
جامعة شط العرب
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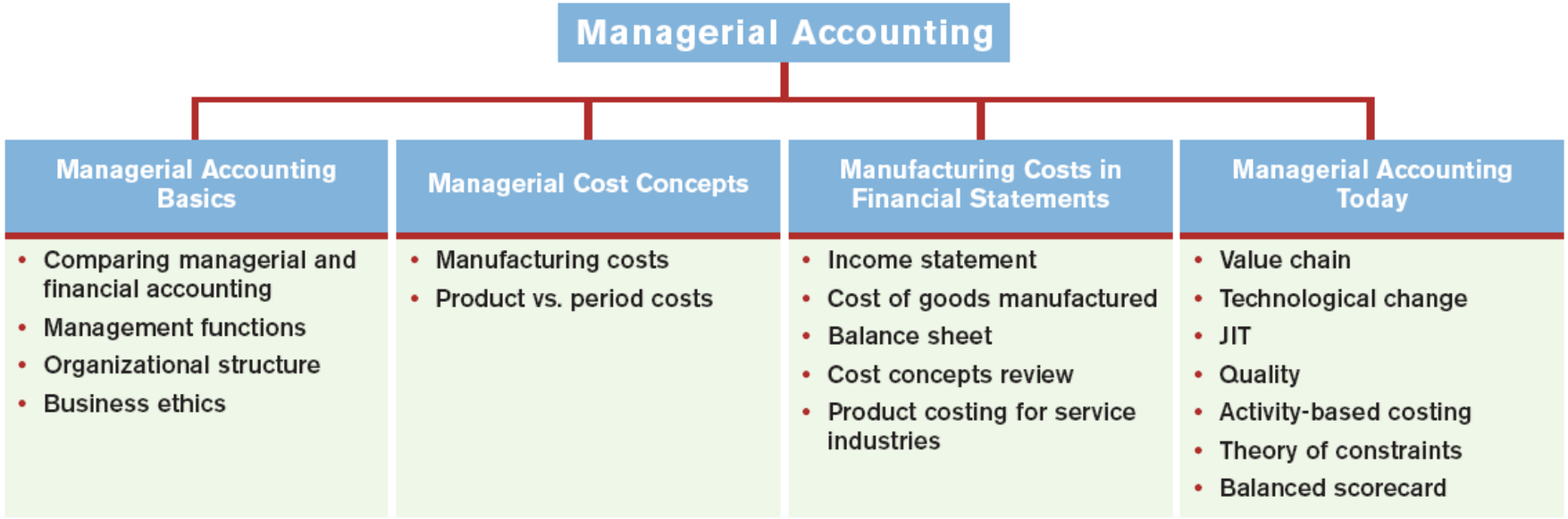
SHATT AL-ARAB UNIVERSITY

CHAPTER 14

MANAGERIAL ACCOUNTING

Accounting, Fourth Edition

Chapter Preview



Study Objectives

1. Explain the distinguishing features of managerial accounting.
2. Identify the 3 broad functions of management.
3. Define the 3 classes of manufacturing costs.
4. Distinguish between product and period costs.
5. Explain the differences between a merchandising and a manufacturing income statement.

Study Objectives

6. Indicate how cost of goods manufactured is determined.
7. Explain the difference between a merchandising and a manufacturing balance sheet.
8. Identify trends in managerial accounting.

Managerial Accounting

Managerial Accounting Basics

- Comparing managerial and financial accounting
- Management functions
- Organizational structure
- Business ethics

Managerial Cost Concepts

- Manufacturing costs
- Product vs. period costs

Manufacturing Costs in Financial Statements

- Income statement
- Cost of Goods Manufactured
- Balance sheet
- Cost concepts review
- Product Costing for Service Industries

Managerial Accounting Today

- Value Chain
- Technological change
- JIT
- Quality
- Activity-based costing
- Theory of constraints
- Balanced scorecard

Managerial Accounting Basics

Definition of Managerial Accounting

A field of accounting that provides economic and financial information for managers and other internal users.

Also called *Management Accounting*.

Managerial Accounting Basics

Distinguishing Features

- **Applies to all types of business –**
  Service, Merchandising, and Manufacturing.
- **Applies to all forms of business organizations –**
  Proprietorships, Partnerships, and Corporations.
- **Applies to not-for-profit as well as profit-oriented companies.**

SO 1 Explain the distinguishing features of managerial accounting.

Managerial Accounting Basics

Distinguishing Features (Continued)

- Changed role in collecting and reporting costs to management as a result of increasingly automated business environment.
- Now more responsible for strategic cost management – assisting in evaluating how well resources are employed by the company.
- Accountants now serve on teams with people from production, marketing,engineering, etc.
- Aid in making critical strategic decisions.

SO 1 Explain the distinguishing features of managerial accounting.

Comparing Managerial and Financial Accounting

Similarities

- **Both managerial and financial accounting deal with economic events of a business –**

  Thus, interests overlap.

- **Both require that economic events be quantified and communicated to interested parties –**

  Determining unit cost is part of managerial accounting,

  Reporting cost of goods manufactured is a part of financial accounting.

SO 1 Explain the distinguishing features of managerial accounting.

Comparing Managerial and Financial Accounting

Differences

Financial Accounting		Managerial Accounting
• External users: stockholders, creditors, and regulators.	**Primary Users of Reports**	• Internal users: officers and managers.
• Financial statements. • Quarterly and annually.	**Types and Frequency of Reports**	• Internal reports. • As frequently as needed.
• General-purpose.	**Purpose of Reports**	• Special-purpose for specific decisions.
• Pertains to business as a whole. • Highly aggregated (condensed). • Limited to double-entry accounting and cost data. • Generally accepted accounting principles.	**Content of Reports**	• Pertains to subunits of the business. • Very detailed. • Extends beyond double-entry accounting to any relevant data. • Standard is relevance to decisions.
• Audit by CPA.	**Verification Process**	• No independent audits.

Illustration 14-1

SO 1 Explain the distinguishing features of managerial accounting.

Review Question

Managerial accounting:

a. Is governed by the Securities and Exchange Commission.

b. Places emphasis on special-purpose information.

c. Pertains to the entity as a whole and is highly aggregated.

d. Is limited to cost data.

SO 1 Explain the distinguishing features of managerial accounting.

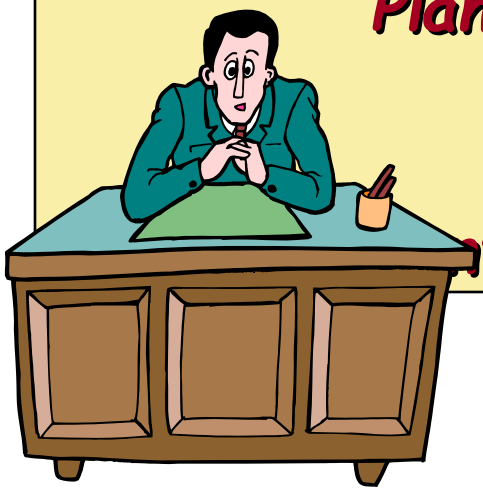
Managerial Accounting Basics

Management Functions

Management's activities and responsibilities can be classified into the following three broad functions:

Planning,

Directing, and



trolling.

SO 2 Identify the 3 broad functions of management.

Management Functions

Planning

- **Look ahead and establish objectives such as-**

  Maximize short-term profit and market share.

  Commit to environmental protection and social programs.

- **Key Objective: Add *value* to the business -**

  Value measured by trading price of stock and by potential selling price of the company.

SO 2 Identify the 3 broad functions of management.

Management Functions

Directing

- Coordinate diverse activities and human resources.
- Implement planned objectives.
- Provide incentives to motivate employees.
- Hire and train employees including executives, managers, and supervisors.
- Produce smooth-running operation.

SO 2 Identify the 3 broad functions of management.

Management Functions

Controlling

- Process of keeping activities on track.
- Determine whether goals are met.
- Decide changes needed to get back on track.

- May use an informal or formal system of evaluations.

Decision making is not a separate management function, but the OUTCOME of the exercise of good judgment in planning, directing, and controlling.

SO 2 Identify the 3 broad functions of management.

Organizational Structure

Within a company, an organization chart shows:

The interrelationships of activities and
The delegation of authority and responsibility.

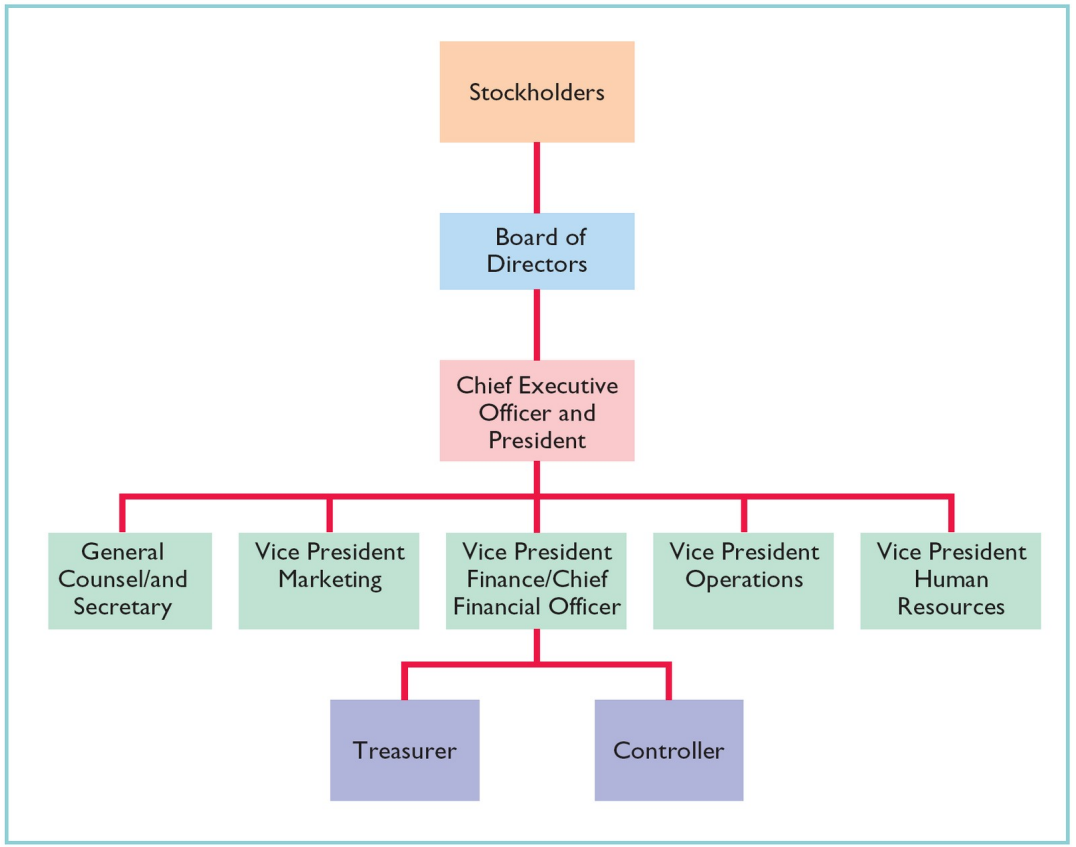


Illustration 14-2

Good Ethics – Good Business

Business Ethics:

- All employees are expected to act ethically.
- An increasing number of organizations have codes of business ethics.
- Despite organizational efforts:
  - Business scandals have caused massive investment losses and employee layoffs.
  - Corporate fraud has increased 13% in last 5 years.
  - Employee fraud – 60% of all fraud.
  - Financial reporting fraud (intentional misstatement of financial reports) is most costly.

Good Ethics – Good Business

Creating Proper Incentives:

- Companies like Motorola, IBM, and Nike expend substantial resources to monitor and evaluate the actions of employees and managers.
- Monitoring can have the negative result of producing incentives for unethical actions.

Employees may feel that they must succeed no matter what.

Ineffective and unrealistic controls may also result in declining product quality.

Good Ethics – Good Business

Code of Ethical Standards

Sarbanes-Oxley Act of 2002

- Clarifies management's responsibilities.
- Certifications by CEO and CFO -

  Fairness of financial statements and *adequacy of internal control.*

- Selection criteria for Board of Directors and Audit Committee.
- Substantially increased penalties for misconduct.
- IMA *Statement of Ethical Professional Practices.*

  Provides guidance for managerial accountants.

Management Functions

Review Question

The management of an organization performs several broad functions. They are:

a. Planning, directing, and selling.

b. Directing, manufacturing, and controlling.

c. Planning, manufacturing, and controlling.

d. Planning, directing, and controlling.

SO 2 Identify the 3 broad functions of management.

Managerial Cost Concepts

Manufacturing Costs

- Manufacturing consists of *activities and processes to convert raw materials into finished goods*.
- In contrast, a merchandising firm sells goods in the form in which they were purchased.
- Manufacturing costs are typically classified as:

Illustration 14-3

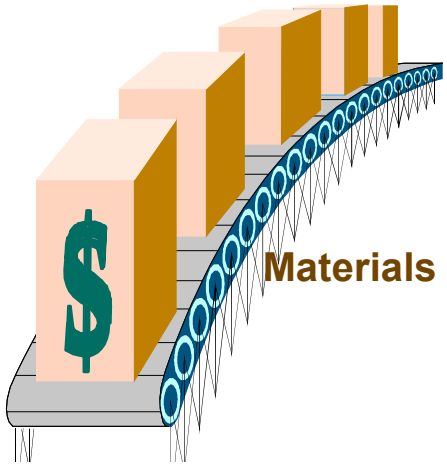
SO 3 – Define the 3 classes of manufacturing costs.

Manufacturing Costs

Materials

Raw Materials:

Basic materials and parts used in the manufacturing process.



Direct Materials :

Raw materials that can be physically and directly associated with the finished product during the manufacturing process.

SO 3 Define the 3 classes of manufacturing costs.

Manufacturing Costs

Materials

Indirect Materials:

- Raw materials that *cannot* be easily associated with the finished product.
- Not physically part of the finished product *or* they are an insignificant part of finished product in terms of cost.
- Considered part of *manufacturing overhead.*

SO 3 Define the 3 classes of manufacturing costs.

Manufacturing Costs

Labor

Direct Labor:

Work of factory employees that can be physically and associated with materials conver into fir

Direct Labor

Indirect Labor:

Work of factory employees that has no physical association with the finished product or for which it is impractical to trace costs to the goods produced.

SO 3 Define the 3 classes of manufacturing costs.

Manufacturing Costs

Manufacturing Overhead

- Costs that are *indirectly* associated with manufacturing the finished product.
- Includes all manufacturing costs *except* direct materials and direct labor.
- Allocation of manufacturing overhead to products can present problems.
- Also called factory overhead, indirect manufacturing costs, or burden.

SO 3 Define the 3 classes of manufacturing costs.

Manufacturing Costs

Review Question

Which of the following is *not* an element of manufacturing overhead?

a. Sales manager's salary.

b. Plant manager's salary.

c. Factory repairman's wages.

d. Product inspector's salary.

SO 3 Define the 3 classes of manufacturing costs.

Product Versus Period Costs

Product Costs

- Components: *Direct material cost*, *direct labor cost*, and *manufacturing overhead.*
- Costs that are a necessary and integral part of producing the product.
- Recorded as *inventory* when incurred, thus may be called inventoriable costs.
- When the finished goods inventory is sold, it then becomes an expense called cost of goods sold.

SO 4 Distinguish between product and period costs.

Product Versus Period Costs

Period Costs

- Matched with revenue of a specific time period and *charged to expense as incurred.*
- Non-manufacturing costs.
- Deducted from revenues in period incurred to determine net income.
- Includes all selling and administrative expenses.

SO 4 Distinguish between product and period costs.

Product Versus Period Costs

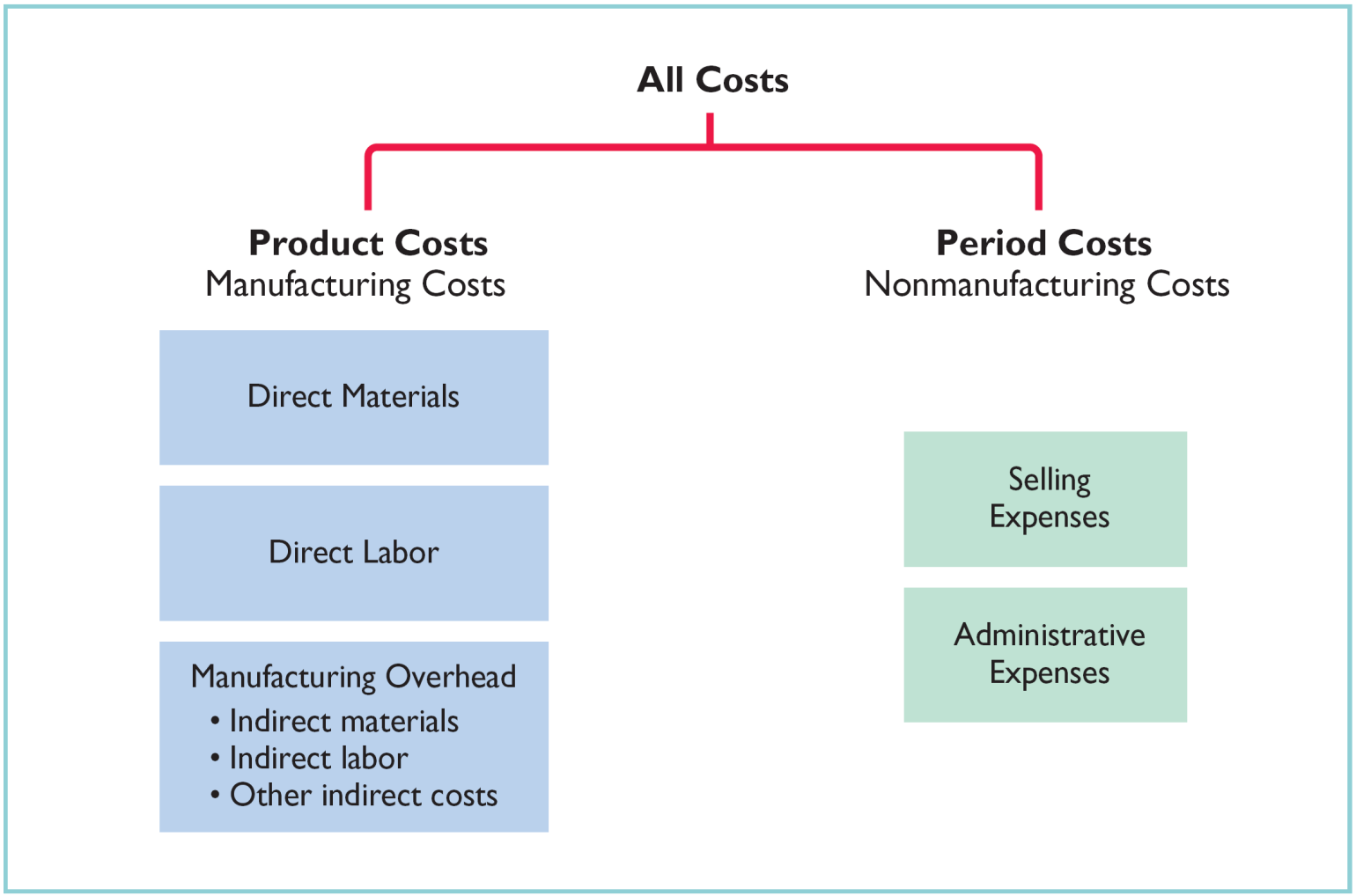


Illustration 14-4

SO 4 Distinguish between product costs and period costs.

Manufacturing Costs in Financial Statements

Income Statement

The income statement for a manufacturer is similar to that of a merchandiser *except* for the *cost of goods sold section.*

SO 5 Explain the difference between a merchandising and a manufacturing income statement.

Manufacturing Costs in Financial Statements

Cost of Goods Sold Components
Merchandiser versus Manufacturer

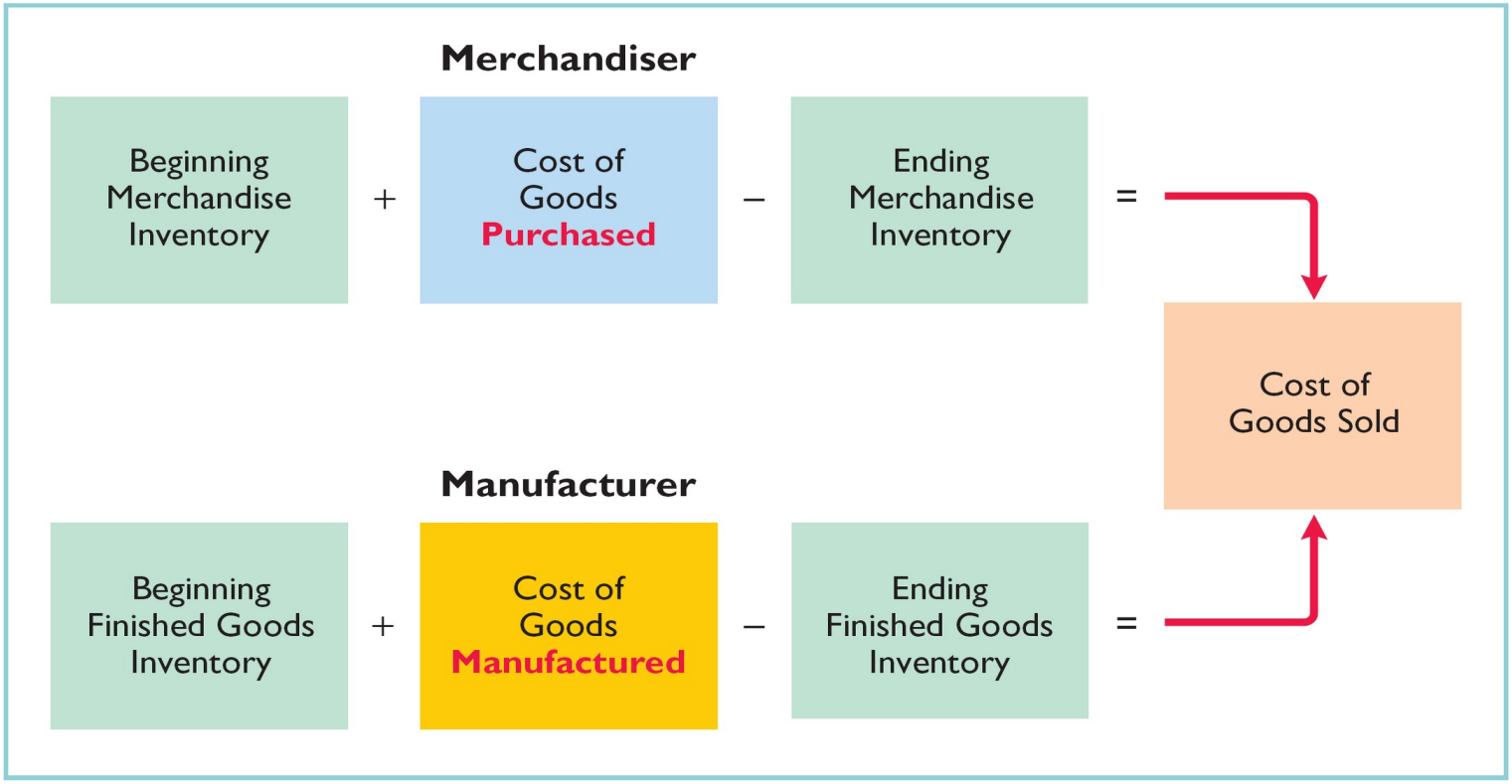


Illustration 14-5

SO 5 Explain the difference between a merchandising and a manufacturing income statement.

Manufacturing Costs in Financial Statements

Cost of Goods Sold Section of the Income Statement

MERCHANDISING COMPANY Income Statement (partial) For the Year Ended December 31, 2012		MANUFACTURING COMPANY Income Statement (partial) For the Year Ended December 31, 2012	
Cost of goods sold		Cost of goods sold	
Merchandise inventory, January 1	$ 70,000	Finished goods inventory, January 1	$ 90,000
Cost of goods purchased	650,000	Cost of goods manufactured (see Illustration 14-8)	370,000
Cost of goods available for sale	720,000	Cost of goods available for sale	460,000
Merchandise inventory, December 31	400,000	Finished goods inventory, December 31	80,000
Cost of goods sold	$ 320,000	Cost of goods sold	$380,000

Illustration 14-6

SO 5 Explain the difference between a merchandising and a manufacturing income statement.

Manufacturing Costs in Financial Statements

Review Question

For the year, Red Company has cost of goods manufactured of $600,000, beginning balance of finished goods inventory of $200,000, and ending balance of finished goods inventory of $250,000.

The cost of goods sold is:

a. $450,000.

b. $500,000.

c. $550,000.

d. $600,000.

Beginning Inventory	$200,000
Cost of Goods Manufactured	600,000
	$800,000
Minus Ending Finished Goods	250,000
Cost of Goods Sold	$550,000

SO 5 Explain the difference between a merchandising and a manufacturing income statement.

Manufacturing Costs in Financial Statements

Determining the Cost of Goods Manufactured

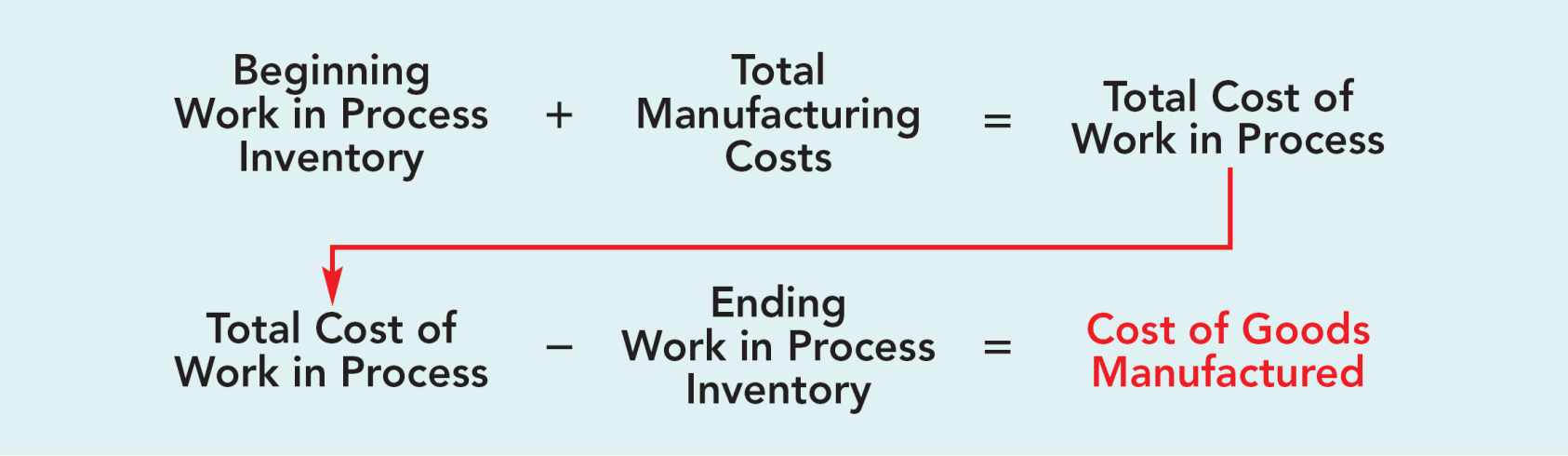


Illustration 14-7

Work in Process – partially completed units of product.

Total Manufacturing Costs – sum of direct material costs, direct labor costs, and manufacturing overhead; all incurred in the current period.

SO 6 Indicate how cost of goods manufactured is determined.

Manufacturing Costs in Financial Statements

OLSEN MANUFACTURING COMPANY
Cost of Goods Manufactured Schedule
For the Year Ended December 31, 2012

Work in process, January 1			$ 18,400
Direct materials			
Raw materials inventory, January 1	$ 16,700		
Raw materials purchases	152,500		
Total raw materials available for use	169,200		
Less: Raw materials inventory, December 31	22,800		
Direct materials used		$146,400	
Direct labor		175,600	
Manufacturing overhead			
Indirect labor	14,300		
Factory repairs	12,600		
Factory utilities	10,100		
Factory depreciation	9,440		
Factory insurance	8,360		
Total manufacturing overhead		54,800	
Total manufacturing costs			376,800
Total cost of work in process			395,200
Less: Work in process, December 31			25,200
Cost of goods manufactured			$370,000

Illustration 14-8

SO 6 Indicate how cost of goods manufactured is determined.

Manufacturing Costs in Financial Statements

Balance Sheet - Inventories

Merchandising Company	Manufacturing Company
One category of inventory: *Merchandise Inventory*	May have three inventory accounts: *Raw Materials* *Work in Process* *Finished Goods*

SO 7 Explain the difference between a merchandising and a manufacturing balance sheet.

Manufacturing Costs in Financial Statements

Balance Sheet - Inventories

MERCHANDISING COMPANY Balance Sheet December 31, 2012		MANUFACTURING COMPANY Balance Sheet December 31, 2012		
Current assets		Current assets		
Cash	$100,000	Cash		$180,000
Receivables (net)	210,000	Receivables (net)		210,000
Merchandise inventory	**400,000**	**Inventories**		
Prepaid expenses	22,000	**Finished goods**	**$80,000**	
Total current assets	$732,000	**Work in process**	**25,200**	
		Raw materials	**22,800**	**128,000**
		Prepaid expenses		18,000
		Total current assets		$536,000

Illustration 14-10

SO 7 Explain the difference between a merchandising and a manufacturing balance sheet

Manufacturing Costs in Financial Statements

Review Question

A cost of goods manufactured schedule shows beginning and ending inventories for:

a. Raw materials and work in process only.
b. Work in process only.
c. Raw materials only.
d. Raw materials, work in process, and finished goods.

Managerial Accounting Today

Service Industry Trends

- U.S. economy, in general, has shifted toward an *emphasis on providing services* rather than goods.
- *Over 50%* of U.S. workers are now employed by service companies.
- Trend is expected to continue in the future.
- *Most of the techniques learned for manufacturing firms are applicable to service companies.*

SO 8 Identify trends in management accounting.

Managerial Accounting Practices

- **Value Chain**

Refers to all activities associated with providing a product or service.

For a manufacturing firm these include the following:

Illustration 14-13

SO 8 Identify trends in management accounting.

Managerial Accounting Today

Managerial Accounting Practices

- **Technological Change**

  Enterprise Resource Planning (ERP) – software programs designed to manage all major business processes.

  Computer-Integrated Manufacturing (CIM) – manufacturing products with increased automation.

- **Just-In-Time (JIT) Inventory Methods**

  Inventory system in which goods are manufactured or purchased just in time for sale.

SO 8 Identify trends in management accounting.

Managerial Accounting Today

Managerial Accounting Practices

- **Quality**

  Increased emphasis on product quality because goods are produced only as needed.

  Total Quality Management (TQM)
  - *a philosophy of zero defects.*

- **Activity-Based-Costing (ABC)**

  Allocates overhead based on use of activities.

  Results in more accurate product costing and scrutiny of all activities in the value chain.

SO 8 Identify trends in management accounting.

Managerial Accounting Today

Managerial Accounting Practices

- **Theory of Constraints**

  Constraints ("bottlenecks") limit the company's potential profitability.

  A specific approach to identify and manage these constraints in order to achieve company goals.

- **Balanced Scorecard**

  Evaluates operations in an *integrated* fashion.

  Uses both financial and non-financial measures.

  Links performance measures to overall company objectives.

SO 8 Identify trends in management accounting.

Managerial Accounting Today

Review Question

Which of the following managerial accounting techniques attempts to allocate manufacturing overhead in way that leads to more accurate product costs?

a. Just-in-time inventory.

b. Total-quality management.

c. Balanced scorecard.

d. Activity-based costing.

SO 8 Identify trends in management accounting.

Chapter Review - Brief Exercise 14-5

Indicate whether each of the following costs of an automobile manufacturer would be classified as direct materials, direct labor, or manufacturing overhead.

DM	a. Windshield
DM	b. Engine
DL	c. Wages of assembly line worker
MO	d. Depreciation of factory machinery
MO	e. Factory machinery lubricants
DM	f. Tires
DM	g. Steering wheel
MO	h. Salary of painting supervisor

Chapter Review - Brief Exercise 14-6

Identify whether each of the following costs should be classified as product costs or period costs.

Product	a. Manufacturing overhead
Period	b. Selling expenses
Period	c. Administrative expenses
Period	d. Advertising expense
Product	e. Direct labor
Product	f. Direct material

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Chapter Twenty Three

Cost-Volume-Profit Analysis

- ***After studding this chapter you should be able to :***

- *State the five components of cost-volume-profit analysis.*
- *Indicate the meaning of contribution margin and the ways it may be expressed.*
- *Identify the three ways that the break-even point may be determined.*
- *Define margin of safety and give the formula for computing it.*
- *Give the formulas for determining sales required to earn target net income.*
- *Describe the essential features of a cost-volume-profit income statement*

This chapter examines one of the most basic planning tools available to managers:

(cost-volume-profit analysis.)

Cost-volume-profit (CVP) analysis examines the behavior of total revenues, total costs, and operating income as changes occur in the out put level, selling price, variable costs per unit, or fixed costs.

Managers commonly use CVP analysis as a tool to help them answer such questions as,

1-How will revenues and costs be affected if we sell 1,000 more units?

2-If we raise or lower our selling prices?

3-If we expand business into overseas markets?

THE BREAKEVEN POINT

- *The breakeven point is that quantity of output where total revenues equal total costs.(that is, where the operating income profit is zero)*

Question:

Why would managers be interested in the breakeven point?

- *Mainly because*

1- They want to avoid operating losses, And the breakeven point tells them

2- what level of sales they must generate to avoid a loss.

For determining the breakeven point :

1- The equation method.

2- The contribution margin method, and

3- The graph method

Equation Approach

Profit = Sales revenue – Variable expenses – Fixed expenses

Unit sales price	×	Sales volume in units

Unit variable expense	×	Sales volume in units

At the break-even point profit equals zero, and the sales volume in units is unknown.

Equation Approach

Profit = Sales revenue – Variable expenses – Fixed expenses

($500 × X) – ($300 × X) – $80,000 = $0

($200X) – $80,000 = $0

X = 400 units

At the break-even point profit equals zero, and the sales volume in units is unknown.

Contribution-Margin Approach

Consider the following information developed by the accountant at Curl, Inc.:

	Total	Per Unit	Percent
Sales (500 surfboards)	$250,000	$ 500	100%
Less: variable expenses	150,000	300	60%
Contribution margin	$100,000	$ 200	40%
Less: fixed expenses	80,000		
Net income	$ 20,000		

Contribution-Margin Approach

For each additional surf board sold, Curl generates $200 in contribution margin.

	Total	Per Unit	Percent
Sales (500 surfboards)	$250,000	$ 500	100%
Less: variable expenses	150,000	300	60%
Contribution margin	$100,000	$ 200	40%
Less: fixed expenses	80,000		
Net income	$ 20,000		

Contribution-Margin Approach

We can calculate the break-even volume using the following equation.

$$\text{Break-even point (in units)} = \frac{\text{Fixed expenses}}{\text{Unit contribution margin}}$$

Let's calculate the break-even point in units for Curl, Inc.

Contribution-Margin Approach

	Total	Per Unit	Percent
Sales (400 surfboards)	$200,000	$ 500	100%
Less: variable expenses	120,000	300	60%
Contribution margin	$ 80,000	$ 200	40%
Less: fixed expenses	80,000		
Net income	$ -		

$$\frac{\$80{,}000}{\$200} = 400 \text{ surfboards}$$

Let's check our calculation.

Contribution-Margin Approach

Break-even Point

	Total	Per Unit	Percent
Sales (400 surfboards)	$200,000	$ 500	100%
Less: variable expenses	120,000	300	60%
Contribution margin	$ 80,000	$ 200	40%
Less: fixed expenses	80,000		
Net income	$ -		

400 × $500 = $200,000

400 × $300 = $120,000

Contribution-Margin Ratio

We can calculate the break-even point in ***sales dollars*** rather than units by using the contribution-margin ratio.

$$\frac{\text{Contribution margin}}{\text{Sales}} = \text{CM Ratio}$$

Contribution-Margin Ratio

We can calculate the break-even point in *sales dollars* rather than units by using the contribution-margin ratio.

$$\frac{\text{Contribution margin}}{\text{Sales}} = \text{CM Ratio}$$

$$\frac{\text{Fixed expense}}{\text{CM Ratio}} = \text{Break-even point (in sales dollars)}$$

Contribution-Margin Ratio

	Total	Per Unit	Percent
Sales (400 surfboards)	$200,000	$ 500	100%
Less: variable expenses	120,000	300	60%
Contribution margin	$ 80,000	$ 200	40%
Less: fixed expenses	80,000		
Net income	$ -		

$$\frac{\$80{,}000}{40\%} = \$200{,}000 \text{ sales}$$

Graphing Cost-Volume-Profit Relationships

Viewing CVP relationships in a graph gives managers a perspective that can be obtained in no other way.

Consider the following information for Curl, Inc.:

	Income 300 units	Income 400 units	Income 500 units
Sales	$ 150,000	$ 200,000	$250,000
Less: variable expenses	90,000	120,000	150,000
Contribution margin	$ 60,000	$ 80,000	$100,000
Less: fixed expenses	80,000	80,000	80,000
Net income (loss)	$ (20,000)	$ -	$ 20,000

Target Net Profit

We can determine the number of surfboards that Curl must sell to earn a profit of $100,000 using the contribution- margin approach.

Contribution-Margin Approach

We can determine the number of surfboards that Curl must sell to earn a profit of $100,000 using the contribution- margin approach.

$$\frac{\text{Fixed expenses} + \text{Target profit}}{\text{Unit contribution margin}} = \text{Units sold to earn the target profit}$$

Contribution-Margin Approach

We can determine the number of surfboards that Curl must sell to earn a profit of $100,000 using the contribution- margin approach.

$$\frac{\text{Fixed expenses + Target profit}}{\text{Unit contribution margin}} = \text{Units sold to earn the target profit}$$

$$\frac{\$80{,}000 + \$100{,}000}{\$200} = 900 \text{ surfboards}$$

Equation Approach

Sales revenue – Variable expenses – Fixed expenses = Profit

($500 × X) – ($300 × X) – $80,000 = $100,000

($200X) = $180,00

X = 900 units

Applying CVP Analysis

Safety Margin

- The difference between budgeted sales revenue and break-even sales revenue.
- The amount by which sales can drop before losses begin to be incurred.

Safety Margin

Curl, Inc. has a break-even point of $200,000. If actual sales are $250,000, the safety margin is $50,000 or 100 surfboards.

	Break-even sales 400 units	Actual sales 500 units
Sales	$ 200,000	$ 250,000
Less: variable expenses	120,000	150,000
Contribution margin	$ 80,000	$ 100,000
Less: fixed expenses	80,000	80,000
Net income	$ -	$ 20,000

Changes in Fixed Costs

- Curl is currently selling 500 surfboards per month.
- The owner believes that an increase of $10,000 in the monthly advertising budget, would increase bike sales to 540 units.

Should we authorize the requested increase in the advertising budget?

Changes in Fixed Costs

	Current Sales (500 Boards)	Proposed Sales (540 Boards)
Sales	$ 250,000	$ 270,000
Less: variable expenses	150,000	
Contribution margin	$ 100,000	
Less: fixed expenses	80,000	
Net income	$ 20,000	

540 units × $500 per unit = $270,000

Changes in Fixed Costs

	Current Sales (500 Boards)	Proposed Sales (540 Boards)
Sales	$ 250,000	$ 270,000
Less: variable expenses	150,000	162,000
Contribution margin	$ 100,000	$ 108,000
Less: fixed expenses	80,000	90,000
Net income	$ 20,000	$ 18,000

$80,000 + $10,000 advertising = $90,000

Changes in Fixed Costs

Sales will increase by $20,000, but net income will decrease by $2,000.

	Current Sales (500 Boards)	Proposed Sales (540 Boards)
	$ 250,000	$ 270,000
Less: variable expenses	150,000	162,000
Contribution margin	$ 100,000	$ 108,000
Less: fixed expenses	80,000	90,000
Net income	$ 20,000	$ 18,000

Changes in Unit Contribution Margin

Because of increases in cost of raw materials, Curl's variable cost per unit has increased from $300 to $310 per surfboard. With no change in selling price per unit, what will be the new break-even point?

Changes in Unit Contribution Margin

Because of increases in cost of raw materials, Curl's variable cost per unit has increased from $300 to $310 per surfboard. With no change in selling price per unit, what will be the new break-even point?

$$(\$500 \times X) - (\$310 \times X) - \$80{,}000 = \$0$$

$$X = 422 \text{ units (rounded up)}$$

Predicting Profit Given Expected Volume

Given: { Fixed expenses, Unit contribution margin, Target net profit } Find: {required sales volume}

Given: { Fixed expenses, Unit contribution margin, Expected sales volume } Find: {expected profit}

Predicting Profit Given Expected Volume

In the coming year, Curl's owner expects to sell 525 surfboards. The unit contribution margin is expected to be $190, and fixed costs are expected to increase to $90,000.

How much profit can we expect to earn?

Predicting Profit Given Expected Volume

In the coming year, Curl's owner expects to sell 525 surfboards. The unit contribution margin is expected to be $190, and fixed costs are expected to increase to $90,000.

Total contribution	-	Fixed cost	=	Profit

($190 × 525) – $90,000 = X

X = $99,750 – $90,000

X = $9,750 profit

CVP Analysis with Multiple Products

For a company with more than one product, sales mix is the relative combination in which a company's products are sold.

Different products have different selling prices, cost structures, and contribution margins.

Let's assume Curl sells surfboards and sailboards and see how we deal with break-even analysis.

CVP Analysis with Multiple Products

Curl provides us with the following information:

Description	Selling Price	Unit Variable Cost	Unit Contribution Margin	Number of Boards
Surfboards	$ 500	$ 300	$ 200	500
Sailboards	1,000	450	550	300
Total sold				800

Description	Number of Boards	% of Total	
Surfboards	500	62.5%	(500 ÷ 800)
Sailboards	300	37.5%	(300 ÷ 800)
Total sold	800	100.0%	

CVP Analysis with Multiple Products

Weighted-average unit contribution margin

Description	Contribution Margin	% of Total	Weighted Contribution
Surfboards	$ 200	62.5%	$ 125.00
Sailboards	550	37.5%	206.25
Weighted-average contribution margin			$ 331.25

$200 × 62.5%

CVP Analysis with Multiple Products

Break-even point

$$\text{Break-even point} = \frac{\text{Fixed expenses}}{\text{Weighted-average unit contribution margin}}$$

$$\text{Break-even point} = \frac{\$170{,}000}{\$331.25}$$

$$\text{Break-even point} = 514 \text{ combined unit sales (rounded up)}$$

CVP Analysis with Multiple Products

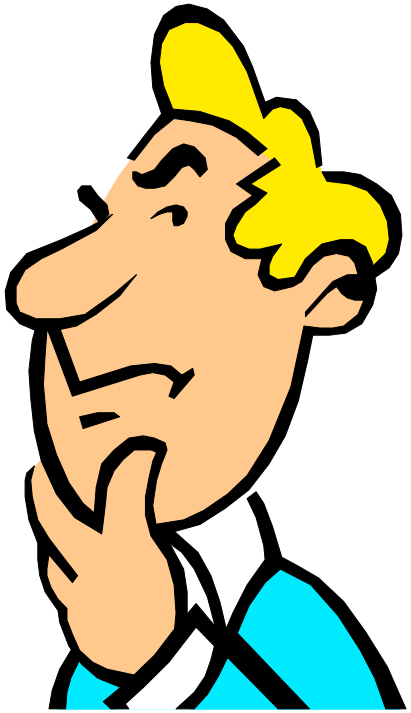
Break-even point

Break-even point = 514 combined unit sales

Description	Breakeven Sales	% of Total	Individual Sales
Surfboards	514	62.5%	321
Sailboards	514	37.5%	193
Total units			514

Assumptions Underlying CVP Analysis

- ☼ Selling price is constant throughout the entire relevant range.
- ❷ Costs are linear over the relevant range.
- ❝ In multi product companies, the sales mix is constant.
- ❹ In manufacturing firms, inventories do not change (units produced = units sold).



Cost Structure and Operating Leverage

- The cost structure of an organization is the relative proportion of its fixed and variable costs.
- Operating leverage is . . .
  - the extent to which an organization uses fixed costs in its cost structure.
  - greatest in companies that have a high proportion of fixed costs in relation to variable costs.

Measuring Operating Leverage

$$\text{Operating leverage factor} = \frac{\text{Contribution margin}}{\text{Net income}}$$

	Actual sales 500 Board
Sales	$ 250,000
Less: variable expenses	150,000
Contribution margin	$ 100,000
Less: fixed expenses	80,000
Net income	$ 20,000

Measuring Operating Leverage

$$\text{Operating leverage factor} = \frac{\text{Contribution margin}}{\text{Net income}}$$

	Actual sales 500 Board
Sales	$ 250,000
Less: variable expenses	150,000
Contribution margin	$ 100,000
Less: fixed expenses	80,000
Net income	$ 20,000

$$\frac{\$100,000}{\$20,000} = 5$$

Measuring Operating Leverage

A measure of how a percentage change in sales will affect profits.

If Curl increases its sales by 10%, what will be the percentage increase in net income?

Measuring Operating Leverage

A measure of how a percentage change in sales will affect profits.

Percent increase in sales		10%
Operating leverage factor	×	5
Percent increase in profits		50%

CVP Analysis, Activity-Based Costing, and Advanced Manufacturing Systems

An activity-based costing system can provide a much more complete picture of cost-volume-profit relationships and thus provide better information to managers.

$$\text{Break-even point} = \frac{\text{Fixed costs}}{\text{Unit contribution margin}}$$

A Move Toward JIT and Flexible Manufacturing

Overhead costs like setup, inspection, and material handling are fixed with respect to sales volume, but they are not fixed with respect to other cost drivers.

This is the fundamental distinction between a traditional CVP analysis and an activity-based costing CVP analysis.

CHAPTER 26

INCREMENTAL ANALYSIS AND CAPITAL BUDGETING

Accounting Principles, Eighth Edition

Study Objectives

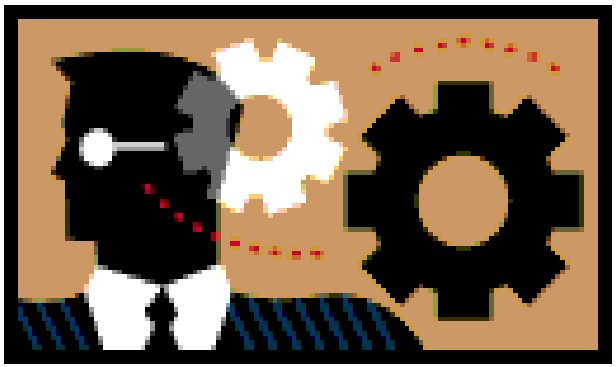
1. Indicate the steps in management's decision-making process.
2. Describe the concept of incremental analysis.
3. Identify the relevant costs in accepting an order at a special price.
4. Identify the relevant costs in a make-or-buy decision.
5. Give the decision rule for whether to sell or process materials.

Study Objectives – Continued

6. Identify the factors to consider in retaining or replacing equipment.
7. Explain the relevant factors in whether to eliminate an unprofitable segment.
8. Determine which products to make and sell when resources are limited.
9. Contrast annual rate of return and cash payback in capital budgeting.
10. Distinguish between the net present value and internal rate of return methods.

Preview of Chapter

- An important purpose of management accounting is to provide managers with relevant information for decision making.
- Considers uses of incremental analysis and capital budgeting in management's decision making process



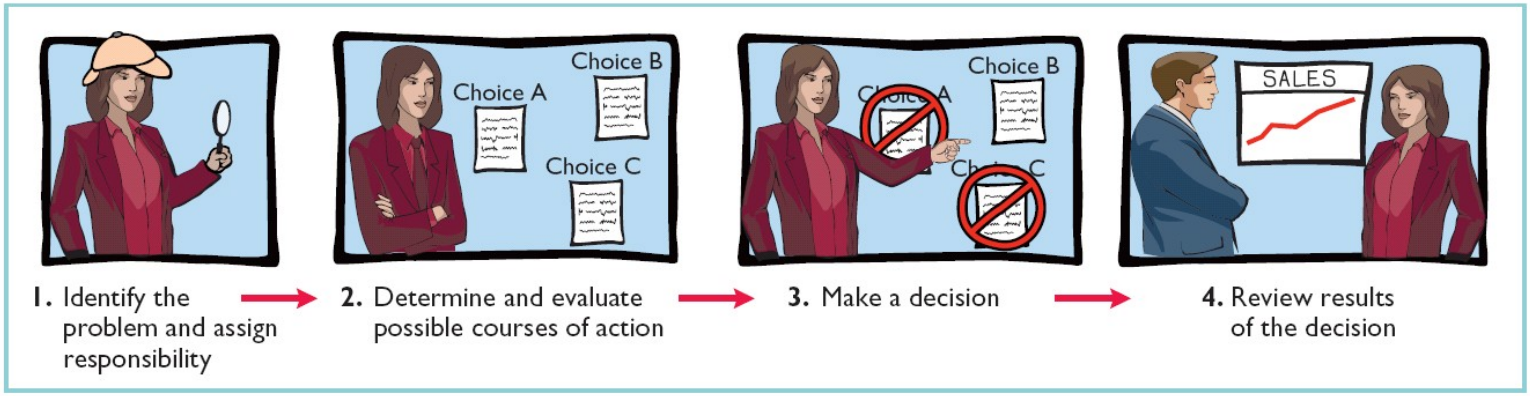
Incremental Analysis and Capital Budgeting

- Management's decision-making process
- How incremental analysis works
- Types of incremental analysis

- Process for evaluation
- Annual rate of return
- Cash payback
- Discounted cash flow

Management's Decision-Making Process

- Important management function
- Does not always follow a set pattern
- Decisions vary in scope, urgency, and importance
- Steps usually involved in process include:



LO 1: Identify the steps in management's decision-making process.

Management's Decision-Making Process

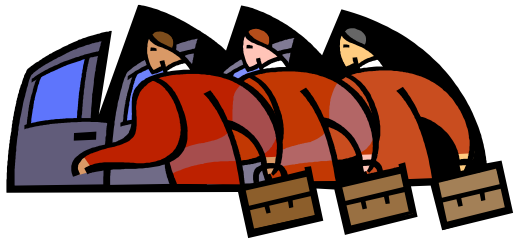
- Considers both financial and non-financial information
- ***Financial information*** includes revenues and costs as well as their effect on overall profitability
- ***Non-financial information*** includes effect on employee turnover, the environment, or overall company image

LO 1: Identify the steps in management's decision-making process.

Management's Decision-Making Process

Incremental Analysis Approach

- Decisions involve a ***choice*** among alternative actions
- Financial data relevant to a decision are the ***data that vary in the future among alternatives***
  - Both costs and revenues may vary *or*
  - Only revenues may vary *or*
  - Only costs may vary



LO 2: Describe the concept of incremental analysis.

Management's Decision-Making Process

Incremental Analysis

- Process used to identify the financial data that change under alternative courses of action
- Identifies probable effects of decisions on future earnings
- Also called *differential analysis* because it focuses on differences

LO 2: Describe the concept of incremental analysis.

How Incremental Analysis Works

Basic Example

Incremental Analysis.xls

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	A	B	C	D
1		Alternative A	Alternative B	Net Income Increase (Decrease)
2	Revenues	$125,000	$110,000	$ (15,000)
3	Costs	100,000	80,000	20,000
4	Net income	$ 25,000	$ 30,000	$ 5,000
5				

Comparison of Alternative B with Alternative A:

- Incremental revenue is $15,000 ***less*** under Alternative B
- Incremental ***cost savings*** of $20,000 is realized
- Alternative B produces ***$5,000 more net income***

LO 2: Describe the concept of incremental analysis.

How Incremental Analysis Works

- Sometimes involves changes that seem contrary to intuition
- Variable costs sometimes **do not change** under alternatives
- Fixed costs sometimes **change** between alternatives
- Incremental analysis **not** the same as CVP analysis

LO 2: Describe the concept of incremental analysis.

Let's Review

Incremental analysis is the process of identifying the financial data that

a. Do not change under alternative courses of action.

b. Change under alternative courses of action.

c. Are mixed under alternative courses of action.

d. None of the above.

LO 2: Describe the concept of incremental analysis.

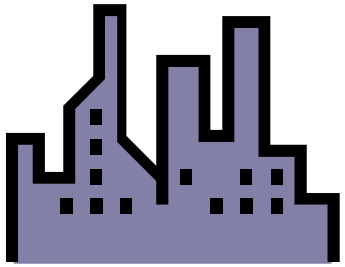
Types of Incremental Analysis

- Accept an order at a special price
- Make or buy
- Sell products or process further
- Retain or replace equipment
- Eliminate an unprofitable business segment
- Allocate limited resources

LO 2: Describe the concept of incremental analysis.

Accept an Order at a Special Price

- Obtain additional business by making a major price concession to a specific customer
- Assumes that sales of products in other markets are not affected by special order
- Assumes that company is not operating at full capacity



LO 3: Identify the relevant costs in accepting an order at a special price.

Accept an Order at a Special Price

Example

- Customer offers to buy a special order of 2,000 units at $11 per unit
  - No effect on normal sales
  - No effect on plant capacity; currently operating at 80% which is 100,000 units
  - Current variable manufacturing cost = $8 per unit
  - Current fixed manufacturing costs = $400,000 or $4 per unit
  - Normal selling price = $20 per unit
- Based strictly on total cost of $12 per unit ($8 + $4), **reject** offer as cost exceeds selling price of $11

LO 3: Identify the relevant costs in accepting an order at a special price.

Accept an Order at a Special Price

Example - Continued

- Fixed costs do not change since within existing capacity – thus ***fixed costs are not relevant***
- Variable manufacturing costs and expected revenues change – thus ***both are relevant to the decision***

Accepting an order at a special price.xls

File Edit View Insert Format Tools Data Window Help

	A	B	C	D
1		Reject Order	Accept Order	Net Income Increase (Decrease)
2	Revenues	$0	$22,000	$ 22,000
3	Costs	0	16,000	(16,000)
4	Net income	$0	$ 6,000	$ 6,000
5				

Decision: Accept the offer; Income increases by $6,000

LO 3: Identify the relevant costs in accepting an order at a special price.

Make or Buy

Must decide whether to make the component parts or to buy them from others

Example:

The following costs are incurred to make 25,000 switches:

Direct materials	$ 50,000
Direct labor	75,000
Variable manufacturing overhead	40,000
Fixed manufacturing overhead	60,000
Total manufacturing costs	$225,000
Total cost per unit ($225,000 ÷ 25,000)	**$9.00**

Alternatively, the switches can be purchased for $8 per switch ($200,000)

Eliminates all variable costs of making switches

Eliminates $10,000 of fixed costs; however, $50,000 remain

LO 4: Identify the relevant costs in a make-or-buy decision.

Make or Buy

Example - Continued

- Total manufacturing cost is $1 higher than purchase price
- Must absorb at least $50,000 of fixed costs under either option

Incremental Analysis - Make or buy.xls

File Edit View Insert Format Tools Data Window Help

	A	B	C	D
1		Make	Buy	Net Income Increase (Decrease)
2	Direct materials	$ 50,000	$ 0	$ 50,000
3	Direct labor	75,000	0	75,000
4	Variable manufacturing costs	40,000	0	40,000
5	Fixed manufacturing costs	60,000	50,000	10,000
6	Purchase price (25,000 × $8)	0	200,000	(200,000)
7	Total annual cost	$225,000	$250,000	$ (25,000)
8				

Decision: Continue to make switches as purchasing adds $25,000 to cost

LO 4: Identify the relevant costs in a make-or-buy decision.

Make or Buy

Opportunity Cost

the ***potential benefit*** that may be obtained from following an alternative course of action

must be considered in incremental analysis

LO 4: Identify the relevant costs in a make-or-buy decision.

Make or Buy

Example – Continued

- Assume that buying the switches allows the company to use the released capacity to earned $28,000 in additional income
- The $28,000 lost income is an additional cost of making the switches – ***an opportunity cost***

Incremental Analysis - Make or buy with opportunity cost.xls

File Edit View Insert Format Tools Data Window Help

	A	B	C	D
1		Make	Buy	Net Income Increase (Decrease)
2	Total annual cost	$225,000	$250,000	$(25,000)
3	Opportunity cost	28,000	0	28,000
4	Total cost	$253,000	$250,000	$ 3,000
5				

Decision: Buy the switches as company is $3,000 better off

LO 4: Identify the relevant costs in a make-or-buy decision.

Let's Review

In a make-or-buy decision, relevant costs are:

a. Manufacturing costs that will be saved.

b. The purchase price of the units.

c. Opportunity costs.

d. All of the above.

LO 4: Identify the relevant costs in a make-or-buy decision.

Sell or Process Further

- May have option to sell product at a given point in production or to process further and sell at a higher price

- **Decision Rule:**

  Process further as long as the incremental revenue from such processing exceeds the incremental processing costs

LO 5: Give the decision rule for whether to sell or process materials further.

Sell or Process Further

Example:

- Costs to manufacture one unfinished table:

  Direct materials $ 15
  Direct labor $ 10
  Variable manufacturing overhead $ 6
  Fixed manufacturing overhead $ 4
  Manufacturing cost per unit **$35**

- Selling price of unfinished unit is $50
- Used capacity used to finish tables to sell for $60 per table
- Relevant unit costs of finishing table:

  Direct materials increase $2
  Direct labor increase $4
  Variable overhead increase $2.40 (60% of direct labor)
  No change in fixed overhead

LO 5: Give the decision rule for whether to sell or process materials further.

Sell or Process Further

Example – Continued

Incremental Analysis - Sell or process further.xls

File Edit View Insert Format Tools Data Window Help

	A	B	C	D
1		Sell	Process Further	Net Income Increase (Decrease)
2	Sales per unit	$50.00	$60.00	$10.00
3	Cost per unit			
4	Direct materials	15.00	17.00	(2.00)
5	Direct labor	10.00	14.00	(4.00)
6	Variable manufacturing overhead	6.00	8.40	(2.40)
7	Fixed manufacturing overhead	4.00	4.00	0.00
8	Total	35.00	43.40	(8.40)
9	Net income per unit	$15.00	$16.60	$ 1.60
10				

Decision: Process further

Incremental revenue ($10) exceeds incremental processing costs ($8.40); income increases $1.60 per unit

LO 5: Give the decision rule for whether to sell or process materials further.

Retain or Replace Equipment

Example:

- Assessment of replacement of factory machine:

	Old Machine	New Machine
Book Value	$ 40,000	
Cost	$ 120,000	
Remaining useful life	four years	four years
Salvage value	-0-	-0-

- Variable manufacturing costs decrease from $160,000 to $125,000 if new machine purchased

LO 6: Identify the factors to consider in retaining or replacing equipment.

Retain or Replace Equipment

Example – Continued

Incremental Analysis - Retain or replace equipment.xls

File Edit View Insert Format Tools Data Window Help

	A	B	C	D	E	F
1		Retain Equipment		Replace Equipment		Net Income Increase (Decrease)
2	Variable manufacturing costs	$640,000	[a]	$500,000	[b]	$140,000
3	New machine cost			120,000		(120,000)
4	Total	$640,000		$620,000		$ 20,000
5						
6	[a](4 years × $160,000)					
7	[b](4 years × $125,000)					
8						

Decision: Replace the Equipment

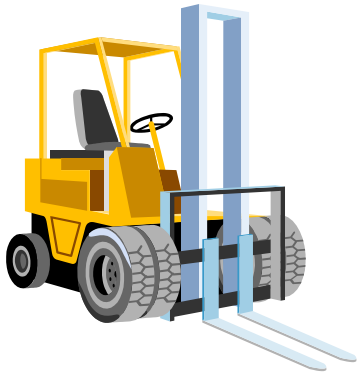
The lower variable costs due to replacement more than offset the cost of the new equipment

LO 6: Identify the factors to consider in retaining or replacing equipment.

Retain or Replace Equipment

Additional Considerations

- The book value of old machine does not affect the decision.
  - Book value is a sunk cost.
  - Costs which cannot be changed by future decisions (sunk cost) are not relevant in incremental analysis.



- However, any trade-in allowance or cash disposal value of the existing asset is relevant.

LO 6: Identify the factors to consider in retaining or replacing equipment.

Let's Review

The decision rule in a sell-or-process-further decision is:

Process further as long as the incremental revenue from processing exceeds:

a. Incremental processing costs.
b. Variable processing costs.
c. Fixed processing costs.
d. No correct answer is given.

LO 5: Give the decision rule for whether to sell or process materials further.

Eliminate an Unprofitable Segment

- Key: **Focus on Relevant Costs**
- Consider effect on related product lines
- Fixed costs allocated to the unprofitable segment **must be absorbed** by the other segments
- Net income may **decrease** when an unprofitable segment is eliminated
- Decision Rule:

Retain the segment unless fixed costs eliminated exceed contribution margin lost

LO 7: Explain the relevant factors in whether to eliminate an unprofitable segment.

Eliminate an Unprofitable Segment

Example:

- Martina Company manufactures three models of tennis rackets:
  - Profitable lines: Pro and Master
  - Unprofitable line: Champ
- Condensed Income Statement data:

	Pro	Master	Champ	Total
Sales	$800,000	$300,000	$100,000	$1,200,000
Variable expenses	520,000	210,000	90,000	820,000
Contribution margin	280,000	90,000	10,000	380,000
Fixed expenses	80,000	50,000	30,000	160,000
Net income	$200,000	$ 40,000	$(20,000)	$ 220,000

Should Champ be eliminated?

LO 7: Explain the relevant factors in whether to eliminate an unprofitable segment.

Eliminate an Unprofitable Segment

Example – Continued

- If Champ is eliminated, allocate its $30,000 fixed costs:

  2/3 to Pro and 1/3 to Master

- Revised Income Statement data:

	Pro	Master	Total
Sales	$800,000	$300,000	$1,100,000
Variable expenses	520,000	210,000	730,000
Contribution margin	280,000	90,000	370,000
Fixed expenses	**100,000**	**60,000**	160,000
Net income	$180,000	$ 30,000	**$ 210,000**

- Total income has ***decreased*** by $10,000

LO 7: Explain the relevant factors in whether to eliminate an unprofitable segment.

Eliminate an Unprofitable Segment

Example – Continued

- Incremental analysis of Champ provided the same results: ***Do Not Eliminate Champ***

Incremental Analysis - Eliminating an unprofitable segment.xls

File Edit View Insert Format Tools Data Window Help

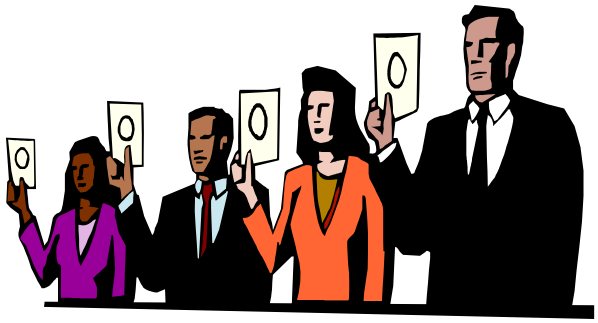
	A	B	C	D
1		Continue	Eliminate	Net Income Increase (Decrease)
2	Sales	$100,000	$ 0	$(100,000)
3	Variable costs	90,000	0	90,000
4	Contribution margin	10,000	0	(10,000)
5	Fixed costs	30,000	30,000	0
6	Net income	$ (20,000)	$(30,000)	$ (10,000)
7				

- Decrease in net income is due to Champ's contribution margin ($10,000) that ***will not*** be realized if the segment is discontinued.

LO 7: Explain the relevant factors in whether to eliminate an unprofitable segment.

Allocate Limited Resources

- **Resources are always limited**
  - Floor space for a retail firm
  - Raw materials, direct labor hours, or machine capacity for a manufacturing firm



- Management must decide ***which products to make and sell to maximize net income***

LO 8: Determine which products to make and sell when resources are limited.

Allocate Limited Resources

Example:

- Collins Company manufactures deluxe and standard pen and pencil sets

- Limiting resource: 3,600 machine hours per month

	Deluxe Sets	Standard Sets
Contribution margin per unit	$8	$6
Machine hours required	0.4	0.2

- Deluxe set has higher contribution margin: $8
- Standard set takes fewer machine hours per unit

LO 8: Determine which products to make and sell when resources are limited.

Allocate Limited Resources

Example: - Continued

- Must compute *contribution margin per unit of limited resource*

	Deluxe Sets	Standard Sets
Contribution margin per unit (**a**)	$8	$6
Machine hours required (**b**)	0.4	0.2
Contribution margin per unit of limited resource [(a) ÷ (b)]	**$20**	**$30**

- Standard sets have higher contribution margin per unit of limited resources

Decision: *Shift sales mix to standard sets or increase machine capacity*

LO 8: Determine which products to make and sell when resources are limited.

Allocate Limited Resources

Example: - Continued

- Alternative: Increase machine capacity from 3,600 to 4,200 machine hours

	Produce Deluxe Sets	Produce Standard Sets
Machine hours (**a**)	600	600
Contribution margin per unit of limited resource (**b**)	$20	$30
Contribution margin [(a) × (b)]	**$12,000**	**$18,000**

- To maximize net income, all the additional 600 hours should be used to produce standard sets

LO 8: Determine which products to make and sell when resources are limited.

Let's Review

If an unprofitable segment is eliminated:

a. Net income will always increase.

b. Variable expenses of the eliminated segment will have to be absorbed by other segments.

c. Fixed expenses allocated to the eliminated segment will have to be absorbed by other segments.

d. Net income will always decrease.

LO 7: Explain the relevant factors in whether to eliminate an unprofitable segment.

Capital Budgeting

- The process of making capital expenditure decisions in business is known as

Capital Budgeting

- The amount of possible capital expenditures usually exceeds the funds available for such expenditures

- Capital budgeting involves choosing among various capital projects to find the one(s) that will

Maximize a company's return on investment

Evaluation Process

- Many companies follow a carefully prescribed process in capital budgeting.

- At least once a year:
  - Proposals are requested from each department
  - The capital budgeting committee screens the proposals and submits its findings to the officers of the company
  - Officers select projects and submit list to the board of directors for approval

Evaluation Process

- Providing management with relevant data for capital budgeting decisions requires familiarity with quantitative techniques.

- The most common techniques are:

Annual Rate of Return

Cash Payback

Discounted Cash Flow

Evaluation Process

- These techniques will be illustrated using the following data for Tappan Company:
  - Investment in new equipment: $130,000
  - Useful life of new equipment: 10 years
  - Zero salvage and straight-line depreciation
  - The expected annual revenues and costs of the new product that will be produced from the investment are:

Sales		$200,000
Less: Costs and expenses		
Manufacturing costs (exclusive of depreciation)	$145,000	
Depreciation expenses ($130,000 ÷ 10)	13,000	
Selling and administrative expenses	22,000	180,000
Income before income taxes		20,000
Income tax expense		7,000
Net income		$ 13,000

Annual Rate of Return

- The annual rate of return technique is based directly on accounting data
- It indicates the profitability of a capital expenditure
- The formula is:

Expected Annual Net Income	÷	Average Investment	=	Annual Rate of Return

- The expected annual net income is from the projected Income Statement

LO 9: Contrast annual rate of return and cash payback in capital budgeting.

Annual Rate of Return

- The average investment is derived from the following formula:

$$\text{Average Investment} = \frac{\text{Original Investment} + \text{Value at End of Useful Life}}{2}$$

- For Tappan Company the average investment is:

[($130,00 + $0) ÷ 2] = $65,000

LO 9: Contrast annual rate of return and cash payback in capital budgeting.

Annual Rate of Return

- The expected rate of return for Tappan Company's investment in new equipment is:

$13,000 ÷ $65,000 = 20%

- The decision rule is:

A project is acceptable if its rate of return is greater than management's minimum rate of return. When choosing among several acceptable projects, the project with the higher rate of return is generally more attractive.

LO 9: Contrast annual rate of return and cash payback in capital budgeting.

Annual Rate of Return

- Principal advantages of the annual rate of return technique:
  - Simplicity of calculations
  - Management's familiarity with accounting terms used in the calculation
- Major limitation of the technique:

  It does not consider the time value of money
- As noted in Appendix C, recognition of the time value of money can make a significant difference between the present and future values of an investment.

LO 9: Contrast annual rate of return and cash payback in capital budgeting.

Cash Payback

- Identifies the time period required to recover the cost of the investment
- Uses the net annual cash flow produced from the investment
- Net annual cash flow can be approximated by taking net income and adding back depreciation
- The formula for computing the cash payback period is:

Cost of Capital Investment	÷	Net Annual Cash Flow	=	Cash Payback Period

LO 9: Contrast annual rate of return and cash payback in capital budgeting.

Cash Payback

Example:

- Tappan Company has net annual cash inflows of $26,000 (Net Income $13,000 + Depreciation $13,000)
- The cash payback period is:

$$\$130{,}000 \div \$26{,}000 = 5 \text{ years}$$

LO 9: Contrast annual rate of return and cash payback in capital budgeting.

Cash Payback

Example:

- Assume Tappan Company has uneven net annual cash inflows
- Now the cash payback period is determined when the cumulative net cash flows equal the cost of the investment

Year	Investment	Net Annual Cash Flow	Cumulative Net Cash Flow
0	$300,000		
1		$ 60,000	$ 60,000
2		90,000	150,000
3		90,000	240,000
4		120,000	360,000
5		100,000	460,000

Cash payback period = **3.5 years**

LO 9: Contrast annual rate of return and cash payback in capital budgeting.

Let's Review

Which of the following is **incorrect** about the annual rate of return technique:

a. The calculation is simple.

b. The accounting terms used are familiar to management.

c. The timing of the cash inflows is not considered.

d. The time value of money is considered.

LO 9: Contrast annual rate of return and cash payback in capital budgeting.

Discounted Cash Flow

- Discounted cash flow techniques generally recognized as best approach to making capital budgeting decisions
- Techniques consider both:
  - Estimated total cash inflows, and
  - The time value of money
- Two methods generally used with the discounted cash flow techniques are

Net Present Value Method

Internal Rate of Return Method

LO 10: Distinguish between the net present value and internal rate of return methods.

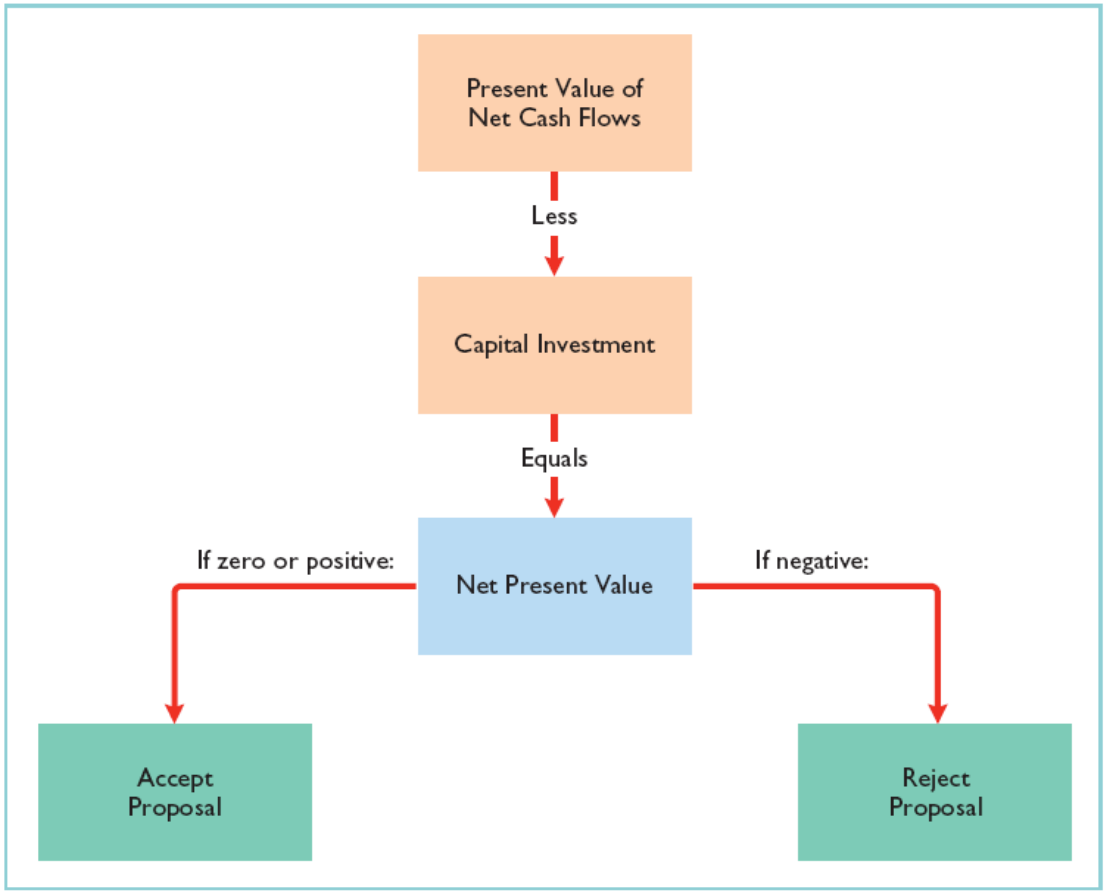
Net Present Value Method

- NPV method compares the **present value of the cash inflows** to the **capital outlay required** by the investment
- The **difference** between the two amounts is referred to as the **net present value**
- The interest rate used to discount the cash flow is the required minimum rate of return
- A proposal is acceptable when the **NPV is zero or positive**
- The higher the positive NPV, the more attractive the investment

LO 10: Distinguish between the net present value and internal rate of return.

Net Present Value Method

Net Present Value Decision Criteria



LO 10: Distinguish between the net present value and internal rate of return methods.

Net Present Value Method

Example: Equal Annual Cash Flows

- Annual cash flows of $26,000 uniform over asset's useful life
- Calculation of present value of annual cash flows (annuity) at 2 different discount rates:

	Present Values at Different Discount Rates	
	12%	15%
Discount factor for 10 periods	5.65022	5.01877
Present value of net annual cash flows:		
$26,000 × 5.65022	$146,906	
$26,000 × 5.01877		$130,488

LO 10: Distinguish between the net present value and internal rate of return methods.

Net Present Value Method

Example: Equal Annual Cash Flows - Continued

- Analysis of proposal using net present values

	12%	15%
Present value of net annual cash flows	$146,906	$130,488
Capital investment	130,000	130,000
Positive (negative) net present value	**$ 16,906**	**$ 488**

- **NPV positive** for both discount rates
- **Accept** proposed capital expenditure at either discount rate

LO 10: Distinguish between the net present value and internal rate of return methods.

Net Present Value Method

Example: Unequal Annual Cash Flows

- Different cash flows each year over asset's useful life; calculation of PV of annual cash flows at 2 different discount rates:

Year	Assumed Net Annual Cash Flows	Discount Factor 12%	Discount Factor 15%	Present Value 12%	Present Value 15%
	(1)	(2)	(3)	(1) × (2)	(1) × (3)
1	$ 36,000	.89286	.86957	$ 32,143	$ 31,305
2	32,000	.79719	.75614	25,510	24,196
3	29,000	.71178	.65752	20,642	19,068
4	27,000	.63552	.57175	17,159	15,437
5	26,000	.56743	.49718	14,753	12,927
6	24,000	.50663	.43233	12,159	10,376
7	23,000	.45235	.37594	10,404	8,647
8	22,000	.40388	.32690	8,885	7,192
9	21,000	.36061	.28426	7,573	5,969
10	20,000	.32197	.24719	6,439	4,944
	$260,000			$155,667	$140,061

LO 10: Distinguish between the net present value and internal rate of return methods.

Net Present Value Method

Example: Unequal Annual Cash Flows - Continued

- Analysis of proposal using net present values

	12%	15%
Present value of net annual cash flows	$155,667	$140,061
Capital investment	130,000	130,000
Positive (negative) net present value	**$ 25,667**	**$ 10,061**

- **NPV positive** for both discount rates
- **Accept** proposed capital expenditure at either discount rate

LO 10: Distinguish between the net present value and internal rate of return methods.

Internal Rate of Return Method

- IRR method finds the interest yield of the potential investment
- IRR – rate that will cause the PV of the proposed capital expenditure to ***equal*** the PV of the expected annual cash inflows
- Two steps in method
  1. Compute the interval rate of return factor
  2. Use the factor and the PV of an annuity of 1 table to find the IRR.

LO 10: Distinguish between the net present value and internal rate of return methods.

Net Present Value Method

Example:

- **Step 1:** The formula for computing the IRR factor:

Capital Investment	÷	Net Annual Cash Flows	=	Internal Rate of Return Factor

- IRR factor for Tappan Company, assuming equal annual cash inflows:

$130,000 ÷ $26,000 = 5.0

LO 10: Distinguish between the net present value and internal rate of return methods.

Net Present Value Method

Example - Continued

- **Step 2:** IRR is the discount factor closest to the IRR factor for the time period covered by the annual cash flows.

TABLE 2
PRESENT VALUE OF AN ANNUITY OF 1

(*n*) Periods	5%	6%	8%	9%	10%	11%	12%	15%
10	7.72173	7.36009	6.71008	6.41766	6.14457	5.88923	5.65022	**5.01877**

- Closest discount factor to 5.0 is 5.01877; thus IRR is approximately 15%

LO 10: Distinguish between the net present value and internal rate of return methods.

Internal Rate of Return Method

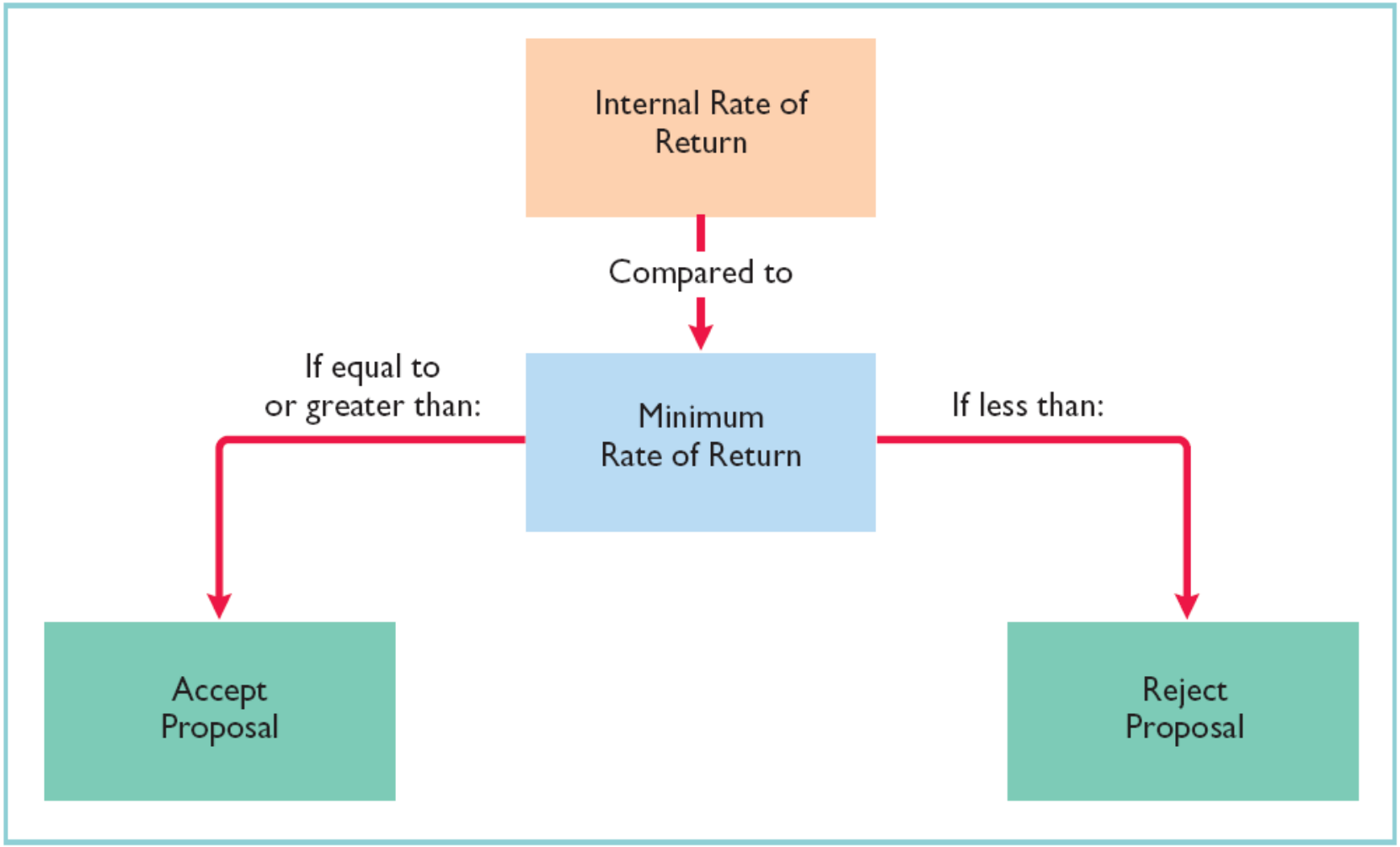
- Compare IRR to management's required minimum rate of return
- **Decision Rule:**

  Accept the project when the IRR is equal to or greater than the required rate of return.

- Assuming a minimum rate of return for Tappan of 10%, project is accepted since IRR of 15% is greater than the required rate.

LO 10: Distinguish between the net present value and internal rate of return methods.

Internal Rate of Return Method



LO 10: Distinguish between the net present value and internal rate of return methods.

Comparison of Discounted Cash Flow Methods

Item	Net Present Value	Internal Rate of Return
1. Objective	Compute net present value (a dollar amount).	Compute internal rate of return (a percentage).
2. Decision rule	If net present value is zero or positive, accept the proposal. If net present value is negative, reject the proposal.	If internal rate of return is equal to or greater than the minimum required rate of return, accept the proposal. If internal rate of return is less than the minimum rate, reject the proposal.

LO 10: Distinguish between the net present value and internal rate of return methods.

Let's Review

A positive net present value means that the:

a. Project's rate of return is less than the cutoff rate.

b. Project's rate of return exceeds the required rate of return.

c. Project's rate of return equals the required rate of return.

d. Project is unacceptable.

LO 10: Distinguish between the net present value and internal rate of return methods.

Chapter Review - Brief Exercise 26-9

Adler Company is considering purchasing new equipment for $400,000. It is expected that the equipment will produce annual net income of $10,000 over its 10-year useful life. Annual depreciation will be $40,000.

Compute the payback period.

Chapter Review - Brief Exercise 26-9

First, calculate net annual cash inflows:

Net income + depreciation

$10,000 + $40,000 = $50,000

Second, divide capital investment by annual cash flows

$400,000 ÷ $50,000 = 8 years

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