CSIT214/CSCI814/HCSC814
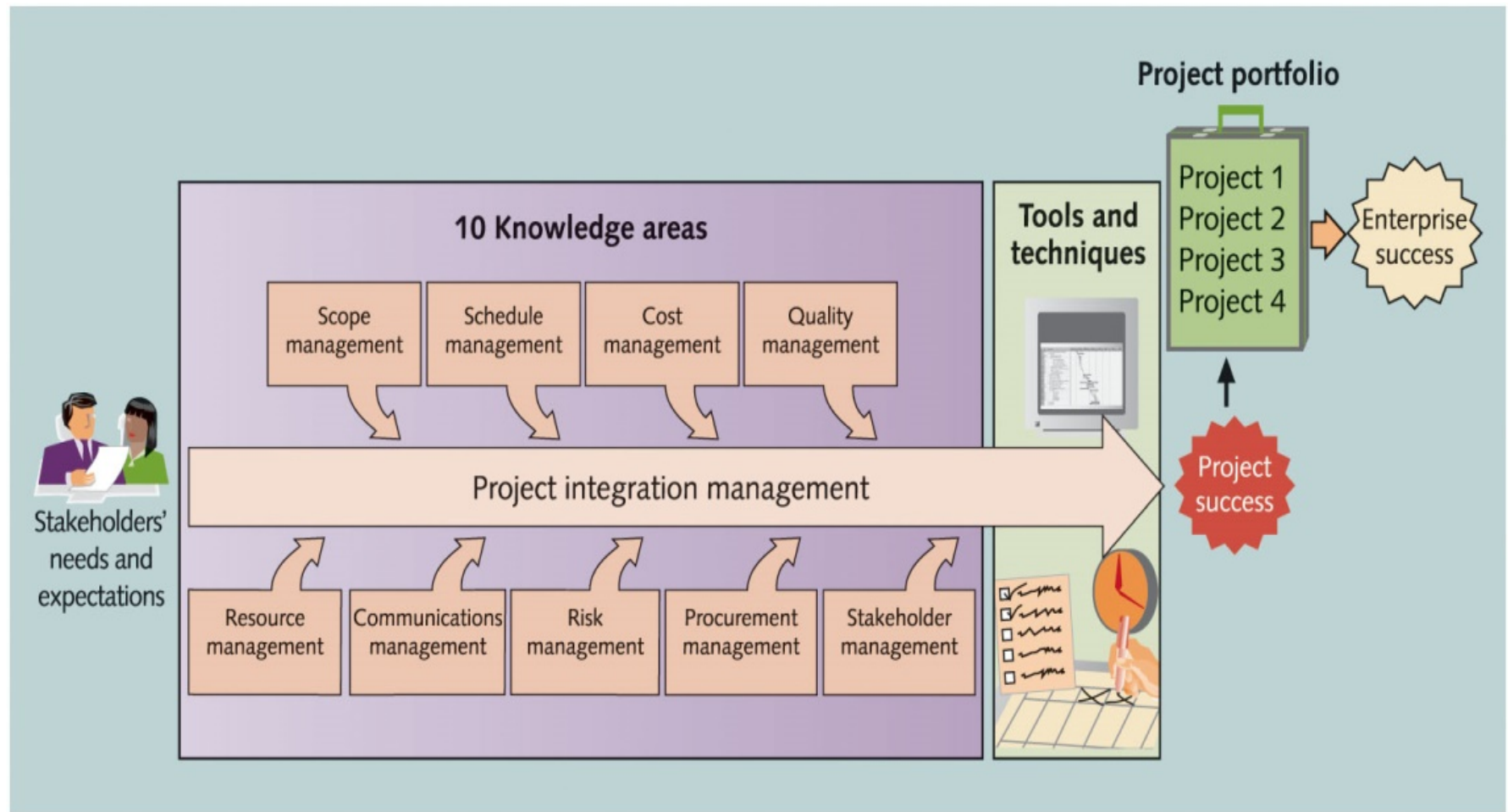## IT Project Management

Project integration management

Project management framework (review)

FIGURE 1-2 Project management framework
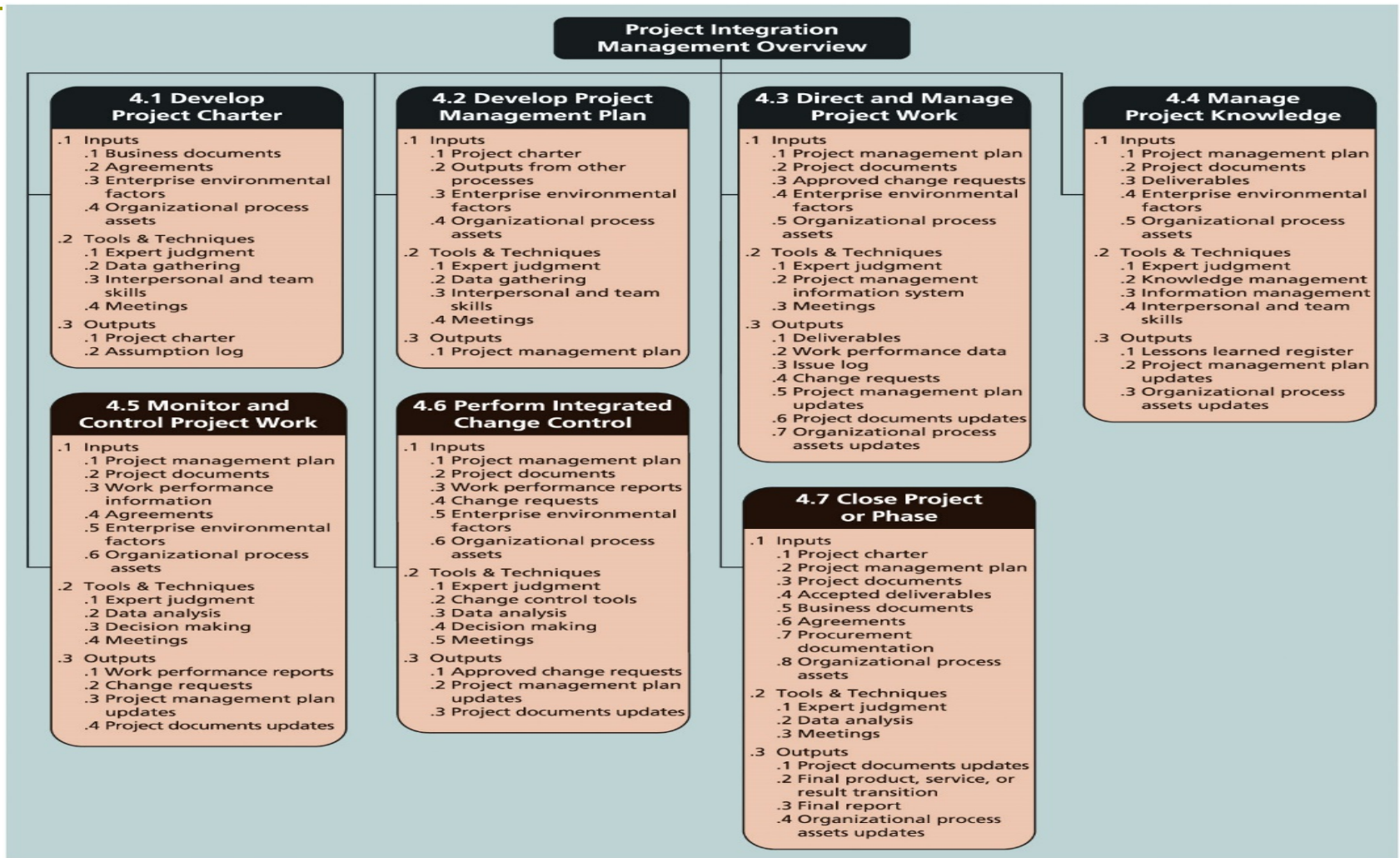
What is Project Integration Management?

- 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

- Project integration management is **not** the same thing as software integration

What is Project Integration Management? (cont.)

- Main processes
  - Developing the **project charter**
  - Developing the **project management plan**
  - **Directing and managing** project work
  - **Monitoring and controlling** project work
  - Performing **integrated change control**
  - **Closing** the project or phase

What is Project Integration Management? (cont.)

Project Integration Management Overview

4.1 Develop Project Charter

.1 Inputs
  .1 Business documents
  .2 Agreements
  .3 Enterprise environmental factors
  .4 Organizational process assets
.2 Tools & Techniques
  .1 Expert judgment
  .2 Data gathering
  .3 Interpersonal and team skills
  .4 Meetings
.3 Outputs
  .1 Project charter
  .2 Assumption log

4.2 Develop Project Management Plan

.1 Inputs
  .1 Project charter
  .2 Outputs from other processes
  .3 Enterprise environmental factors
  .4 Organizational process assets
.2 Tools & Techniques
  .1 Expert judgment
  .2 Data gathering
  .3 Interpersonal and team skills
  .4 Meetings
.3 Outputs
  .1 Project management plan

4.3 Direct and Manage Project Work

.1 Inputs
  .1 Project management plan
  .2 Project documents
  .3 Approved change requests
  .4 Enterprise environmental factors
  .5 Organizational process assets
.2 Tools & Techniques
  .1 Expert judgment
  .2 Project management information system
  .3 Meetings
.3 Outputs
  .1 Deliverables
  .2 Work performance data
  .3 Issue log
  .4 Change requests
  .5 Project management plan updates
  .6 Project documents updates
  .7 Organizational process assets updates

4.4 Manage Project Knowledge

.1 Inputs
  .1 Project management plan
  .2 Project documents
  .3 Deliverables
  .4 Enterprise environmental factors
  .5 Organizational process assets
.2 Tools & Techniques
  .1 Expert judgment
  .2 Knowledge management
  .3 Information management
  .4 Interpersonal and team skills
.3 Outputs
  .1 Lessons learned register
  .2 Project management plan updates
  .3 Organizational process assets updates

4.5 Monitor and Control Project Work

.1 Inputs
  .1 Project management plan
  .2 Project documents
  .3 Work performance information
  .4 Agreements
  .5 Enterprise environmental factors
  .6 Organizational process assets
.2 Tools & Techniques
  .1 Expert judgment
  .2 Data analysis
  .3 Decision making
  .4 Meetings
.3 Outputs
  .1 Work performance reports
  .2 Change requests
  .3 Project management plan updates
  .4 Project documents updates

4.6 Perform Integrated Change Control

.1 Inputs
  .1 Project management plan
  .2 Project documents
  .3 Work performance reports
  .4 Change requests
  .5 Enterprise environmental factors
  .6 Organizational process assets
.2 Tools & Techniques
  .1 Expert judgment
  .2 Change control tools
  .3 Data analysis
  .4 Decision making
  .5 Meetings
.3 Outputs
  .1 Approved change requests
  .2 Project management plan updates
  .3 Project documents updates

4.7 Close Project or Phase

.1 Inputs
  .1 Project charter
  .2 Project management plan
  .3 Project documents
  .4 Accepted deliverables
  .5 Business documents
  .6 Agreements
  .7 Procurement documentation
  .8 Organizational process assets
.2 Tools & Techniques
  .1 Expert judgment
  .2 Data analysis
  .3 Meetings
.3 Outputs
  .1 Project documents updates
  .2 Final product, service, or result transition
  .3 Final report
  .4 Organizational process assets updates

Source: Project Management Institute, Inc. *A Guide to the Project Management Body of Knowledge, (PMBOK® Guide) — Sixth Edition* (2017), Figure 4-1, Page 71.

FIGURE 4-1 Project integration management summary

Strategic Planning and Project Selection (1 of 3)

- Strategic planning involves determining **long-term objectives**
  - Analyzing the **strengths** and **weaknesses** of an organization
  - Studying **opportunities** and **threats** in the business environment
  - Predicting future trends
  - Projecting the need for new products and services
- **SWOT analysis**
  - Strengths, Weaknesses, Opportunities, and Threats
- **Identifying potential projects**
  - Start of project initiation
- **Aligning IT with business strategy**
  - Organization must develop a strategy for using IT to define how it will support the organization's objectives

SWOT analysis - example

- Group of four people who want to start a new business in the film industry could perform a SWOT analysis to help identify potential projects
- Strengths:
  - As experienced professionals, we have numerous contacts in the film industry.
  - Two of us have strong sales and interpersonal skills.
  - Two of us have strong technical skills and are familiar with several filmmaking software tools.
  - We all have impressive samples of completed projects.

SWOT analysis - example

- Weaknesses:
  - None of us have accounting or financial experience.
  - We have no clear marketing strategy for products and services.
  - We have little money to invest in new projects.
  - We have no company website and limited use of technology to run the business.
- Opportunities:
  - A potential client has mentioned a large project she would like us to bid on.
  - The film industry continues to grow.
  - There are two major conferences this year where we could promote our company.

SWOT analysis - example

- Threats:
  - Other individuals or companies can provide the services we can.
  - Customers might prefer working with more established individuals and organizations.
  - There is high risk in the film business.
- Based on their SWOT analysis, the four entrepreneurs outline potential projects as follows:
  - Find an external accountant or firm to help run the business.
  - Hire someone to develop a company website, focusing on our experience and past projects.
  - Develop a marketing plan.
  - Develop a strong proposal to get the large project the potential client mentioned.
  - Plan to promote the company at two major conferences this year.

SWOT analysis - example
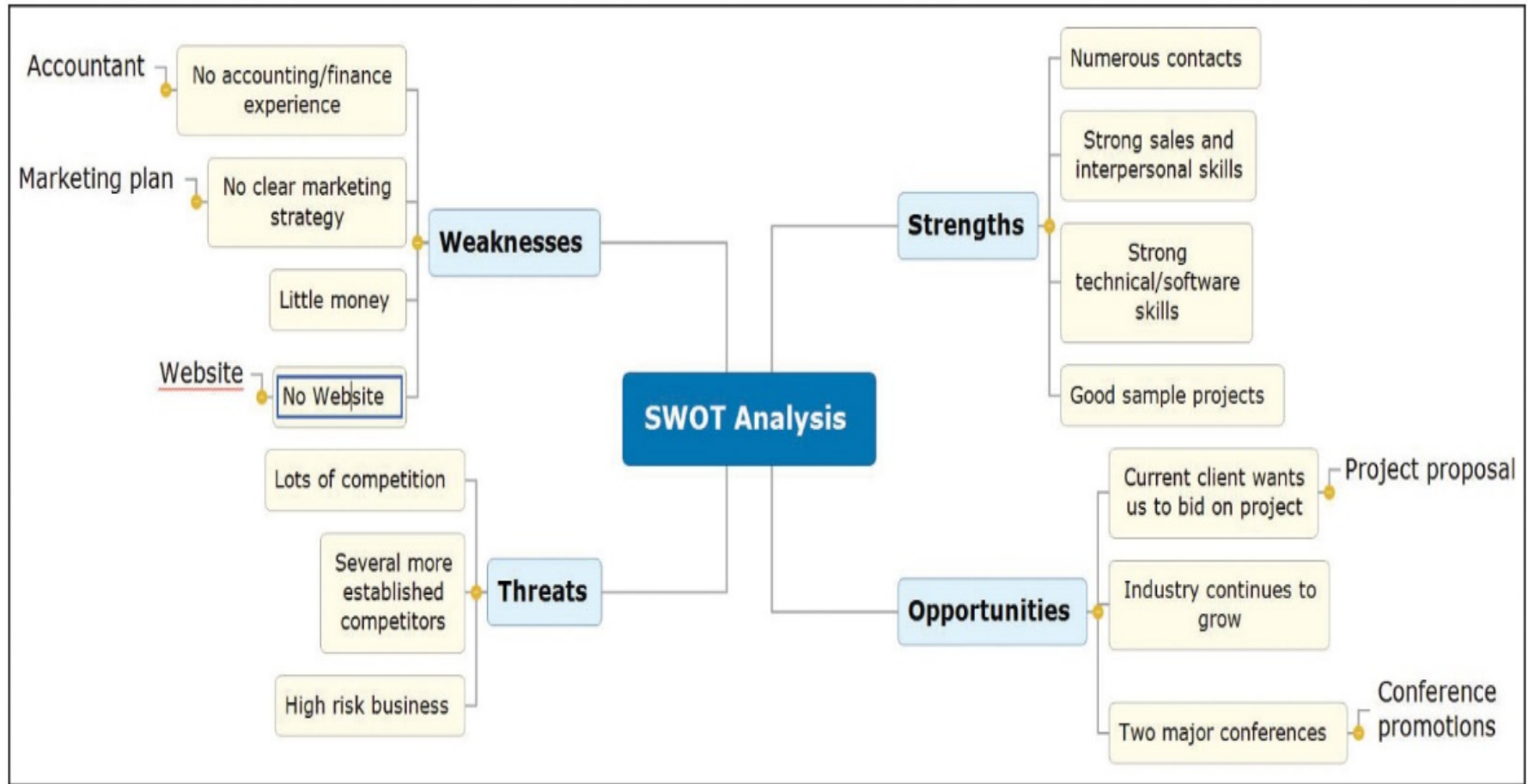
FIGURE 4-2 Mind map of a SWOT analysis to help identify potential projects

Strategic Planning and Project Selection

Information Technology Planning Stages

Results Produced

Information Technology Strategy Planning
→ Tie information technology strategy to mission and vision of organization. Identify key business areas.

Business Area Analysis
→ Document key business processes that could benefit from information technology.

Project Planning
→ Define potential projects. Define project scope, benefits, and constraints.

Resource Allocation
→ Select information technology projects. Assign resources.

FIGURE 4-3   Planning process for selecting IT projects

Methods for Selecting Projects

- Potential projects must be narrowed down
  - Methods for selecting projects
    - 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

- Projects that address broad organizational needs are much more likely to be successful because they will be important to the organization
  - Examples: improve safety or increase morale

- Important criteria for selecting projects
  - **Need**
    - Do people in the organization agree that the project needs to be done?
  - **Funding**
    - Does the organization have the desire and capacity to provide adequate funds to perform the project?
  - **Will**
    - Is there a strong will to make the project succeed?

Categorizing IT Projects

- Categorizations
  - **Project's impetus**: respond to a problem, opportunity, or directive
    - Problems: are undesirable situations that prevent an organization from achieving its goals.
    - Opportunities: are chances to improve the organization.
    - Directives: are new requirements imposed by management, government, or some external influence.
  - **Time window**: How long it will take to do and when it is needed
  - **Priority**: Overall priority of the project

Performing Financial Analyses

- Financial considerations are often an important consideration in selecting projects
  - Regardless of current economics
- Primary methods for determining the projected financial value of projects
  - Net present value (NPV) analysis
  - Return on investment (ROI)
  - Payback analysis

Net Present Value Analysis

- 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
  - Projects with higher NPVs are preferred

	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

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

where t equals the year of the cash flow, n is the last year of the cash flow, A is the amount of cash flow each year, and r is the discount rate.

Net Present Value Analysis

- NPV calculations
  - Determine **estimated costs and benefits** for the life of the project and the products it produces
  - Determine the **discount rate.**
    - The discount rate is used to calculate the annual discount factor: $1/(1+r)^t$, where r is the discount rate and t is the year.
  - Calculate the **net present value**
- Important considerations
  - Some organizations refer to the investment year or years for project costs as Year 0 and do not discount costs in Year 0
  - Discount rate can vary, often based on the prime rate and other economic considerations
  - Costs can be entered as negative numbers and can be listed first (and then benefits)

Return on Investment

- 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
    - 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

Return on Investment

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					

FIGURE 4-5   JWD Consulting net present value and return on investment example

ROI = (total discounted benefits-total discounted costs)/discounted costs

Pen and paper exercise

- Perform a financial analysis for a project. Assume that the projected costs and benefits for this project are spread over four years as follows: Estimated costs are $300,000 in Year 1 and $40,000 each year in Years 2, 3, and 4. Estimated benefits are $0 in Year 1 and $120,000 each year in Years 2, 3, and 4. Use a 7 percent discount rate, and round the discount factors to two decimal places.

- Calculate NPV and ROI

Payback Analysis (1 of 2)

- 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
  - Determines how much time will elapse before accrued benefits overtake accrued and continuing costs
  - Payback occurs when the net cumulative discounted benefits equals the costs
  - Many organizations have requirements for the length of the payback period of an investment

Payback Analysis (2 of 2)
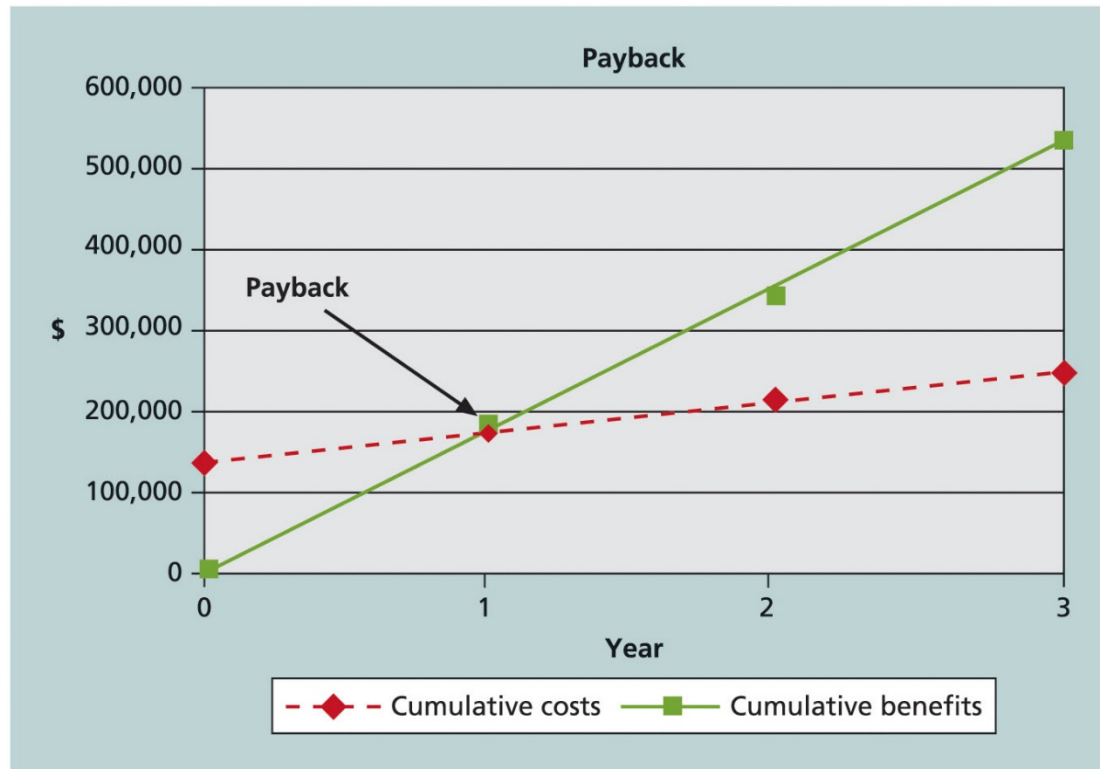
FIGURE 4-6   Charting the payback period for the JWD Consulting project

Using a Weighted Scoring Model

- 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

Using a Weighted Scoring Model (cont.)

- Possible criteria for IT projects include the following:
  - Supports key business objectives or strategies
  - Has strong internal sponsor
  - Has strong customer support
  - Uses realistic level of technology
  - Can be implemented in one year or less
  - Provides positive NPV
  - Has low risk in meeting scope, time, and cost goals

Using a Weighted Scoring Model

	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**

Weighted Score by Project

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 is a strategic planning and management system that helps organizations align business activities to strategy, improve communications, and monitor performance against strategic goals

  Check out https://www.balancedscorecard.org/ for more details

Developing a Project Charter (1 of 2)

- 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 project charter is a key output of the initiation process

Developing a Project Charter (2 of 2)

- Inputs for developing a project charter
  - Business case
  - Benefits management plan
  - Agreements
  - Enterprise environmental factors
  - Organizational process assets

Project charter

- A project charter should include **at least** the following basic information:
  - The project's title and date of authorization
  - The project manager's name and contact information
  - A summary schedule, including the planned start and finish dates; if a summary milestone schedule is available, it should also be included or referenced
  - A summary of the project's budget or reference to budgetary documents
  - A brief description of the project objectives, including the business need or other justification for authorizing the project
  - Project success criteria, including project approval requirements and who signs off on the project
  - A summary of the planned approach for managing the project, which should describe stakeholder needs and expectations, important assumptions, and constraints, and should refer to related documents, such as a communications management plan, as available
  - A roles and responsibilities matrix
  - A sign-off section for signatures of key project stakeholders
  - A comments section in which stakeholders can provide important comments related to the project

Project charter example

Project Title: Next-gen 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 Next-gen DNA-sequencing instrument project has been under way for three years. It is a crucial project for our company. This is the first charter for the project; the objective is to complete the first version of the instrument software 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.

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 Next-gen 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)

ROLES AND RESPONSIBILITIES

Name	Role	Position	Contact Information

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

Developing a Project Management Plan

- 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/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
  - References to other project planning documents

Using Guidelines to Create Project Management Plans

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

Source: 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
  - Products of the project are produced during the execution phase
- The project manager needs to focus on leading the project team and managing stakeholder relationships to execute the project management plan successfully
  - Project resource management, communications management, and stakeholder management are crucial to a project's success

Coordinating Planning and Execution

- Project planning and execution are **intertwined and inseparable** activities
  - The main function of creating a project management plan is to guide project execution
- Those who will do the work should help to plan the work
  - All project personnel need to develop both planning and executing skills, and they need experience in these areas

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
  - The project management plan provides the baseline for identifying and controlling project changes
    - A baseline is a starting point, a measurement, or an observation that is documented so that it can be used for future comparison.

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 are the project charter, project management plan, project documents, accepted deliverables, business documents, agreements, procurement documentation, and organizational process assets
    - Main tools and techniques are expert judgment, data analysis, and meetings

Case study

- 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.

Case study (cont.)

- 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.

Case study (cont.)

- 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?

- What went wrong here? Was Nick a good project manager? Why or why not? What could Nick have done to be a better project manager?