

Chapter 4: Project Integration Management

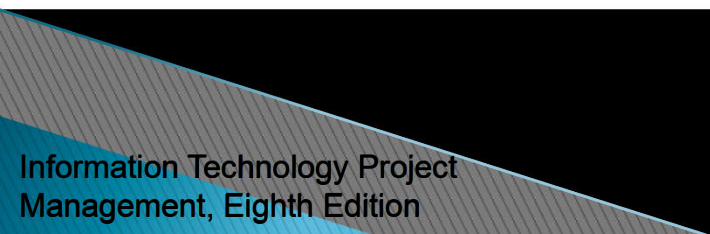
**Information Technology Project
Management, Eighth Edition**

Note: See the text itself for full citations.



Learning Objectives

- ▶ Describe an overall framework for project integration management as it relates to the other project management knowledge areas and the project life cycle
- ▶ Discuss the strategic planning process and apply different project selection methods
- ▶ Explain the importance of creating a project charter to formally initiate projects
- ▶ Describe project management plan development, understand the content of these plans, and review approaches for creating them



Learning Objectives

- ▶ Explain project execution, its relationship to project planning, the factors related to successful results, and tools and techniques to assist in directing and managing project work
- ▶ Describe the process of monitoring and controlling a project
- ▶ Understand the integrated change control process, planning for and managing changes on information technology (IT) projects, and developing and using a change control system
- ▶ Explain the importance of developing and following good procedures for closing projects
- ▶ Describe how software can assist in project integration



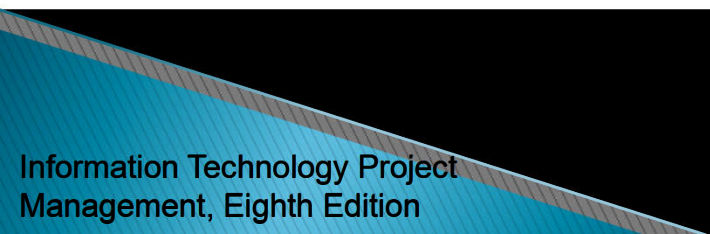
Nick Carson recently became project manager of a critical biotech enterprise at his Silicon Valley company. This project involved creating the hardware and software for a next generation (next-gen) DNA-sequencing instrument used in assembling and analyzing the human genome. Several companies were competing to build smaller, faster sequencing instruments that would reduce the costs and improve the quality of data analysis in this rapidly changing field. The biotech project was the company's largest endeavor, and it had tremendous potential for future growth and revenue.

Unfortunately, there were problems managing this large project. It had been under way for three years and had already gone through three different project managers. Nick had been the lead software developer on the project before top management made him the project manager. The CEO told him to do whatever it took to deliver the first version of the product in four months and a production version in nine months. Negotiations for a potential corporate buyout with a larger company influenced top management's sense of urgency to complete the project.

Highly energetic and intelligent, Nick had the technical background to make the project a success. He delved into the technical problems and found some critical flaws that kept the next-gen DNA-sequencing instrument from working. Nevertheless, he was having difficulty in his new role as project manager. Although Nick and his team got the product out on time, top management was upset because Nick did not focus on managing all aspects of the project. He never provided them with accurate schedules or detailed plans of what was happening on the project. Instead of performing the work of project manager, Nick had taken on the role of software integrator and troubleshooter. Nick, however, did not understand top management's complaints—he delivered the product, didn't he? Didn't they realize how valuable he was?

The Key to Overall Project Success: Good Project Integration Management (项目集成管理)

- ▶ 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

- ▶ 1. Developing the project charter involves working with stakeholders to create the document that formally authorizes a project—the charter.
- ▶ 2. Developing the project management plan involves coordinating all planning efforts to create a consistent, coherent document—the project management plan.
- ▶ 3. Directing and managing project work involves carrying out the project management plan by performing the activities included in it.

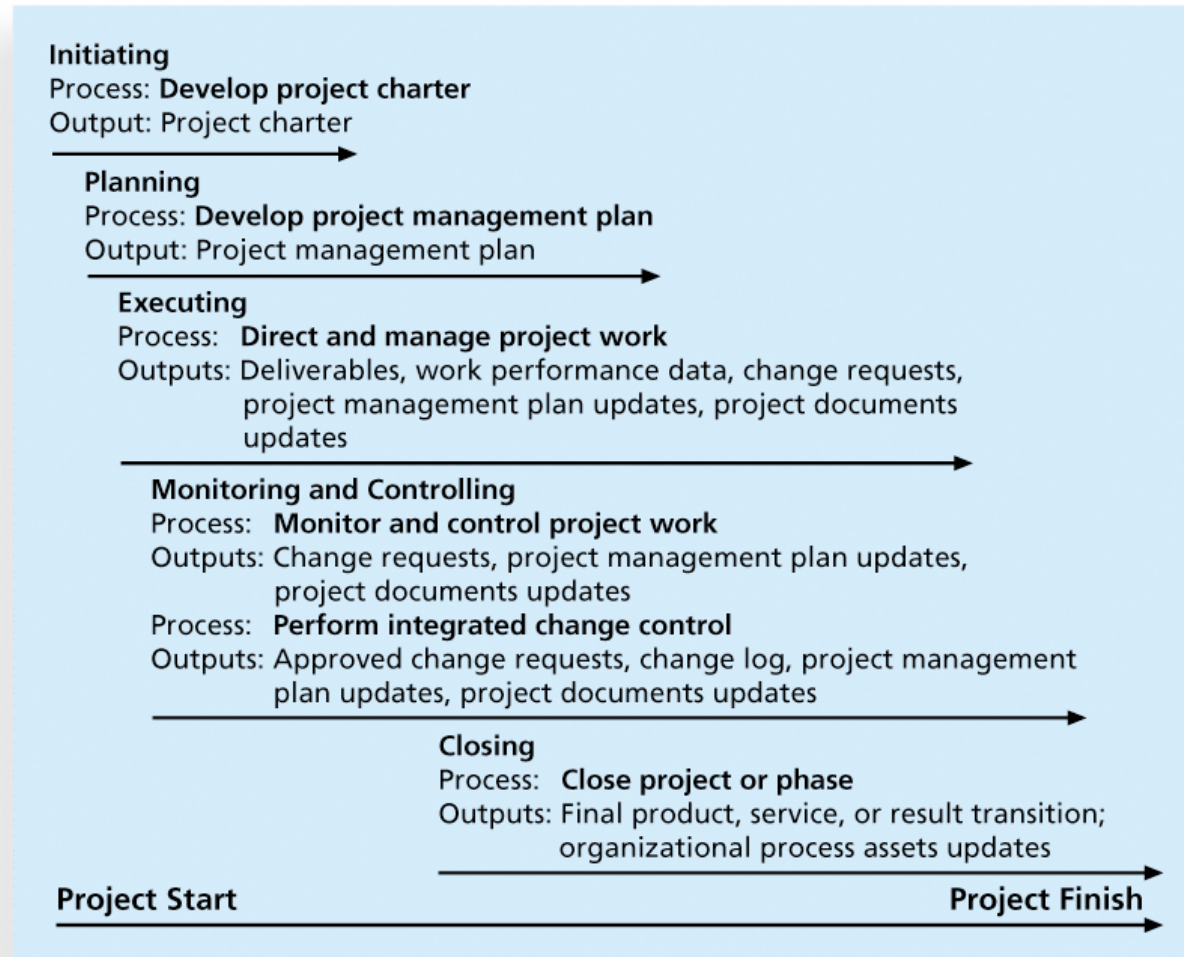


Project Integration Management Processes (cont'd)

- ▶ 4. Monitoring and controlling project work involves overseeing activities to meet the performance objectives of the project
- ▶ 5. Performing integrated change control involves identifying, evaluating, and managing changes throughout the project life cycle.
- ▶ 6. Closing the project or phase involves finalizing all activities to formally close the project or phase.



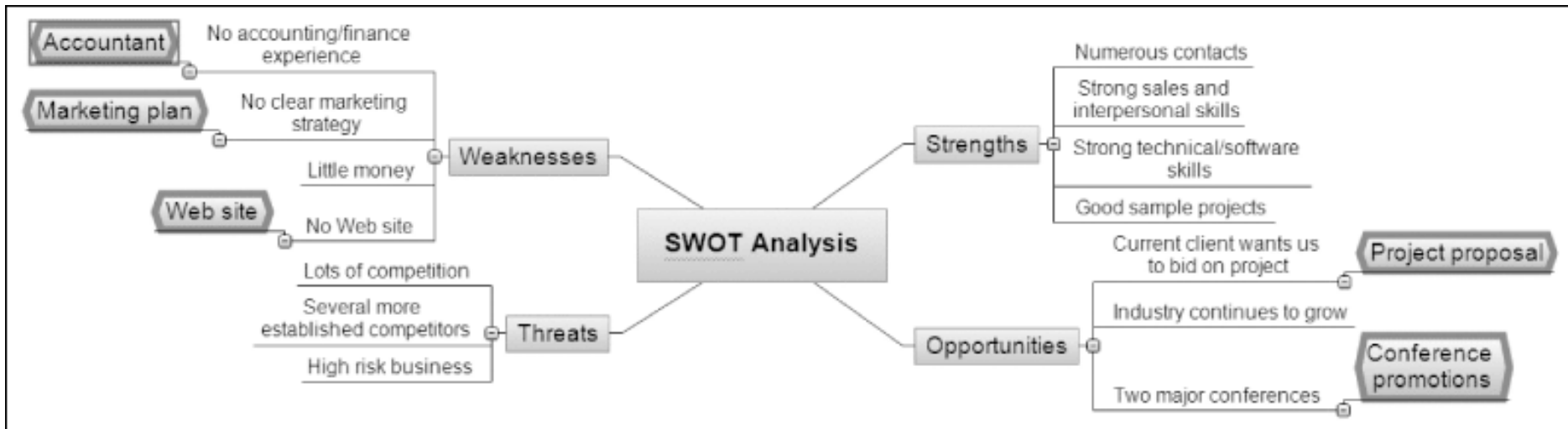
Figure 4-1. Project Integration Management Summary



Strategic Planning and Project Selection

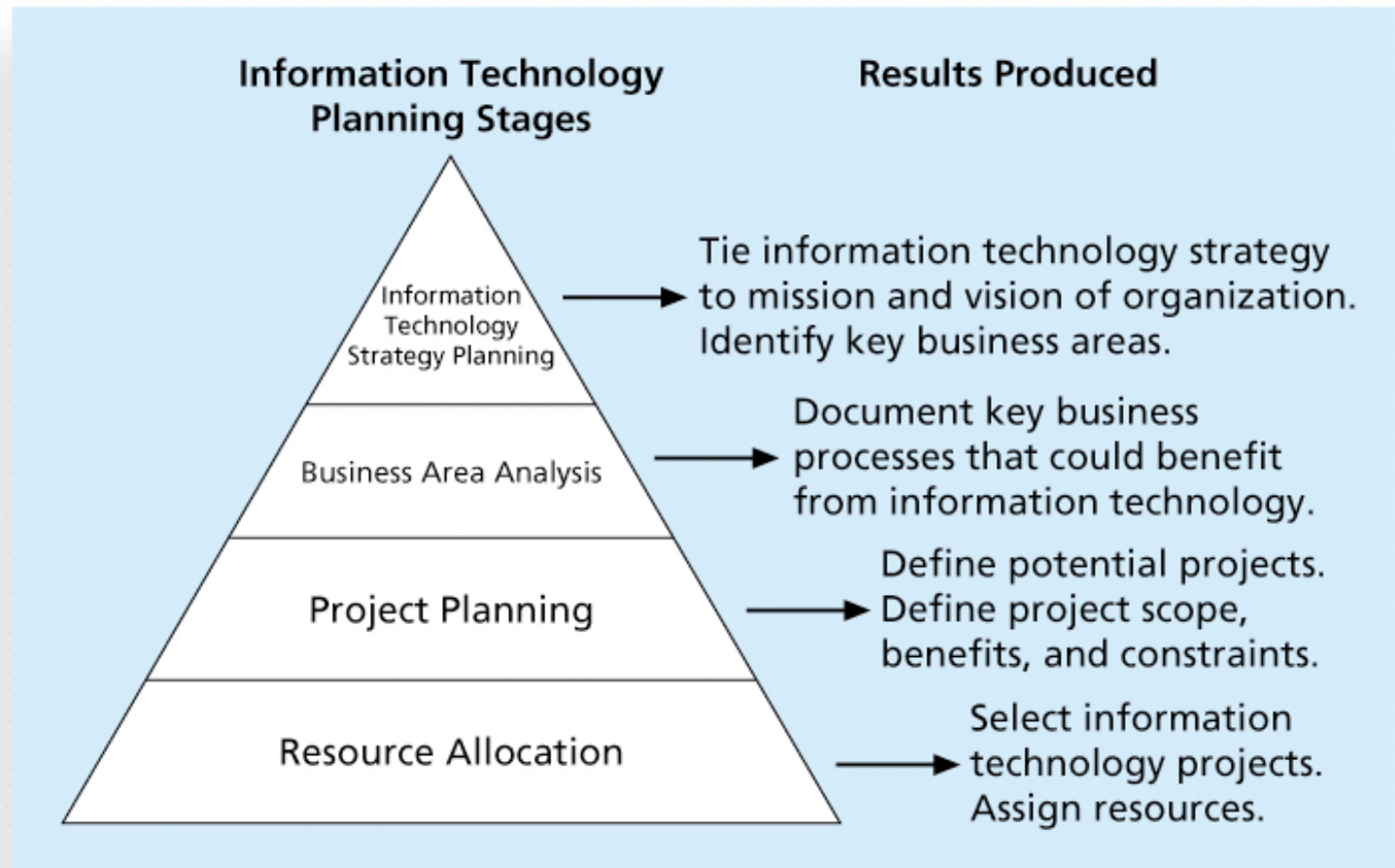
- ▶ **Strategic planning (战略计划)** involves determining long-term objectives, predicting future trends, and projecting the need for new products and services
- ▶ Organizations often perform a **SWOT analysis** by using **mind mapping (心智图法)**
 - analyzing **S**trengths, **W**eaknesses, **O**pportunities, 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



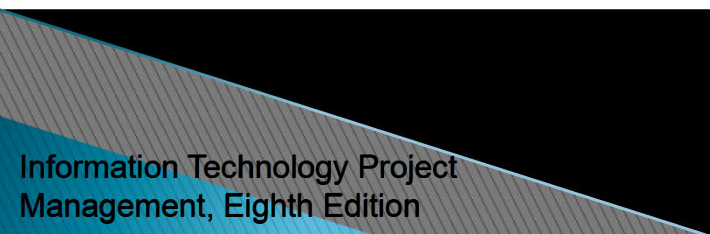
MindManager
FreeMind (free version)

Figure 4-3. Information Technology Planning Process



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



Focusing on Broad Organizational Needs

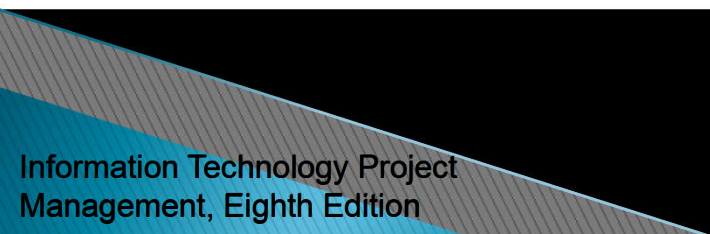
- ▶ It is often difficult to provide strong justification for many IT projects, but everyone agrees they have a high value
- ▶ Three important criteria for projects:
 - There is a ***need*** for the project
 - There are ***funds*** available
 - There's a strong ***will*** to make the project succeed

Categorizing IT Projects

- ▶ One categorization is whether the project addresses
 - a problem
 - an opportunity, or
 - a directive
- ▶ 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
- ▶ Three primary methods for determining the projected financial value of projects:
 - Net present value (NPV) analysis (净现值分析)
 - Return on investment (ROI) (投资回报分析)
 - Payback analysis (回收期分析)



Net Present Value Analysis

(净现值分析)

- ▶ **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
- ▶ Positive NPV: the return exceeds the **cost of capital** (资本成本)
- ▶ The higher the NPV, the better

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							
17							

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

Figure 4-5. NPV Example (cont.)

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					

$$NPV = \sum_{t=0}^T A_t / (1 + r)^t$$

Figure 4-5. NPV Example (cont.)

$$\text{discount factor} = 1 / (1 + r)^t = 1 / (1 + \text{discount rate})^{\text{year}}$$

$$\text{Year 1: discount factor} = 1 / (1 + 0.08)^1 = 0.93$$

$$\text{Year 2: discount factor} = 1 / (1 + 0.08)^2 = 0.86$$

$$\text{discount cost} = \text{cost} \times \text{discount factor}$$

$$\text{discount cost for Year 1} = \$40,000 \times 0.93 = \$37,200$$

$$\text{NPV} = \sum_{t=0}^n A_t / (1 + r)^t$$

A_t : cash flow at Year t , equals to “benefit-cost” at Year t .

$$\text{NPV} = \$516,000 - \$243,200 = \$272,800$$

NPV Calculations

- ▶ Determine estimated costs and benefits for the life of the project and the products it produces
- ▶ Determine the discount rate (check with your organization on what to use)
- ▶ Calculate the NPV (see text for details)
- ▶ Notes: Some organizations consider the investment year as year 0, while others start in year 1. Some people entered costs as negative numbers, while others do not. Check with your organization for their preferences

Return on Investment(投资回报)

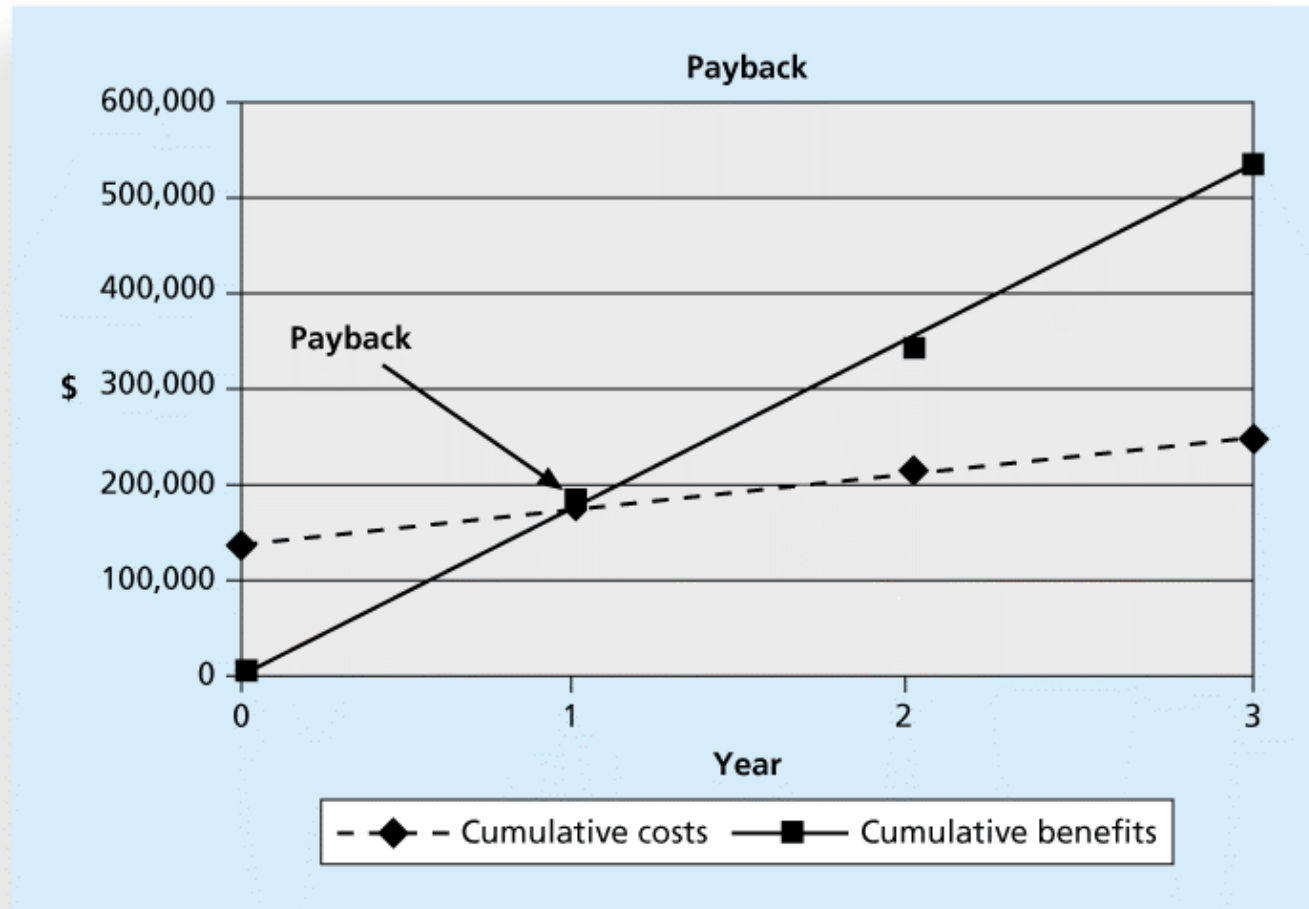
- ▶ **Return on investment (ROI)** is calculated by subtracting the project costs from the benefits and then dividing by the costs
$$\text{ROI} = (\text{total discounted benefits} - \text{total discounted costs}) / \text{discounted costs}$$
$$\text{ROI} = (516000 - 243200) / 243200 = 112\% \text{ (Figure 4-5)}$$
- ▶ The higher the ROI is, the better
- ▶ Many organizations have a **required rate of return(必要回报率)** or minimum acceptable rate of return on investment for projects
- ▶ **Internal rate of return (IRR)(内部收益率)** can be calculated by finding the discount rate that makes the NPV zero

Payback Analysis(回收期分析)

- ▶ Another important financial consideration is payback analysis
- ▶ The **payback period(回收期)** 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



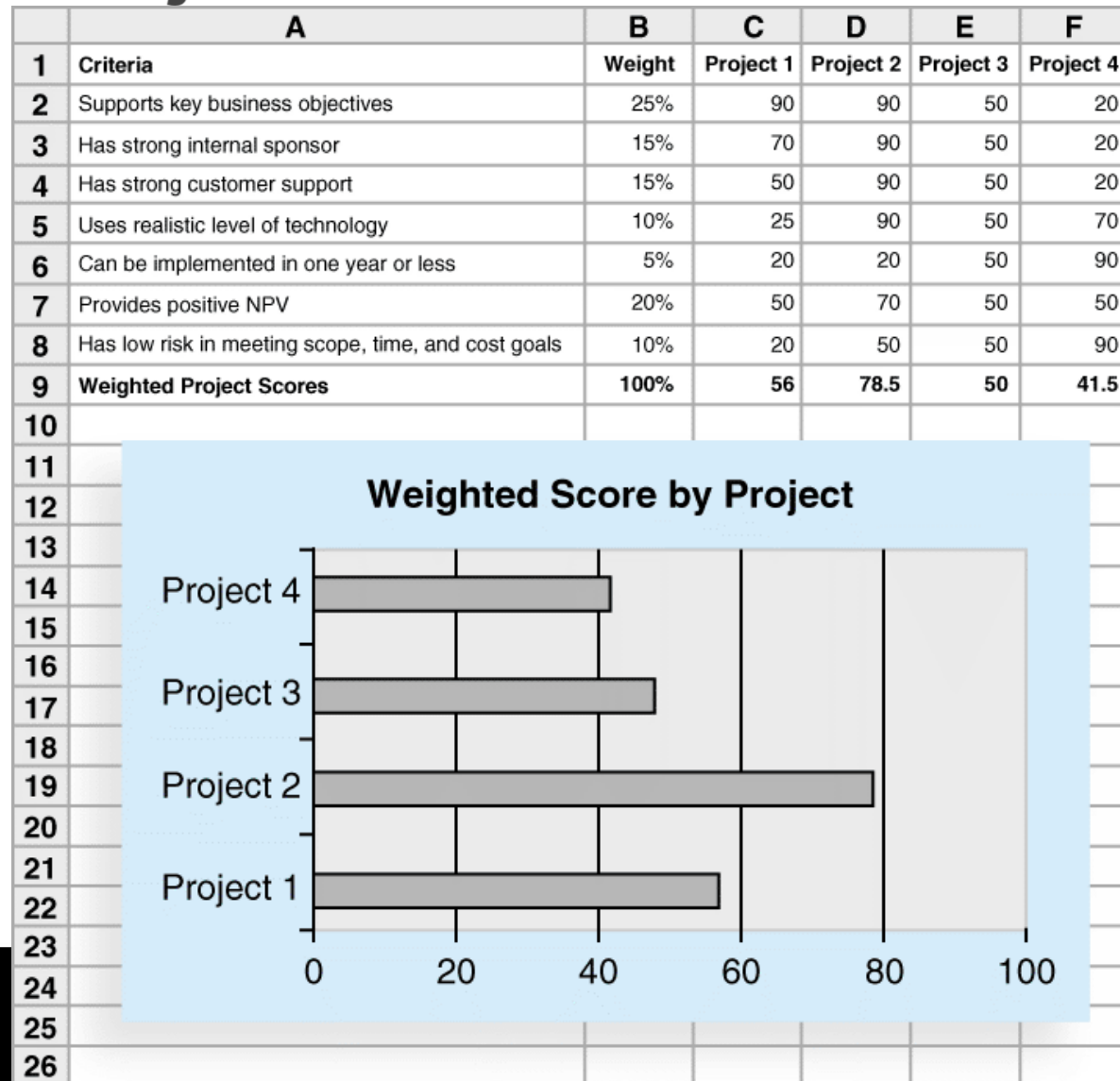
Figure 4-6. Charting the Payback Period



Weighted Scoring Model(加权打分模型)

- ▶ 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
 - 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



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(平衡计分卡)**
 - 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

Developing a Project Charter

(制定项目章程)

- ▶ 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

Inputs for Developing a Project Charter

- ▶ A project statement of work
- ▶ A business case
- ▶ Agreements
- ▶ Enterprise environmental factors
- ▶ **Organizational process assets(组织过程资产)**, which include formal and informal plans, policies, procedures, guidelines, information systems, financial systems, management systems, lessons learned, and historical information

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. Project Charter (cont.)

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

Susan Johnson

Erik Haus

Maggie Elliot

Nick Carson

Renyong Chi

Bill Strom

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

Figure 3-2. Kick-off Meeting Agenda

项目启动会议

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:

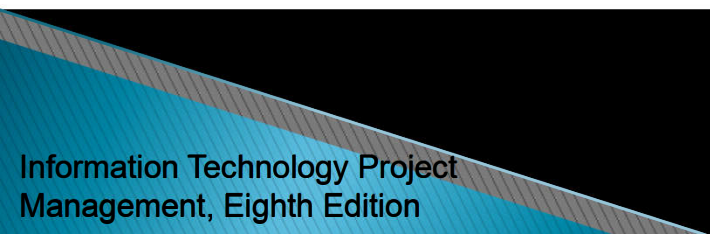
Developing a Project Management Plan

- ▶ A **project management plan** is a document used to coordinate all project planning documents and help guide a project's execution and control
- ▶ Plans should be dynamic, flexible, and subject to change.



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



Introduction or overview of the project

- ▶ Project name
- ▶ A brief description
- ▶ The sponsor's name
- ▶ Names of the PM and key team members
- ▶ Deliverables of the project
- ▶ Important reference materials
- ▶ Definitions and acronyms

Description of how the project is organized

- ▶ Organisational charts
- ▶ Project responsibilities
- ▶ Other organisational or process-related information



Management and technical processes used on the project

- ▶ Management objectives
- ▶ Project controls
- ▶ Risk management
- ▶ Project staffing
- ▶ Technical processes



Work to be done, schedule, and budget information

- ▶ Major work packages
- ▶ Key deliverables
- ▶ Summary of schedule
- ▶ Detailed schedule
- ▶ Summary budget
- ▶ Detailed budget



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.

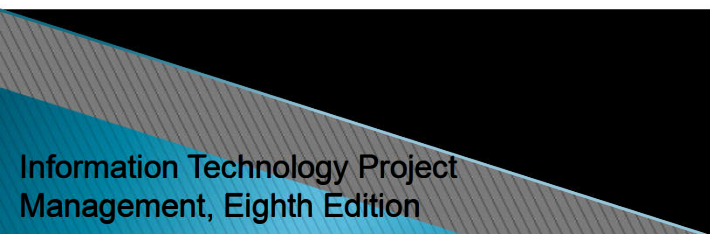
Directing and Managing Project Work

- ▶ 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

Capitalizing on Product, Business, and Application Area Knowledge

- ▶ It is often helpful for IT project managers to have prior technical experience
- ▶ On small projects, the project manager may be required to perform some of the technical work or mentor team members to complete the projects
- ▶ On large projects, the project manager must understand the business and application area of the project



Project Execution Tools and Techniques

- ▶ **Expert judgment:** Experts can help project managers and their teams make many decisions related to project execution
- ▶ **Meetings:** Meetings allow people to develop relationships, pick up on important body language or tone of voice, and have a dialogue to help resolve problems.
- ▶ **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.



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(基准)** is the approved project management plan plus approved changes



Performing 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 **change control system** is 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 **change control board** is 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

- ▶ **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).

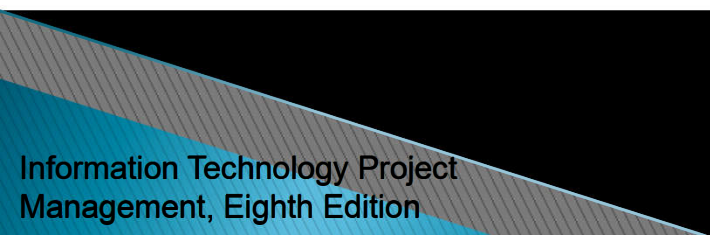
Use effective configuration management.

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 or Phases

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

Chapter Summary

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

