Survey of Accounting, 9e

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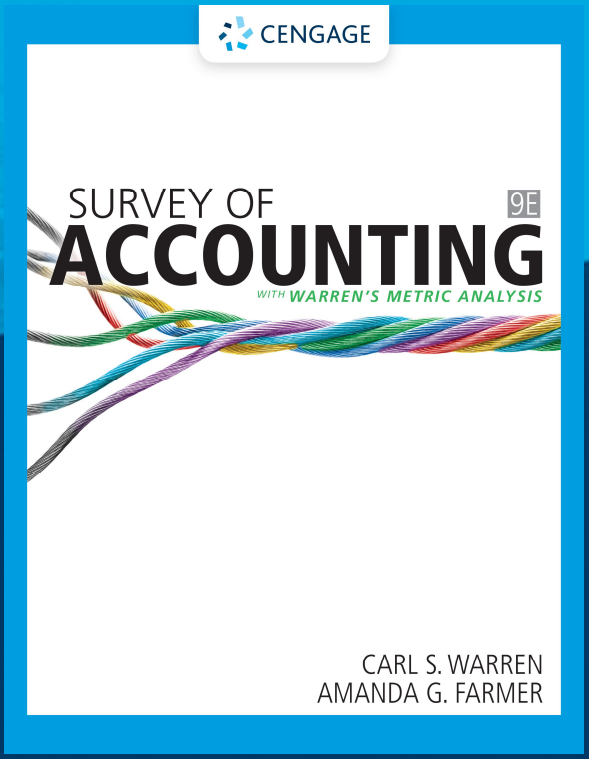

Chapter 12

Differential Analysis and Product Pricing

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Learning Objectives

- Describe differential analysis for managerial decision making
- Apply differential analysis for deciding whether to:
  - Lease or sell
  - Discontinue segment or product
  - Manufacture or purchase
  - Replace a fixed asset
  - Process further or sell
  - Sell at a special price

Learning Objectives (continued)

- Determine the selling price of a product, using the total cost concept
- Describe and illustrate the use of contribution margin per unit of production constraint for managerial decision making and performance analysis

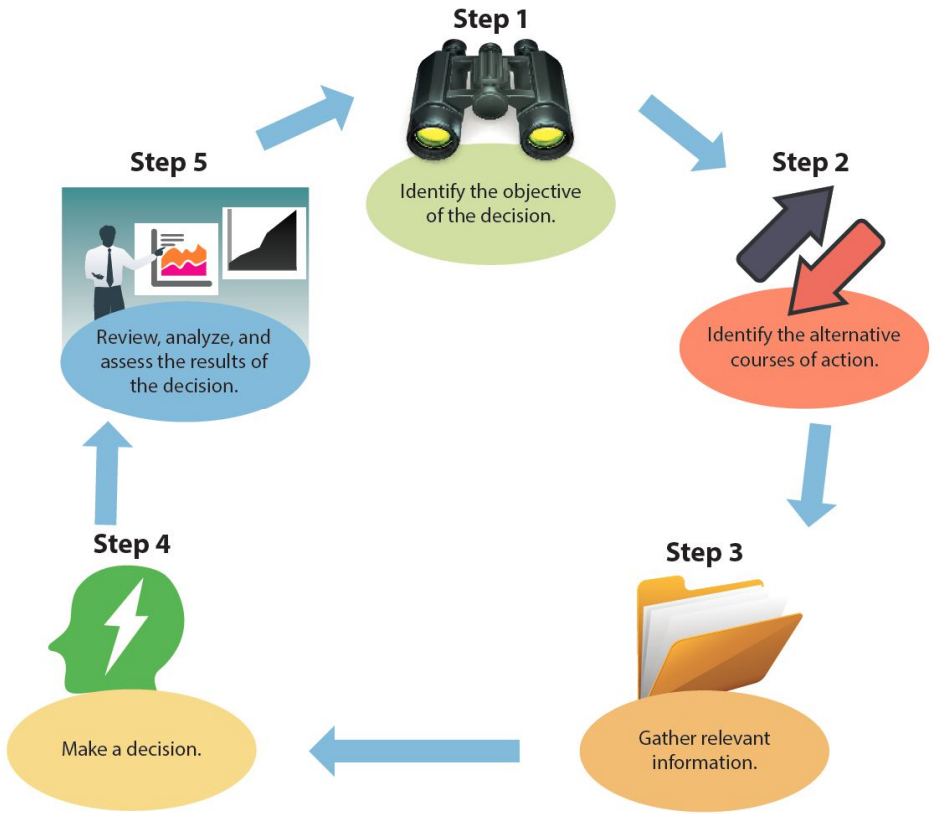
Learning Objective 1

Describe differential analysis for managerial decision making

Managerial Decision Making

- Involves choosing between alternative courses of action
- Managerial decision-making process varies depending on the type of decision
- Accounting facilitates managerial decision making
  - Gathers relevant information for managerial decisions
  - Reports this information to management
  - Provides management feedback on the results of the decisions

Exhibit 1: Managerial Decision Making



Differential Revenue, Differential Cost, and Differential Income

Differential revenue

- Amount of increase or decrease in revenue that is expected from a course of action as compared to an alternative

Differential cost

- Amount of increase or decrease in cost that is expected from a course of action as compared to an alternative

Differential income (or loss)

- Difference between the differential revenue and the differential costs

Differential Analysis

- Focuses on the effect of alternative courses of action on revenues and costs
  - Sometimes called incremental analysis
- **Sunk costs** are incurred in the past and are irrelevant
- Reporting format is as follows:

Differential revenue from alternatives:		
Revenue from alternative A	$XXX	
Revenue from alternative B	(XXX)	
Differential revenue		$ XXX
Differential cost of alternatives:		
Cost of alternative A	$XXX	
Cost of alternative B	(XXX)	
Differential cost		(XXX)
Net differential income or loss from alternatives		**$ XXX**

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Learning Objective 2

Apply differential analysis for deciding whether to:

- Lease or sell
- Discontinue segment or product
- Manufacture or purchase
- Replace a fixed asset
- Process further or sell
- Sell at a special price

Applying Differential Analysis

- Differential analysis is applied for the following decisions:
  - Leasing or selling equipment
  - Discontinuing an unprofitable segment or product
  - Manufacturing or purchasing a needed part
  - Replacing fixed assets
  - Processing further or selling a product
  - Accepting additional business at a special price

Lease or Sell

- Management may lease or sell a piece of equipment that is no longer needed
- Karnes Company is considering leasing or selling the equipment
  - Original cost of equipment is $200,000
  - Accumulated depreciation is $120,000
  - Alternatives
    - Lease option: Total revenue for five-year lease of $160,000 less $35,000 for estimated repairs, taxes, etc.
    - Sell option: Sale price of $100,000 less 6% commission on sales

Exhibit 3: Differential Analysis Report—Lease or Sell

Lease or Sell Equipment
Differential Analysis Report

Differential revenue from alternatives:		
Revenue from lease	$160,000	
Revenue from sale	(100,000)	
Differential revenue from lease		$ 60,000
Differential cost of alternatives:		
Repair, insurance, and property tax expenses from lease	$ 35,000	
Commission expense on sale ($100,000 × 6%)	(6,000)	
Differential cost of lease		(29,000)
Net differential income from the lease alternative		**$31,000**

Exhibit 4: Traditional Analysis Report—Lease or Sell

Lease or Sell Equipment
Traditional Analysis Report

Lease alternative:			
Revenue from lease		$ 160,000	
Depreciation expense for remaining five years	$80,000		
Repair, insurance, and property tax expenses	35,000	(115,000)	
Net gain			$ 45,000
Sell alternative:			
Sales price		$ 100,000	
Book value of equipment	$80,000		
Commission expense	6,000	(86,000)	
Net gain			(14,000)
Net differential income from the lease alternative			**$31,000**

Discontinuing a Segment or Product

- Avoids loss generated by a product, department, branch, territory, or other segment
- Eliminates all of the segment's variable costs
- May not eliminate fixed costs such as depreciation, insurance, and property taxes
  - Company's income may decrease rather than increase if the unprofitable segment is discontinued

Condensed Income Statement

- Condensed income statement for Montana Wheat Cereal Co.

Montana Wheat Cereal Co.
Condensed Income Statement

	Corn Flakes	Toasted Oats	Bran Flakes	Total Company
Sales	$ 500,000	$ 400,000	$100,000	$1,000,000
Cost of goods sold:				
Variable costs	$(220,000)	$(200,000)	$ (60,000)	$ (480,000)
Fixed costs	(120,000)	(80,000)	(20,000)	(220,000)
Total cost of goods sold	$(340,000)	$(280,000)	$ (80,000)	$ (700,000)
Gross profit	$ 160,000	$ 120,000	$ 20,000	$ 300,000
Operating expenses:				
Variable expenses	$ (95,000)	$ (60,000)	$ (25,000)	$ (180,000)
Fixed expenses	(25,000)	(20,000)	(6,000)	(51,000)
Total operating expenses	$(120,000)	$ (80,000)	$ (31,000)	$ (231,000)
Operating income (loss)	$ 40,000	$ 40,000	$ (11,000)	$ 69,000

- Since Bran Flakes incurred an operating loss of $11,000, the company is considering discontinuing it

Exhibit 6: Differential Analysis Report—Discontinue an Unprofitable Segment

Discontinue Brand Flakes Differential Analysis Report		
Differential revenue from annual sales of Bran Flakes:		
Revenue from sales		$100,000
Differential cost of annual sales of Bran Flakes:		
Variable cost of goods sold	$60,000	
Variable operating expenses	25,000	(85,000)
Annual differential income from sales of Bran Flakes		**$15,000**

Exhibit 7: Income Statement without Bran Flakes

Montana Wheat Cereal Co.
Condensed Income Statement

	Corn Flakes	Toasted Oats	Total Company
Sales	$ 500,000	$ 400,000	$ 900,000
Cost of goods sold:			
Variable costs	$(220,000)	$(200,000)	$(420,000)
Fixed costs	(130,000)*	(90,000)*	(220,000)
Total cost of goods sold	$(350,000)	$(290,000)	$ (640,000)
Gross profit	$ 150,000	$ 110,000	$ 260,000
Operating expenses:			
Variable expenses	$ (95,000)	$ (60,000)	$(155,000)
Fixed expenses	(28,000)*	(23,000)*	(51,000)
Total operating expenses	$(123,000)	$ (83,000)	$ (206,000)
Operating income (loss)	**$ 27,000**	**$ 27,000**	**$ 54,000**

*Bran Flakes' fixed costs of $20,000 and $6,000 are allocated equally to Corn Flakes and Toasted Oats.

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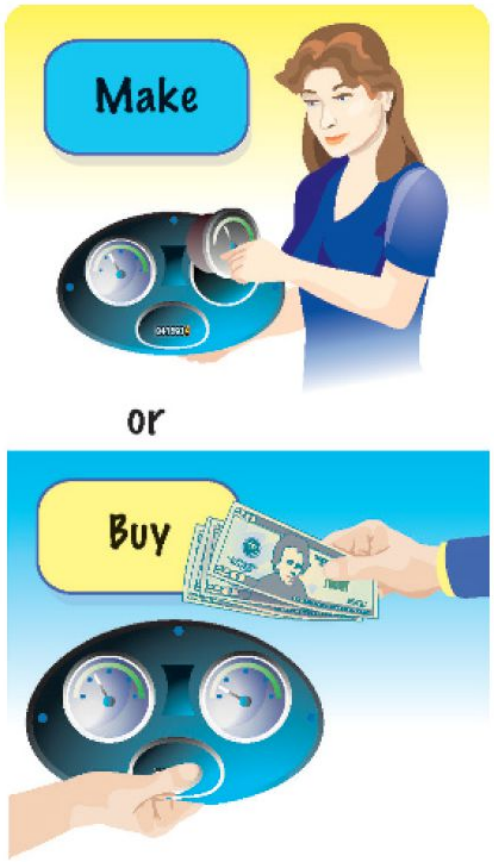
Make or Buy

- Differential analysis helps decide whether to make or buy a part



Make or Buy (continued)

- An automobile manufacturer has been purchasing instrument panels for $240 a unit
  - Estimation of cost per unit for manufacturing an instrument panel internally is as follows:

Direct materials	$ 80
Direct labor	80
Variable factory overhead	52
Fixed factory overhead	68
Total cost per unit	$280

- Should the company make or buy the part?

Exhibit 8: Differential Analysis Report—Make or Buy

Make or Buy Instrument Panels Differential Analysis Report		
Purchase price of an instrument panel		$240
Differential cost to manufacture:		
Direct materials	$80	
Direct labor	80	
Variable factory overhead	52	(212)
Cost savings from manufacturing an instrument panel		**$ 28**

Replace Equipment

- Assume that a business is considering replacing a machine
  - Old machine
    - Total book value: $100,000
    - Estimated remaining useful life: 5 years
    - Estimated selling price: $25,000
  - Cost of new machine: $250,000
    - Estimated useful life: 5 years
    - Estimated residual value: 0
  - The new machine will reduce annual variable costs from $225,000 to $150,000

Exhibit 9: Differential Analysis Report—Replace Machine

Replace Old Machine
Differential Analysis Report

Annual variable costs—present machine	$ 225,000	
Annual variable costs—new machine	(150,000)	
Annual differential decrease in cost	$ 75,000	
Number of years applicable	× 5	
Total differential decrease in cost	$ 375,000	
Proceeds from sale of present machine	25,000	$400,000
Cost of new machine		(250,000)
Net differential decrease in cost, five-year total		$150,000
Annual net differential decrease in cost—new machine ($150,000 ÷ 5 years)		**$ 30,000**

Other Factors Affecting Equipment Replacement Decisions

- Differences between the remaining useful life of old equipment and the estimated life of new equipment
- Improvement in the overall quality of a product
- Time value of money and other uses for cash needed to purchase new equipment
- Opportunity cost of alternative courses of action

Opportunity Cost

- Illustration: Cash outlay of $250,000 for the new machine less the $25,000 proceeds from the sale of the old machine could be invested to yield a 15% return
  - Annual opportunity cost related to the purchase of the new machine is $33,750 ($225,000 × 15%)
    - Opportunity cost of $33,750 exceeds the annual cost savings of $30,000
    - It is not beneficial to replace the machine for an annual cost savings of $30,000

Process or Sell

- A 4,000-gallon batch of kerosene sells at $2.50 per gallon
  - Cost of producing kerosene is $2,400 per batch
  - One could continue processing kerosene into gasoline by selling at $3.50 per gallon for an additional cost of $650 per batch
    - 20% of the kerosene will evaporate during production
- Should the company sell or process further?

Exhibit 10: Differential Analysis Report—Process or Sell

Process Kerosene Further
Differential Analysis Report

Differential revenue from further processing per batch:		
Revenue from sale of gasoline [(4,000 gallons − 800 gallons evaporation) × $3.50]	$11,200	
Revenue from sale of kerosene (4,000 gallons × $2.50)	(10,000)	
Differential revenue		$1,200
Differential cost per batch:		
Additional cost of producing gasoline		(650)
Differential income from further processing gasoline per batch		$ 550

Accept Business at a Special Price

- Companies may be offered the opportunity to sell their products at prices other than the normal prices
  - Differential revenue from accepting the special price is compared to the differential costs of producing and delivering the product to the customer

Accepting Business at a Special Price

- Game Ball Inc. currently sells an average of 10,000 basketballs per month
  - Factory has a monthly productive capacity of 12,500 basketballs
  - Normal (domestic) selling price: $30 per ball
  - Manufacturing costs
    - Variable costs: $12.50 per ball
    - Fixed costs: $7.50 per ball

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Exhibit 11: Differential Analysis Report—Sell at Special Price

Sell Basketballs to Exporter
Differential Analysis Report

Differential revenue from accepting offer:	
Revenue from sale of 5,000 additional units at $18	$ 90,000
Differential cost of accepting offer:	
Variable costs of 5,000 additional units at $12.50	(62,500)
Differential income from accepting offer	**$27,500**

Learning Objective 3

Determine the selling price of a product, using the total cost concept

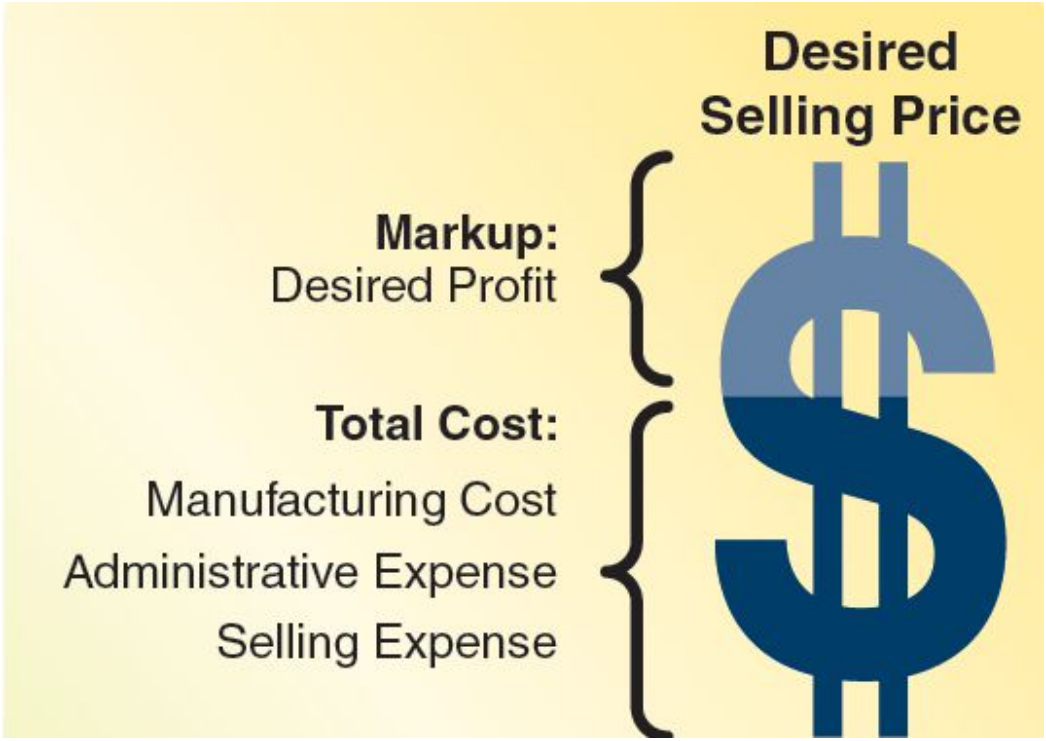
Setting Normal Product Selling Prices

- Normal selling price must be set high enough to:
  - Cover all expenses
  - Provide a reasonable profit
- Market methods used by managers to determine selling price
  - Demand-based concept
  - Competition-based concept

Cost-Plus Methods

- Managers can use one of the following three cost-plus methods to determine the selling price:
  - Total cost concept
  - Product cost concept
  - Variable cost concept
- Normal Selling Price = Cost Amount per Unit + Markup
  - Management determines a **markup** based on the desired profit for the product

Exhibit 12: Total Cost Concept of Pricing



Total Cost Concept of Pricing: Nebula Inc.

- Assume the following data for 100,000 digital projection clocks that Nebula Inc. expects to produce and sell during the current year:

Manufacturing costs:		
Direct materials ($3.00 × 100,000)		$ 300,000
Direct labor ($10.00 × 100,000)		1,000,000
Factory overhead:		
Variable costs ($1.50 × 100,000)	$150,000	
Fixed costs	50,000	200,000
Total manufacturing costs		$1,500,000
Selling and administrative expenses:		
Variable expenses ($1.50 × 100,000)	$150,000	
Fixed costs	20,000	
Total selling and administrative expenses		170,000
Total cost		$1,670,000
Desired rate of return		20%
Total assets		$ 800,000

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Total Cost Concept of Pricing: Nebula Inc. (continued 1)

- Total cost per unit is calculated as follows:

$$\text{Total Cost per Unit} = \frac{\text{Total Cost}}{\text{Estimated Units Produced and Sold}}$$

$$= \frac{\$1,670,000}{100,000 \text{ units}} = \$16.70 \text{ per unit}$$

- The markup percentage is calculated as follows:

$$\text{Desired Profit} = \text{Desired Rate of Return} \times \text{Total Assets}$$

$$= 20\% \times \$800,000 = \$160,000$$

$$\text{Markup Percentage} = \frac{\text{Desired Profit}}{\text{Total Cost}} = \frac{\$160,000}{\$1,670,000} = 9.6\% \text{ (rounded)}$$

Total Cost Concept of Pricing: Nebula Inc. (continued 2)

- Computation of markup per unit

$$\text{Markup per Unit} = \text{Markup Percentage} \times \text{Total Cost per Unit}$$
$$= 9.6\% \times \$16.70 = \$1.60 \text{ per unit}$$

- Computation of normal selling price

Total cost per unit	$16.70
Markup per unit	1.60
Normal selling price per unit	$18.30

Total Cost Concept of Pricing: Nebula Inc. (continued 3)

- Income statement

NEBULA INC.
Income Statement

Sales (100,000 units × $18.30)		$1,830,000
Expenses:		
Variable (100,000 units × $16.00)	$1,600,000	
Fixed ($50,000 + $20,000)	70,000	(1,670,000)
Operating income		$ 160,000

Target Costing

- Method of setting prices that combines market-based pricing with a cost-reduction emphasis

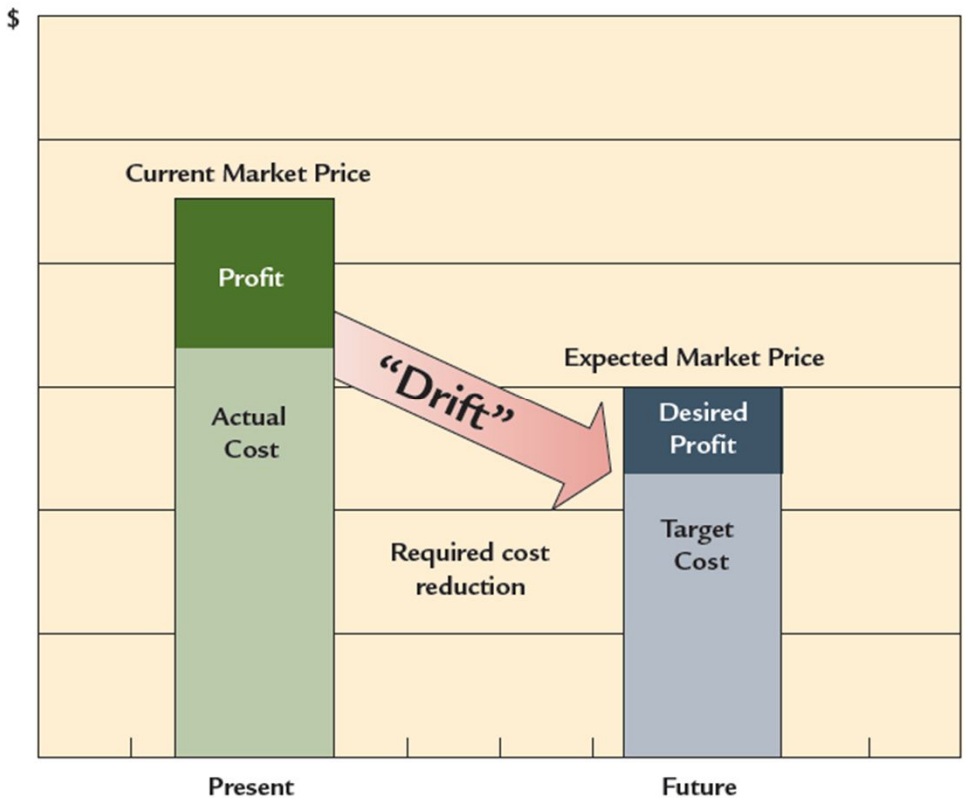
$$\text{Target Cost} = \text{Expected Selling Price} - \text{Desired Profit}$$

- A future selling price is anticipated using:
  - Demand-based concepts
  - Competition-based concepts
- Target cost is normally less than the current cost
  - Managers try to reduce costs from the design and manufacture of the product
- Useful in highly competitive markets such as automobiles and the market for smartphones and computer tablets

Planned Cost Reduction

- Sometimes referred to as the cost drift
- Ways to reduce cost include:
  - Simplifying the design
  - Reducing the cost of direct materials
  - Reducing the direct labor costs
  - Eliminating waste

Exhibit 13: Target Cost Concept

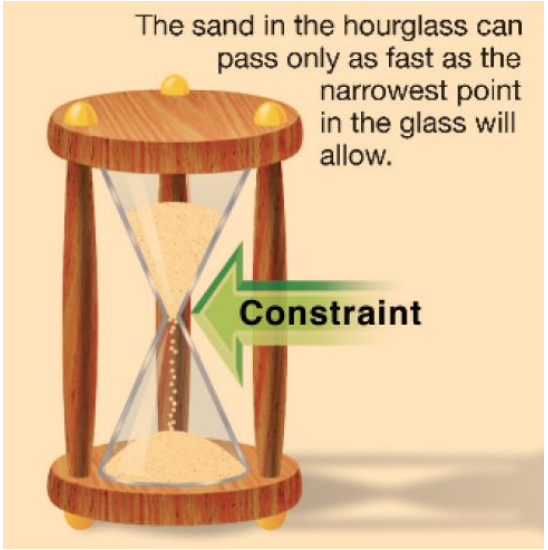


Learning Objective 4

Describe and illustrate the use of contribution margin per unit of production constraint for managerial decision making and performance analysis

Production Constraint and Profit

- Demand for a company's product exceeds its ability to produce the product
- **Theory of constraints (TOC)**
  - Focuses on reducing the influence of bottlenecks on production processes
- Companies should attempt to maximize their profits when faced with production constraints



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Production Constraint and Profit: Illustration

- Rapidan Tool Company makes three types of wrenches: small, medium, and large

	Small Wrench	Medium Wrench	Large Wrench
Unit selling price	$130	$140	$160
Unit variable cost	(40)	(40)	(40)
Unit contribution margin	$ 90	$100	$120
Heat treatment hours per unit	1 hr.	4 hrs.	8 hrs.

$$\text{Unit Contribution Margin per Production Constraint Hour} = \frac{\text{Unit Contribution Margin}}{\text{Heat Treatment Hours per Unit}}$$

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Production Constraint and Profit: Illustration
(continued)

- Calculation of unit contribution margin per heat treatment suggests that the small wrench is the most profitable

Small Wrenches

$$\text{Unit Contribution Margin per Heat Treatment Hour} = \frac{\$90}{1 \text{ hr.}} = \$90 \text{ per hr.}$$

Medium Wrenches

$$\text{Unit Contribution Margin per Heat Treatment Hour} = \frac{\$100}{4 \text{ hrs.}} = \$25 \text{ per hr.}$$

Large Wrenches

$$\text{Unit Contribution Margin per Heat Treatment Hour} = \frac{\$120}{8 \text{ hrs.}} = \$15 \text{ per hr.}$$

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Production Constraints and Pricing

- Unit contribution margin per constraint resource is used adjusts product prices to reflect the product's use of the constraint
- Products that use a large amount of the constrained resource require a higher contribution margin
  - Least profitable of the resources

Production Constraints and Pricing: Illustration

- Rapidan Tool Company cannot decrease the variable cost per unit and the heat treatment hours for the large wrench
- Price of the large wrench that would make it as profitable as the small wrench is determined as follows:

$$\text{Unit Contribution Margin per Heat Treatment Hour for Small Wrench} = \frac{\text{Revised Price of Large Wrench} - \text{Unit Variable Cost for Large Wrench}}{\text{Heat Treatment Hours per Unit for Large Wrench}}$$

$$\$90 = \frac{\text{Revised Price of Large Wrench} - \$40}{8}$$

$$\$720 = \text{Revised Price of Large Wrench} - \$40$$

$$\$760 = \text{Revised Price of Large Wrench}$$

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Production Constraints and Pricing: Illustration
(continued)

- If the large wrench's price is increased to $760, it would provide the same unit contribution margin per heat treatment hour as the small wrench

$$\text{Unit Contribution Margin per Heat Treatment Hour} = \frac{\text{Unit Contribution Margin}}{\text{Heat Treatment Hours per Unit}}$$

$$\$90 \text{ per hr.} = \frac{\$720}{8 \text{ hrs.}}$$

End of Chapter 12