project integration management is critical to providing stakeholder satisfaction
  - **Interface management** – identifying and managing the points of interaction between various elements of the project
    - The number of interfaces can increase exponentially as the number of people involved in the project increases
    - Therefore, the PM must establish and maintain good communication and relationships with all stakeholders, customers the project team, top management , other PMs and opponents of the project.
      - This was one of Nick Carson's mistakes – he did not find out what top management expected of him as PM and did not see the big picture

What Went Wrong?

- The Airbus A380 megajet project was two years behind schedule in Oct. 2006, causing Airbus' parent company to face an expected loss of $6.1 billion over the next four years
- The project suffered from severe integration management problems, or "integration disintegration"
  - Pre-assembled bundles containing hundreds of miles of cabin wiring were delivered from a German factory to the assembly line in France
  - Workers discovered that the bundles didn't fit properly into the plane. Assembly slowed to a near-standstill, as workers tried to pull the bundles apart and re-thread them through the fuselage. Now Airbus will have to go back to the drawing board and redesign the wiring system."*
  - The problem was caused by factories in Toulouse and Hamburg using different versions of a design software program which made it difficult for the two machines to communicate with each other. Top management should have made it a priority to have all sites use the same version of the software.

*Matlack, Carol. "First, Blame the Software," *BusinessWeek Online (October 5, 2006).*

Strategic Planning and Project Selection

- **Strategic planning** involves determining long-term objectives, predicting future trends, and projecting the need for new products and services
- Organizations often perform a **SWOT analysis**
  - Analyzing **S**trengths, **W**eaknesses, **O**pportunities, and **T**hreats
- As part of strategic planning, organizations:
  - Identify potential projects
  - Use realistic methods to select which projects to work on
  - Formalize project initiation by issuing a project charter

Figure 4-2. Mind Map of a SWOT Analysis to Help Identify Potential Projects

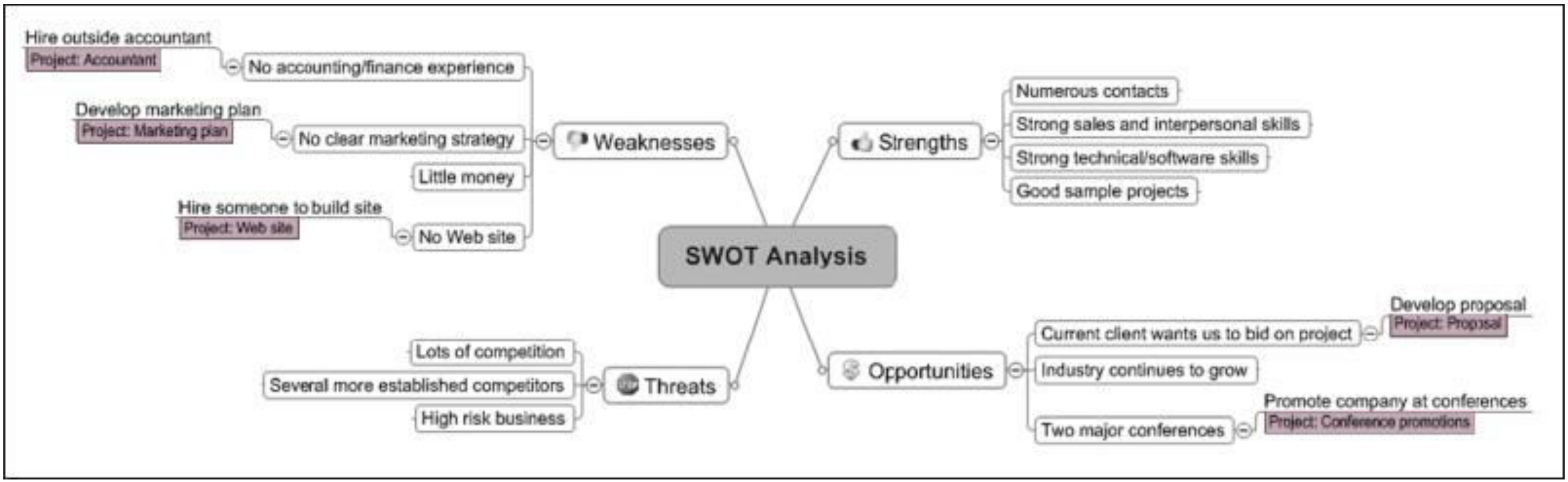
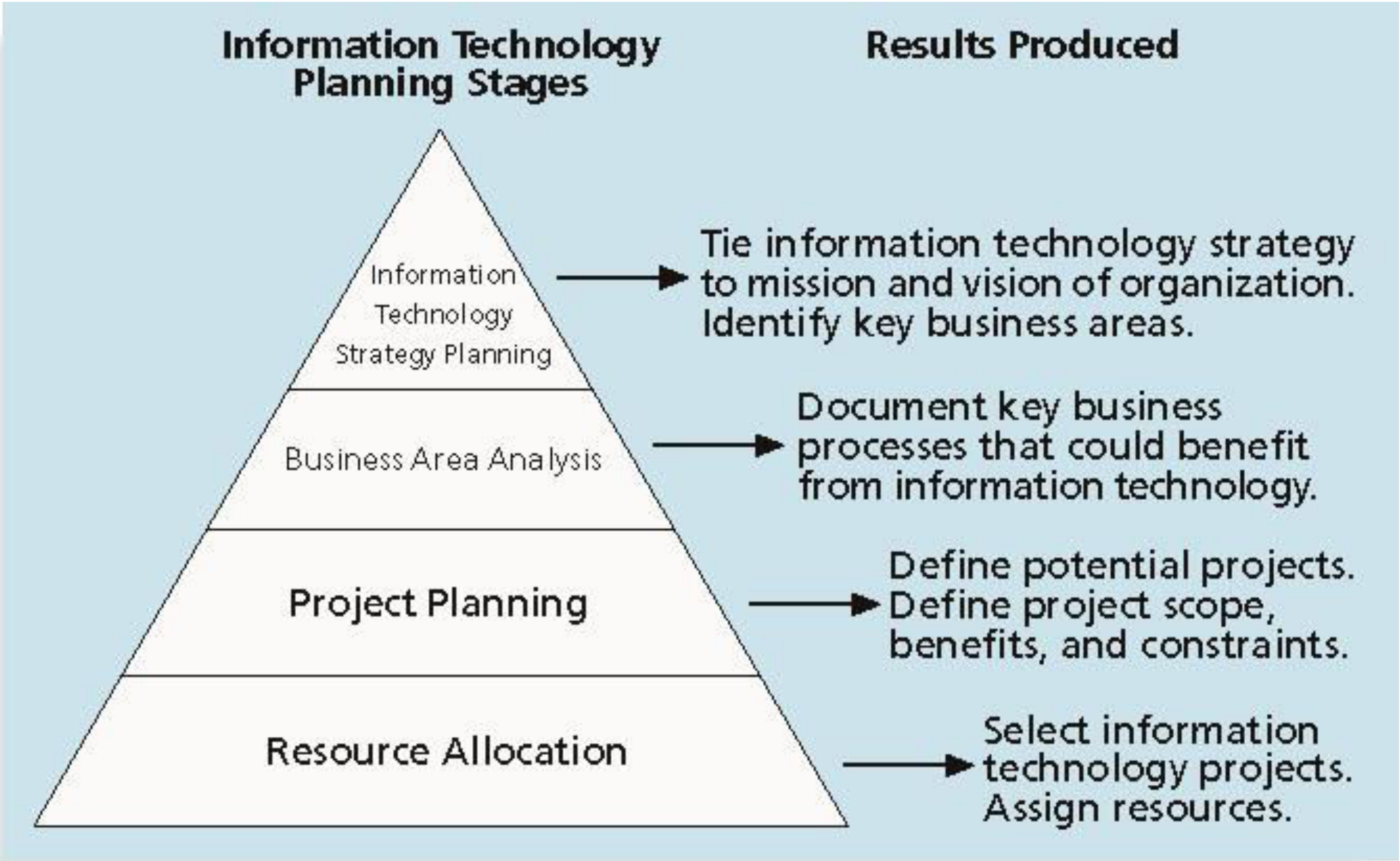


Figure 4-3. Information Technology Planning Process



Aligning IT with Business Strategy

- This is consistently the top concern for CIOs
- Research shows that supporting explicit business objectives is the number one reason cited for why organizations invest in IT projects
  - An organization's strategic plan should guide the IT project selection process
- Many IT systems are "strategic" because they directly support key business strategies
  - Wal-Mart's inventory control system
  - Fed-Ex's online package tracking system

Best Practice

- **Only one in seven product concepts comes to fruition**
  - Companies like Proctor & Gamble, Johnson and Johnson, Hewlett Packard, and Sony are consistently successful in New Product Development (NPD) because they use a disciplined, systematic approach to NPD projects based on best practices
    - Align projects and resources with business strategies
    - Focus on customer needs when identifying potential projects
    - Assign project managers to lead the projects
- **Four important forces behind NPD success include the following:**
  1. A product innovation and technology strategy for the business
  2. Resource commitment and focusing on the right projects, or solid portfolio management
  3. An effective, flexible and streamlined idea-to-launch process
  4. The right climate and culture for innovation, true cross-functional teams, and senior management commitment to NPD

Methods for Selecting Projects

- There are usually more projects than available time and resources to implement them
- Methods for selecting projects include:
  - Focusing on broad organizational needs
  - Categorizing information technology projects
  - Performing net present value or other financial analyses
  - Using a weighted scoring model
  - Implementing a balanced scorecard
- In practice, organizations usually use a combination of these approaches to select projects. Each approach has its pros and cons

Focusing on Broad Organizational Needs

- Projects that address broad organizational needs are more likely to be successful because they will be important to the organization
- It is often difficult to provide strong justification for many IT projects, but everyone agrees they have a high value
- "It is better to measure gold roughly than to count pennies precisely"
- Three important criteria for projects:
  - There is a ***need*** for the project
  - There are ***funds*** available
  - There's a strong ***will*** to make the project succeed

Categorizing IT Projects

- One categorization is the impetus for a project i.e., responding to :
  - A **problem** is an undesirable situation that prevents an org. from achieving its goals – system slow, needs upgrades
  - An **opportunity** is a chance to improve the org. – creating a new product
  - A **directive** is a new requirement imposed by management, govt or some external influence – medical technologies must meet govt requirements
- Another categorization is how long it will take to do and when it is needed
- Another is the overall priority of the project

Financial Analysis of Projects

- Financial considerations are often an important consideration in selecting projects
  - "Projects are never ends in themselves. Financially they are always a means to an end, cash" Dennis Cohen and Robert Graham , *The Project Manager's MBA*
- Three primary methods for determining the projected financial value of projects
  - Net present value (NPV) analysis
  - Return on investment (ROI)
  - Payback analysis
- PMs must become familiar with the language of business executives in order to make their case

Net Present Value Analysis

- A dollar earned today is worth more than a dollar earned five years from now
- **Net present value** (NPV) analysis is a method of calculating the expected net monetary gain or loss from a project by discounting all expected future cash inflows and outflows to the present point in time
- Projects with a positive NPV should be considered if financial value is a key criterion because that means the return from a project exceeds the cost of capital (the return available by investing the capital elsewhere)
- The higher the NPV, the better

Net Present Value Analysis

- NPV is the difference between the present value of cash inflows and the present value of cash outflows.
- NPV compares the value of a dollar today to the value of that same dollar in the future, taking inflation and returns into account.
- For example, if a retail clothing business wants to purchase an existing store, it would first estimate the future cash flows that store would generate, and then discount those cash flows into one lump-sum present value amount, say $565,000.
  - If the owner of the store was willing to sell his business for less than $565,000, the purchasing company would likely accept the offer as it presents a positive NPV investment.
  - Conversely, if the owner would not sell for less than $565,000, the purchaser would not buy the store, as the investment would present a negative NPV at that time and would, therefore, reduce the overall value of the clothing company.

Net Present Value Analysis

- NPV = Net Present value = Present value of net cash flows
  - Each cash inflow/outflow is discounted back to its PV and then they are summed.

$$\mathrm{NPV} = C_0 + \sum_{t=1}^{N} \frac{C_t}{(1+r)^t}$$ or shortened $$\mathrm{NPV} = \sum_{t=0}^{N} \frac{C_t}{(1+r)^t}$$

t – the time of the cash flow
N – the total time of the project
r – the discount rate (the rate of return that could be earned on an investment in the financial markets with similar risk.)
C_t – the net cash flow (the amount of cash) at time *t*
C_0 – the initial investment

Net Present Value Analysis

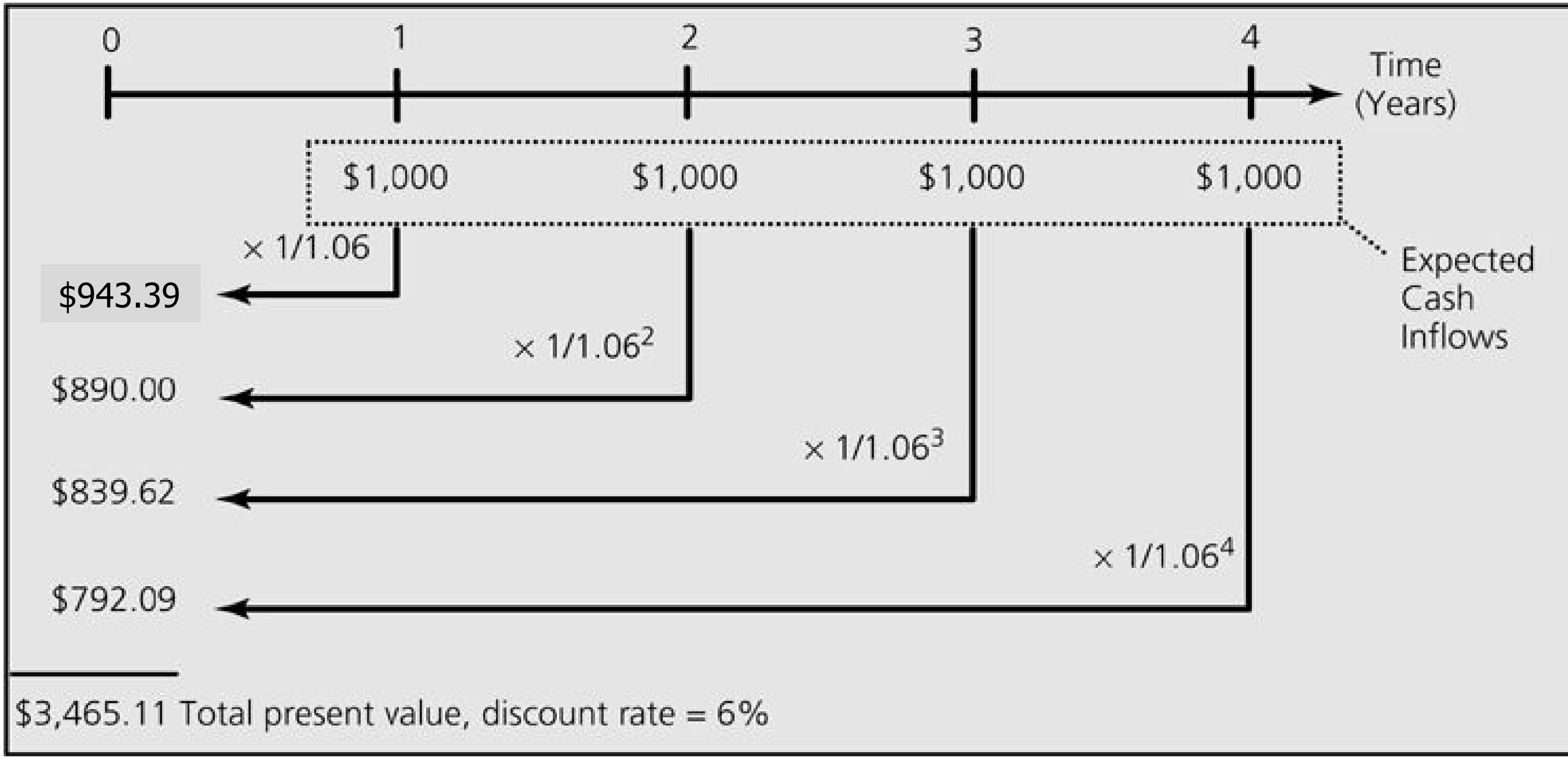


Figure 4-4. Net Present Value Example

	A	B	C	D	E	F	G
1	Discount rate	10%					
2							
3	PROJECT 1	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
4	Benefits	$0	$2,000	$3,000	$4,000	$5,000	$14,000
5	Costs	$5,000	$1,000	$1,000	$1,000	$1,000	$9,000
6	Cash flow	($5,000)	$1,000	$2,000	$3,000	$4,000	$5,000
7	NPV →	$2,316					
8		Formula =npv(b1,b6:f6)					
9							
10	PROJECT 2	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
11	Benefits	$1,000	$2,000	$4,000	$4,000	$4,000	$15,000
12	Costs	$2,000	$2,000	$2,000	$2,000	$2,000	$10,000
13	Cash flow	($1,000)	$0	$2,000	$2,000	$2,000	$5,000
14	NPV →	$3,201					
15		Formula =npv(b1,b13:f13)					
16							

Note that totals are equal, but NPVs are not because of the time value of money

Figure 4-5. JWD Consulting NPV Example

Multiply by the discount factor each year, then take cum. benefits – costs to get NPV

Discount rate	**8%**					
Assume the project is completed in Year 0			**Year**			
	0	**1**	**2**	**3**	**Total**	
Costs	140,000	40,000	40,000	40,000		
Discount factor	1	0.93	0.86	0.79		
Discounted costs	**140,000**	**37,200**	**34,400**	**31,600**	**243,200**	
Benefits	0	200,000	200,000	200,000		
Discount factor	1	0.93	0.86	0.79		
Discounted benefits	**0**	**186,000**	**172,000**	**158,000**	**516,000**	
Discounted benefits - costs	(140,000)	148,800	137,600	126,400	**272,800**	← **NPV**
Cumulative benefits - costs	(140,000)	8,800	146,400	272,800		
ROI →	**112%**					
	Payback In Year 1					

Note: See the template called business_case_financials.xls

NPV Calculations

- Determine estimated costs and benefits for the life of the project and the products it produces
- Determine the discount rate
- Calculate the NPV
  - Use NPV function in Excel (npv(discount rate, cash flows range))
  - Calculate total discounted benefits and total discounted costs . NPV is benefits - costs

Return on Investment

- **Return on investment** (ROI) is calculated by subtracting the project costs from the benefits and then dividing by the costs
  - ROI = (total discounted benefits - total discounted costs) / discounted costs
- The higher the ROI, the better
- Many organizations have a **required rate of return** or minimum acceptable rate of return on investment for projects
- **Internal rate of return** (IRR) can by calculated by finding the discount rate that makes the NPV equal to zero

Internal Rate of Return

- **Internal Rate of Return** (IRR): The discount rate that makes the net present value of investment zero.
  - It is an indicator of the **efficiency** of an investment, as opposed to NPV, which indicates value or magnitude.
  - The IRR is the annualized effective compounded return rate which can be earned on the invested capital, i.e., the yield on the investment.
  - A project is a good investment proposition if its IRR is greater than the rate of return that could be earned by alternate investments (investing in other projects, buying bonds, even putting the money in a bank account).
    - Thus, the IRR should be compared to any alternate costs of capital including an appropriate risk premium.

Internal Rate of Return

- Mathematically the IRR is defined as any discount rate that results in an NPV of zero of a series of cash flows.
- In general, if the IRR is greater than the project's cost of capital, or hurdle rate (minimum rate of return that must be met for a company to undertake a particular project), the project will add value for the company.

Internal Rate of Return

To find the internal rate of return, find the value(s) of r that satisfies the following equation:

$$\mathrm{NPV} = C_0 + \sum_{t=1}^{N} \frac{C_t}{(1+r)^t} = 0$$

(See net present value for details on this formula.)

Example

Year	Cash Flow
0	-100
1	+30
2	+35
3	+40
4	+45

Internal Rate of Return (IRR)

$$\mathrm{NPV} = -100 + \frac{30}{(1+r)^1} + \frac{35}{(1+r)^2} + \frac{40}{(1+r)^3} + \frac{45}{(1+r)^4} = 0 \Rightarrow r \approx 17.09$$

IRR = r,

IRR = 17.09%

Net Present Value (NPV)

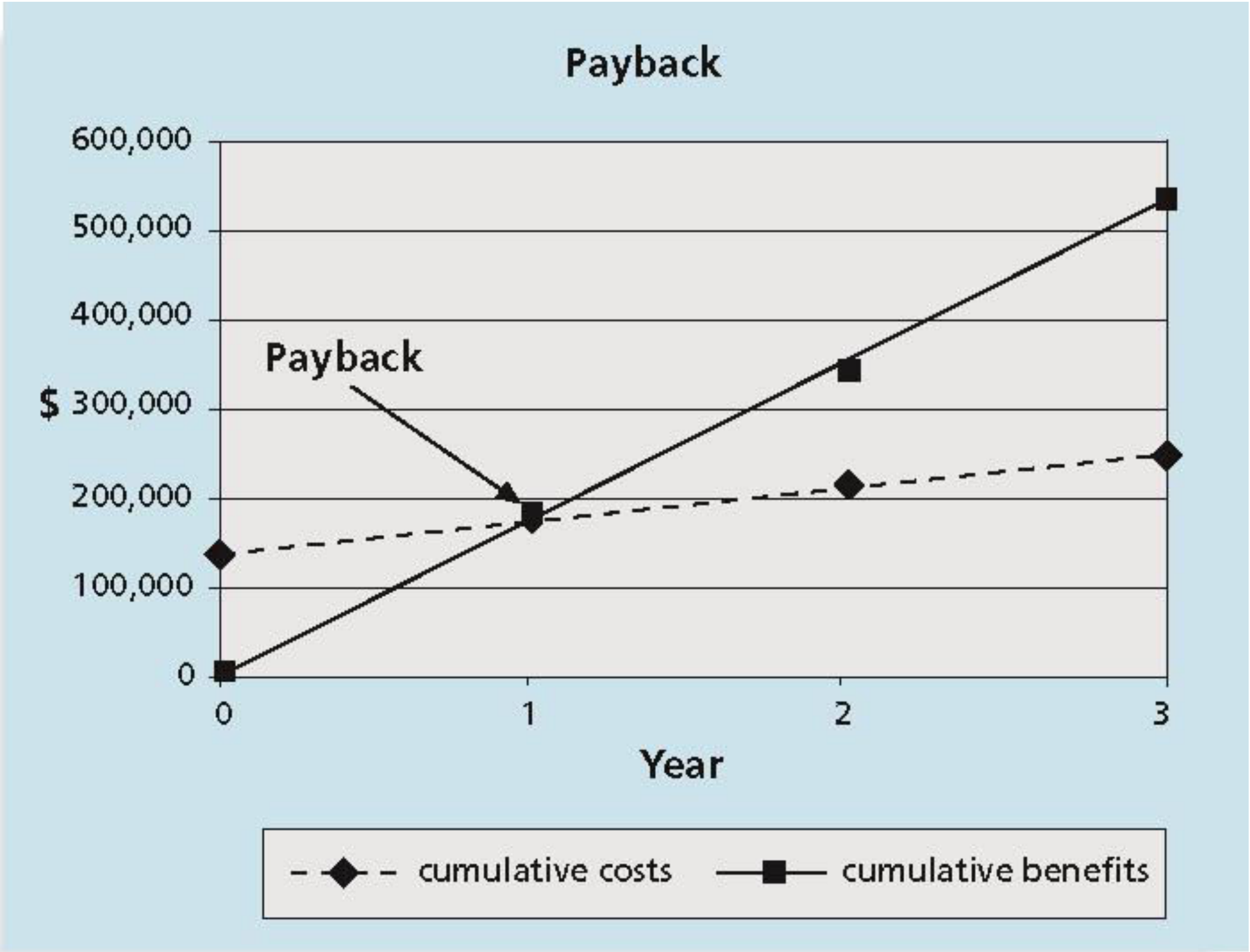
Thus using r = IRR = 17.09%,

$$\mathrm{NPV} = -100 + \frac{30}{(1+17.09\%)^1} + \frac{35}{(1+17.09\%)^2} + \frac{40}{(1+17.09\%)^3} + \frac{45}{(1+17.09\%)^4} = 0.00$$

Payback Analysis

- Another important financial consideration is payback analysis
- The **payback period** is the amount of time it will take to recoup, in the form of net cash inflows, the total dollars invested in a project
- Payback occurs when the net cumulative discounted benefits equals the costs
- Many organizations want IT projects to have a fairly short payback period

Figure 4-6. Charting the Payback Period

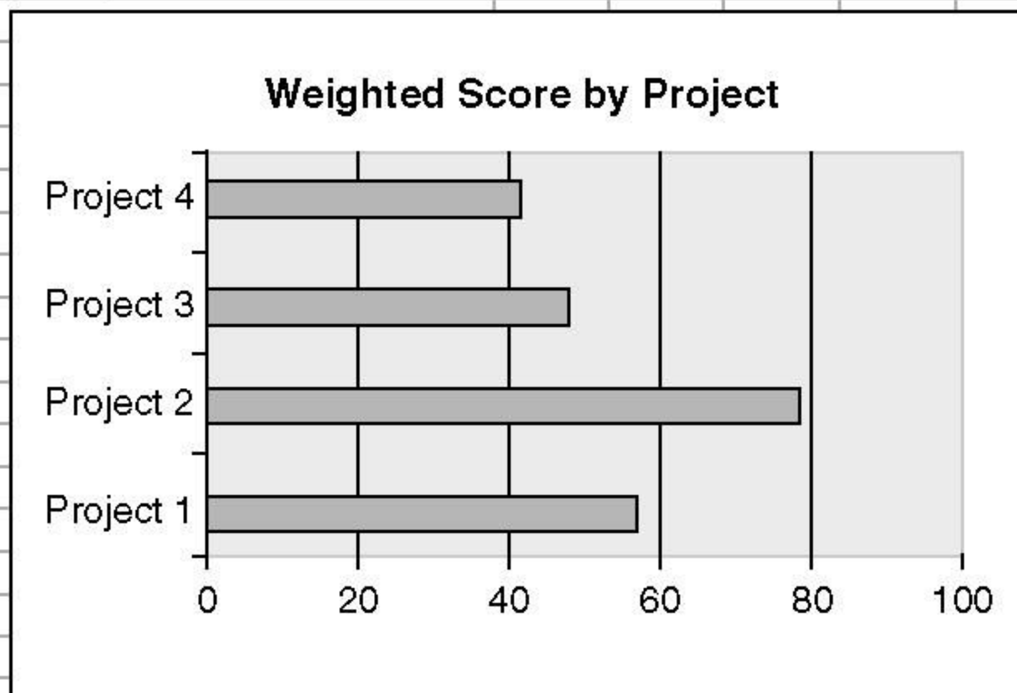


Weighted Scoring Model

- A weighted scoring model is a tool that provides a systematic process for selecting projects based on many criteria
  - Identify criteria important to the project selection process
    1. Supports key business objectives
    2. Has strong internal sponsor
    3. Has strong customer support
  - Assign weights (percentages) to each criterion so they add up to 100%
  - Assign scores to each criterion for each project
  - Multiply the scores by the weights and get the total weighted scores
- The higher the weighted score, the better

Figure 4-7. Sample Weighted Scoring Model for Project Selection

	A	B	C	D	E	F
1	**Criteria**	**Weight**	**Project 1**	**Project 2**	**Project 3**	**Project 4**
2	Supports key business objectives	25%	90	90	50	20
3	Has strong internal sponsor	15%	70	90	50	20
4	Has strong customer support	15%	50	90	50	20
5	Uses realistic level of technology	10%	25	90	50	70
6	Can be implemented in one year or less	5%	20	20	50	90
7	Provides positive NPV	20%	50	70	50	50
8	Has low risk in meeting scope, time, and cost goals	10%	20	50	50	90
9	**Weighted Project Scores**	**100%**	**56**	**78.5**	**50**	**41.5**



Implementing a Balanced Scorecard

- Drs. Robert Kaplan and David Norton developed this approach to help select and manage projects that align with business strategy
- A **balanced scorecard**:
  - Is a methodology that converts an organization's value drivers, such as customer service, innovation, operational efficiency, and financial performance, to a series of defined metrics
- See www.balancedscorecard.org for more information

Balanced Scorecard Institute

- The balanced scorecard is a strategic planning and management system that is used extensively in business and industry, government, and nonprofit organizations worldwide to align business activities to the vision and strategy of the organization, improve internal and external communications, and monitor organizational performance against strategic goals.
- It can help an organization by translating high level organizational strategy into something that employees can understand and act upon in their day-to-day operations and initiatives

Balanced Scorecard Institute

- An effectively implemented balanced scorecard can help an organization in many ways:
  - Increase focus on strategy and results instead of tasks
  - Break down communication silos between departments
  - Better understand and react to customer needs
  - Improve organizational performance by measuring what matters
  - Help leaders make better decisions based on leading performance indicators instead of lagging financial data
  - Help leaders budget time and resources more effectively
  - Help leaders and employees prioritize the work they do

Balanced Scorecard Institute

- The balanced scorecard suggests that we view the organization from four perspectives, and to develop metrics, collect data and analyze it relative to each of these perspectives

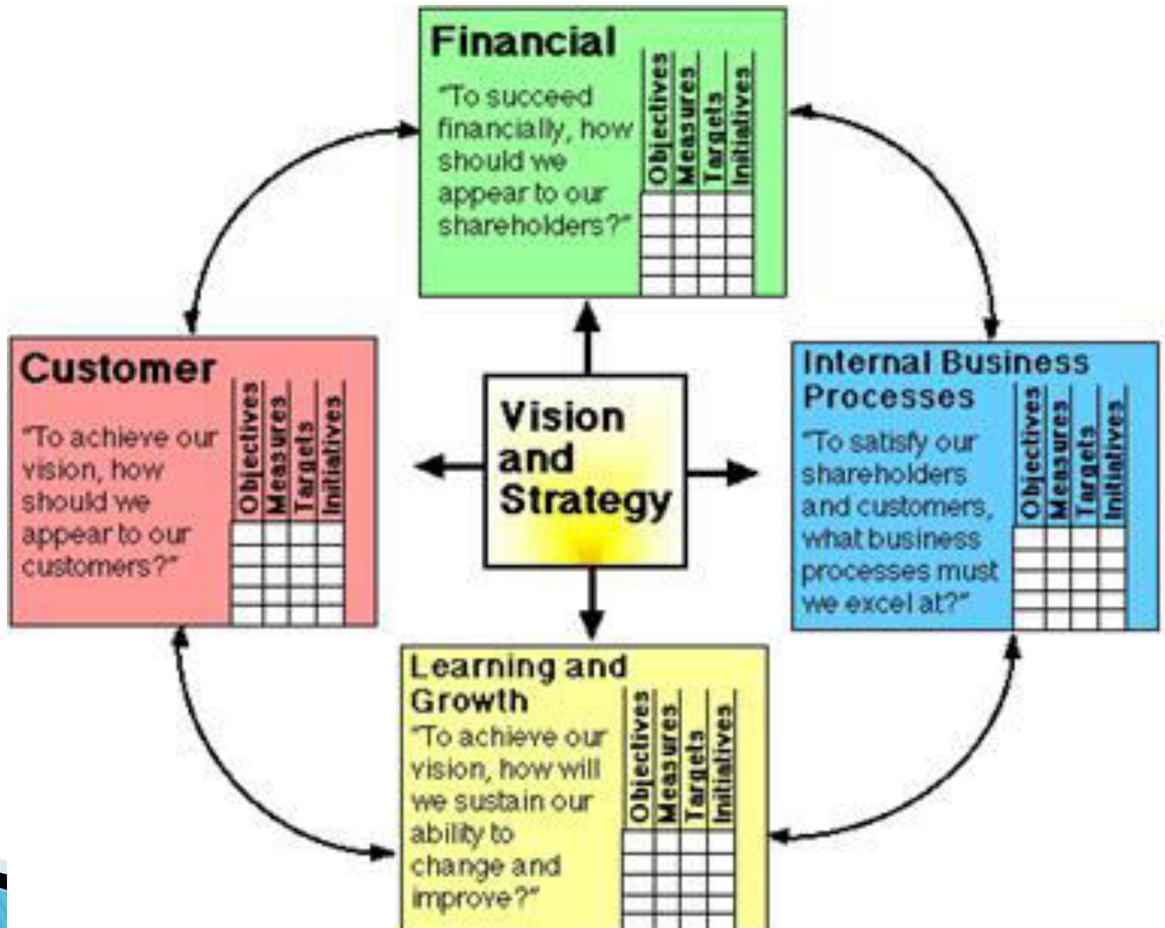
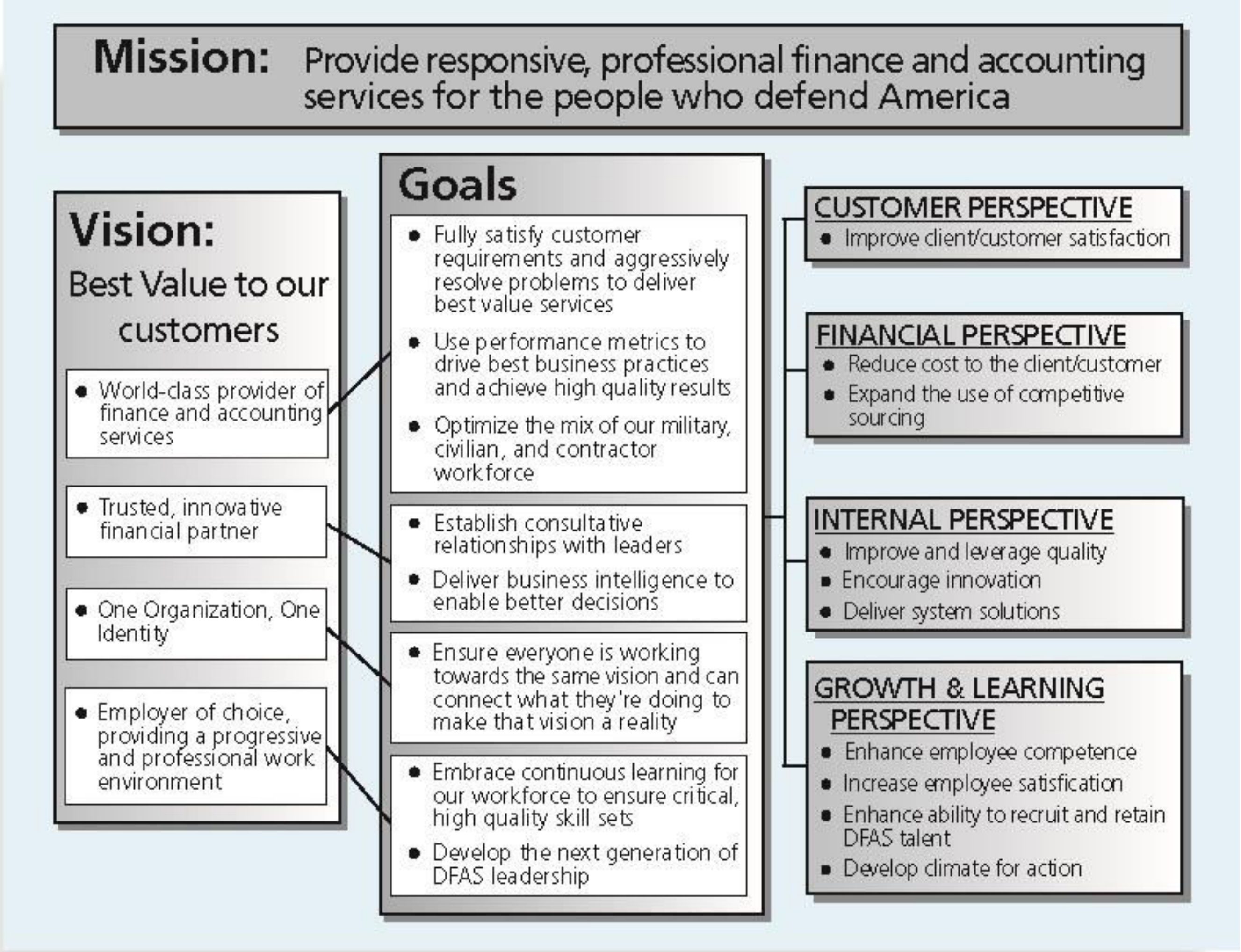


Figure 4-8. Balanced Scorecard Example



Project Charters

- After deciding what project to work on, it is important to let the rest of the organization know
- A **project charter** is a document that formally recognizes the existence of a project and provides direction on the project's objectives and management
- Key project stakeholders should sign a project charter to acknowledge agreement on the need and intent of the project; a signed charter is a key output of project integration management

Table 4-1. Project Charter for the DNA-Sequencing Instrument Completion Project

Project Title: DNA-Sequencing Instrument Completion Project
Date of Authorization: February 1
Project Start Date: February 1 **Projected Finish Date:** November 1

Key Schedule Milestones:

- Complete first version of the software by June 1
- Complete production version of the software by November 1

Budget Information: The firm has allocated $1.5 million for this project, and more funds are available if needed. The majority of costs for this project will be internal labor. All hardware will be outsourced.

Project Manager: Nick Carson, (650) 949-0707, ncarson@dnaconsulting.com

Project Objectives: The DNA-sequencing instrument project has been underway for three years. It is a crucial project for our company. This is the first charter for the project, and the objective is to complete the first version of the software for the instrument in four months and a production version in nine months.

Main Project Success Criteria: The software must meet all written specifications, be thoroughly tested, and be completed on time. The CEO will formally approve the project with advice from other key stakeholders.

Table 4-1. Charter (continued)

Approach:

- Hire a technical replacement for Nick Carson and a part-time assistant as soon as possible.
- Within one month, develop a clear work breakdown structure, scope statement, and Gantt chart detailing the work required to complete the DNA sequencing instrument.
- Purchase all required hardware upgrades within two months.
- Hold weekly progress review meetings with the core project team and the sponsor.
- Conduct thorough software testing per the approved test plans.

ROLES AND RESPONSIBILITIES

Name	Role	Position	Contact Information
Ahmed Abrams	Sponsor	CEO	aabrams@dnaconsulting.com
Nick Carson	Project Manager	Manager	ncarson@dnaconsulting.com
Susan Johnson	Team Member	DNA expert	sjohnson@dnaconsulting.com
Renyong Chi	Team Member	Testing expert	rchi@dnaconsulting.com
Erik Haus	Team Member	Programmer	ehaus@dnaconsulting.com
Bill Strom	Team Member	Programmer	bstrom@dnaconsulting.com
Maggie Elliot	Team Member	Programmer	melliot@dnaconsulting.com

Sign-off: (Signatures of all the above stakeholders)

Ahmed Abrams *Nick Carson*
Susan Johnson *Renyong Chi*
Erik Haus *Bill Strom*
Maggie Elliot

Comments: (Handwritten or typed comments from above stakeholders, if applicable)

"I want to be heavily involved in this project. It is crucial to our company's success, and I expect everyone to help make it succeed." —Ahmed Abrams

"The software test plans are complete and well documented. If anyone has questions, do not hesitate to contact me." —Renyong Chi

Project Management Plans

- A **project management plan** is a document used to coordinate all project planning documents and help guide a project's execution and control
- Plans created in the other knowledge areas are subsidiary parts of the overall project management plan

Common Elements of a Project Management Plan

- Introduction or overview of the project
- Description of how the project is organized
- Management and technical processes used on the project
- Work to be done, schedule, and budget information

Table 4-2. Sample Contents for a Software Project Management Plan (SPMP)

MAJOR SECTION HEADINGS	SECTION TOPICS
Overview	Purpose, scope, and objectives; assumptions and constraints; project deliverables; schedule and budget summary; evolution of the plan
Project Organization	External interfaces; internal structure; roles and responsibilities
Managerial Process Plan	Start-up plans (estimation, staffing, resource acquisition, and project staff training plans); work plan (work activities, schedule, resource, and budget allocation); control plan; risk management plan; closeout plan
Technical Process Plans	Process model; methods, tools, and techniques; infrastructure plan; product acceptance plan
Supporting Process Plans	Configuration management plan; verification and validation plan; documentation plan; quality assurance plan; reviews and audits; problem resolution plan; subcontractor management plan; process improvement plan

IEEE Standard 1058-1998.

What the Winners Do

"The winners clearly spell out what needs to be done in a project, by whom, when, and how. For this they use an integrated toolbox, including PM tools, methods, and techniques…If a scheduling template is developed and used over and over, it becomes a repeatable action that leads to higher productivity and lower uncertainty. Sure, using scheduling templates is neither a breakthrough nor a feat. But laggards exhibited almost no use of the templates. Rather, in constructing schedules their project managers started with a clean sheet, a clear waste of time."*

*Milosevic, Dragan and And Ozbay. "Delivering Projects: What the Winners Do." Proceedings of the Project Management Institute Annual Seminars & Symposium (November 2001).

Project Execution

- Project execution involves managing and performing the work described in the project management plan
- The majority of time and money is usually spent on execution
- The application area of the project directly affects project execution because the products of the project are produced during execution

Coordinating Planning and Execution

- Project planning and execution are intertwined and inseparable activities
- Those who will do the work should help to plan the work
- Project managers must solicit input from the team to develop realistic plans

Providing Leadership and a Supportive Culture

- Project managers must lead by example to demonstrate the importance of creating and then following good project plans
- Organizational culture can help project execution by:
  - Providing guidelines and templates
  - Tracking performance based on plans
- Project managers may still need to break the rules to meet project goals, and senior managers must support those actions

Important Skills for Project Execution

- General management skills like leadership, communication, and political skills
- Product, business, and application area skills and knowledge
- Use of specialized tools and techniques

Project Execution Tools and Techniques

- **Expert judgment**: experts can help project managers and their teams make many decisions related to project execution
- **Project management information systems**: there are hundreds of project management software products available on the market today, and many organizations are moving toward powerful enterprise project management systems that are accessible via the Internet
- See the What Went Right? example of Kuala Lumpur's Integrated Transport Information System on p. 159

Monitoring and Controlling Project Work

- Changes are inevitable on most projects, so it's important to develop and follow a process to monitor and control changes
- Monitoring project work includes collecting, measuring, and disseminating performance information
- A **baseline** is the approved project management plan plus approved changes

Media Snapshot

- The 2002 Olympic Winter Games and Paralympics took five years to plan and cost more than $1.9 billion. PMI awarded the Salt Lake Organizing Committee (SLOC) the Project of the Year award for delivering world-class games.
- Four years before the Games began, the SLOC used a Primavera software-based system with a cascading color-coded WBS to integrate planning…The SLOC also used an Executive Roadmap, a one-page list of the top 100 Games-wide activities, to keep executives apprised of progress. Activities were tied to detailed project information within each department's schedule. A 90-day highlighter showed which managers were accountable for each integrated activity.
- Fraser Bullock, SLOC Chief Operating Officer and Chief, said, "We knew when we were on and off schedule and where we had to apply additional resources. The interrelation of the functions meant they could not run in isolation—it was a smoothly running machine."*

*Foti, Ross, "The Best Winter Olympics, Period," PM Network (January 2004) 23.

Integrated Change Control

- Three main objectives are:
  - Influencing the factors that create changes to ensure that changes are beneficial
  - Determining that a change has occurred
  - Managing actual changes as they occur

Change Control on Information Technology Projects

- Former view: the project team should strive to do exactly what was planned on time and within budget
- Problem: stakeholders rarely agreed up-front on the project scope, and time and cost estimates were inaccurate
- Modern view: project management is a process of constant communication and negotiation
- Solution: changes are often beneficial, and the project team should plan for them

Change Control System

- A formal, documented process that describes when and how official project documents and work may be changed
- Describes who is authorized to make changes and how to make them

Change Control Board (CCB)

- A formal group of people responsible for approving or rejecting changes on a project
- CCBs provide guidelines for preparing change requests, evaluate change requests, and manage the implementation of approved changes
- Includes stakeholders from the entire organization

Making Timely Changes

- Some CCBs only meet occasionally, so it may take too long for changes to occur
- Some organizations have policies in place for time-sensitive changes
  - "48-hour policy" allows project team members to make decisions; then they have 48 hours to reverse the decision pending senior management approval
  - Delegate changes to the lowest level possible, but keep everyone informed of changes

Configuration Management

- Ensures that the descriptions of the project's products are correct and complete
- Involves identifying and controlling the functional and physical design characteristics of products and their support documentation
- Configuration management specialists identify and document configuration requirements, control changes, record and report changes, and audit the products to verify conformance to requirements
- See www.icmhq.com for more information

Table 4-3. Suggestions for Performing Integrated Change Control

View project management as a process of constant communication and negotiation.
Plan for change.
Establish a formal change control system, including a change control board (CCB).
Use effective configuration management.
Define procedures for making timely decisions on smaller changes.
Use written and oral performance reports to help identify and manage change.
Use project management and other software to help manage and communicate changes.
Focus on leading the project team and meeting overall project goals and expectations.

Closing Projects and Phases

- To close a project or phase, you must finalize all activities and transfer the completed or cancelled work to the appropriate people
- Main outputs include:
  - Final product, service, or result transition
  - Organizational process asset updates

Using Software to Assist in Project Integration Management

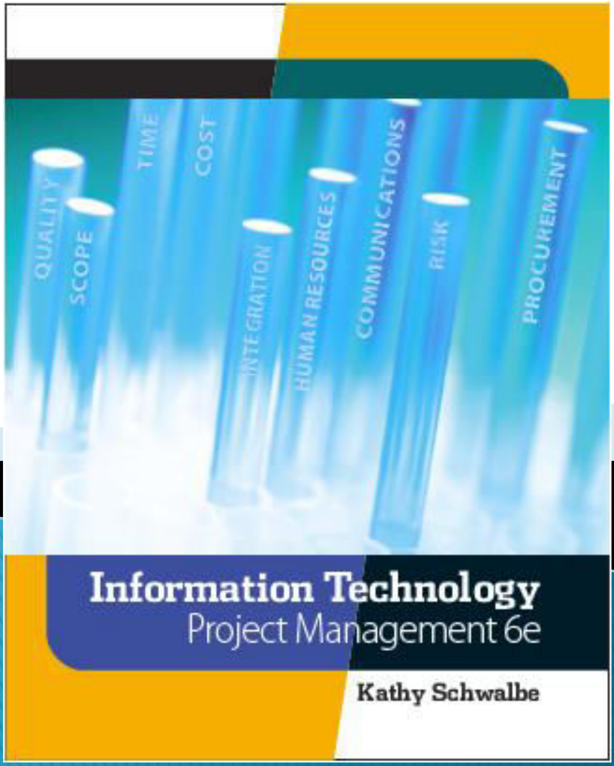
- Several types of software can be used to assist in project integration management
  - Documents can be created with word processing software
  - Presentations are created with presentation software
  - Tracking can be done with spreadsheets or databases
  - Communication software like e-mail and Web authoring tools facilitate communications
  - Project management software can pull everything together and show detailed and summarized information
  - **Business Service Management** (BSM) tools track the execution of business process flows

Chapter Summary

- Project integration management involves coordinating all of the other knowledge areas throughout a project's life cycle
- Main processes include:
  - Develop project charter
  - Develop project management plan
  - Direct and manage project execution
  - Monitor and control project work
  - Perform integrated change control
  - Close the project or phase

Chapter 5: Project Scope Management

Information Technology Project Management, Sixth Edition



Note: See the text itself for full citations.

Learning Objectives

- Understand the importance of good project scope management
- Discuss methods for collecting and documenting requirements in order to meet stakeholder needs and expectations
- Explain the scope definition process and describe the contents of a project scope statement
- Discuss the process for creating a work breakdown structure using the analogy, top-down, bottom-up, and mind-mapping approaches

Learning Objectives (continued)

- Explain the importance of verifying scope and how it relates to defining and controlling scope
- Understand the importance of controlling scope and approaches for preventing scope-related problems on information technology projects
- Describe how software can assist in project scope management

What is Project Scope Management?

- **Scope** refers to *all* the work involved in creating the products of the project and the processes used to create them
- A **deliverable** is a product produced as part of a project, such as hardware or software, planning documents, or meeting minutes
- Project scope management includes the processes involved in defining and controlling what is or is not included in a project

Project Scope Management Processes

- **Collecting requirements**: defining and documenting the features and functions of the products produced during the project as well as the processes used for creating them
- **Defining scope**: reviewing the project charter, requirements documents, and organizational process assets to create a scope statement
- **Creating the WBS**: subdividing the major project deliverables into smaller, more manageable components
- **Verifying scope**: formalizing acceptance of the project deliverables
- **Controlling scope**: controlling changes to project scope throughout the life of the project

Figure 5-1. Project Scope Management Summary

Planning
Process: **Collect requirements**
Outputs: Requirements documentation, requirements management plan, requirements traceability matrix
Process: **Define scope**
Outputs: Project scope statement, project document updates
Process: **Create WBS**
Outputs: WBS, WBS dictionary, scope baseline, project document update

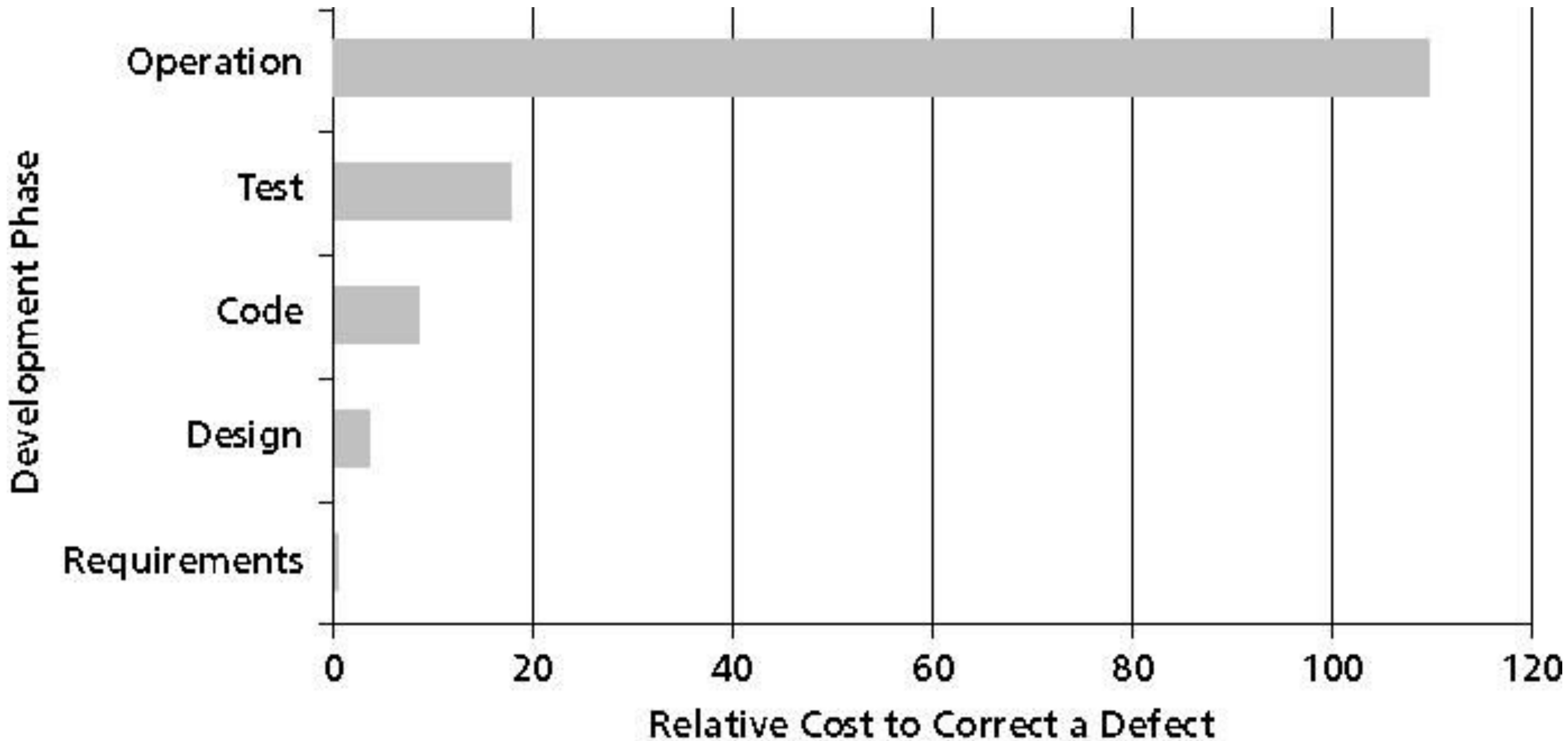
Monitoring and Controlling
Process: **Verify scope**
Outputs: Accepted deliverables, change requests, project document updates
Process: **Control Scope**
Outputs: Work performance measurements, organizational process assets updates, change requests, project management plan updates, project document updates

Project Start **Project Finish**

Collecting Requirements

- A **requirement** is "a condition or capability that must be met or possessed by a system, product, service, result, or component to satisfy a contract, standard, specification, or other formal document" (PMBOK® Guide, 2008)
- For some IT projects, it is helpful to divide requirements development into categories called elicitation, analysis, specification, and validation
- It is important to use an iterative approach to defining requirements since they are often unclear early in a project

Figure 5-2. Relative Cost to Correct a Software Requirement Defect



Source: Robert B. Grady, "An Economic Release Decision Model: Insights into Software Project Management." *Proceedings of the Applications of Software Measurement Conference* (Orange Park, FL: Software Quality Engineering, 1999), pp.227–239.

Methods for Collecting Requirements

- Interviewing
- Focus groups and facilitated workshops
- Using group creativity and decision-making techniques
- Questionnaires and surveys
- Observation
- Prototyping
- Software tools

What Went Right?

- Genesys Telecommunications Laboratories uses Accept software, a product planning and innovation management application and winner of the Excellence in Product Management Award from 2006–2008
- Accept helps them instill a consistent, repeatable, and predictable process for new product definition and development
- They can define what information comprises a requirement and enforce discipline around that process

Documenting Requirements

- Requirements documents are often generated by software and include text, images, diagrams, videos, and other media; they are often broken down into different categories such as functional, service, performance, quality, training requirements, and so on
- A **requirements management plan** describes how project requirements will be analyzed, documented, and managed
- A **requirements traceability matrix (RTM)** is a table that lists requirements, various attributes of each requirement, and the status of the requirements to ensure that all requirements are addressed

Table 5-1. Sample Requirements Traceability Matrix

Requirement No.	Name	Category	Source	Status
R32	Laptop memory	Hardware	Project charter and corporate laptop specifications	Complete. Laptops ordered meet requirement by having 4GB of memory.

Defining Scope

- Key inputs for preparing the project scope statement include the project charter, requirements documentation, and organizational process assets such as policies and procedures related to scope statements as well as project files and lessons learned from previous, similar projects
- As time progresses, the scope of a project should become more clear and specific

Table 5-3. Further Defining Project Scope

Project Charter:
Upgrades may affect servers . . . (listed under Project Objectives)
Project Scope Statement, Version 1:
Servers: If additional servers are required to support this project, they must be compatible with existing servers. If it is more economical to enhance existing servers, a detailed description of enhancements must be submitted to the CIO for approval. See current server specifications provided in Attachment 6. The CEO must approve a detailed plan describing the servers and their location at least two weeks before installation.
Project Scope Statement, Version 2:
Servers: This project will require purchasing ten new servers to support Web, network, database, application, and printing functions. Virtualization will be used to maximize efficiency. Detailed descriptions of the servers are provided in a product brochure in Appendix 8 along with a plan describing where they will be located.

Media Snapshot

- Many people enjoy watching television shows like *Trading Spaces*, where participants have two days and $1,000 to update a room in their neighbor's house; since the time and cost are set, it's the scope that has the most flexibility
- Although most homeowners are very happy with work done on the show, some are obviously disappointed; part of agreeing to be on the show includes signing a release statement acknowledging that you will accept whatever work has been done
- Too bad you can't get sponsors for most projects to sign a similar release form; it would make project scope management much easier!

Creating the Work Breakdown Structure (WBS)

- A **WBS** is a deliverable-oriented grouping of the work involved in a project that defines the total scope of the project
- WBS is a foundation document that provides the basis for planning and managing project schedules, costs, resources, and changes
- **Decomposition** is subdividing project deliverables into smaller pieces
- A **work package** is a task at the lowest level of the WBS

Figure 5-3. Sample Intranet WBS Organized by Product

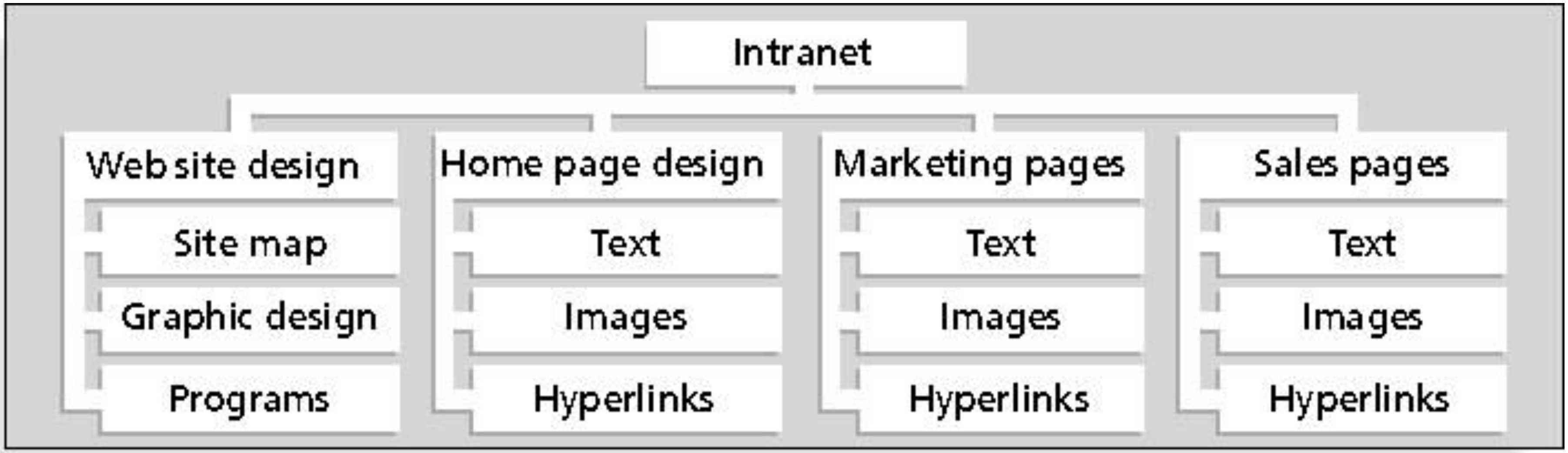
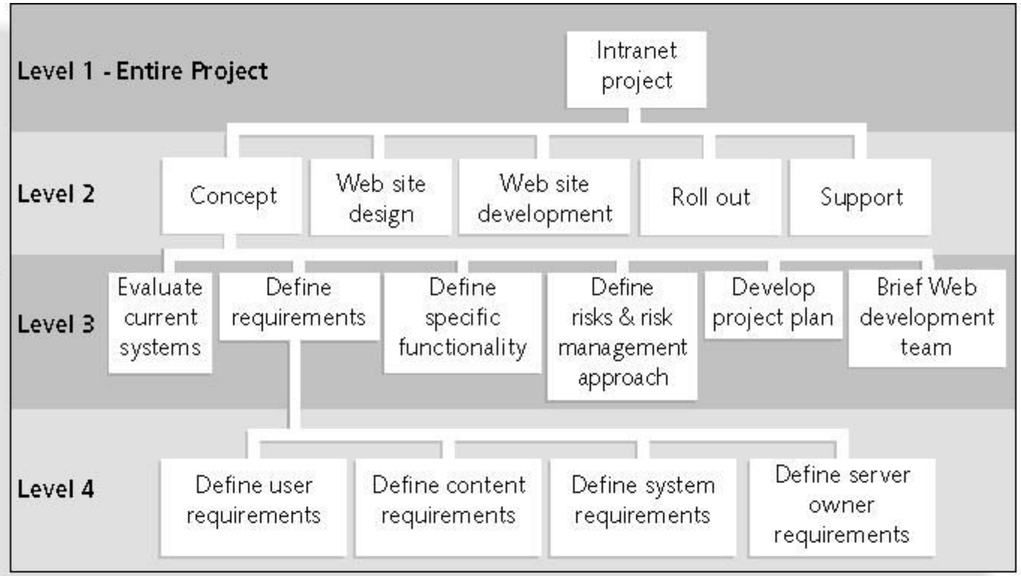


Figure 5-4. Sample Intranet WBS Organized by Phase

Chart form



Tabular form with Microsoft Project numbering

1.0 Concept
- 1.1 Evaluate current systems
- 1.2 Define requirements
  - 1.2.1 Define user requirements
  - 1.2.2 Define content requirements
  - 1.2.3 Define system requirements
  - 1.2.4 Define server owner requirements
- 1.3 Define specific functionality
- 1.4 Define risks and risk management approach
- 1.5 Develop project plan
- 1.6 Brief Web development team

2.0 Web site design
3.0 Web site development
4.0 Roll out
5.0 Support

Tabular form with PMI numbering

1.1 Concept
- 1.1.1 Evaluate current systems
- 1.1.2 Define requirements
  - 1.1.2.1 Define user requirements
  - 1.1.2.2 Define content requirements
  - 1.1.2.3 Define system requirements
  - 1.1.2.4 Define server owner requirements
- 1.1.3 Define specific functionality
- 1.1.4 Define risks and risk management approach
- 1.1.5 Develop project plan
- 1.1.6 Brief Web development team

1.2 Web site design
1.3 Web site development
1.4 Roll out
1.5 Support

Figure 5-5. Intranet WBS and Gantt Chart in Microsoft Project

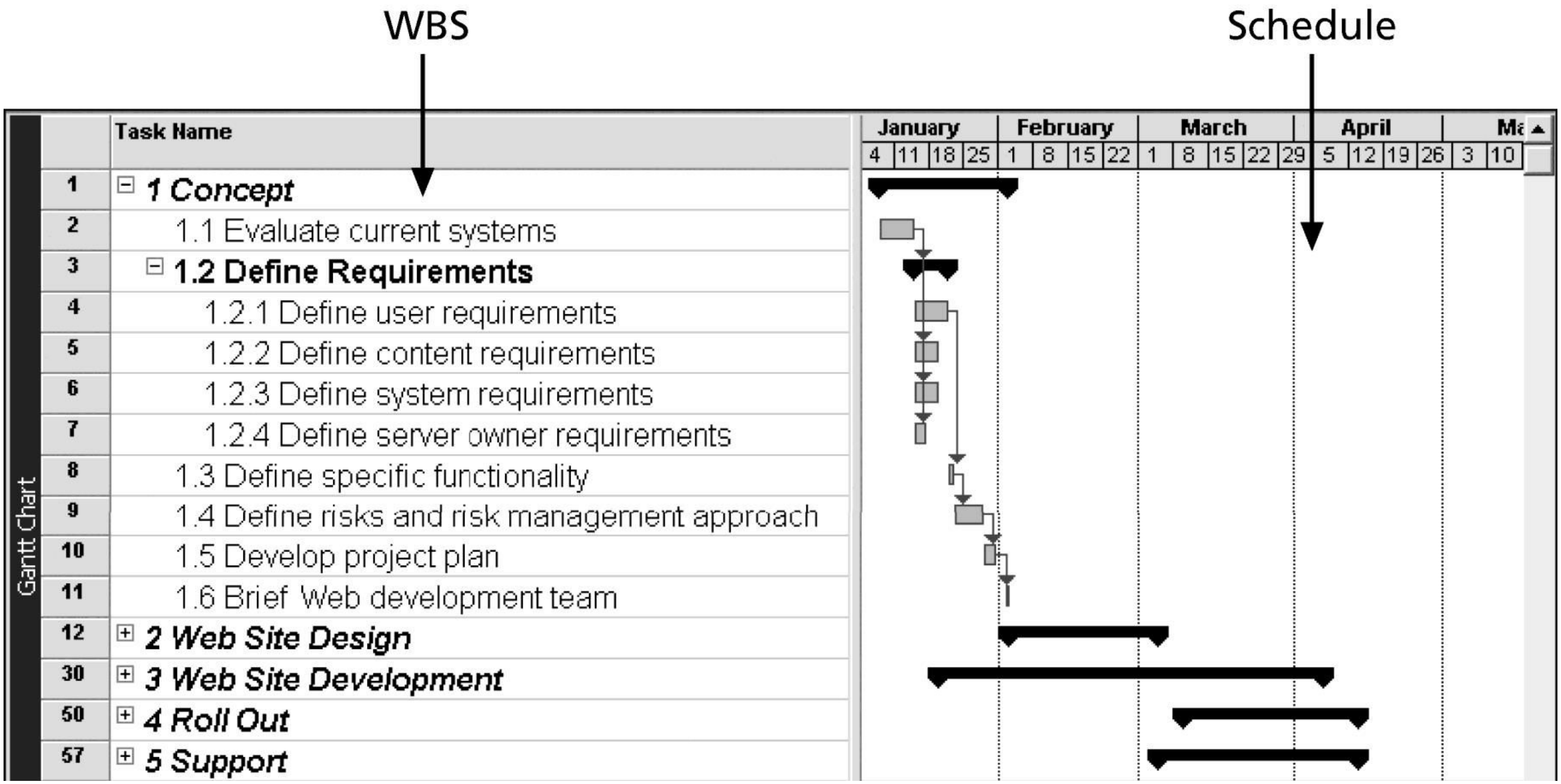


Figure 5-6. Intranet Gantt Chart Organized by Project Management Process Groups

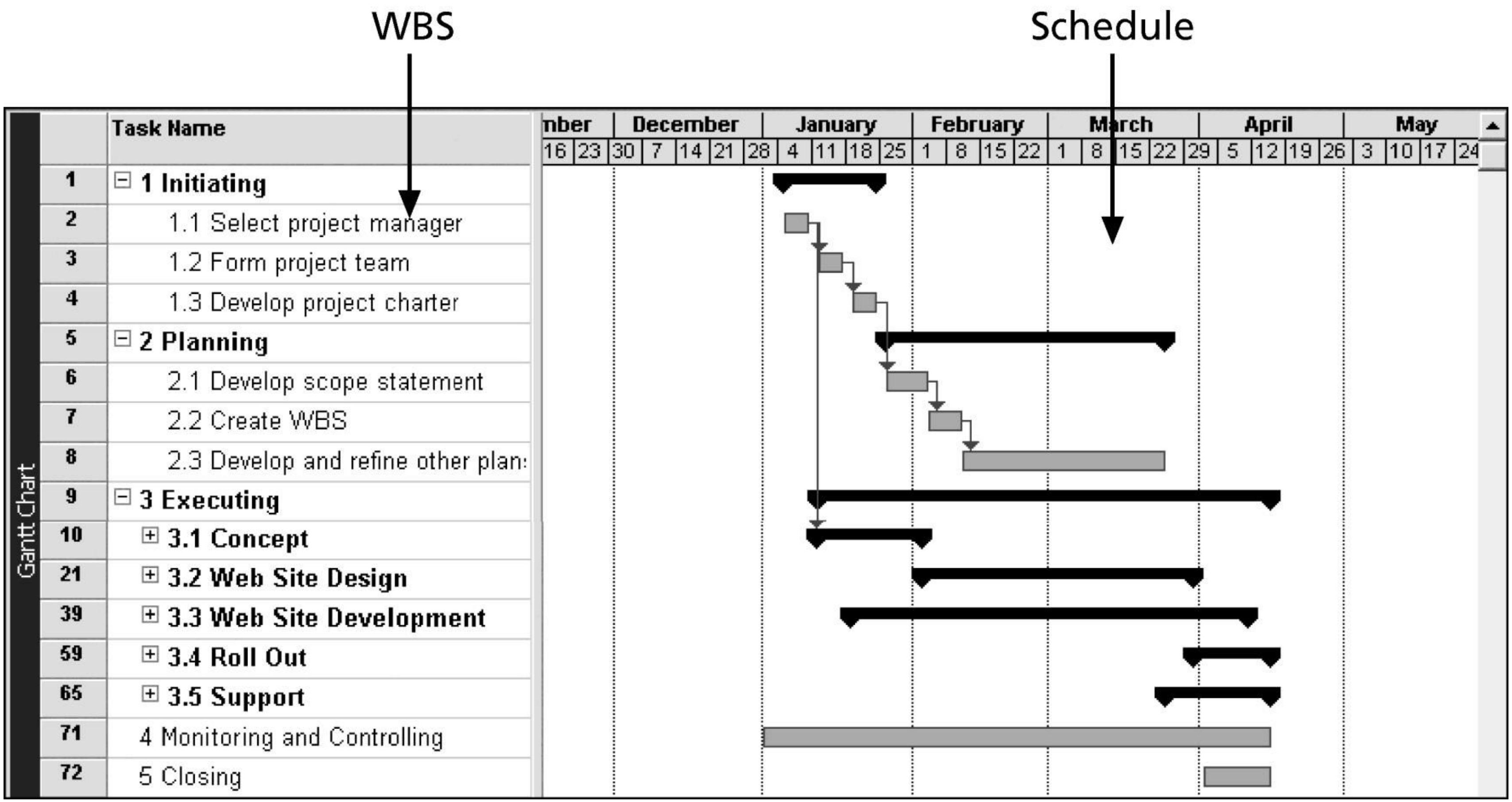


Table 5-4. Executing Tasks for JWD Consulting's WBS

- 3.0 Executing
  - 3.1 Survey
  - 3.2 User inputs
  - 3.3 Intranet site content
    - 3.3.1 Templates and Tools
    - 3.3.2 Articles
    - 3.3.3 Links
    - 3.3.4 Ask the Expert
    - 3.3.5 User requests feature
  - 3.4 Intranet site design
  - 3.5 Intranet site construction
  - 3.6 Site testing
  - 3.7 Site promotion
  - 3.8 Site roll out
  - 3.9 Project benefits measurement

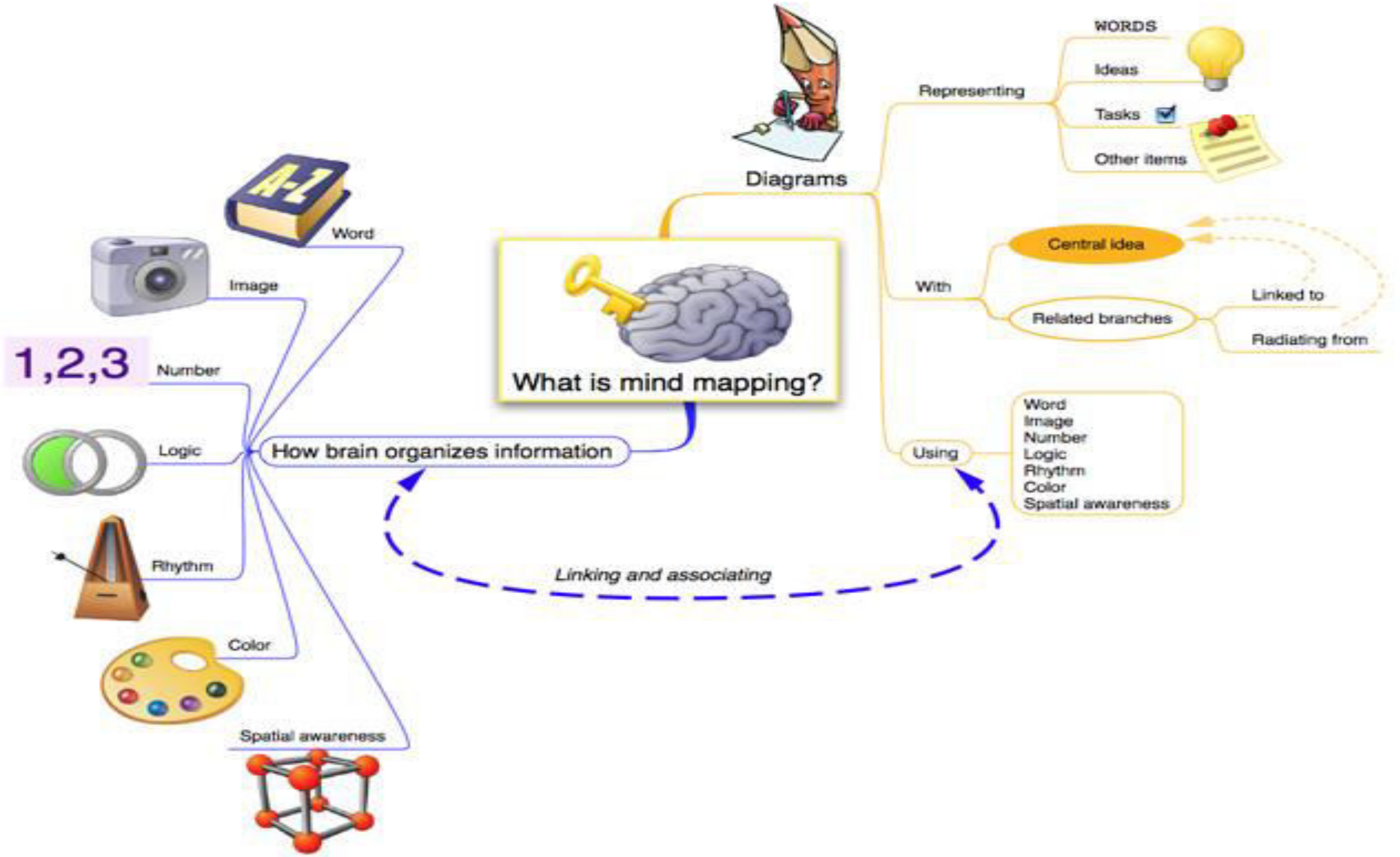
Approaches to Developing WBSs

- Using guidelines: some organizations, like the DOD, provide guidelines for preparing WBSs
- The **analogy approach**: review WBSs of similar projects and tailor to your project
- The **top-down approach**: start with the largest items of the project and break them down
- The **bottom-up approach**: start with the specific tasks and roll them up
- Mind-mapping approach: **mind mapping** is a technique that uses branches radiating out from a core idea to structure thoughts and ideas

Mind Mapping

- Mind Mapping is a way of creating pictures that show ideas in the same way that they are represented in your brain.
- Your brain uses words, pictures, numbers, logic, rhythm, color and spatial awareness to build up unique pictures of information.
- The ideas are linked together in a way that makes it easy to understand and remember.
- http://www.novamind.com/mind-mapping/
- http://www.youtube.com/watch?v=MlabrWv25qQ

Mind Mapping



Mind Mapping

- Use just key words, or wherever possible images.
- Start from the center of the page and work out.
- Make the center a clear and strong visual image that depicts the general theme of the map.
- Create sub-centers for sub-themes.
- Put key words **on** lines. This reinforces structure of notes.
- Print rather than write in script. It makes them more readable and memorable. Lower case is more visually distinctive (and better remembered) than upper case.
- Use color to depict themes, associations and to make things stand out.
- Anything that **stands out** on the page will stand out in your mind.
- Think three-dimensionally.
- Use arrows, icons or other visual aids to show links between different elements.
- Don't get stuck in one area. If you dry up in one area go to another branch.
- Put ideas down as they occur, wherever they fit. Don't judge or hold back.
- Break boundaries. If you run out of space, don't start a new sheet; paste more paper onto the map. (Break the 8x11 mentality.)
- Be creative. Creativity aids memory.
- From http://www.peterrussell.com/MindMaps/HowTo.php

Figure 5-7. Sample Mind-Mapping Approach for Creating a WBS

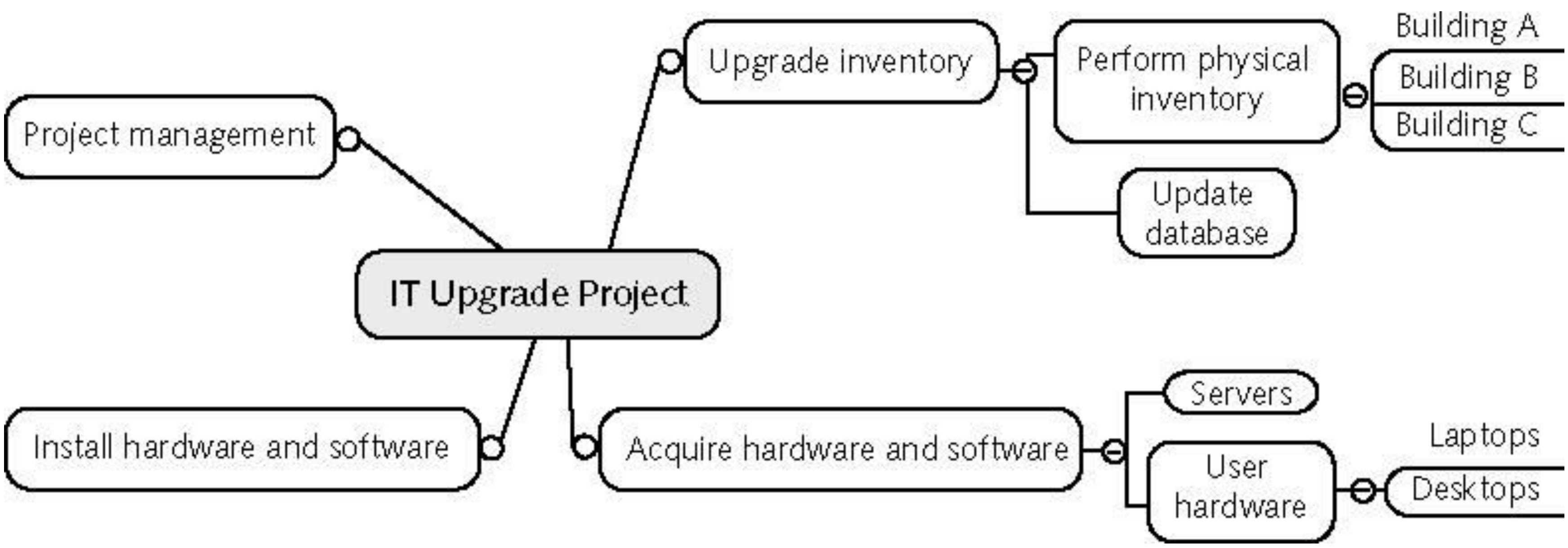
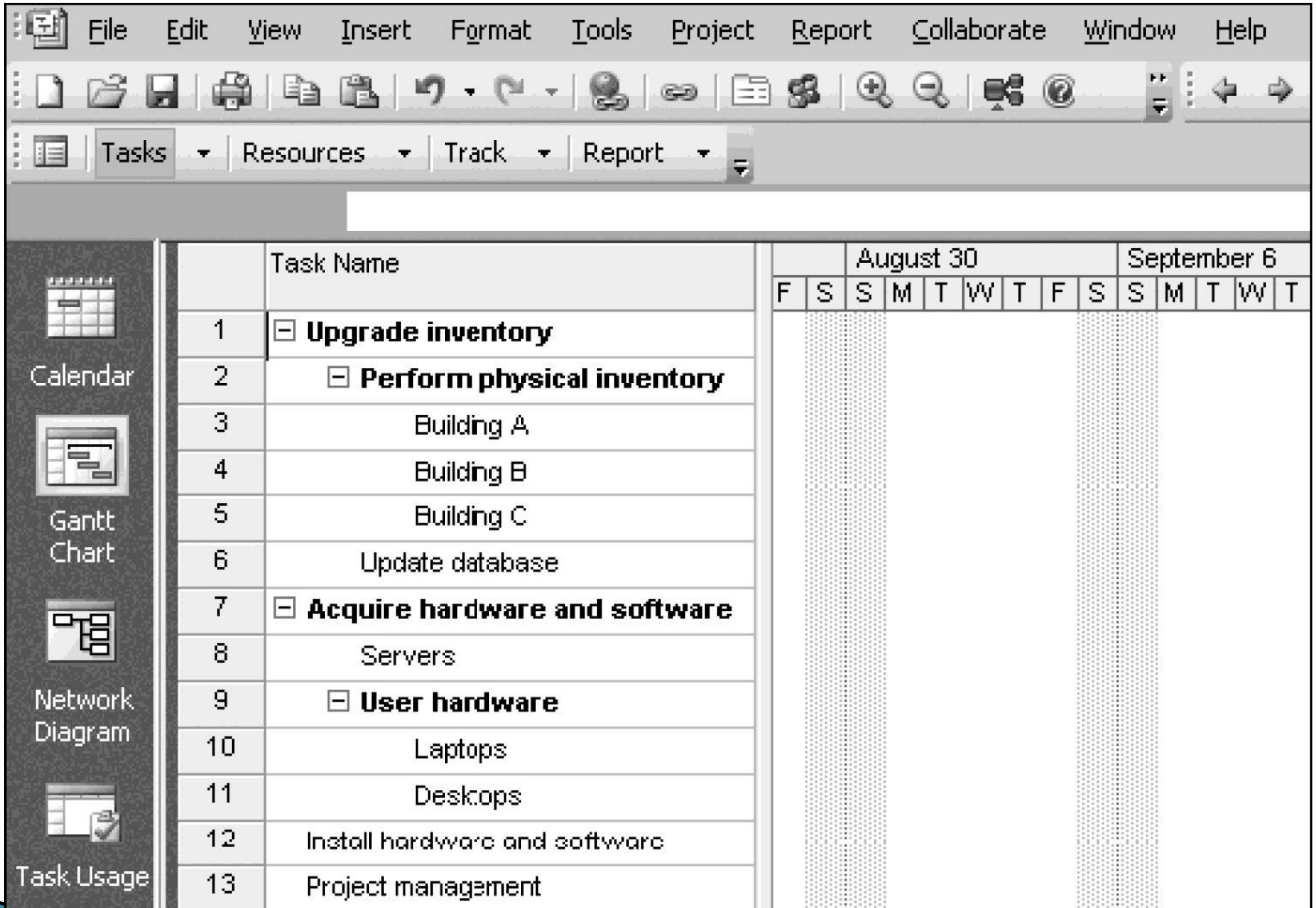


Figure 5-8. Project 2007 File with WBS Generated from a Mind Map



The WBS Dictionary and Scope Baseline

- Many WBS tasks are vague and must be explained more so people know what to do and can estimate how long it will take and what it will cost to do the work
- A **WBS dictionary** is a document that describes detailed information about each WBS item
- The approved project scope statement and its WBS and WBS dictionary form the **scope baseline**, which is used to measure performance in meeting project scope goals

Advice for Creating a WBS and WBS Dictionary

- A unit of work should appear at only one place in the WBS
- The work content of a WBS item is the sum of the WBS items below it
- A WBS item is the responsibility of only one individual, even though many people may be working on it
- The WBS must be consistent with the way in which work is actually going to be performed; it should serve the project team first and other purposes only if practical

Advice for Creating a WBS and WBS Dictionary (continued)

- Project team members should be involved in developing the WBS to ensure consistency and buy-in
- Each WBS item must be documented in a WBS dictionary to ensure accurate understanding of the scope of work included and not included in that item
- The WBS must be a flexible tool to accommodate inevitable changes while properly maintaining control of the work content in the project according to the scope statement

What Went Wrong?

- A project scope that is too broad and grandiose can cause severe problems
  - Scope creep and an overemphasis on technology for technology's sake resulted in the bankruptcy of a large pharmaceutical firm, Texas-based FoxMeyer Drug
  - In 2001, McDonald's fast-food chain initiated a project to create an intranet that would connect its headquarters with all of its restaurants to provide detailed operational information in real time; after spending $170 million on consultants and initial implementation planning, McDonald's realized that the project was too much to handle and terminated it

Verifying Scope

- It is very difficult to create a good scope statement and WBS for a project
- It is even more difficult to verify project scope and minimize scope changes
- **Scope verification** involves formal acceptance of the completed project scope by the stakeholders
- Acceptance is often achieved by a customer inspection and then sign-off on key deliverables

Controlling Scope

- Scope control involves controlling changes to the project scope
- Goals of scope control are to:
  - Influence the factors that cause scope changes
  - Assure changes are processed according to procedures developed as part of integrated change control
  - Manage changes when they occur
- **Variance** is the difference between planned and actual performance

Best Practices for Avoiding Scope Problems

1. Keep the scope realistic. Don't make projects so large that they can't be completed. Break large projects down into a series of smaller ones.
2. Involve users in project scope management. Assign key users to the project team and give them ownership of requirements definition and scope verification.
3. Use off-the-shelf hardware and software whenever possible. Many IT people enjoy using the latest and greatest technology, but business needs, not technology trends, must take priority.
4. Follow good project management processes. As described in this chapter and others, there are well-defined processes for managing project scope and others aspects of projects.

Suggestions for Improving User Input

- Develop a good project selection process and insist that sponsors are from the user organization
- Have users on the project team in important roles
- Have regular meetings with defined agendas, and have users sign off on key deliverables presented at meetings
- Deliver something to users and sponsors on a regular basis
- Don't promise to deliver when you know you can't
- Co-locate users with developers

Suggestions for Reducing Incomplete and Changing Requirements

- Develop and follow a requirements management process
- Use techniques such as prototyping, use case modeling, and JAD to get more user involvement
- Put requirements in writing and keep them current
- Create a requirements management database for documenting and controlling requirements

Suggestions for Reducing Incomplete and Changing Requirements (continued)

- Provide adequate testing and conduct testing throughout the project life cycle
- Review changes from a systems perspective
- Emphasize completion dates to help focus on what's most important
- Allocate resources specifically for handling change requests/enhancements like NWA did with ResNet

Using Software to Assist in Project Scope Management

- Word-processing software helps create several scope-related documents
- Spreadsheets help to perform financial calculations and weighted scoring models and to develop charts and graphs
- Communication software like e-mail and the Web help clarify and communicate scope information
- Project management software helps in creating a WBS, the basis for tasks on a Gantt chart
- Specialized software is available to assist in project scope management

Chapter Summary

- Project scope management includes the processes required to ensure that the project addresses all the work required, and only the work required, to complete the project successfully
- Main processes include:
  - Collect requirements
  - Define scope
  - Create WBS
  - Verify scope
  - Control scope

Chapter 6: Project Time Management

Information Technology Project Management, Sixth Edition

Note: See the text itself for full citations.

Learning Objectives

- Understand the importance of project schedules and good project time management
- Define activities as the basis for developing project schedules
- Describe how project managers use network diagrams and dependencies to assist in activity sequencing
- Understand the relationship between estimating resources and project schedules
- Explain how various tools and techniques help project managers perform activity duration estimating

Learning Objectives (continued)

- Use a Gantt chart for planning and tracking schedule information, find the critical path for a project, and describe how critical chain scheduling and the Program Evaluation and Review Technique (PERT) affect schedule development
- Discuss how reality checks and people issues are involved in controlling and managing changes to the project schedule
- Describe how project management software can assist in project time management and review words of caution before using this software

Importance of Project Schedules

- Managers often cite delivering projects on time as one of their biggest challenges
- 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

Individual Work Styles and Cultural Differences Cause Schedule Conflicts

- One dimension of the Meyers-Briggs Type Indicator focuses on peoples' attitudes toward structure and deadline
- Some people prefer to follow schedules and meet deadlines while others do not (J vs. P)
- Difference cultures and even entire countries have different attitudes about schedules

Media Snapshot

- In contrast to the 2002 Salt Lake City Winter Olympic Games (see Chapter 4's Media Snapshot), planning and scheduling was very different for the 2004 Summer Olympic Games held in Athens, Greece
- Many articles were written before the opening ceremonies predicting that the facilities would not be ready in time; many people were pleasantly surprised by the amazing opening ceremonies, beautiful new buildings, and state-of-the-art security and transportation systems in Athens
- The Greeks even made fun of critics by having construction workers pretend to still be working as the ceremonies began

Project Time Management Processes

- **Defining activities**: identifying the specific activities that the project team members and stakeholders must perform to produce the project deliverables
- **Sequencing activities**: identifying and documenting the relationships between project activities
- **Estimating activity resources**: estimating how many **resources** a project team should use to perform project activities
- **Estimating activity durations**: estimating the number of work periods that are needed to complete individual activities
- **Developing the schedule**: analyzing activity sequences, activity resource estimates, and activity duration estimates to create the project schedule
- **Controlling the schedule**: controlling and managing changes to the project schedule

Figure 6-1. Project Time Management Summary

Planning
Process: **Define activities**
Outputs: Activity list, activity attributes, milestone list
Process: **Sequence activities**
Outputs: Project schedule network diagrams, project document updates
Process: **Estimate activity resources**
Outputs: Activity resource requirements, resource breakdown structure, project document updates
Process: **Estimate activity durations**
Outputs: Activity duration estimates, project document updates
Process: **Develop schedule**
Outputs: Project schedule, schedule baseline, schedule data, project document updates

Monitoring and Controlling
Process: **Control schedule**
Outputs: Work performance measurements, organizational process assets updates, change requests, project management plan updates, project document updates

Project Start **Project Finish**

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 that normally has no duration
- It often takes several activities and a lot of work to complete a milestone
- They're useful tools for setting schedule goals and monitoring progress
- Examples include obtaining customer sign-off on key documents or completion of specific products

What Went Wrong?

- At the U.S. Federal Bureau of Investigation (FBI), poor time management was one of the reasons behind the failure of Trilogy, a "disastrous, unbelievably expensive piece of vaporware, which was more than four years in the (un)making. The system was supposed to enable FBI agents to integrate intelligence from isolated information silos within the Bureau."*
- In May 2006, the Government Accounting Agency said that the Trilogy project failed at its core mission of improving the FBI's investigative abilities and was plagued with missed milestones and escalating costs

*Roberts, Paul, "Frustrated contractor sentenced for hacking FBI to speed deployment," *InfoWorld Tech Watch, (July 6, 2006).*

Sequencing Activities

- Involves reviewing activities and determining dependencies
- A **dependency** or **relationship** is the sequencing of project activities or tasks
- You *must* determine dependencies in order to use critical path analysis

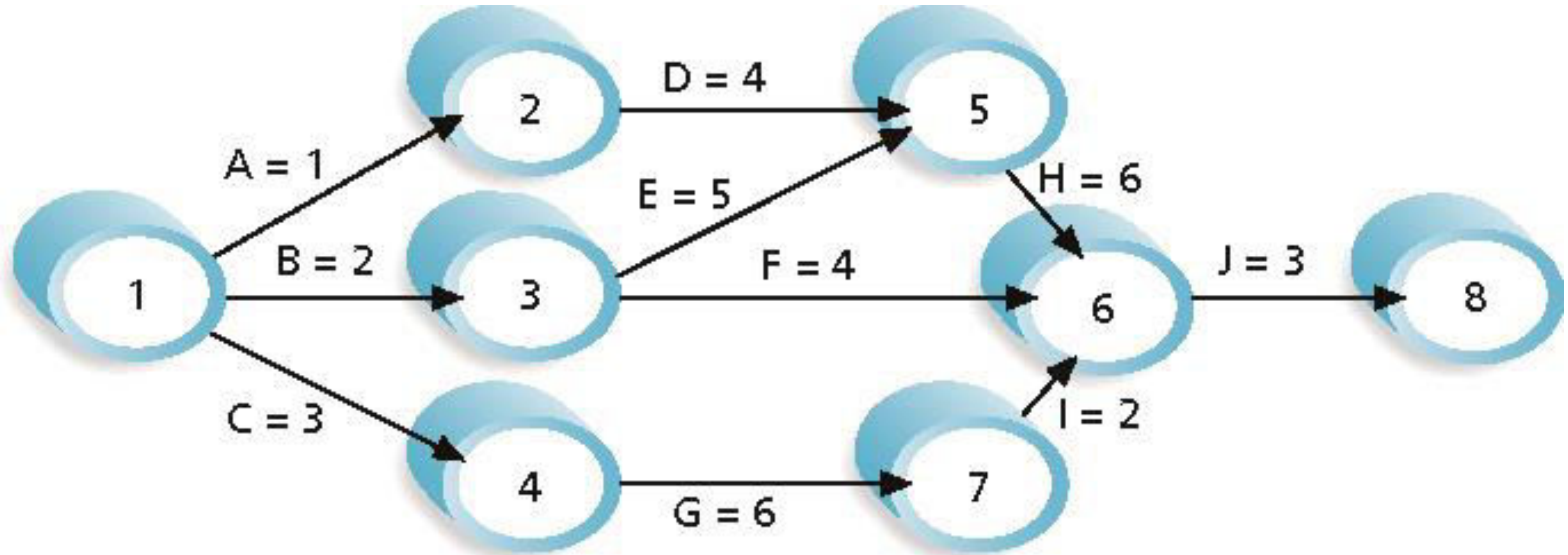
Three types of Dependencies

- **Mandatory dependencies**: inherent 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 schematic display of the logical relationships among, or sequencing of, project activities
- Two main formats are the arrow and precedence diagramming methods

Figure 6-2. Sample Activity-on-Arrow (AOA) Network Diagram for Project X



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

Arrow Diagramming Method (ADM)

- Also called activity-on-arrow (AOA) network diagrams
- Activities are represented by arrows
- Nodes or circles are the starting and ending points of activities
- Can only show finish-to-start dependencies

Process for Creating AOA Diagrams

1. Find all of 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 ADM method and used by project management software
- Better at showing different types of dependencies

Figure 6-3. Task Dependency Types

Task dependencies

The nature of the dependencies between linked tasks. You link tasks by defining a dependency between their finish and start dates. For example, the "Contact caterers" task must finish before the start of the "Determine menus" task. There are four kinds of task dependencies in Microsoft Project:

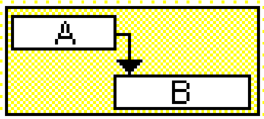
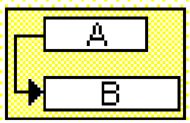
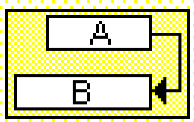
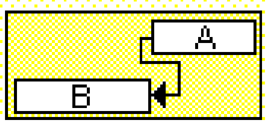
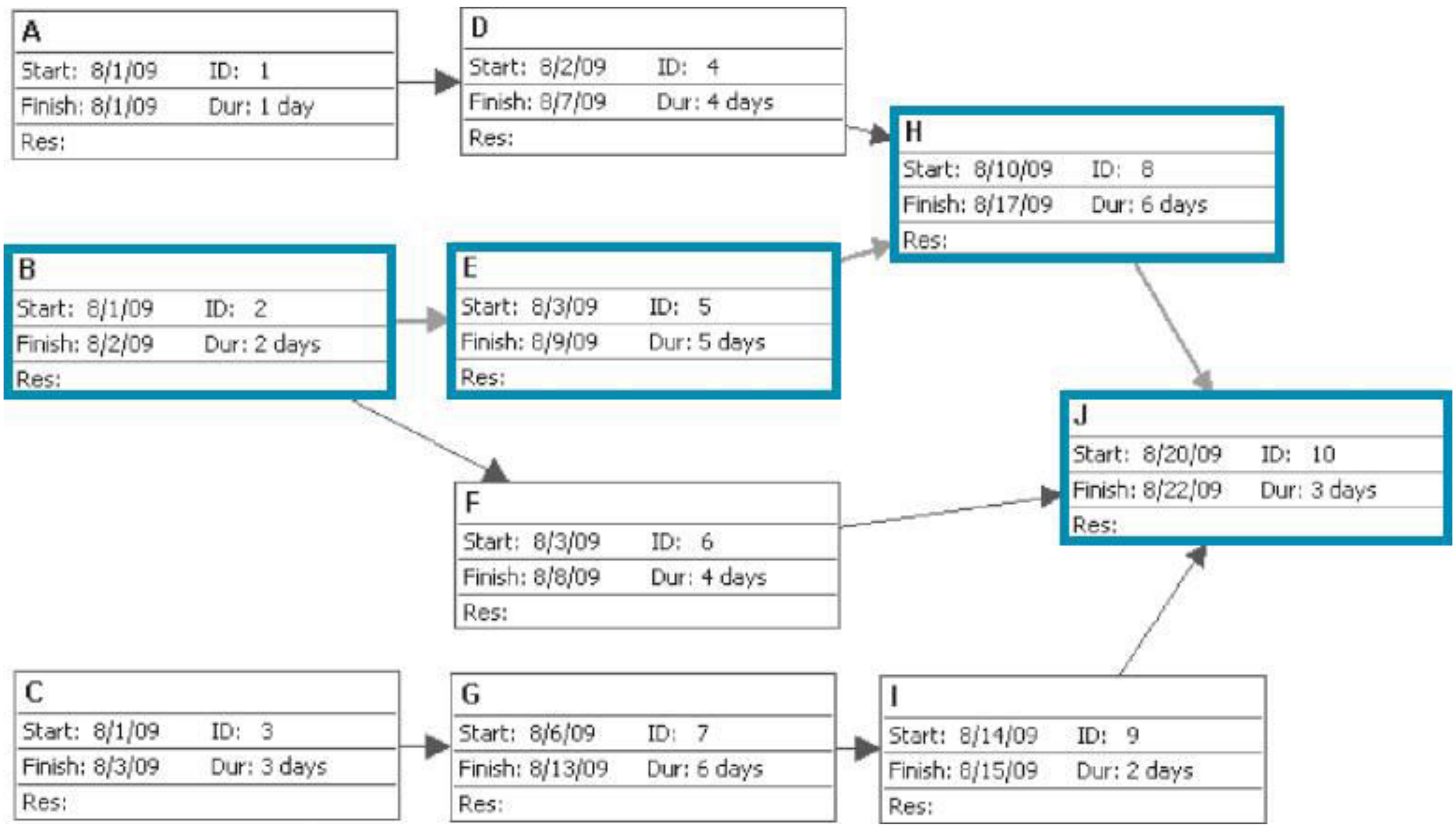
Task dependency	Example	Description
Finish-to-start (FS)		Task (B) cannot start until task (A) finishes.
Start-to-start (SS)		Task (B) cannot start until task (A) starts.
Finish-to-finish (FF)		Task (B) cannot finish until task (A) finishes.
Start-to-finish (SF)		Task (B) cannot finish until task (A)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

Figure 6-4. Sample PDM Network Diagram



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

Activity Duration Estimating

- **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
- People doing the work should help create estimates, and an expert should review them

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 and Monte Carlo simulations

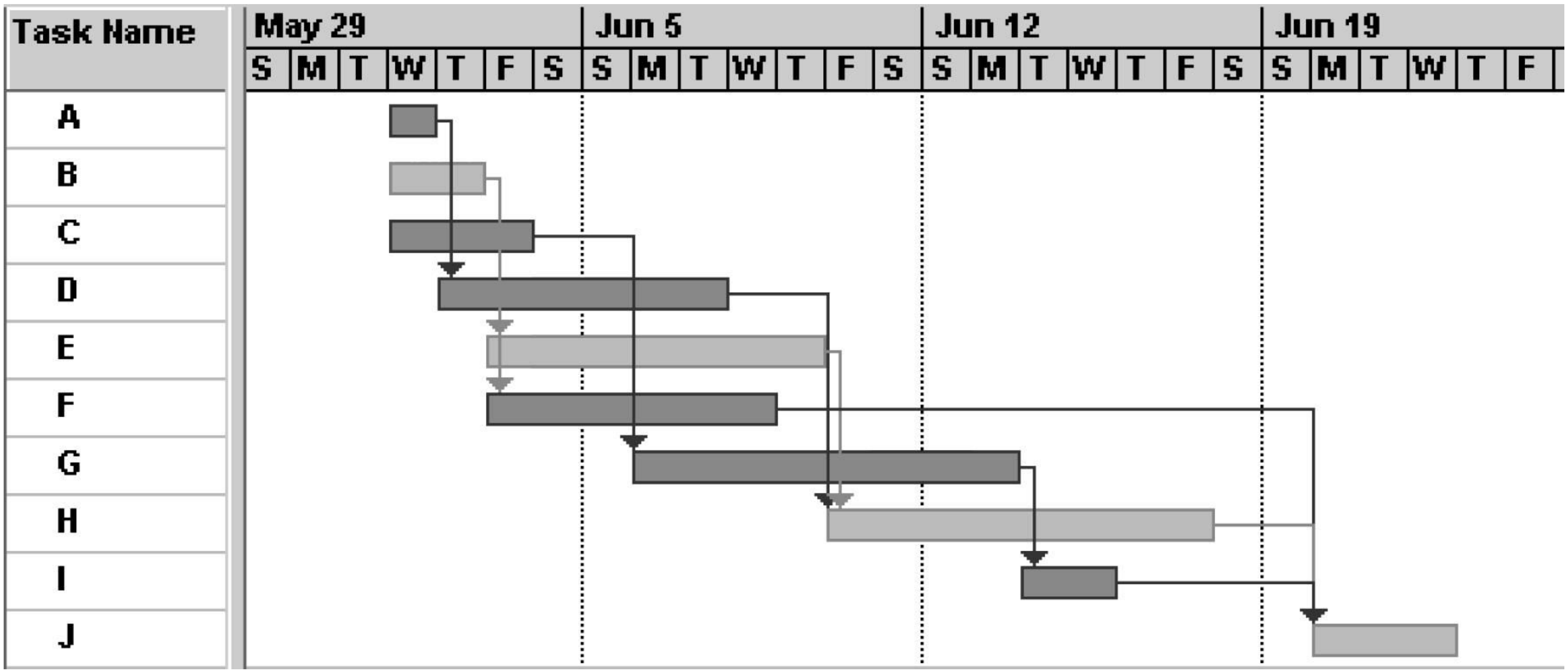
Developing the Schedule

- Uses results of the other time management processes to determine the start and end date 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, and critical chain scheduling, and PERT analysis

Gantt Charts

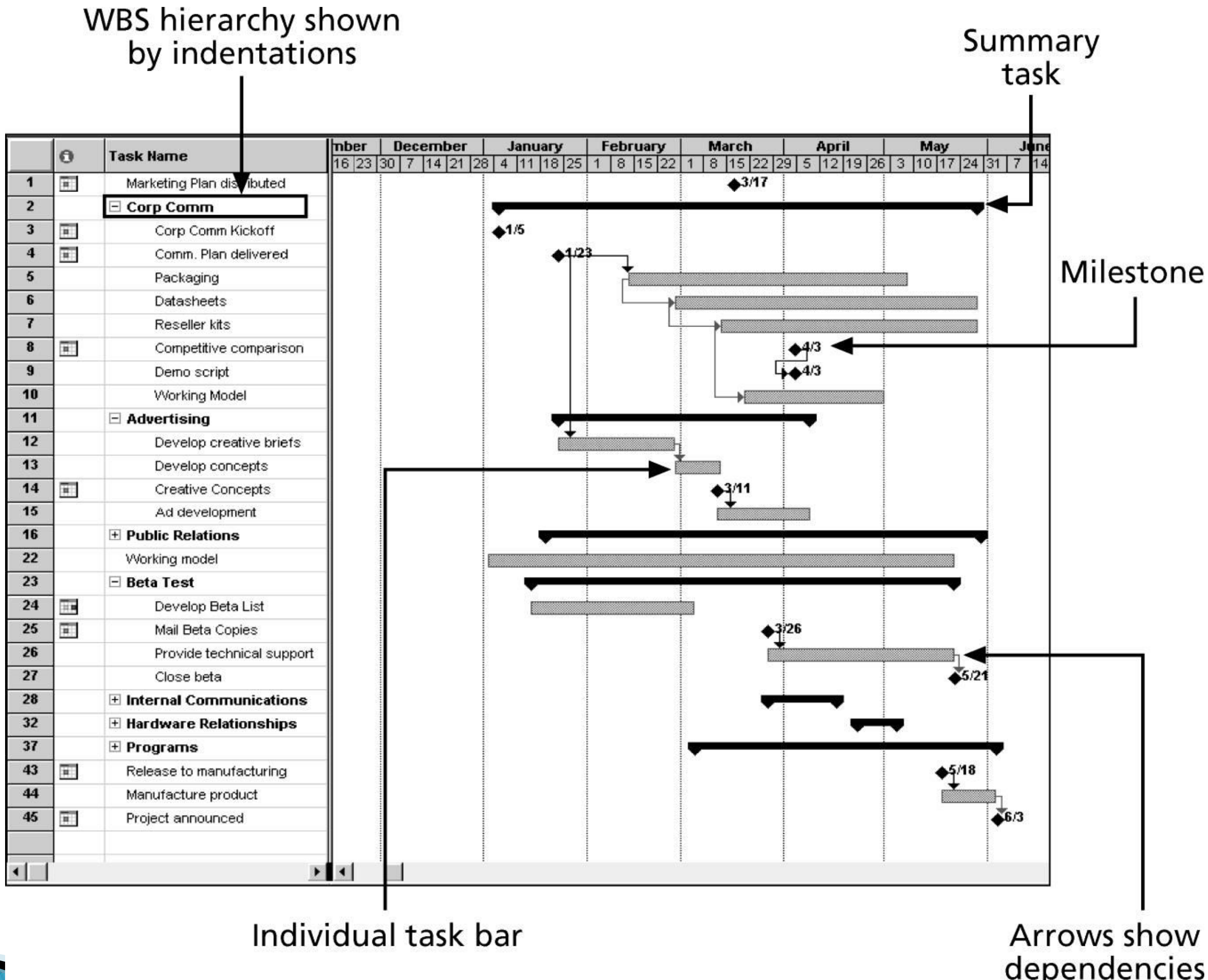
- **Gantt charts** provide a standard format for displaying project schedule information by listing project activities and their corresponding start and finish dates in a calendar format
- Symbols include:
  - Black diamonds: milestones
  - Thick black bars: summary tasks
  - Lighter horizontal bars: durations of tasks
  - Arrows: dependencies between tasks

Figure 6-5. Gantt Chart for Project X



Note: Darker bars would be red in Project 2007 to represent critical tasks.

Figure 6-6. 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

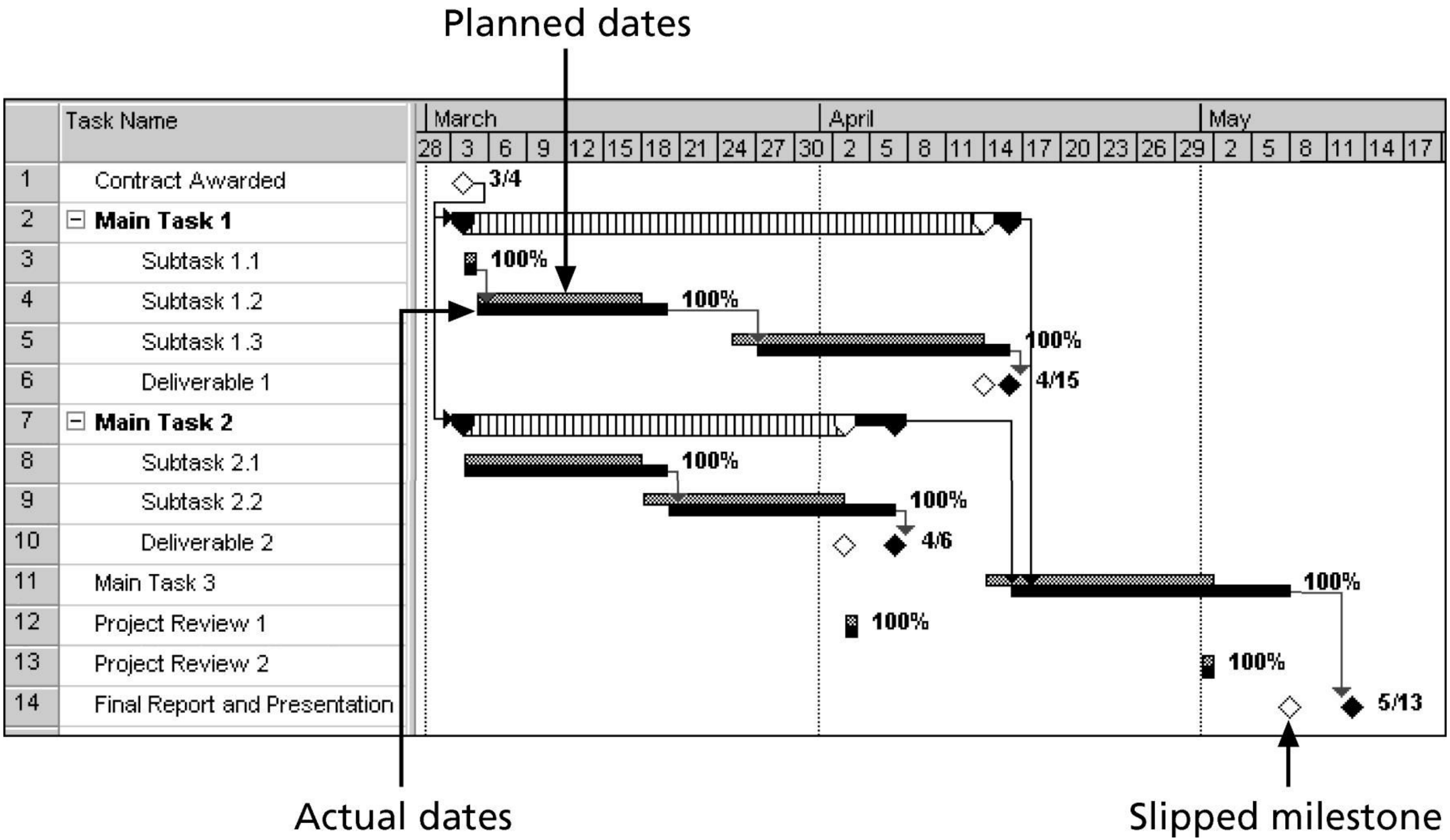
SMART Criteria

- Milestones should be:
  - **S**pecific
  - **M**easurable
  - **A**ssignable
  - **R**ealistic
  - **T**ime-framed

Best Practice

- Schedule risk is inherent in the development of complex systems. Luc Richard, the founder of www.projectmangler.com, suggests that project managers can reduce schedule risk through project milestones, a best practice that involves identifying and tracking significant points or achievements in the project. The five key points of using project milestones include the following:
  1. Define milestones early in the project and include them in the Gantt chart to provide a visual guide.
  2. Keep milestones small and frequent.
  3. The set of milestones must be all-encompassing.
  4. Each milestone must be binary, meaning it is either complete or incomplete.
  5. Carefully monitor the critical path.

Figure 6-7. Sample Tracking Gantt Chart



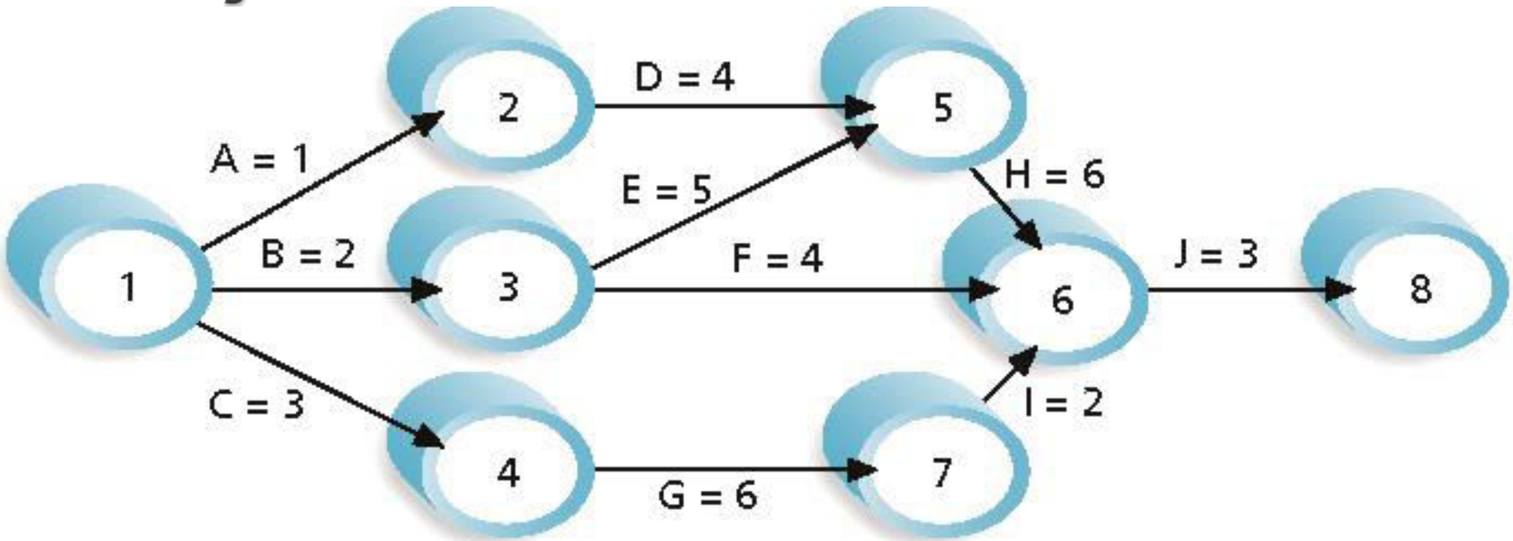
Critical Path Method (CPM)

- **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

- First 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

Figure 6-8. Determining the Critical Path for Project X



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.

More on the Critical Path

- A project team at Apple computer put a stuffed gorilla on the top of the cubicle of the person currently managing critical task
- The critical path is *not* the one with all the critical activities; it only accounts for time
  - Remember the example of ***growing grass*** being on the critical path for Disney's Animal Kingdom
- 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

Using Critical Path Analysis to Make Schedule Trade-offs

- **Free slack** or **free float** is the amount of time an activity can be delayed without delaying the early start of any immediately following activities
- **Total slack** or **total float** is the amount of time an activity may be delayed from its early start without delaying the planned project finish date
- A **forward pass** through the network diagram determines the early start and finish dates
- A **backward pass** determines the late start and finish dates

Figure 6-9. Calculating Early and Late Start and Finish Dates

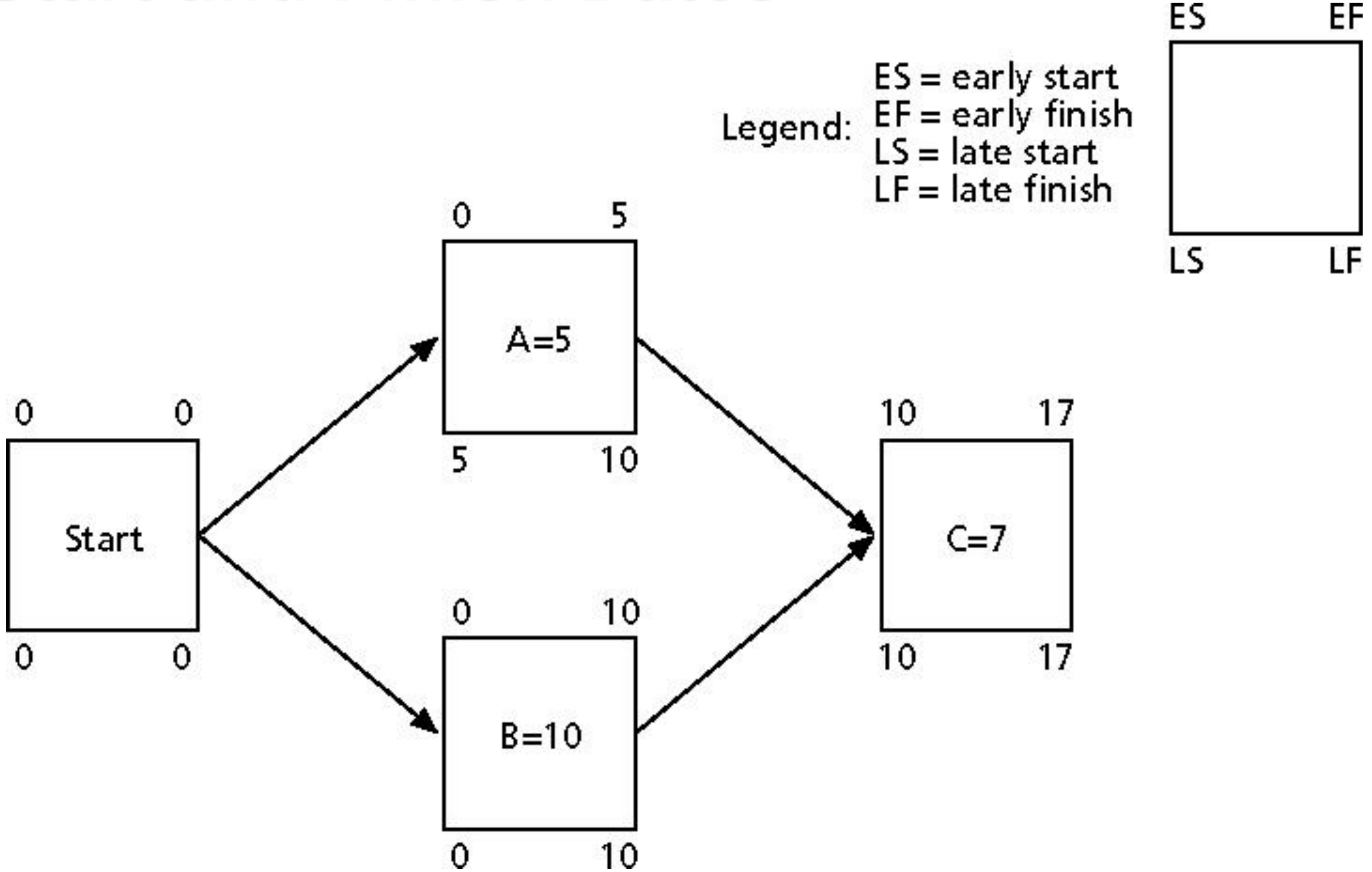


Table 6-1. Free and Total Float or Slack for Project X

Task Name	Start	Finish	Late Start	Late Finish	Free Slack	Total Slack
A	8/3/09	8/3/09	8/5/09	8/5/09	0d	2d
B	8/3/09	8/4/09	8/3/09	8/4/09	0d	0d
C	8/3/09	8/5/09	8/5/09	8/7/09	0d	2d
D	8/4/09	8/7/09	8/6/09	8/11/09	2d	2d
E	8/5/09	8/11/09	8/5/09	8/11/09	0d	0d
F	8/5/09	8/10/09	8/14/09	8/17/09	7d	7d
G	8/6/09	8/13/09	8/10/09	8/17/09	0d	2d
H	8/12/09	8/19/09	8/12/09	8/19/09	0d	0d
I	8/14/09	8/17/09	8/18/09	8/19/09	2d	2d
J	8/20/09	8/24/09	8/20/09	8/24/09	0d	0d

Using the Critical Path to Shorten a Project Schedule

- Three main techniques for shortening schedules
  - 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

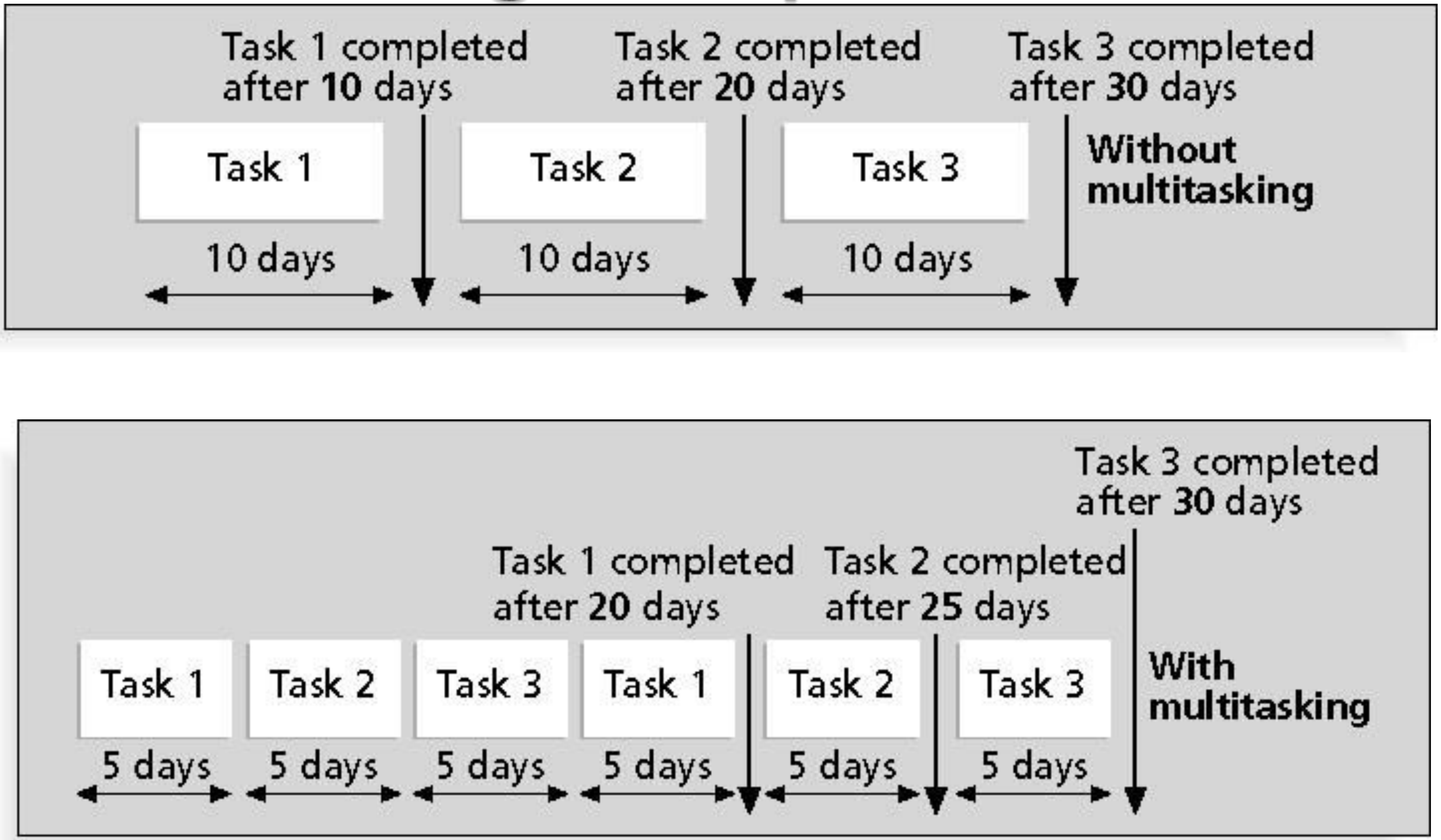
Importance of Updating Critical Path Data

- It is important to update project schedule information to meet time goals for a project
- The critical path may change as you enter actual start and finish dates
- If you know the project completion date will slip, negotiate with the project sponsor

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
- Uses the **Theory of Constraints (TOC)**
  - A management philosophy developed by Eliyahu M. Goldratt and introduced in his book *The Goal*
- Attempts to minimize **multitasking**
  - When a resource works on more than one task at a time

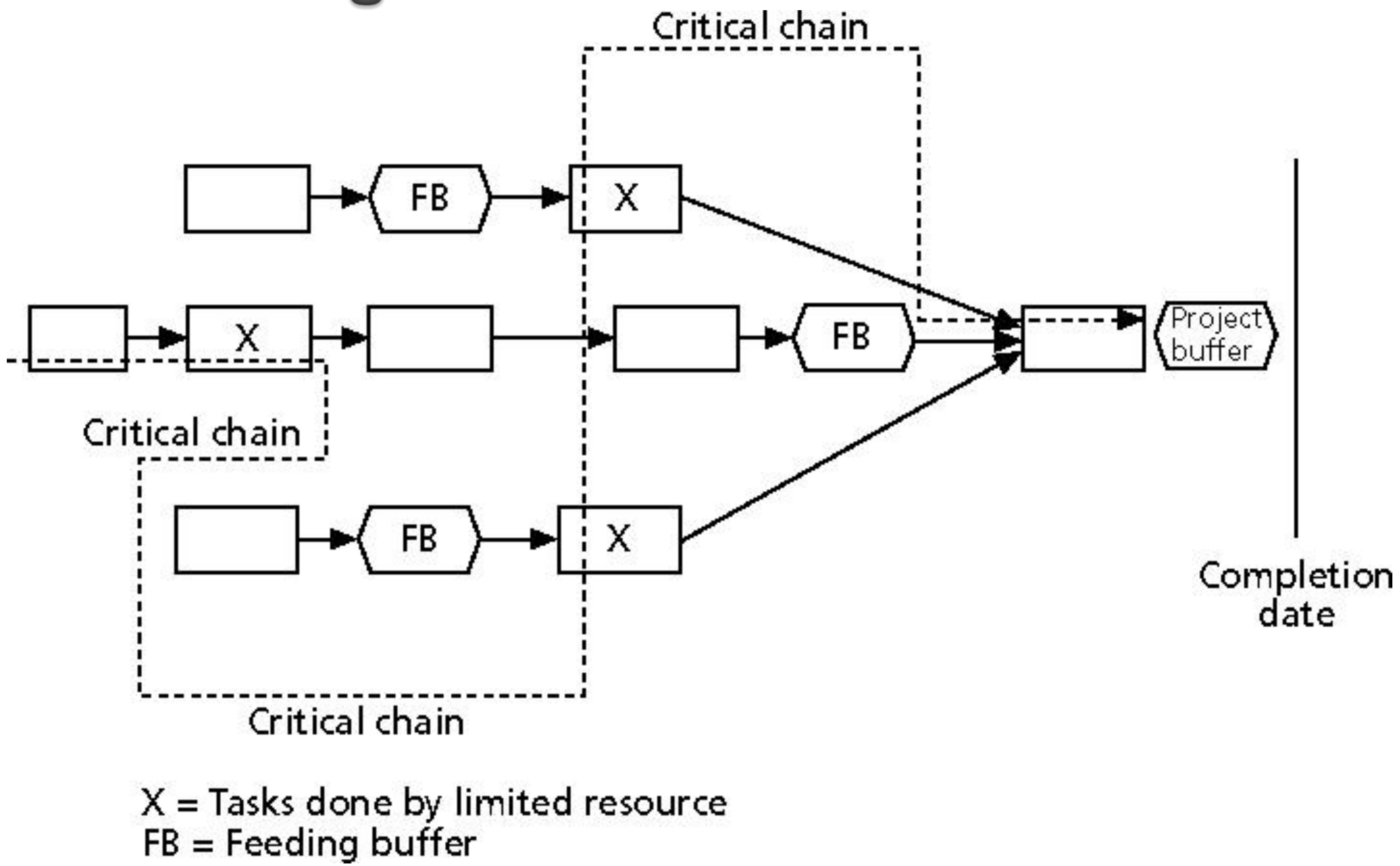
Figures 6-10a and 6-10b. Multitasking Example



Buffers and Critical Chain

- A **buffer** is additional time to complete a task
- **Murphy's Law** states that if something can go wrong, it will
- **Parkinson's Law** states that work expands to fill the time allowed
- 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:
  - **Project buffers** or additional time added before the project's due date
  - **Feeding buffers** or additional time added before tasks on the critical path

Figure 6-11. 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 **=**

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

- Example:

PERT weighted average =

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

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

Schedule Control 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

Controlling the Schedule

- Goals are to know the status of the schedule, influence factors that cause schedule changes, determine that the schedule has changed, and manage changes when they occur
- Tools and techniques include:
  - Progress reports
  - A schedule change control system
  - Project management software, including schedule comparison charts like the tracking Gantt chart
  - Variance analysis, such as analyzing float or slack
  - Performance management, such as earned value (Chapter 7)

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

Working with People Issues

- Strong leadership helps projects succeed more than good PERT charts
- Project managers should use:
  - Empowerment
  - Incentives
  - Discipline
  - Negotiation

What Went Right?

- Mittal Steel Poland earned Poland's Project Excellence Award in 2007 for implementing a SAP system
- Derek Prior, research director at AMR Research, identified three things the most successful SAP implementation projects do to deliver business benefits:
  - Form a global competence centre
  - Identify super-users for each location
  - Provide ongoing involvement of managers in business processes so they feel they own these processes

Using Software to Assist in Time Management

- Software for facilitating communications helps people exchange schedule-related information
- Decision support models help analyze trade-offs that can be made
- Project management software can help in various time management areas

Words of Caution on Using Project Management Software

- Many people misuse project management software because they don’t understand important concepts and have not had training
- You must enter dependencies to have dates adjust automatically and to determine the critical path
- You must enter actual schedule information to compare planned and actual progress

Chapter Summary

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

Chapter 7: Project Cost Management

Information Technology Project Management, Sixth Edition

Note: See the text itself for full citations.

Learning Objectives

- Understand the importance of project cost management
- Explain basic project cost management principles, concepts, and terms
- Discuss different types of cost estimates and methods for preparing them

Learning Objectives (continued)

- Understand the processes involved in cost budgeting and preparing a cost estimate and budget for an information technology project
- Understand the benefits of earned value management and project portfolio management to assist in cost control
- Describe how project management software can assist in project cost management

The Importance of Project Cost Management

- IT projects have a poor track record for meeting budget goals
- The CHAOS studies found the average cost **overrun** (the additional percentage or dollar amount by which actual costs exceed estimates) ranged from 180 percent in 1994 to *56* percent in 2004; other studies found overruns to be 33-34 percent

What Went Wrong?

- The U.S. government, especially the Internal Revenue Service (IRS), continues to provide examples of how not to manage costs
  - A series of project failures by the IRS in the 1990s cost taxpayers more than $50 billion a year
  - In 2006, the IRS was in the news for a botched upgrade to its fraud-detection software, costing $318 million in fraudulent refunds that didn't get caught
  - A 2008 Government Accountability Office (GAO) report stated that more than 400 U.S. government agency IT projects, worth an estimated $25 billion, suffer from poor planning and underperformance
- The United Kingdom's National Health Service IT modernization program was called the greatest IT disaster in history with an estimated $26 billion overrun

What is Cost and Project Cost Management?

- **Cost** is a resource sacrificed or foregone to achieve a specific objective or something given up in exchange
- Costs are usually measured in monetary units like dollars
- **Project cost management** includes the processes required to ensure that the project is completed within an approved budget

Project Cost Management Processes

- **Estimating costs**: developing an approximation or estimate of the costs of the resources needed to complete a project
- **Determining the budget**: allocating the overall cost estimate to individual work items to establish a baseline for measuring performance
- **Controlling costs**: controlling changes to the project budget

Figure 7-1. Project Cost Management Summary

Planning
Process: **Estimate costs**
Outputs: Activity cost estimates, basis of estimates, project document updates
Process: **Determine budget**
Outputs: Cost performance baseline, project funding requirements, product document updates

Monitoring and Controlling
Process: **Control costs**
Outputs: Work performance measurements, budget forecasts , organizational process assets updates, change requests, project management plan updates, project document updates

Project Start **Project Finish**

Basic Principles of Cost Management

- Most members of an executive board better understand and are more interested in financial terms than IT terms, so IT project managers must speak their language
  - **Profits** are revenues minus expenditures
  - **Profit margin** is the ratio of revenues to profits
  - **Life cycle costing** considers the total cost of ownership, or development plus support costs, for a project
  - **Cash flow analysis** determines the estimated annual costs and benefits for a project and the resulting annual cash flow

Table 7-1. Cost of Downtime for IT Applications

Type of IT Application	Cost/Minute
Securities trading	$73,000
Enterprise Requirements Planning (ERP)	$14,800
Order processing	$13,300
Electronic commerce	$12,600
Supply chain	$11,500
Point of sale (POS)	$ 4,700
Automatic teller machine (ATM)	$ 3,600
E-mail	$ 1,900

What Went Right?

- Many organizations use IT to reduce operational costs
- Technology has decreased the costs associated with processing an ATM transaction:
  - In 1968, the average cost was $5
  - In 1978, the cost went down to $1.50
  - In 1988, the cost was just a nickel
  - In 1998, it only cost a penny
  - In 2008, the cost was just half a penny!
- Investing in green IT and other initiatives has helped both the environment and companies' bottom lines; Michael Dell, CEO of Dell, reached his goal to make his company "carbon neutral" in 2008

Basic Principles of Cost Management

- **Tangible costs** or **benefits** are those costs or benefits that an organization can easily measure in dollars
- **Intangible costs** or **benefits** are costs or benefits that are difficult to measure in monetary terms
- **Direct costs** are costs that can be directly related to producing the products and services of the project
- **Indirect costs** are costs that are not directly related to the products or services of the project, but are indirectly related to performing the project
- **Sunk cost** is money that has been spent in the past; when deciding what projects to invest in or continue, you should *not* include sunk costs

Basic Principles of Cost Management

- **Learning curve theory** states that when many items are produced repetitively, the unit cost of those items decreases in a regular pattern as more units are produced
- **Reserves** are dollars included in a cost estimate to mitigate cost risk by allowing for future situations that are difficult to predict
  - **Contingency reserves** allow for future situations that may be partially planned for (sometimes called **known unknowns**) and are included in the project cost baseline
  - **Management reserves** allow for future situations that are unpredictable (sometimes called **unknown unknowns**)

Estimating Costs

- Project managers must take cost estimates seriously if they want to complete projects within budget constraints
- It's important to know the types of cost estimates, how to prepare cost estimates, and typical problems associated with IT cost estimates

Table 7-2. Types of Cost Estimates

Type of Estimate	When Done	Why Done	How Accurate
Rough Order of Magnitude (ROM)	Very early in the project life cycle, often 3–5 years before project completion	Provides estimate of cost for selection decisions	–50% to +100%
Budgetary	Early, 1–2 years out	Puts dollars in the budget plans	–10% to +25%
Definitive	Later in the project, less than 1 year out	Provides details for purchases, estimates actual costs	–5% to +10%

Cost Management Plan

- A **cost management plan** is a document that describes how the organization will manage cost variances on the project
- A large percentage of total project costs are often labor costs, so project managers must develop and track estimates for labor

Table 7-3. Maximum Departmental Headcounts by Year

Department	Year 1	Year 2	Year 3	Year 4	Year 5	Totals
Information systems	24	31	35	13	13	116
Marketing systems	3	3	3	3	3	15
Reservations	12	29	33	9	7	90
Contractors	2	3	1	0	0	6
Totals	41	66	72	25	23	227

Cost Estimation Tools and Techniques

- Basic tools and techniques for cost estimates:
  - **Analogous** or **top-down estimates**: use the actual cost of a previous, similar project as the basis for estimating the cost of the current project
  - **Bottom-up estimates**: involve estimating individual work items or activities and summing them to get a project total
  - **Parametric modeling** uses project characteristics (parameters) in a mathematical model to estimate project costs

Typical Problems with IT Cost Estimates

- Estimates are done too quickly
- Lack of estimating experience
- Human beings are biased toward underestimation
- Management desires accuracy

Sample Cost Estimate

- See pages 265-270 for a detailed example of creating a cost estimate for the Surveyor Pro project described in the opening case
- Before creating an estimate, know what it will be used for, gather as much information as possible, and clarify the ground rules and assumptions for the estimate
- If possible, estimate costs by major WBS categories
- Create a cost model to make it easy to make changes to and document the estimate

Figure 7-2. Surveyor Pro Project Cost Estimate

	# Units/Hrs.	Cost/Unit/Hr.	Subtotals	WBS Level 1 Totals	% of Total
WBS Items					
1. Project Management				**$306,300**	**20%**
Project manager	960	$100	$96,000		
Project team members	1920	$75	$144,000		
Contractors (10% of software development and testing)			$66,300		
2. Hardware				**$76,000**	**5%**
2.1 Handheld devices	100	$600	$60,000		
2.2 Servers	4	$4,000	$16,000		
3. Software				**$614,000**	**40%**
3.1 Licensed software	100	$200	$20,000		
3.2 Software development*			$594,000		
4. Testing (10% of total hardware and software costs)			$69,000	**$69,000**	**5%**
5. Training and Support				**$202,400**	**13%**
Trainee cost	100	$500	$50,000		
Travel cost	12	$700	$8,400		
Project team members	1920	$75	$144,000		
6. Reserves (20% of total estimate)			$253,540	**$253,540**	**17%**
Total project cost estimate				**$1,521,240**	

* See software development estimate

Figure 7-3. Surveyor Pro Software Development Estimate

Surveyor Pro Software Development Estimate Created October 5

1. Labor Estimate	# Units/Hrs.	Cost/Unit/Hr.	Subtotals	**Calculations**
Contractor labor estimate	3000	$150	$450,000	3000*150
Project team member estimate	1920	$75	$144,000	1920*75
Total labor estimate			**$594,000**	Sum above two values
2. Function point estimate**	Quantity	Conversion Factor	Function Points	**Calculations**
External inputs	10	4	40	10*4
External interface files	3	7	21	3*7
External outputs	4	5	20	4*5
External queries	6	4	24	6*4
Logical internal tables	7	10	70	7*10
Total function points			**175**	Sum above function point values
Java 2 languange equivalency value			46	Assumed value from reference
Source lines of code (SLOC) estimate			8,050	175*46
Productivity×KSLOC^Penalty (in months)			29.28	3.13*8.05^1.072 (see reference)
Total labor hours (160 hours/month)			4,684.65	29.28*160
Cost/labor hour ($120/hour)			$120	Assumed value from budget expert
Total function point estimate			**$562,158**	4684.65*120

**Approach based on paper by William Roetzheim, "Estimating Software Costs," Cost Xpert Group, Inc. (2003) using the COCOMO II default linear productivity factor (3.13) and penalty factor (1.072).

Determining the Budget

- Cost budgeting involves allocating the project cost estimate to individual work items over time
- The WBS is a required input to the cost budgeting process since it defines the work items
- Important goal is to produce a **cost baseline**
  - A time-phased budget that project managers use to measure and monitor cost performance

Figure 7-4. Surveyor Pro Project Cost Baseline

Surveyor Pro Project Cost Baseline Created October 10*

WBS Items	1	2	3	4	5	6	7	8	9	10	11	12	Totals
1. Project Management													
1.1 Project manager	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	96,000
1.2 Project team members	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	144,000
1.3 Contractors		6,027	6,027	6,027	6,027	6,027	6,027	6,027	6,027	6,027	6,027	6,027	66,300
2. Hardware													
2.1 Handheld devices				30,000	30,000								60,000
2.2 Servers				8,000	8,000								16,000
3. Software													
3.1 Licensed software				10,000	10,000								20,000
3.2 Software development		60,000	60,000	80,000	127,000	127,000	90,000	50,000					594,000
4. Testing			6,000	8,000	12,000	15,000	15,000	13,000					69,000
5. Training and Support													
5.1 Trainee cost									50,000				50,000
5.2 Travel cost									8,400				8,400
5.3 Project team members							24,000	24,000	24,000	24,000	24,000	24,000	144,000
6. Reserves				10,000	10,000	30,000	30,000	60,000	40,000	40,000	30,000	3,540	253,540
Totals	20,000	86,027	92,027	172,027	223,027	198,027	185,027	173,027	148,427	90,027	80,027	53,567	1,521,240

*See the lecture slides for this chapter on the companion Web site for a larger view of this and other figures in this chapter. Numbers are rounded, so some totals appear to be off.

Media Snapshot

- U.S. President Barack Obama successfully used the media and information technology in his campaign
  - The Obama campaign used 16 different online social platforms to interact with people of various backgrounds; sources say 80 percent of all contributions originated from these social networks
  - In a 60 Minutes episode shortly after the election, campaign leaders discussed some of the details of the campaign
  - The Web site My.BarackObama was created to develop an online community with more than a million members

Controlling Costs

- Project cost control includes:
  - Monitoring cost performance
  - Ensuring that only appropriate project changes are included in a revised cost baseline
  - Informing project stakeholders of authorized changes to the project that will affect costs
- Many organizations around the globe have problems with cost control

Earned Value Management (EVM)

- **EVM** is a project performance measurement technique that integrates scope, time, and cost data
- Given a **baseline** (original plan plus approved changes), you can determine how well the project is meeting its goals
- You must enter actual information periodically to use EVM
- More and more organizations around the world are using EVM to help control project costs

Earned Value Management Terms

- The **planned value (PV)**, formerly called the budgeted cost of work scheduled (BCWS), also called the budget, is that portion of the approved total cost estimate planned to be spent on an activity during a given period
- **Actual cost (AC)**, formerly called actual cost of work performed (ACWP), is the total of direct and indirect costs incurred in accomplishing work on an activity during a given period
- The **earned value (EV)**, formerly called the budgeted cost of work performed (BCWP), is an estimate of the value of the physical work actually completed
- EV is based on the original planned costs for the project or activity and the rate at which the team is completing work on the project or activity to date

Rate of Performance

- **Rate of performance (RP)** is the ratio of actual work completed to the percentage of work planned to have been completed at any given time during the life of the project or activity
- Brenda Taylor, Senior Project Manager in South Africa, suggests this term and approach for estimating earned value
- For example, suppose the server installation was halfway completed by the end of week 1: the rate of performance would be 50% because by the end of week 1, the planned schedule reflects that the task should be 100 percent complete and only 50 percent of that work has been completed

Table 7-4. Earned Value Calculations for One Activity after Week One

Activity	Week 1	Week 2	Total	% Complete After Week 1	Earned Value After Week 1 (EV)
Purchase Web server	10,000	0	10,000	75%	**7,500**
Planned Value (PV)	10,000	0	10,000		
Actual Cost (AC)	15,000	5,000	20,000		
Cost Variance (CV)	—7,500				
Schedule Variance (SV)	—2,500				
Cost Performance Index (CPI)	50%				
Schedule Performance Index (SPI)	75%				

Table 7-5. Earned Value Formulas

TERM	FORMULA
Earned Value	EV = PV to date × RP
Cost Variance	CV = EV – AC
Schedule Variance	SV = EV – PV
Cost Performance Index	CPI = EV/AC
Schedule Performance Index	SPI = EV/PV
Estimate at Completion (EAC)	EAC = BAC/CPI
Estimated Time to Complete	Original Time Estimate/SPI

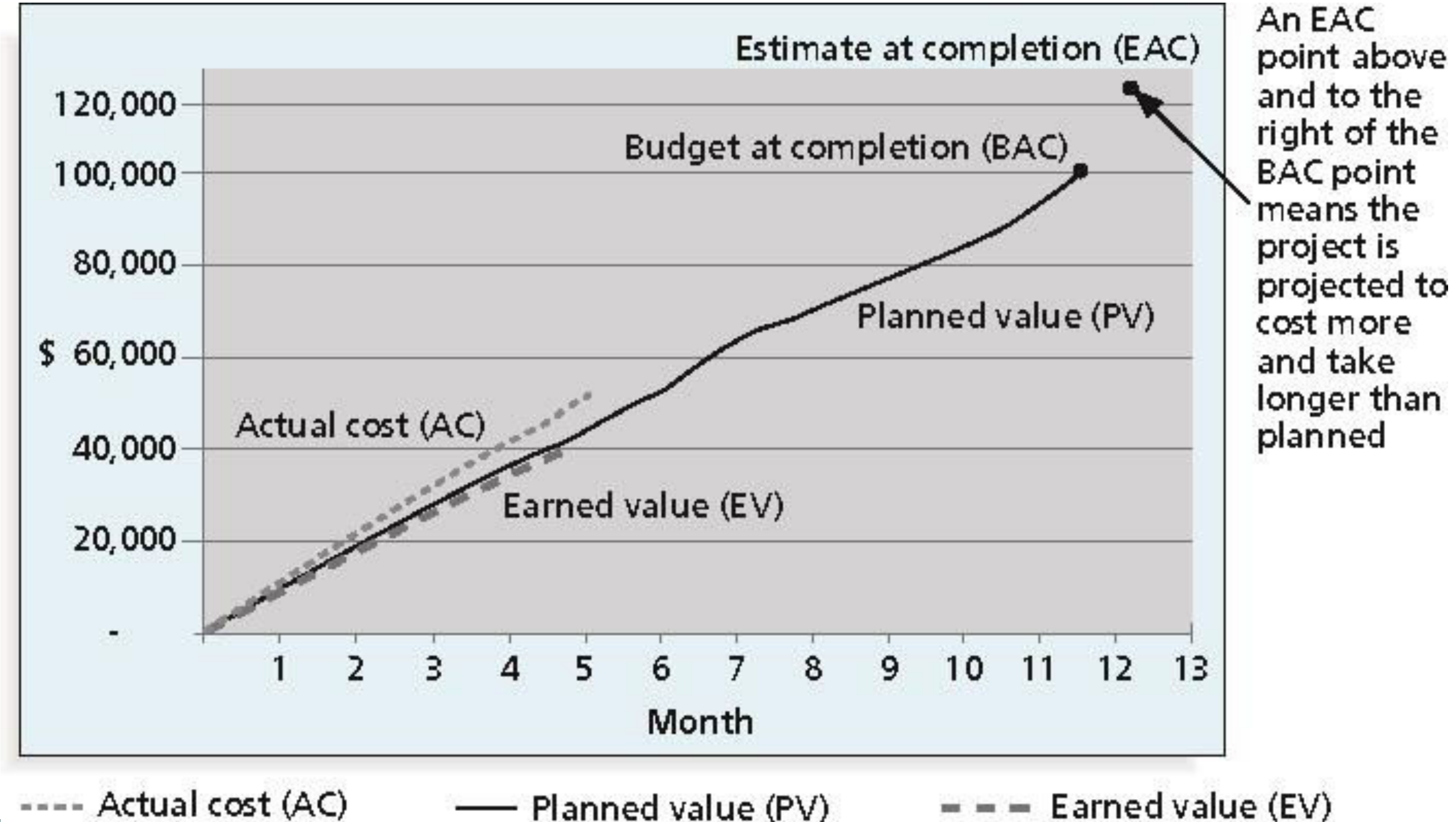
Rules of Thumb for Earned Value Numbers

- Negative numbers for cost and schedule variance indicate problems in those areas
- CPI and SPI less than 100% indicate problems
- Problems mean the project is costing more than planned (over budget) or taking longer than planned (behind schedule)
- The CPI can be used to calculate the **estimate at completion** (EAC), an estimate of what it will cost to complete the project based on performance to date; the **budget at completion** (BAC) is the original total budget for the project

Earned Value Calculations for a One-Year Project After Five Months

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	**Activity**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**PV**	**% Complete**	**EV**
2	Plan and staff project	4,000	4,000											8,000	100	8,000
3	Analyze requirements		6,000	6,000										12,000	100	12,000
4	Develop ERDs			4,000	4,000									8,000	100	8,000
5	Design database tables				6,000	4,000								10,000	100	10,000
6	Design forms, reports, and queries					8,000	4,000							12,000	50	6,000
7	Construct working prototype						10,000							10,000	-	-
8	Test/evaluate prototype						2,000	6,000						8,000	-	-
9	Incorporate user feedback							4,000	6,000	4,000				14,000	-	-
10	Test system									4,000	4,000	2,000		10,000	-	-
11	Document system											3,000	1,000	4,000	-	-
12	Train users												4,000	4,000	-	-
13	Monthly Planned Value (PV)	4,000	10,000	10,000	10,000	12,000	16,000	10,000	6,000	8,000	4,000	5,000	5,000	100,000		44,000
14	Cumulative Planned Value (PV)	4,000	14,000	24,000	34,000	46,000	62,000	72,000	78,000	86,000	90,000	95,000	100,000			
15	Monthly Actual Cost (AC)	4,000	11,000	11,000	12,000	15,000										
16	Cumulative Actual Cost (AC)	4,000	15,000	26,000	38,000	53,000										
17	Monthly Earned Value (EV)	4,000	10,000	10,000	10,000	10,000										
18	Cumulative Earned Value (EV)	4,000	14,000	24,000	34,000	44,000										
19	Project EV as of May 31	44,000														
20	Project PV as of May 31	46,000														
21	Project AC as of May 31	$ 53,000														
22	**CV=EV-AC**	**$ (9,000)**														
23	**SV=EV-PV**	**$ (2,000)**														
24	**CPI=EV/AC**	**83%**														
25	**SPI=EV/PV**	**96%**														
26	**Estimate at Completion (EAC)**	**$120,455**	(original plan of $100,000 divided by CPI of 83%)													
27	**Estimated time to complete**	**12.55**	(original plan of 12 months divided by SPI of 96%)													

Figure 7-5. Earned Value Chart for Project after Five Months



Project Portfolio Management

- Many organizations collect and control an entire suite of projects or investments as one set of interrelated activities in a portfolio
- Five levels for project portfolio management
  1. Put all your projects in one database
  2. Prioritize the projects in your database
  3. Divide your projects into two or three budgets based on type of investment
  4. Automate the repository
  5. Apply modern portfolio theory, including risk-return tools that map project risk on a curve

Benefits of Portfolio Management

- Schlumberger saved $3 million in one year by organizing 120 information technology projects into a portfolio
- ROI of implementing portfolio management software by IT departments:
  - Savings of 6.5 percent of the average annual IT budget by the end of year one
  - Improved annual average project timeliness by 45.2 percent
  - Reduced IT management time spent on project status reporting by 43 percent and IT labor capitalization reporting by 55 percent
  - Decreased the time to achieve financial sign-off for new IT projects by 20.4 percent, or 8.4 days

Best Practice

- A global survey released by Borland Software in 2006 suggests that many organizations are still at a low level of maturity in terms of how they define project goals, allocate resources, and measure overall success of their information technology portfolios; some of the findings include the following:
  - Only 22 percent of survey respondents reported that their organization either effectively or very effectively uses a project plan for managing projects
  - Only 17 percent have either rigorous or very rigorous processes for project plans, which include developing a baseline and estimating schedule, cost, and business impact of projects
  - Only 20 percent agreed their organizations monitor portfolio progress and coordinate across inter-dependent projects

Using Software to Assist in Cost Management

- Spreadsheets are a common tool for resource planning, cost estimating, cost budgeting, and cost control
- Many companies use more sophisticated and centralized financial applications software for cost information
- Project management software has many cost-related features, especially enterprise PM software
- Portfolio management software can help reduce costs

Chapter Summary

- Project cost management is a traditionally weak area of IT projects, and project managers must work to improve their ability to deliver projects within approved budgets
- Main processes include:
  - Estimate costs
  - Determine the budget
  - Control costs