Course Material

On

Cost and Management Accounting II

(AcFn2092)

Credit Hours – 3 (5 EtCTS)

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MEKELLE UNIVERSITY

COLLEGE OF BUSINESS AND ECONOMICS
DEPARTMENT OF ACCOUNTING AND FINANCE PROGRAM

Course Information	
Course Code	**AcFn 2092**
Course Title	**Cost and Management Accounting –II**
Degree Program	**BA Degree in Accounting and Finance**
Module	**Cost and managerial accounting**
Instructor's Information	
ETCTS Credits	5
Contact Hours (per week)	3
Course Objectives	After successfully completing this course, the students should be able to: ✓ Explain the importance of cost- volume- profit analysis; ✓ Describe the benefit of budgeting and its application; ✓ Prepare a master budget; ✓ Prepare a flexible budget; ✓ Compute and interpret variances; ✓ Apply relevant costing to different decisions; ✓ Explain the methods of pricing; ✓ Explain the costs and benefits of decentralization.
Course Description	The course builds on the knowledge acquired from the course entitled cost and Management Accounting and introduces some new concepts and uses of accounting tools and techniques in the analysis, planning and control of business operations and management decision making processes. Topics covered include: Intensive review of the management decision making processes and nature of management information, examination of concepts and rationale underlying managerial accounting, managerial methods, the budgeting process and standard costing, the investment decision and quantitative methods of evaluation.
WEEKS	**Course Contents**
2WEEK {1ST&2ND	**1. Cost-Volume-Profit Relationships** 1.1. Variable and fixed cost behavior and patterns 1.2. Break-even analysis uses and techniques 1.3. Planning with cost-volume-profit Data 1.4. Limitation of CVP analysis
2 WEEKS {3RD&4TH}	**2. The Master Budget** 2.1. The overall plan and its characteristics 2.2. Advantages of budgeting 2.3. Types of budgets 2.4. Developing the master budget 2.5. Difficulties of sales forecasting
3WEEKS {5TH,6TH&7TH}	**3. Flexible Budgets and Standards** 3.1. Static vs. Flexible budgets 3.2. Standards for material and labor 3.3. Controllability and variance analysis 3.3.1. Direct material 3.3.2. Direct labor, 3.4. Overheads

3WEEKS {8TH,9TH&10TH}	**4. Measuring Mix and Yield Variances** 4.1. Sales variances 4.1.1. Sales volume variance 4.1.2. Sales Mix Variance 4.1.3. Market-size and market-share variance. 4.2. Input variances 4.2.1. Direct materials Mix and Yield Variances 4.2.2. Direct Labor Mix and Yield variances 4.3. Productivity Measurement
3 WEEKS {11TH,12TH&13TH}	**5. Decision-making and Relevant Information** 5.1. The role of Accounting in special decisions 5.2. The meaning of relevance 5.3. Irrelevance of past costs and future costs that will not differ 5.4. Special decision areas 5.4.1. Make or Buy decision 5.4.2. Special Order decisions 5.4.3. Add or Drop decisions 5.4.4. Product Mix decisions 5.4.5. Scarce Resource decisions
2WEEKS {13TH&14TH}	**6. Pricing Decisions and Cost Management** 6.1. Major influence on pricing decisions 6.2. Costing and pricing for the short run and long run. 6.3. Cost plus target rate of return on investment
1 WEEKS {16TH}	**7. Decentralization and Transfer Pricing** 7.1. Decentralization 7.2. Responsibility Center 7.3. Transfer Price
Roles of the students	The success of this course depends on the students' individual and collective contribution to the class discussions. Students are expected to participate voluntarily, or will be called upon, to contribute to set exercises and problems. Students are also expected to read the assigned readings and prepare the cases before each class so that they could contribute effectively to class discussions. Students must attempt assignments by their own. Proficiency in this course comes from individual knowledge and understanding. Copying the works of others is considered as serious offenses and leads to disciplinary actions.
Assessment/Evaluation	Contineous tests for esch chapter Assignments Term paper (industry assessments, as needed) Final exam
Text and reference books	**Text Book:** Horngren, Datar & Rajan. Cost Accounting: A Managerial Emphasis, 14th Ed. 2012 **Reference Books** Garison. Noreen and Brewer, Managerial Accounting, 13th Ed. 2010 Gray and Ricketts; "Cost and Managerial Accounting" Heltger and Matulich; "Managerial Accounting" Moore - Jaedicke- Anderson; "Managerial Accounting"

CHAPTER ONE

COST-VOLUME-PROFIT RELATIONSHIPS

Variable and fixed cost behaviour and patterns

Cost behavior refers to how a certain cost will behave in response to a change in level of activity. For planning purposes, a manager must be able to anticipate which of these will happen; and if a cost can be expected to change, the manager must know by how much it will change. To help make such distinctions, costs are often characterized as variable, fixed, or mixed.

Variable Cost:

A *variable cost* is a cost that varies, in total, in a direct proportion to changes in the level of activity. The activity can be expressed in many ways, such as, units produced, units sold, miles driven, beds occupied, hours worked and so forth. *Direct material* is a good example of a variable cost. The variable cost is constant if expressed on a per unit basis.

Fixed Cost:

A *fixed cost* is a cost that remains constant, in total, regardless of changes in the level of activity. Unlike variable costs, fixed costs are not affected by changes in activity. Consequently, as the activity level rises and falls, the fixed costs remain constant in total amount unless influenced by any outside forces, such as price changes. Rent is a good example of fixed cost. Average fixed cost per unit increases and decreases inversely with changes in activity.

Mixed/Semi Variable Cost

A **mixed cost** is one that contains both variable and fixed cost elements together. *Mixed cost* is also known as *semi variable cost*. Examples of mixed costs include electricity, water and telephone bills. The rent paid for the line or counter is a fixed cost, the kilowatt hour or number of calls payment is a variable cost as payment varies with usage.

Cost-volume-profit analysis

Cost-volume-profit analysis examines the behaviour of total revenues, total costs, and operating profit as changes occur in the output level, selling price, variable costs per unit, or fixed costs.

Managers use cost-volume-profit (CVP) analysis to identify the levels of operating activity needed to avoid losses, achieve targeted profits, plan future operations, and monitor organizational performance.

Accountants often perform CVP analysis to plan future levels of operating activity and provide information about:

- Which products or services to emphasize
- The volume of sales needed to achieve a targeted level of profit
- The amount of revenue required to avoid losses
- Whether to increase fixed costs
- How much to budget for discretionary expenditures
- Whether fixed costs expose the organization to an unacceptable level of risk

Profit Equation and Contribution Margin

CVP analysis begins with the basic profit equation.

Profit = Total revenue -Total costs

Separating costs into variable and fixed categories, we express profit as:

Profit =Total revenue - Total variable costs -Total fixed costs

Contribution margin indicates why operating income changes as the number of units sold changes. The contribution margin is **total revenue minus total variable costs**. Similarly, the contribution margin per unit is the selling price per unit minus the variable cost per unit. Both contribution margin and contribution margin per unit are valuable tools when considering the effects of volume on profit. Contribution margin per unit tells us how much revenue from each unit sold can be applied towards fixed costs. Once enough units are sold to cover all fixed costs, then the contribution margin per unit from all remaining sales becomes profit.

Expressing CVP Relationships

There are three related methods to deal with the model CVP relationships:

1. The equation method
2. The contribution margin method
3. The graph method

The equation method and the contribution margin method are most useful when managers want to determine operating income at *few specific levels* of sales (for example 5, 15, 25, and 40 units sold). The graph method helps managers visualize the relationship between units sold and operating income over *a wide range* of quantities of units sold. However, different methods are useful for different decisions.

1. **Equation Method**

Revenues - Variable costs - Fixed costs = Operating income

Note:

***Revenues = Selling price (SP) × Quantity of units sold (Q)**

***Variable costs = Variable cost per unit (VCU) × Quantity of units sold (Q)**

Thus:

(SP× Q) – (VCU×Q) – fixed cost = operating income……..Equation 1

Equation 1 becomes the basis for calculating operating income for different quantities of units sold.

2. **Contribution Margin Method**

Rearranging equation 1,

(SP-VCU) × (Q) – fixed cost = operating income

= (Contribution margin× Q) – fixed cost= operating income……Equation 2

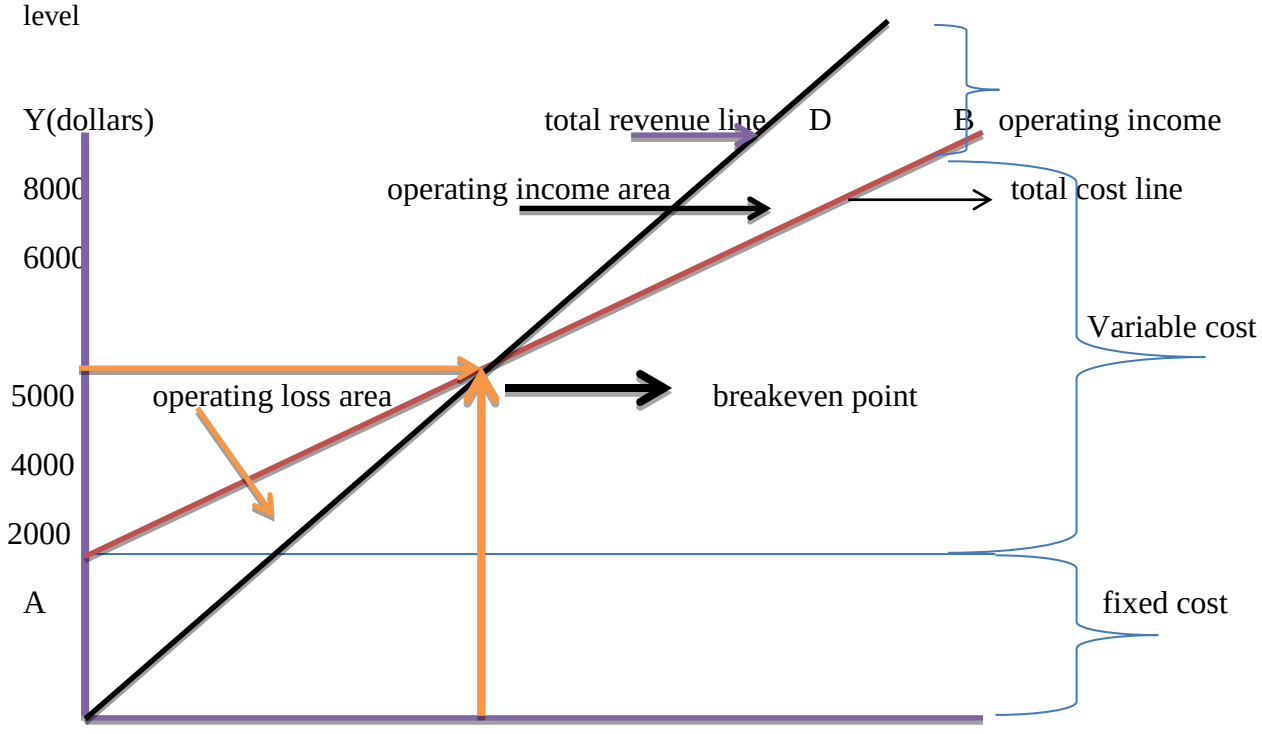
3. **Graph Method**

In the graph method, we represent total costs and total revenues graphically. Each is shown as a line on a graph.

Total costs line. The total costs line is the sum of fixed costs and variable costs. In this example the total costs line is the straight line from point **A** through point **B.**

Total revenue line. One convenient starting point is $0 revenues at 0 units sold, which is point C. Select a second point by choosing any other convenient output level and determining the corresponding total revenues. The total revenue line is the straight line from point C through point D.

Profit or loss at any sales level can be determined by the vertical distance between the two lines at that level



C 10 20 25 30 40 50 X(unit sold)

Cost-Volume-Profit Assumptions

CPV analysis to be applied, there are assumptions including:

1. Changes in the levels of revenues and costs arise only because of changes in the number of products (or service) or units sold. The number of units sold is the only revenue driver and the only cost driver.
2. Total costs can be separated into two components: a fixed component that does not vary with units sold and a variable component that changes with respect to units sold.
3. When represented graphically, the behaviors of total revenues and total costs are linear (meaning they can be represented as a straight line) in relation to units sold within a relevant range (and time period).
4. Selling price, variable cost per unit, and total fixed costs (within a relevant range and time period) are known and constant.

An important feature of CVP analysis is distinguishing fixed from variable costs. Always keep in mind, however, that whether a cost is variable or fixed depends on the time period for a decision. The shorter the time horizon, the higher the percentage of total costs considered fixed. Always consider the relevant range, the length of the time horizon, and the specific decision situation when classifying costs as variable or fixed.

Break Even Point and Target Operating Income

The **breakeven point (BEP)** is that quantity of output sold, at which total revenues equal total costs, that is, the quantity of output sold that results in $0 of operating income.

Example:

If the company sold one unit at $ 200, variable cost per unit $120, and also fixed cost is $ 2,000, what will be the amount of break-even quantity?

- Recall the equation method (equation 1):

(SP× Q) – (VCU×Q) – fixed cost = operating income

= ($200×Q) - ($120×Q) - $2,000= 0

= $80× Q = 2,000

= Q = 2,000 ÷ 80 per unit

= 25 units

Interpretation:

If the company sells fewer than 25 units, it will incur a loss; if it sells 25 units, it will be at breakeven; and if it sells more than 25 units, it will make a profit. While this breakeven point is expressed in units, it can also be expressed in revenues (Dollar): 25 units × $200 selling price= $5,000.

- Recall the contribution margin method (Equation 2):

(Contribution margin× Q) – fixed cost= operating income,

Since at break even, operation income is zero (0),

***Contribution margin per unit × Breakeven number of units = Fixed cost……..Equation 3**

Rearranging Equation 3 and entering the data,

Breakeven number of units = Fixed cost ÷ contribution margin per unit = $2,000÷ $80= 25 units

Breakeven revenues = Breakeven number of units × Selling price

= 25 units × $200 per unit = $5,000

In practice (because they have multiple products), companies usually calculate breakeven point directly in terms of revenues using contribution margin percentages.

Contribution margin percentage = $\frac{\text{Contribution margin per unit}}{\text{Selling price}} = \frac{\$80}{\$200} = 0.4 \text{ or } 40\%$

That is, 40% of each dollar of revenue, or 40 cents, is contribution margin. To breakeven, contribution margin must equal fixed costs of $2,000. To earn $2,000 of contribution margin, when $1 of revenue earns $0.40 of contribution margin, revenues must equal $2,000÷ 0.40 = $5,000.

While the breakeven point tells managers *how much they must sell to avoid a loss*, managers are equally interested in how they will *achieve the operating income targets* underlying their strategies and plans.

Target Operating Income

We illustrate target operating income calculations by asking the following question:

How many units must the company sell to earn an operating income of $1,200 based on the above example? One approach is to keep plugging in different quantities and check when operating income equals $1,200. The result shows that operating income is $1,200 when 40 packages are sold. A more convenient approach is to use equation 1.

(SP× Q) – (VCU×Q) – fixed cost = operating income……. Equation 1

We denote by Q the unknown quantity of units the company must sell to earn an operating income of $1,200. The selling price is $200, variable cost per package is $120, fixed costs are $2,000, and target operating income is $1,200. Substituting these values into equation 1, we have:

($200 * *Q*) - ($120 * *Q*) - $2,000 = $1,200

$80 * *Q* = $2,000 + $1,200 = **$3,200**

Q = $3,200 per unit = 40 units

$80

Alternatively, we could use Equation 2,

(Contribution margin× Q) – fixed cost= operating income……Equation 2

Given a target operating income ($1,200 in this case), we can rearrange terms to get Equation 4.

$$\mathbf{Q = \frac{Fixed\ costs + Target\ operating\ income}{Contribution\ margin\ per\ unit}} \quad \textbf{……..,…….Equation 4}$$

$$\mathbf{Q} = \frac{\$2,000 + \$1,200}{\$80 \text{ per unit}} = 40 \text{ units}$$

The revenues needed to earn an operating income of $1,200 can also be calculated directly by recognizing (1) that $3,200 of contribution margin must be earned (fixed costs of $2,000 plus operating income of $1,200) and (2) that $1 of revenue earns $0.40 (40 cents) of contribution margin. To earn $3,200 of contribution margin, revenues must equal $3,200÷ 0.40 = $8,000.

Target Net Income and Income Taxes

Net income is operating income plus non-operating revenues (such as interest revenue) minus non-operating costs (such as interest cost) minus income taxes. For simplicity, throughout this chapter **we assume non-operating revenues and non-operating costs are zero**. Thus,

Net income= Operating income - Income taxes

In many companies, the income targets for managers in their strategic plans are expressed in terms of net income. That's because top management wants subordinate managers to take into account the effects their decisions have on operating income after income taxes. Some decisions may not result in large operating incomes, but they may have favorable tax consequences, making them attractive on a net income basis—the measure that drives shareholders' dividends and returns.

To make net income evaluations, CVP calculations for target income must be stated in terms of t*arget net income* instead of *target operating income*. For example, the company may be interested in knowing the quantity of units it must sell to earn a net income of $960, assuming an income tax rate of 40%.

Target net income = (target operating income) – (target operating income × tax rate)

= target operating income × (1 – tax rate)

$$\textbf{Target operating income} = \frac{\text{Target net income}}{1 - \text{Tax rate}} = \frac{\$\ 960}{1 - 0.40} = \$1,600$$

The key step is to take the target net income number and convert it into the corresponding target operating income number. We can then use Equation 1 for target operating income and substitute numbers from our previous example.

($200 * Q) - ($120 * Q) - $2,000 = $1,600

$80 * Q = $3,600

Q = \$3,600/ \$80 per unit = 45 units : Quantity of units required to be sold

Focusing the analysis on target net income instead of target operating income will not change the breakeven point. That's because, by definition, operating income at the breakeven point is \$0, and no income taxes are paid when there is no operating income.

Using CVP Analysis for Decision Making

Managers also use CVP analysis to guide other decisions, many of them strategic decisions. Consider a decision about choosing additional features for an existing product. Different choices can affect selling prices, variable cost per unit, fixed costs, units sold, and operating income. CVP analysis helps managers make product decisions by estimating the expected profitability of these choices.

Strategic decisions invariably entail risk. CVP analysis can be used to evaluate how operating income will be affected if the original predicted data are not achieved—say, if sales are 10% lower than estimated. Evaluating this risk affects other strategic decisions a company might make. For example, if the probability of a decline in sales seems high, a manager may take actions to change the cost structure to have more variable costs and fewer fixed costs.

We return to our previous example to illustrate how CVP analysis can be used for strategic decisions concerning advertising and the selling price.

1. **Decision to Advertise**

Suppose the company anticipates selling 40 units at the fair. The data indicate that the company's operating income will be \$1,200. It is considering placing an advertisement describing the product and its features in the fair brochure. The advertisement will be a fixed cost of \$500. It thinks that advertising will increase sales by 10% to 44 packages. Should the company advertise? The following table presents the CVP analysis.

	40 Packages Sold with No Advertising (1)	44 Packages Sold with Advertising (2)	Difference (3) = (2) - (1)
Revenues (\$200 * 40; \$200 * 44)	\$8,000	\$8,800	\$ 800
Variable costs (\$120 * 40; \$120 * 44)	4,800	5,280	480
Contribution margin (\$80 * 40; \$80 * 44)	3,200	3,520	320
Fixed costs	2,000	2,500	500
Operating income	\$1,200	\$1,020	\$(180)

Decision: Operating income will decrease from \$1,200 to \$1,020, so it should not advertise.

2. **Decision to Reduce Selling Price**

Having decided not to advertise, the company is contemplating whether to reduce the selling price to $175. At this price, they think that they will sell 50 units. At this quantity, the package wholesaler who supplies the product will sell the packages to it for $115 per unit instead of $120. Should the company reduce the selling price?

Contribution margin from lowering prices to $175: ($175 - $115) per unit * 50 units…… $3,000

Contribution margin from maintaining price at $200: ($200 - $120) per unit * 40 units….. 3,200

Change in contribution margin from lowering prices $..... (200)

Decreasing the price will reduce the contribution margin by $200 and, because the fixed costs of $2,000 will not change, it will also reduce operating income by $200. The company should not reduce the selling price.

Sensitivity Analysis and Margin of Safety

Sensitivity analysis is a "what-if" technique that managers use to examine how an outcome will change if the original predicted data are not achieved or if an underlying assumption changes. In the context of CVP analysis, sensitivity analysis answers questions such as, "What will operating income be if the quantity of units sold decreased by 5% from the original prediction?" and "What will operating income be if the variable cost per unit increases by 10%?" Sensitivity analysis broadens managers' perspectives to possible outcomes that might occur *before* costs are committed.

The margin of safety answers the "what-if" question: If budgeted revenues are above breakeven and drop, how far can they fall below budget before the breakeven point is reached? Sales might decrease as a result of a competitor introducing a better product, or poorly executed marketing programs, and so on.

Margin of safety = Budgeted (or actual) revenues - Breakeven revenues

Margin of safety (in units) = Budgeted (or actual) sales quantity - Breakeven quantity

Assume that the company has fixed costs of $2,000, a selling price of $200, and variable cost per unit of $120. If the company sells 40 units, budgeted revenues are $8,000 and budgeted operating income is $1,200. The breakeven point is 25 units or $5,000 in total revenues.

Margin of safety = budgeted revenues - breakeven revenues = $ 8000 - $ 5000= $ 3,000

Margin of safety (in units) = Budgeted sales unit - Breakeven sales unit = 40 – 25 = 15 units

Margin of safety percentage = Margin of safety in dollars / Budgeted (or actual) revenues = $3,000 / $8,000 = 37.5%

This result means that revenues would have to decrease substantially, by 37.5%, to reach breakeven revenues. The high margin of safety gives the company confidence that they are unlikely to suffer a loss.

Sensitivity analysis is a simple approach to recognizing uncertainty, which is the possibility that an actual amount will deviate from an expected amount. Sensitivity analysis gives managers a good feel for the risks involved.

Cost Planning and CVP

Managers have the ability to choose the levels of fixed and variable costs in their cost structures. This is a strategic decision. The followings are various factors that managers and management accountants consider as they make this decision.

a. Alternative Fixed-Cost/Variable-Cost Structures

CVP-based sensitivity analysis highlights the risks and returns as fixed costs are substituted for variable costs in a company's cost structure.

	Fixed Cost	Variable Cost	Number of units required to be sold at $200 selling Price to earn target operating income of $0 (Breakeven point)	
$2,000				
Line 6	$2,000	$120	25	50
Line 11	$2,800	$100	28	48

Compared to line 6, line 11, with higher fixed costs, has more risk of loss (has a higher breakeven point) but requires fewer units to be sold (48 versus 50) to earn operating income of $2,000. CVP analysis can help managers evaluate various fixed-cost/variable-cost structures.

b. Operating Leverage

The risk-return trade-off across alternative cost structures can be measured as *operating leverage*. Operating leverage describes the effects that fixed costs have on changes in operating income as changes occur in units sold and contribution margin. Organizations with a high proportion of fixed costs in their cost structures have high operating leverage. Small increases in sales lead to large increases in operating income. Small decreases in sales result in relatively large decreases in operating income, leading to a greater risk of operating losses.

At any given level of sale, Degree of operating leverage $= \frac{\text{Contribution margin}}{\text{Operating income}}$

Effects of Sales Mix on Income

Sales mix is the quantities (or proportion) of various products (or services) that constitute total unit sales of a company. Suppose XYZ Co. is now budgeting for a subsequent college fair in New York. It plans to sell two different test-prep packages—GMAT Success and GRE Guarantee—and budgets the following:

	GMAT Success	GRE Guarantee	Total
Expected sales	60	40	100
Revenues, $200 and $100 per unit	$12,000	$4,000	$16,000

Variable costs, $120 and $70 per unit	7,200	2,800	10,000
Contribution margin, $80 and $30 per unit	$4,800	$1,200	6,000
Fixed costs			4,500
Operating income			$1,500

What is the breakeven point?

In contrast to the single-product (or service) situation, the total number of units that must be sold to break even in a multiproduct company depends on the sales mix—the combination of the number of units of GMAT Success sold and the number of units of GRE Guarantee sold. We assume that the budgeted sales mix (60 units of GMAT Success sold for every 40 units of GRE Guarantee sold, that is, a ratio of 3:2) will not change at different levels of total unit sales. That is, we think of XYZ co selling a bundle of 3 units of GMAT Success and 2 units of GRE Guarantee. (Note that this does not mean that XYZ co. Physically bundles the two products together into one big package.) Each bundle yields a contribution margin of $300 calculated as follows:

	Number of Units of GMAT Success and GRE Guarantee in Each Bundle	Contribution Margin per Unit for GMAT Success and GRE Guarantee	Contribution Margin of the Bundle
GMAT Success	3	$80	$240
GRE Guarantee	2	30	60
Total			$300

To compute the breakeven point, we calculate the number of bundles XYZ co. needs to sell.

$$\text{Break even point in bundles} = \frac{\text{Fixed cost}}{\text{Contribution margin per bundle}} = \frac{\$4500}{300 \text{ per bundle}} = 15 \text{ bundles}$$

Breakeven point in units of GMAT Success and GRE Guarantee is as follows:

GMAT Success: 15 bundles * 3 units of GMAT Success per bundle 45 units

GRE Guarantee: 15 bundles * 2 units of GRE Guarantee per bundle 30 units

Total number of units to break even…… 75 units

Breakeven point in dollars for GMAT Success and GRE Guarantee is as follows:

GMAT Success: 45 units * $200 per unit $ 9,000

GRE Guarantee: 30 units * $100 per unit 3,000

Breakeven revenues……. $12,000

When there are multiple products, it is often convenient to use contribution margin percentage. Under this approach, XYZ Co. first calculates the revenues from selling a bundle of 3 units of GMAT Success and 2 units of GRE Guarantee:

	Number of Units In Each Bundle	Selling Price Of GMAT Success And GRE Guarantee	for GMAT Success and GRE Guarantee Revenue of the Bundle
GMAT Success	3	$200	$600

GRE Guarantee	2	100	200
Total			$800

Contribution margin percentage = Contribution margin of the bundle = $300 = 0.375 or 37.5%
For the bundle Revenue of the bundle 800

Breakeven = Fixed costs = $4,500 = $12,000
Revenues Contribution margin % for the bundle 0.375

Number of bundles = Breakeven revenues = $12,000 = 15 bundles
Required to be sold Revenue per bundle $800 per bundle
To break even

The breakeven point in units and dollars for GMAT Success and GRE Guarantee are as follows:

GMAT Success: 15 bundles * 3 units of GMAT Success per bundle 45 units $200 per unit = $9,000

GRE Guarantee: 15 bundles * 2 units of GRE Guarantee per bundle 30 units $100 per unit = $3,000

Recall that in all our calculations we have assumed that the budgeted sales mix (3 units of GMAT Success for every 2 units of GRE Guarantee) will not change at different levels of total unit sales.

Dear students:

We prepare exercises to work on and check yourself whether you understand and grasp the main points of the chapter.

EXERCISES FOR CHAPTER ONE

1.The Express Banquet has two restaurants that are open 24-hours a day. Fixed costs for the two restaurants together total $459,000 per year. Service varies from a cup of coffee to full meals. The average sales check per customer is $8.50. The average cost of food and other variable costs for each customer is $3.40. The income tax rate is 30%. Target net income is $107,100.

A. Compute the revenues needed to earn the target net income.

B. How many customers are needed to break even? To earn net income of $107,100?

C. Compute net income if the number of customers is 170,000.

2. Suppose Doral Corp.'s breakeven point is revenues of $1,100,000.Fixed costs are $660,000.

A. Compute the contribution margin percentage.

B. Compute the selling price if variable costs are $16 per unit.

C. Suppose 95,000 units are sold. Compute the margin of safety in units and dollars.

3. Garrett Manufacturing sold 410,000 units of its product for $68 per unit in 2011.Variable cost per unit is $60 and total fixed costs are $1,640,000.

A. Calculate: (i) contribution margin and (ii) operating income.

B. Garrett's current manufacturing process is labor intensive. Kate Schoenen, Garrett's production manager, has proposed investing in state-of-the-art manufacturing equipment, which will increase the annual fixed costs to $5,330,000. The variable costs are expected to decrease to $54 per unit. Garrett

expects to maintain the same sales volume and selling price next year. How would acceptance of Schoenen's proposal affect your answers to (i) and (ii) in requirement A?

C. Should Garrett accept Schoenen's proposal? Explain.

4. Color Rugs are holding a two-week carpet sale at Jerry's Club, a local warehouse store. Color Rugs plans to sell carpets for $500 each. The company will purchase the carpets from a local distributor for $350 each, with the privilege of returning any unsold units for a full refund. Jerry's Clubhas offered Color Rugs two payment alternatives for the use of space.

- Option 1: A fixed payment of $5,000 for the sale period
- Option 2: 10% of total revenues earned during the sales period

Assume Color Rugs will incur no other costs.

A. Calculate the breakeven point in units for (a) option 1 and (b) option 2.

B. At what level of revenues will Color Rugs earn the same operating income under either option?

a. For what range of unit sales will Color Rugs prefer option 1?

b. For what range of unit sales will Color Rugs prefer option 2?

C. Calculate the degree of operating leverage at sales of 100 units for the two rental options.

D. Briefly explain and interpret your answer to requirement 3.

5. Data 1-2-3 is a top-selling electronic spreadsheet product.

Data is about to release version 5.0. It divides its customers into two groups: new customers and upgrade customers (those who previously purchased Data 1-2-3, 4.0 or earlier versions). Although the same physical product is provided to each customer group, sizable differences exist in selling prices and variable marketing costs:

	New Customers		**Upgrade Customers**	
Selling price		$275		$100
Variable costs				
Manufacturing	$35		$35	
Marketing	65	**100**	15	**50**
Contribution margin		**$175**		**$50**

The fixed costs of Data 1-2-3, 5.0 are $15,000,000. The planned sales mix in units is 60% new customers and40% upgrade customers.

1. What is the Data 1-2-3, 5.0 breakeven points in units, assuming that the planned 60%:40% sales mix is attained?

2. If the sales mix is attained, what is the operating income when 220,000 total units are sold?

3. Show how the breakeven point in units changes with the following customer mixes:

a. New 40% and Upgrade 60%

b. New 80% and Upgrade 20%

c. Comment on the results

CHAPTER TWO

Master Budget and Responsibility Accounting

What is budget?

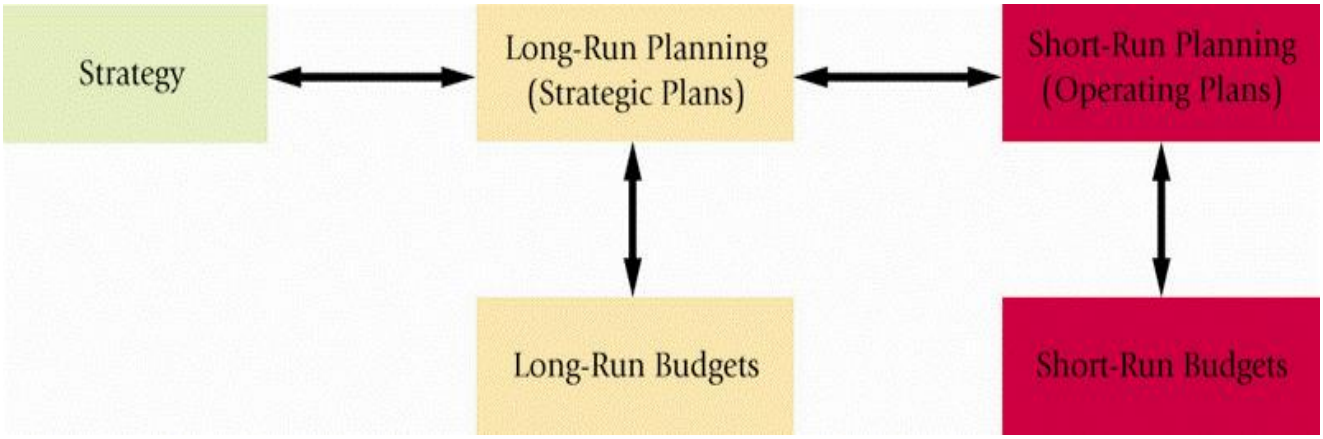
Budget is the quantitative expression of a proposed plan of action by management for a specified period, and an aid to coordinating what needs to be done to implement that plan may include both financial and non-financial data.

A financial budget quantifies management's expectations regarding income, cash flows, and financial position. Just as financial statements are prepared for past periods, financial statements can be prepared for future periods—for example, a budgeted income statement, a budgeted statement of cash flows, and a budgeted balance sheet. Underlying these financial budgets are nonfinancial budgets for, say, units manufactured or sold, number of employees, and number of new products being introduced to the marketplace.

The Ongoing Budget Process

1. Managers and accountants plan the performance of the company, taking into account past performance and anticipated future changes
2. Senior managers distribute a set of goals against which actual results will be compared
3. Accountants help managers investigate deviations from budget. Corrective action occurs at this point
4. Managers and accountants assess market feedback, changed conditions, and their own experiences as plans are laid for the next budget period.

Strategy, Planning and Budgets, Illustrated



Choosing the Budget Period (Generally fiscal years)

The annual operating budget may be divided into quarterly and monthly budgets.

ADVANTAGES OF BUDGETS

Budgets are an integral part of management control systems and well managed budget:

- Provides a framework for judging performance
- Motivates managers and other employees
- Promotes coordination and communication among subunits within the company

MASTER BUDGET

- **The master budget** expresses the managements' operating and financial plan for a specified period and it includes a set of budgeted financial statements.

Components of Master Budgets

- **Operating Budget** – building blocks leading to the creation of the Budgeted Income Statement
- **Financial Budget** – building blocks based on the Operating Budget that lead to the creation of the Budgeted Balance Sheet and the Budgeted Statement of Cash Flows

Basic Operating Budget Steps include; prepare the :

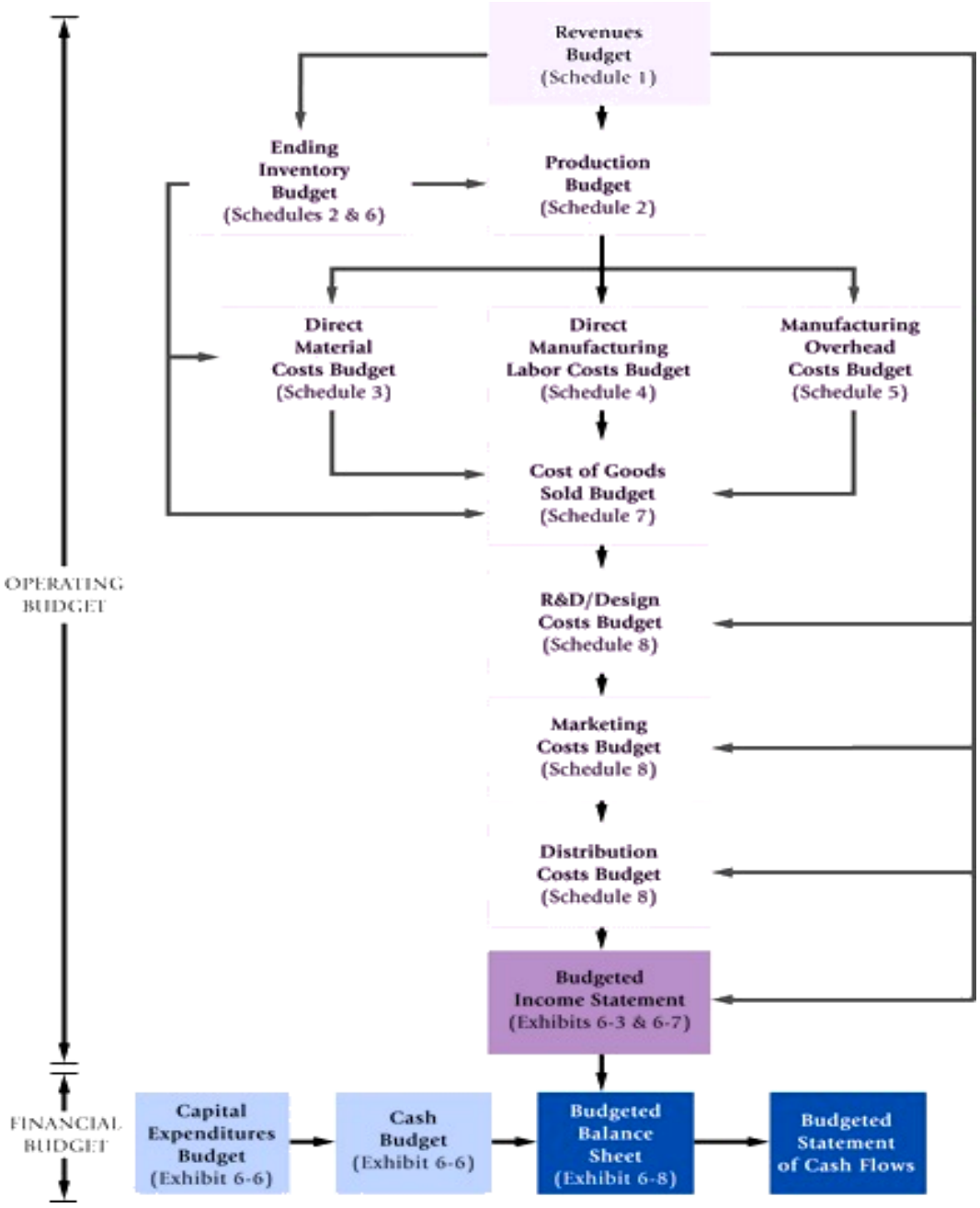
1. Revenues Budget
2. Production Budget (in Units)
3. Direct Materials Usage Budget and Direct Materials Purchases Budget
4. Direct Manufacturing Labor Budget
5. Manufacturing Overhead Costs Budget
6. Ending Inventories Budget
7. Cost of Goods Sold Budget
8. Operating Expense (Period Cost) Budget
9. Budgeted Income Statement

Basic Financial Budget Steps

Based on the Operating Budgets: prepare the;

1. Capital Expenditures Budget
2. Cash Budget
3. Budgeted Balance Sheet
4. Budgeted Statement of Cash Flows

The figure below summarizes the sample Master Budget.



The Sales Budget

- The sales budget is the Key to the entire budgeting process because all other schedules derived from it. Therefore, a mistake here makes the entire budget less effective.

Where would you go to get accurate sales forecasting information?

- Forecasting includes the following sources: past history, backlog of unfulfilled orders, marketing plans, competition, new products, availability of resources, economic conditions, customer, sales force, industry trends

Budgeting Example

Royal Company is manufacturing business which produces and sold product X to its existing and new customers. The company is preparing budgets for the quarter ending June 30, 2017.

Budgeted sales for the next five months will be:

April	20,000 units
May	50,000 units
June	30,000 units
July	25,000 units
August	15,000 units.

The selling price is $10 per unit. So based on the given information prepare the sales (revenue) budget for the quarter end June 30,2017.

The Sales Budget

	April	May	June	Quarter
Budgeted sales (units)	20,000	50,000	30,000	100,000
Selling price per unit	$ 10	$ 10	$ 10	$ 10
Total sales	$200,000	$500,000	$300,000	$1,000,000

All sales are on account. Royal's collection pattern is:

- 70% collected in the month of sale, 25% collected in the month following sale, 5% is uncollectible.
- The March 31 accounts receivable balance of $30,000 will be collected in full.

Expected Cash Collections

	April	May	June	Quarter
Accounts rec. - 3/31	$ 30,000			$ 30,000
April sales				
70% x $200,000	140,000			140,000
25% x $200,000		$ 50,000		50,000
May sales				
70% x $500,000		350,000		350,000
25% x $500,000			$ 125,000	125,000
June sales				
70% x $300,000			210,000	210,000
Total cash collections	$ 170,000	$ 400,000	$ 335,000	$ 905,000

Note: The 25% of June sales ($75,000) to be collected in July becomes the Accounts Receivable balance at the end of June.

The Production Budget information

- Production must be adequate to meet budgeted sales and provide for sufficient ending inventory.
- The management at Royal Company wants ending inventory to be equal to 20% of the following month's budgeted sales in units. This is how much inventory that is required to meet production needs in the next period.
- On March 31, 4,000 units were on hand.

The Production Budget

	April	May	June	Quarter
Budgeted sales	20,000	50,000	30,000	100,000
Add desired ending inventory	10,000	6,000	5,000	5,000
Total needed	30,000	56,000	35,000	105,000
Less beginning inventory	4,000	10,000	6,000	4,000
Required production	26,000	46,000	29,000	101,000

Ending inventory based on 20% of July sales(25,000)

Manufacturing Cost Budgets

Now that we know production needs, we need to determine how much material; labor and overhead will be required to meet those needs.

- To determine cost of goods manufactured, we also need to know ending WIP inventory.

The Direct Materials Budget information

- At Royal Company, five pounds of material are required per unit of product.
- Management wants materials on hand at the end of each month equal to 10% of the following month's production.
- On March 31, 13,000 pounds of material are on hand. Material cost is $0.40 per pound.

The Direct Materials Budget

	April	May	June	Quarter
Production	26,000	46,000	29,000	101,000
Materials per unit	5	5	5	5
Production needs	130,000	230,000	145,000	505,000
Add desired ending inventory	23,000	14,500	11,500	11,500
Total needed	153,000	244,500	156,500	516,500
Less beginning inventory	13,000	23,000	14,500	13,000
Materials to be purchased	140,000	221,500	142,000	503,500
Material cost per unit	$0.4	$0.4	$0.4	$0.4
Material cost	$56,000	$88,600	$56,800	$201,400

Ending inventory will be 10% of July production needs

Expected Cash Disbursement for Materials

- Royal pays $0.40 per pound for its materials.
- One-half of a month's purchases are paid for in the month of purchase; the other half is paid in the following month. The March 31 accounts payable balance is $12,000.

Expected Cash Disbursement for Materials

	April	May	June	Quarter
Accounts pay. 3/31	$ 12,000			$ 12,000
April purchases				
50% x $56,000	28,000			28,000
50% x $56,000		$ 28,000		28,000
May purchases				
50% x $88,600		44,300		44,300
50% x $88,600			$ 44,300	44,300
June purchases				
50% x $56,800			28,400	28,400
Total cash disbursements	$ 40,000	$ 72,300	$ 72,700	$185,000

Note: The 50% of June purchases payable in July ($28,400) is the Accounts Payable balance at the end of June.

The Direct Labor Budget

- At Royal, each unit of product requires 0.05 hours of direct labor.
- The Company has a "no layoff" policy so all employees will be paid for 40 hours of work each week. In exchange for the "no layoff" policy, workers agreed to a wage rate of $10 per hour regardless of the hours worked (No overtime pay).
- For the next three months, the direct labor workforce will be paid for a minimum of 1,500 hours per month.

	April	May	June	Quarter
Production	26,000	46,000	29,000	101,000
Direct labor hours	0.05	0.05	0.05	0.05
Labor hours required	1,300	2,300	1,450	5,050
Guaranteed labor hours	1,500	1,500	1,500	
Labor hours paid	1,500	2,300	1,500	5,300
Wage rate	$ 10	$ 10	$ 10	$ 10
Total direct labor cost	$ 15,000	$ 23,000	$ 15,000	$ 53,000

Note: Cash disbursement equals total direct labor cost since it is paid in period earned

Manufacturing Overhead Budget

- Royal Company uses a variable manufacturing overhead rate of $1 per unit produced.

- Fixed manufacturing overhead is $50,000 per month and includes $20,000 of noncash costs (primarily depreciation of plant assets).

	April	May	June	Quarter
Production in units	26,000	46,000	29,000	101,000
Variable mfg. OH rate	$ 1	$ 1	$ 1	$ 1
Variable mfg. OH costs	$ 26,000	$ 46,000	$ 29,000	$ 101,000
Fixed mfg. OH costs	50,000	50,000	50,000	150,000
Total mfg. OH costs	76,000	96,000	79,000	251,000
Less noncash costs	20,000	20,000	20,000	60,000
Cash disbursements for manufacturing OH	$ 56,000	$ 76,000	$ 59,000	$ 191,000

Note: - depreciation is non-cash expense

Ending Finished Goods Inventory Budget

- Now, Royal can complete the ending finished goods inventory budget.
- At Royal, manufacturing overhead is applied to units of product on the basis of direct labor hours.

Ending Finished Goods Inventory Budget

Production costs per unit	Quantity		Cost	Total
Direct materials	5.00	lbs.	$ 0.40	$ 2.00
Direct labor	0.05	hrs.	$10.00	0.50
Manufacturing overhead	0.05	hrs.	$49.70	2.49
				$ 4.99
Budgeted finished goods inventory				
Ending inventory in units				
Unit product cost				$ 4.99
Ending finished goods inventory				?

Total mfg. OH for quarter $251,000
Total labor hours required 5,050 hrs
(from DL budget & MOH budget)

= $49.7/hr

Production costs per unit	Quantity		Cost	Total
Direct materials	5.00	lbs.	$ 0.40	$ 2.00
Direct labor	0.05	hrs.	$10.00	0.50
Manufacturing overhead	0.05	hrs.	$49.70	2.49
				$ 4.99
Budgeted finished goods inventory				
Ending inventory in units				5,000
Unit product cost				$ 4.99
Ending finished goods inventory				$24,950

Selling and Administrative Expense Budget

- At Royal, variable selling and administrative expenses are $0.50 per unit sold.
- Fixed selling and administrative expenses are $70,000 per month.
- The fixed selling and administrative expenses include $10,000 in costs – primarily depreciation – that are not cash outflows of the current month.

	April	May	June	Quarter
Budgeted sales	20,000	50,000	30,000	100,000
Variable selling and admin. rate	$ 0.50	$ 0.50	$ 0.50	$ 0.50
Variable expense	$10,000	$25,000	$15,000	$ 50,000
Fixed selling and admin. expense	70,000	70,000	70,000	210,000
Total expense	80,000	95,000	85,000	260,000
Less noncash expenses	10,000	10,000	10,000	30,000
Cash disburse-ments for selling & admin.	$70,000	$85,000	$75,000	$230,000

The Cash Budget

Royal:

- Maintains a 16% open line of credit for $75,000.
- Maintains a minimum cash balance of $30,000.
- Borrows on the first day of the month and repays loans on the last day of the month.
- Pays a cash dividend of $49,000 in April.
- Purchases $143,700 of equipment in May and $48,300 in June paid in cash.
- Has an April 1 cash balance of $40,000.

	April	May	June	Quarter
Beginning cash balance	$ 40,000			
Add cash collections	170,000			
Total cash available	210,000			
Less disbursements				
Materials	40,000			
Direct labor	15,000			
Mfg. overhead	56,000			
Selling and admin.	70,000			
Equipment purchase	-			
Dividends	49,000			
Total disbursements	230,000			
Excess (deficiency) of cash available over disbursements	$ (20,000)			

Because the company maintains a cash balance of $30,000, the company must borrow on its line of credit. **Financing and Repayment**

	April	May	June	Quarter
Excess (deficiency) of Cash available over disbursements	$ (20,000)			
Financing:				
Borrowing	50,000			
Repayments	-			
Interest	-			
Total financing	50,000			
Ending cash balance	$ 30,000	$ 30,000	$ -	$ -

Ending cash balance for April is the beginning May balance.

	April	May	June	Quarter
Beginning cash balance	$ 40,000	$ 30,000		
Add cash collections	170,000	400,000		
Total cash available	210,000	430,000		
Less disbursements				
Materials	40,000	72,300		
Direct labor	15,000	23,000		
Mfg. overhead	56,000	76,000		
Selling and admin.	70,000	85,000		
Equipment purchase	-	143,700		
Dividends	49,000	-		
Total disbursements	230,000	400,000		
Excess (deficiency) of cash available over disbursements	$ (20,000)	$ 30,000		

Financing and Repayment

	April	May	June	Quarter
Excess (deficiency) of Cash available over disbursements	$ (20,000)	$ 30,000		
Financing:				
Borrowing	50,000	-		
Repayments	-	-		
Interest	-	-		
Total financing	50,000	-		
Ending cash balance	$ 30,000	$ 30,000		

Note:-Because the ending cash balance is exactly $30,000, Royal will not repay the loan this month

The cash budget

	April	May	June	Quarter
Beginning cash balance	$ 40,000	$ 30,000	$ 30,000	$ 40,000
Add cash collections	170,000	400,000	335,000	905,000
Total cash available	210,000	430,000	365,000	945,000
Less disbursements				
Materials	40,000	72,300	72,700	185,000
Direct labor	15,000	23,000	15,000	53,000
Mfg. overhead	56,000	76,000	59,000	191,000
Selling and admin.	70,000	85,000	75,000	230,000
Equipment purchase	-	143,700	48,300	192,000
Dividends	49,000	-	-	49,000
Total disbursements	230,000	400,000	270,000	900,000
Excess (deficiency) of cash available over disbursements	$ (20,000)	$ 30,000	$ 95,000	$ 45,000

Financing and Repayment

	April	May	June	Quarter
Excess (deficiency) of Cash available over disbursements	$ (20,000)	$ 30,000	$ 95,000	$ 45,000
Financing:				
Borrowing	50,000	-	-	50,000
Repayments	-	-	(50,000)	(50,000)
Interest	-	-	(2,000)	(2,000)
Total financing	50,000	-	(52,000)	(2,000)
Ending cash balance	$ 30,000	$ 30,000	$ 43,000	$ 43,000

Note: - $50,000 × 16% × 3/12 = $2,000 Borrowings on April 1 and repayment of June 30.

The Budgeted Income Statement

After we complete the cash budget, we can prepare the budgeted income statement for Royal based on the information available .from the above budgets.

Royal Company
Budgeted Income Statement
For the Three Months Ended June 30

Sales (100,000 units @ $10)	$ 1,000,000
Cost of goods sold (100,000 @ $4.99)	499,000
Gross margin	501,000
Selling and administrative expenses	260,000
Operating income	241,000
Interest expense	2,000
Net income	$ 239,000

The Budgeted Balance Sheet

Royal reported the following account balances prior to preparing its budgeted financial statements:

- Land - $50,000
- Common stock - $200,000
- Retained earnings - $146,150
- Equipment - $175,000
- Add 143,700 in May and 48,300 in June for ending balance of $367,000

The budgeted balance sheet is prepared based on the information available from both operational and financial budgets.

Tips:

Prepare the budgeted balance sheet based on the information provided above.

Exercises:

1. **(Horngren ex.** 6-35 , page 219)

Slopes, Inc., manufactures and sells snowboards. The company manufactures a single model, the Pipex. In the summer of 2011, Slopes' management accountant gathered the following data to prepare budgets for 2012:

Materials and Labor Requirements

Direct materials

Wood	5 board feet (b.f.) per snowboard
Fiberglass	6 yards per snowboard
Direct manufacturing labor	5 hours per snowboard

Slopes' CEO expects to sell 1,000 snowboards during 2012 at an estimated retail price of $450 per board. Further, the CEO expects 2012 beginning inventory of 100 snowboards and would like to end 2012 with 200 snowboards in stock.

Direct Materials Inventories

	Beginning Inventory 1/1/2012	Ending Inventory 12/31/2012
Wood	2,000 b.f.	1,500 b.f.
Fiberglass	1,000 yards	2,000 yards

Variable manufacturing overhead is $7 per direct manufacturing labor-hour. There are also $66,000 in fixed manufacturing overhead costs budgeted for 2012. Slopes combines both variable and fixed manufacturing overhead into a single rate based on direct manufacturing labor-hours. Variable marketing costs are allocated at the rate of $250 per sales visit. The

marketing plan calls for 30 sales visits during 2012. Finally, there are $30,000 in fixed nonmanufacturing costs budgeted for 2012.

Additional information:

	2011 Unit Price	2012 Unit Price
Wood	$28 .00 per b.f.	$30.00 per b.f.
Fiberglass	$ 4.80 per yard	$ 5.00 per yard
Direct manufacturing labor	$24.00 per hour	$25.00 per hour

The inventoriable unit cost for ending finished goods inventory on December 31, 2011, is $374.80.

Budgeted balances at December 31, 2012, in the selected accounts are as follows

Cash	$ 10,000
Property, plant, and equipment (net)	850,000
Current liabilities	17,000
Long-term liabilities	178,000
Stockholders' equity	800,000

Required:

Prepare the (a) :

1. 2012 revenues budget (in dollars).
2. 2012 production budget (in units).
3. Direct material usage and purchases budgets for 2012.
4. Direct manufacturing labor budget for 2012.
5. Manufacturing overhead budget for 2012.
6. What is the budgeted manufacturing overhead rate for 2012?
7. What is the budgeted manufacturing overhead cost per output unit in 2012?
8. Calculate the cost of a snowboard manufactured in 2012.
9. Prepare an ending inventory budget for both direct materials and finished goods for 2012.
10. Prepare a cost of goods sold budget for 2012.
11. Prepare the budgeted income statement for Slopes, Inc., for the year ending December 31, 2012.
12. Prepare the budgeted balance sheet for Slopes, Inc., as of December 31, 201

CHAPTER THREE

Flexible Budgets and Standards

Static Budgets and Variances

A **variance** is the difference between actual results and expected performance. The expected performance is also called **budgeted performance**, which is a point of reference for making comparisons. Variance has various uses for managers in their daily activities and their long run strategy.

Variance highlights the areas that have deviated most from expectations; variances enable managers to focus their efforts on the most critical areas. Variances are also used in performance evaluation and to motivate managers. Sometimes variances suggest that the company should consider a change in strategy. For example, large negative variances caused by excessive defect rates for a new product may suggest a flawed product design. Managers may then want to investigate the product design and potentially change the mix of products being offered.

The benefits of variance analysis are not restricted to companies. In today's difficult economic environment, public officials have realized that the ability to make timely tactical alterations based on variance information guards against having to make more draconian adjustments later.

Static Budgets and Static-Budget Variances

The **static budget**, or master budget, is based on the level of output planned at the start of the budget period. The master budget is called a static budget because the budget for the period is developed around a single (static) planned output level.

The **static-budget variance** is the difference between the actual result and the corresponding budgeted amount in the static budget.

A **favorable variance**—denoted F and has the effect, when considered in isolation, of increasing operating income relative to the budgeted amount. For revenue items, F means actual revenues exceed budgeted revenues. For cost items, F means actual costs are less than budgeted costs.

An **unfavorable variance**—denoted U and has the effect, when viewed in isolation, of decreasing operating income relative to the budgeted amount. Unfavorable variances are also called *adverse variances* in some countries, such as the United Kingdom.

Consider Webb Company, a firm that manufactures and sells jackets. The jackets require tailoring and many other hand operations. Webb sells exclusively to distributors, who in turn sell to independent clothing stores and retail chains. For simplicity, we assume that Webb's only costs are in the manufacturing function; Webb incurs no costs in other value-chain functions, such as marketing and distribution. We also assume that all units manufactured in April 2011 are sold in April 2011. Therefore, all direct materials are purchased and used in the same budget period, and there is no direct materials inventory at either the beginning or the end

of the period. No work-in-process or finished goods inventories exist at either the beginning or the end of the period. Webb has three variable-cost categories. The budgeted variable cost per jacket for each category is as follows:

Cost Category	Variable Cost per Jacket
Direct material costs	$60
Direct manufacturing labor costs	16
Variable manufacturing overhead costs	12
Total variable costs	$88

The *number of units manufactured* is the cost driver for direct materials, direct manufacturing labor, and variable manufacturing overhead. The relevant range for the cost driver is from 0 to 12,000 jackets. Budgeted and actual data for April 2011 follow:

Budgeted fixed costs for production between 0 and 12,000 jackets…… $276,000
Budgeted selling price…… $ 120 per jacket
Budgeted production and sales…… 12,000 jackets
Actual production and sales……..…..… 10,000 jackets

Level 1 Analysis

	Actual Results (1)	Static-Budget Variances (2) = (1) − (3)	Static Budget (3)
Units sold	10,000	2,000 U	12,000
Revenues	$ 1,250,000	$190,000 U	$ 1,440,000
Variable costs			
Direct materials	621,600	98,400 F	720,000
Direct manufacturing labor	198,000	6,000 U	192,000
Variable manufacturing overhead	130,500	13,500 F	144,000
Total variable costs	950, 100	105,900 F	1,056,000
Contribution margin	299,900	84,100 U	384,000
Fixed costs	285,000	9,000 U	276,000
Operating income	$ 14,900	$ 93,100 U	$108,000

$ 93,100 U
Static-budget variance

Static budget variance for operating income =Actual result – Static budget amount
= $14,900 - $108,000 = $93,100 U.

Remember, Webb produced and sold only 10,000 jackets, although managers anticipated an output of 12,000 jackets in the static budget. *Managers want to know how much of the static-budget variance is because of inaccurate forecasting of output units sold and how much is due to Webb's performance in manufacturing and selling 10,000 jackets.* Managers, therefore, create a flexible budget, which enables a more in-depth understanding of deviations from the static budget.

Flexible Budgets

A **flexible budget** calculates budgeted revenues and budgeted costs based on *the actual output in the budget period*. The flexible budget is prepared at the end of the period (April 2011), after the actual output of 10,000 jackets is known. The flexible budget is the *hypothetical* budget that Webb would have prepared at the start of the budget period if it had correctly forecast the actual output of 10,000 jackets.

In preparing the flexible budget, note that:

- The budgeted selling price is the same $120 per jacket used in preparing the static budget.
- The budgeted unit variable cost is the same $88 per jacket used in the static budget.
- The budgeted *total* fixed costs are the same static-budget amount of $276,000. Why? Because the 10,000 jackets produced falls within the relevant range of 0 to 12,000 jackets. Therefore, Webb would have budgeted the same amount of fixed costs, $276,000, whether it anticipated making 10,000 or 12,000 jackets.

The *only* difference between the static budget and the flexible budget is that the static budget is prepared for the planned output of 12,000 jackets, whereas the flexible budget is based on the actual output of 10,000 jackets. The static budget is being "flexed," or adjusted, from 12,000 jackets to 10,000 jackets. The flexible budget for 10,000 jackets assumes that all costs are either completely variable or completely fixed with respect to the number of jackets produced.

Webb develops its flexible budget in three steps.

Step 1: Identify the Actual Quantity of Output. In April 2011, Webb produced and sold 10,000 jackets.

Step 2: Calculate the Flexible Budget for Revenues Based on Budgeted Selling Price and Actual Quantity of Output.

Flexible-budget revenues = $120 per jacket * 10,000 jackets

= $1,200,000

Step 3: Calculate the Flexible Budget for Costs Based on Budgeted Variable Cost per Output Unit, Actual Quantity of Output, and Budgeted Fixed Costs.

Flexible-budget variable costs

Direct materials, $60 per jacket * 10,000 jackets…….. $ 600,000

Direct manufacturing labor, $16 per jacket * 10,000 jackets……... 160,000

Variable manufacturing overhead, $12 per jacket * 10,000 jackets……..120,000

Total flexible-budget variable costs ……..880,000

Flexible-budget fixed costs ……276,000

Flexible-budget total costs…… $1,156,000

The flexible budget allows for a more detailed analysis of the $93,100 unfavorable static-budget variance for operating income.

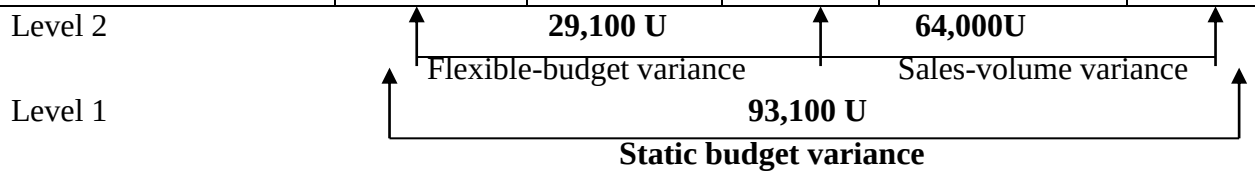
Flexible-Budget Variances and Sales-Volume Variances

The **sales-volume variance** is the difference between a flexible-budget amount and the corresponding static-budget amount. The **flexible-budget variance** is the difference between an actual result and the corresponding flexible-budget amount.

The flexible-budget-based variance analysis for Webb, which subdivides the $93,100 unfavorable static-budget variance for operating income into two parts: a flexible-budget variance of $29,100 U and a sales-volume variance of $64,000 U.

Level 2 Flexible-Budget-Based Variance Analysis for Webb Company for April 2011

	Actual results **(1)**	**Flexible-Budget variances** **(2) = (1) – (3)**	**Flexible Budget** **(3)**	Sales volume variances **(4) = (3) – (5)**	Static budget **(5)**
Units sold	10,000	0	10,000	2000 U	12,000
Revenues	$ 1,250,000	50,000 F	1,200,000	$240,000 U	$1,440,000
Variable costs					
Direct materials	621,600	21,600 U	600,000	120,000 F	720,000
Direct manufacturing labor	198,000	38,000 U	160,000	32,000 F	192,000
V. manufacturing overhead	130,500	10,500 U	120,000	24,000 F	144,000
Total variable costs	950,100	70,100 U	880,000	176,000 F	1,056,000
Contribution margin	299,900	20,100 U	320,000	64,000 U	384,000
Fixed manufacturing costs	285,000	9,000 U	276,000	0	276,000
Operating income	$ 14,900	$29,100 U	$ 44,000	$ 64,000 U	$ 108,000



Sales-Volume Variances

The difference between the *static-budget and the flexible-budget* amounts is called the sales-volume variance because it arises *solely* from the difference between the 10,000 actual quantity (volume) of jackets sold and the 12,000 quantity of jackets expected to be sold in the static budget.

Sales-volume variance for operating income = Flexible budget amount - Static budget amount
= $44,000 - $108,000
= $64,000 U

Sales-volume variance for operating income =
(Budgeted contribution margin per unit) * (Actual units sold – Static budget units sold)
= (Budgeted selling price - Budgeted variable cost per unit) * (Actual units sold- Static-budget units sold)
= ($120 per jacket - $88 per jacket) * (10,000 jackets - 12,000 jackets)
= $32 per jacket * (-2,000 jackets)
= $64,000 U

Webb's managers determine that the unfavorable sales-volume variance in operating income could be because of one or more of the following reasons:

1. The overall demand for jackets is not growing at the rate that was anticipated.
2. Competitors are taking away market share from Webb.

3. Webb did not adapt quickly to changes in customer preferences and tastes.
4. Budgeted sales targets were set without careful analysis of market conditions.
5. Quality problems developed that led to customer dissatisfaction with Webb's jackets.

Flexible-budget variances are a better measure of operating performance than static-budget variances because they compare actual revenues to budgeted revenues and actual costs to budgeted costs for the same 10,000 jackets of output.

The flexible-budget variance for revenues is called the **selling-price variance** because it arises solely from the difference between the actual selling price and the budgeted selling price:

Selling price variance = (Actual selling price – Budgeted selling price) * Actual units sold
= ($125 per jacket - $120 per jacket) * 10,000 jackets
= $50,000 F

Price Variances and Efficiency Variances for Direct-Cost Inputs

To gain further insight, almost all companies subdivide the flexible-budget variance for direct-cost inputs into two more-detailed variances:

1. A price variance that reflects the difference between an actual input price and a budgeted input price.
2. An efficiency variance that reflects the difference between an actual input quantity and a budgeted input quantity.

The information available from these variances (which we call level 3 variances) helps managers to better understand past performance and take corrective actions to implement superior strategies in the future. Managers generally have more control over efficiency variances than price variances because the quantity of inputs used is primarily affected by factors inside the company (such as the efficiency with which operations are performed), while changes in the price of materials or in wage rates may be largely dictated by market forces outside the company.

Obtaining Budgeted Input Prices and Budgeted Input Quantities

To calculate price and efficiency variances, Webb needs to obtain budgeted input prices and budgeted input quantities. Webb's three main sources for this information are past data, data from similar companies, and standards.

1. Actual input data from past periods. Most companies have past data on actual input prices and actual input quantities. These historical data could be analyzed for trends or patterns to obtain estimates of budgeted prices and quantities. The advantage of past data is that they represent quantities and prices that are real rather than hypothetical and can serve as benchmarks for continuous improvement. Another advantage is that past data are typically available at low cost. However, there are limitations to using past data. Past data can include inefficiencies such as wastage of direct materials. They also do not incorporate any changes expected for the budget period.

2. **Data from other companies that have similar processes.** The benefit of using data from peer firms is that the budget numbers represent competitive benchmarks from other companies. For example, Baptist Healthcare System in Louisville, Kentucky, maintains detailed flexible

budgets and benchmarks its labor performance against hospitals that provide similar types of services and volumes and are in the upper quartile of a national benchmark. The main difficulty of using this source is that input price and input quantity data from other companies are often not available or may not be comparable to a particular company's situation.

3. **Standards developed by Webb.** A **standard** is a carefully determined price, cost, or quantity that is used as a benchmark for judging performance. Standards are usually expressed on a per-unit basis. Consider how Webb determines its direct manufacturing labor standards. Webb conducts engineering studies to obtain a detailed breakdown of the steps required to make a jacket. Each step is assigned a standard time based on work performed by a *skilled* worker using equipment operating in an *efficient* manner. There are two advantages of using standard times: (i) They aim to exclude past inefficiencies and (ii) they aim to take into account changes expected to occur in the budget period. An example of (ii) is the decision by Webb, for strategic reasons, to lease new sewing machines that operate at a faster speed and enable output to be produced with lower defect rates. Similarly, Webb determines the standard quantity of square yards of cloth required by a skilled operator to make each jacket.

The term "standard" refers to many different things. Always clarify its meaning and how it is being used. A **standard input** is a carefully determined quantity of input such as square yards of cloth or direct manufacturing labor-hours required for one unit of output, such as a jacket. A **standard price** is a carefully determined price that a company expects to pay for a unit of input. In the Webb example, the standard wage rate that Webb expects to pay its operators is an example of a standard price of a direct manufacturing labor-hour. A **standard cost** is a carefully determined cost of a unit of output for example, the standard direct manufacturing labor cost of a jacket at Webb.

Standard cost per output unit for = Standard input allowed * Standard price per
Each variable direct-cost input for one output unit input unit

Standard direct material cost per jacket: 2 square yards of cloth input allowed per output unit (jacket) manufactured, at $30 standard price per square yard

Standard direct material cost per jacket = 2 square yards * $30 per square yard = $60

Standard direct manufacturing labor cost per jacket: 0.8 manufacturing labor-hour of input allowed per output unit manufactured, at $20 standard price per hour

Standard direct manufacturing labor cost per jacket = 0.8 labor-hour * $20 per labor-hour = $16

Note:-*To clarify, budgeted input prices, input quantities, and costs need not be based on standards. As we saw previously, they could be based on past data or competitive benchmarks, for example. However, when standards are used to obtain budgeted input quantities and prices, the terms "standard" and "budget" are used interchangeably.*

Data for Calculating Webb's Price Variances and Efficiency Variances

Consider Webb's two direct-cost categories. The actual cost for each of these categories for the 10,000 jackets manufactured and sold in April 2011 is as follows:

Direct Materials Purchased and Used

1. Square yards of cloth input purchased and used……. 22,200

2. Actual price incurred per square yard……..…… $ 28
3. Direct material costs (22,200 * $28) ……$621,600

Direct Manufacturing Labor

1. Direct manufacturing labor-hours……. 9,000
2. Actual price incurred per direct manufacturing labor-hour ……$ 22
3. Direct manufacturing labor costs (9,000 * $22) …….$198,000

A price variance is the difference between actual price and budgeted price, multiplied by actual input quantity, such as direct materials purchased or used. A price variance is sometimes called an **input-price variance** or **rate variance**, especially when referring to a price variance for direct manufacturing labor.

An **efficiency variance** is the difference between actual input quantity used—such as square yards of cloth of direct materials—and budgeted input quantity allowed for actual output, multiplied by budgeted price. An efficiency variance is sometimes called a **usage variance**.

The formula for computing the price variance is as follows:

Price variance= (Actual price of input - Budgeted price of input) * Actual quantity of input

Price variances for Webb's two direct-cost categories are as follows:

Direct materials…… ($28 per sq. yard – $30 per sq. yard) * 22,200 square yards = **$44,400 F**

Direct manufacturing labor……. ($22 per hour – $20 per hour) * 9,000 hours = $18,000 U

Efficiency Variance

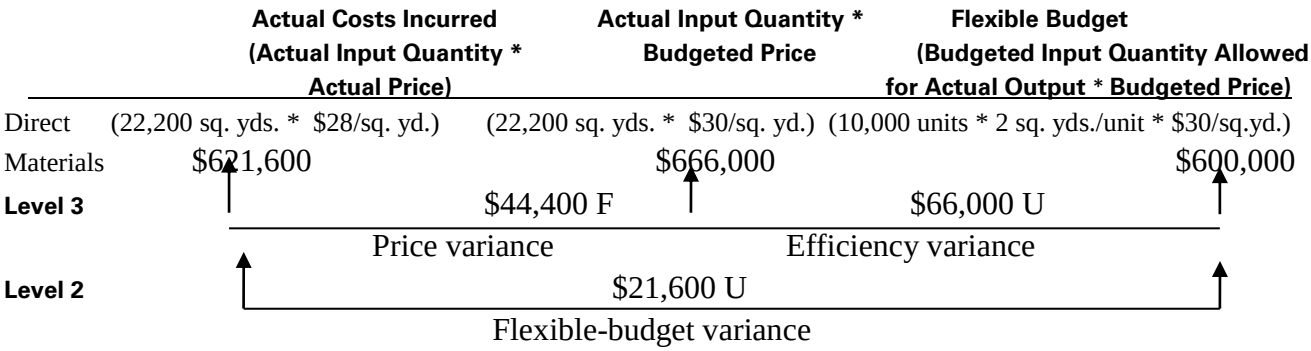
Efficiency Variance = (Actual quantity of - Budgeted quantity of input
Input used allowed for actual output) * Budgeted price of input

The idea here is that a company is inefficient if it uses a larger quantity of input than the budgeted quantity for its actual level of output; the company is efficient if it uses a smaller quantity of input than was budgeted for that output level.

The efficiency variances for each of Webb's direct-cost categories are as follows:

Direct materials [22,200 sq. yds. – (10,000 units * 2 sq. yds./unit)] * $30 per sq. yard
= (22,200 sq. yds. – 20,000 sq. yds.) * $30 per sq. yard = $66,000 U

Direct manufacturing Labor [9,000 hours – (10,000 units * 0.8 hour/unit)] * $20 per hour
= (9,000 hours – 8,000 hours) * $20 per hour = 20,000 U



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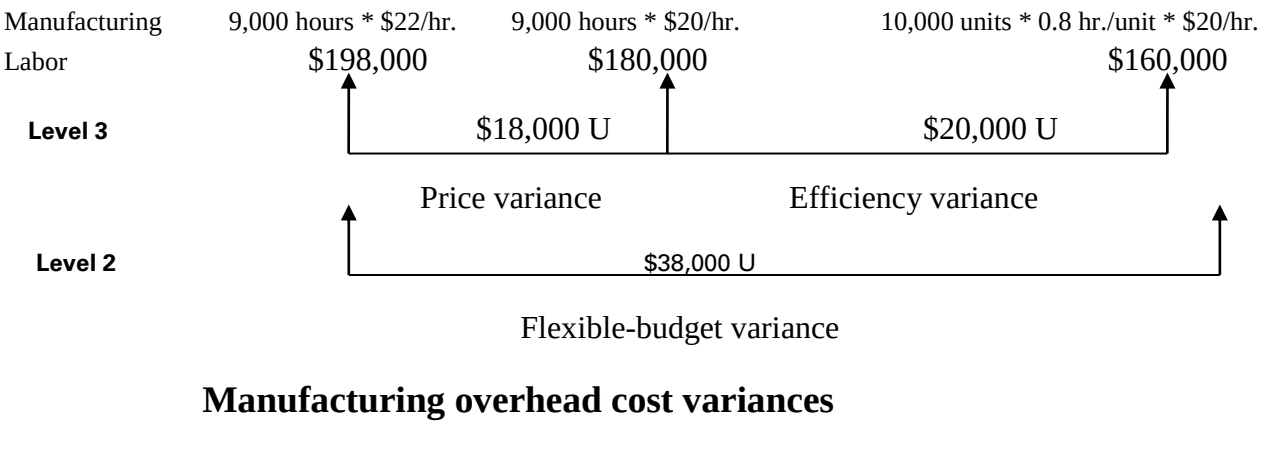

Manufacturing overhead cost variances

Standard costing is a costing system that (a) traces direct costs to output produced by multiplying the standard prices or rates by the standard quantities of inputs allowed for actual outputs produced and (b) allocates overhead costs on the basis of the standard overhead-cost rate times the standard quantities of the allocation bases allowed for the actual outputs produced.

The standard cost of Webb's jackets can be computed at the start of the budget period. Webb's management accountants calculate standard overhead cost rates based on the planned amount of variable and fixed overhead and the standard quantities of the allocation bases.

Developing Budgeted Variable Overhead Rates

Budgeted variable overhead cost-allocation rates can be developed in four steps.

Step 1: Choose the Period to Be Used for the Budget. Webb uses a 12-month budget period.

Step 2: Select the Cost-Allocation Bases to Use in Allocating Variable Overhead Costs to Output Produced. Webb's operating managers select machine-hour as the cost-allocation base because they believe that machine-hour is the only cost driver of variable overhead. Based on an engineering study, Webb estimates it will take 0.40 of a machine-hour per actual output unit. For its budgeted output of 144,000 jackets in 2011 Webb budgets 57,600 (0.40* 144,000) machine-hours.

Step 3: Identify the Variable Overhead Costs Associated with Each Cost-Allocation Base. Webb groups all of its variable overhead costs, including costs of energy, machine maintenance, engineering support, indirect materials, and indirect manufacturing labor in a single cost pool. Webb's total budgeted variable overhead costs for 2011 are $1,728,000.

Step 4: Compute the Rate per Unit of Each Cost-Allocation Base Used to Allocate Variable Overhead Costs to Output Produced. Dividing the amount in Step 3 ($1,728,000) by the

amount in Step 2 (57,600 machine-hours), Webb estimates a rate of $30 per standard machine-hour for allocating its variable overhead costs.

Webb calculates the budgeted variable overhead cost rate per output unit as follows:

Budgeted variable Overhead cost rate per Output unit = Budgeted input allowed per output unit * Budgeted variable overhead cost rate per input unit

= 0.40 hours per jacket * $30 per hour = $12 per jacket

Developing Budgeted Fixed Overhead Rates

The process of developing the budgeted fixed overhead rate is the same as that detailed earlier for calculating the budgeted variable overhead rate.

Step 1: Choose the Period to Use for the Budget. A fixed overhead cost is typically 12 months to help smooth out seasonal effects.

Step 2: Select the Cost-Allocation Bases to Use in Allocating Fixed Overhead Costs to Output Produced. For simplicity, we assume Webb expects to operate at capacity in fiscal year 2011—with a budgeted usage of 57,600 machine-hours for a budgeted output of 144,000 jackets.

Step 3: Identify the Fixed Overhead Costs Associated with Each Cost-Allocation Base. Webb's fixed overhead budget for 2011 is $3,312,000.

Step 4: Compute the Rate per Unit of Each Cost-Allocation Base Used to Allocate Fixed Overhead Costs to Output Produced.

$$\text{Budgeted fixed overhead cost per unit of cost-allocation base} = \frac{\text{Budgeted total costs in fixed overhead cost pool}}{\text{Budgeted total quantity of cost allocation base}}$$

$$= \frac{\$3{,}312{,}000}{57{,}600} = \$57.50 \text{ per machine-hour}$$

Webb can now calculate the budgeted fixed overhead cost per output unit as follows:

Budgeted fixed overhead cost per Output unit = Budgeted quantity of cost-allocation base allowed per output unit * Budgeted fixed overhead cost per unit of cost-allocation base

= 0.40 of a machine-hour per jacket * $57.50 per machine-hour

= $23.00 per jacket

When preparing monthly budgets for 2011, Webb divides the $3,312,000 annual total fixed costs into 12 equal monthly amounts of $276,000.

Variable Overhead Cost Variances

The following data are for April 2011, when Webb produced and sold 10,000 jackets:

		Actual Result	Flexible-Budget Amount
1.	Output units (jackets)	10,000	10,000
2.	Machine-hours per output unit	0.45	0.40
3.	Machine-hours (1 * 2)	4,500	4,000
4.	Variable overhead costs	$130,500	$120,000
5.	Variable overhead costs per machine-hour (4 ÷ 3)	$ 29.00	$ 30.00
6.	Variable overhead costs per output unit (4 ÷ 1)	$ 13.05	$ 12.00

Flexible-Budget Analysis

Variable overhead flexible-budget variance= Actual costs incurred - Flexible-budget amount

= $130,500 - $120,000 = $10,500 U

Webb's managers can get further insight into the reason for the $10,500 unfavorable variance by subdividing it into the efficiency variance and spending variance.

Variable Overhead Efficiency Variance

The variable overhead efficiency variance is the difference between the actual quantity of the cost-allocation base used and budgeted quantity of the cost-allocation base that should have been used to produce actual output, multiplied by the budgeted variable overhead cost per unit of the cost-allocation base.

Variable overhead Efficiency variance = (Actual quantity of variable overhead cost-allocation base used for actual output - Budgeted quantity of variable overhead cost-allocation base allowed for actual output) * Budgeted variable overhead cost per unit of cost-allocation base

= (4,500 hours - 0.40 hr./unit * 10,000 units) * $30 per hour

= (4,500 hours - 4,000 hours) * $30 per hour = $15,000 U

The efficiency variance for variable overhead cost is based on the efficiency with which *the cost-allocation base* is used.

Variable Overhead Spending Variance

The variable overhead spending variance is the difference between actual variable overhead cost per unit of the cost-allocation base and budgeted variable overhead cost per unit of the cost-allocation base, multiplied by the actual quantity of variable overhead cost-allocation base used for actual output.

Variable overhead Spending variance = (Actual variable overhead cost per unit Of cost-allocation base - Budgeted variable overhead cost per unit of cost-allocation base) Actual quantity of variable overhead cost-allocation base used for actual output

= ($29 per machine-hour - $30 per machine-hour) * 4,500 machine-hours

= (- $1 per machine-hour) * 4,500 machine-hours

= $4,500 F

Fixed Overhead Cost Variances

The fixed overhead flexible-budget variance is the difference between actual fixed overhead costs and fixed overhead costs in the flexible budget:

Fixed overhead flexible-budget variance = Actual costs incurred - Flexible-budget amount

= $285,000 - $276,000 = $9,000 U

There is not an efficiency variance for fixed overhead costs. That's because a given lump sum of fixed overhead costs will be unaffected by how efficiently machine-hours are used to produce output in a given budget period. Because there is no efficiency variance, the fixed overhead spending variance is the same amount as the fixed overhead flexible-budget variance:

Fixed overhead spending variance = Actual costs incurred - Flexible-budget amount

= $285,000 - $276,000 = $9,000 U

Production-Volume Variance

The production-volume variance, also referred to as the denominator-level variance, is the difference between budgeted fixed overhead and fixed overhead allocated on the basis of actual output produced. The allocated fixed overhead can be expressed in terms of allocation base units (machine-hours for Webb) or in terms of the budgeted fixed cost per unit:

Production volume variance = Budgeted fixed overhead - Fixed overhead allocated for actual Output units produced

= $276,000 - (0.40 hour per jacket * $57.50 per hour * 10,000 jackets)

= $276,000 - ($23 per jacket * 10,000 jackets)

= $276,000 - $230,000 = $46,000 U

The $46,000 U production-volume variance can also be thought of as $23 per jacket 2,000 jackets that were *not* produced (12,000 jackets planned – 10,000 jackets produced).

Exercises:

Solve the following questions:

1. Marron, Inc., produces the basic fillings used in many popular frozen desserts and treats—vanilla and chocolate ice creams, puddings, meringues, and fudge. Marron uses standard costing and carries over no inventory from one month to the next. The ice-cream product group's results for June 2012 were as follows:

	A	B	C
1	**Performance Report, June 2012**		
2		**Actual Results**	**Static Budget**
3	**Units (pounds)**	**355,000**	**345,000**
4	**Revenues**	**$1,917,000**	**$1,880,250**
5	**Variable manufacturing cost**	**1,260,250**	**1,207,500**
6	**Contribution margin**	**$ 656,750**	**$ 672,750**

Ted Levine, the business manager for ice-cream products, is pleased that more pounds of ice cream were sold than budgeted and that revenues were up. Unfortunately, variable manufacturing costs went up too. The bottom line is that contribution margin declined by $16,000, which is less than 1% of the budgeted revenues of $1,880,250. Overall, Levine feels that the business is running fine. Levine would also like to analyze how the company is performing compared to the overall market for ice-cream products. He knows that the expected total market for ice-cream products was 1,150,000 pounds and that the actual total market was 1,109,375 pounds

Required 1.

1. Calculate the static-budget variance in units, revenues, variable manufacturing costs, and contribution margin. What percentage is each static-budget variance relative to its static-budget amount?
2. Break down each static-budget variance into a flexible-budget variance and a sales-volume variance.
3. Calculate the selling-price variance.
4. Calculate the market-share and market-size variances.
5. Assume the role of management accountant at Marron. How would you present the results to Ted Levine? Should he be more concerned? If so, why?

2. The Monroe Corporation manufactures lamps. It has set up the following standards per finished unit for direct materials and direct manufacturing labor:

Direct materials: 10 lb. at $4.50 per lb.	$45.00
Direct manufacturing labor: 0.5 hour at $30 per hour	15.00

The number of finished units budgeted for January 2012 was 10,000; 9,850 units were actually produced.

Actual results in January 2012 were as follows:

Direct materials: 98,055 lb. used	
Direct manufacturing labor: 4,900 hours	$154,350

Assume that there was no beginning inventory of either direct materials or finished units.

During the month, materials purchased amounted to 100,000 lb., at a total cost of $465,000. Input price variances are isolated upon purchase. Input-efficiency variances are isolated at the time of usage.

Required:

1. Compute the January 2012 price and efficiency variances of direct materials and direct manufacturing labor.

2. . Comment on the January 2012 price and efficiency variances of Monroe Corporation.

3. Why might Monroe calculate direct materials price variances and direct materials efficiency variances with reference to different points in time?

3. Rhaden Company produces sweat-resistant headbands for joggers. Information pertaining to Rhaden's operations for May 2011 follows:

	Actual	Budget
Units sold	230, 550	220,000
Sales revenue	$3,412,140	$3,300,000
Variable cost ratio	68%	64%
Market size in units	4,350,000	4,400,000

Required:

1. Compute the sales volume variance for May 2011.
2. Compute the market-share and market-size variances for May 2011.
3. Comment on possible reasons for the variances you computed in requirement 2

CHAPTER FOUR

Measuring Mix and Yield Variances

Sales mix and quantity variances

When calculating sales variances as part of variance analysis, one issue that arises is when a company sells more than one product. Two possible scenarios can occur:

If customers are unlikely to buy one product instead of another from the same company, then separate sales volume variances can be calculated

If, on the other hand, customers might substitute one product for another, then the concept of sales mix is important and separate sales volume variances can be replaced by a combined sales mix variance

Sales Quantity Variance

Sales Quantity Variance measures the change in standard profit or contribution margin arising from the difference between the actual and anticipated number of units sold during a period.

Sales quantity variance is an extension of the sales volume variance which demonstrates the impact of a higher or lower sales quantity as compared to budget. The difference between the sales volume variance and sales quantity variance is that the former is calculated using the actual sales volume, whereas the latter is calculated using the sales volume of products in the proportion of standard mix.

Sales Quantity Variance may be calculated as follows:

Sales Quantity Variance =

$$\left(\begin{array}{l}\text{Actual units of all} \\ \text{Products sold}\end{array} - \begin{array}{l}\text{budgeted units of} \\ \text{all product sold)}\end{array}\right) * \begin{array}{l}\text{Budgeted sales} \\ \text{mix percentage}\end{array} * \begin{array}{l}\text{budgeted contribution} \\ \text{margin per unit}\end{array}$$

Sales Mix Variance

Sales Mix Variance measures the change in profit or contribution attributable to the variation in the proportion of the different products from the standard mix.

Sales Mix Variance is one of the two sub-variances of sales volume variance *(the other being sales quantity variance)*. Sales mix variance quantifies the effect of the variation in the proportion of different products sold during a period from the **standard mix** determined in the budget-setting process.

Sales Mix Variance= actual units of * $\left(\begin{array}{l}\text{actual sales} \\ \end{array} - \begin{array}{l}\text{budgeted sales} \\ \end{array}\right)$ * budgeted

All products sold mix percentage mix percentage contribution margin

Example

Etho. Inc. is a small company that specializes in the manufacture and sale of gaming computers. Currently, the company offers two models of gaming PCs:

- Turbox - A professional gaming PC with a water-cooling system priced at $2,500
- Speedo - An entry level gaming PC with standard fan cooling priced at $1,000

Etho budgeted sales of 1,600 units of Turbox and 2,400 units of Speedo in the last year. The standard variable costs of a single unit of Turbox and Speedo were set at $1,500 and $750 respectively. The sales team at Etho managed to sell 1,300 units of Turbox and 3,700 units of Speedo during the last year.

Required:

A. Based on the above information compute Sales Quantity Variance?

B. compute sales mix variance?

Solution;

A. For sales quantity variance

1st compute the budgeted mix ratio

Standard (budgeted) mix ratio: 40% Turbox* and 60% Speedo; i.e 1,600 / (1,600 + 2,400) % = 40% Turbox

2nd compute the budgeted contribution margin

Turbox= $2,500 - $1,500 = 1000 and Speedo= $1,000 – 750 = 250

3rd compute the variance

Sales quantity variance; for turbox = (5000-4000) * 0.4 * 1000 = $400,000

For Speedo = (5000-4000) * 0.6* 250 = $ 150,000

Total sales quantity variance = 400,000 + 150,000 = 550,000 Favorable

B. For sales mix variance

1st we have to compute actual and budgeted sales mix ratio

Standard (budgeted) mix ratio: 40% Turbox and 60% Speedo; i.e 1,600 / (1,600 + 2,400) % = 40% Turbox

Actual mix ratio: 26% turbox and 74% Speedo; i.e 1,300/(1,300+2700)%= 26% turbox

2nd we have to determine the budgeted contribution margin

Turbox= $2,500 - $1,500 = 1000 and Speedo= $1,000 – 750 = 250

3rd compute the variance

Sales mix variance for turbox=5, 000 (0.26- 0.4) * 1000= 700,000 unfavorable

For Speedo= 5,000(0.74-0.6)*250= 175,000 favorable

Total sales mix variance…….525, 000 unfavorable

Market-Share and Market-Size Variances

The **market-share variance** is the difference in budgeted contribution margin for actual market size in units caused solely by *actual market share* being different from *budgeted market share*. The formula for computing the market share variance is as follows:

Market-share Variance = Actual market size in units * [Actual market share – Budgeted market share] * budgeted contribution margin Per unit

= 62,500 units * (0.16 - 0.20) * $32 per unit

= **$80,000 U**

Webb lost 4.0 market-share percentage points—from the 20% budgeted share to the actual share of 16%. The $80,000 U market-share variance is the decline in contribution margin as a result of those lost sales.

The **market-size variance** is the difference in budgeted contribution margin at budgeted market share caused solely by *actual market size in units* being different from *budgeted market size in units*. The formula for computing the market size variance is as follows:

Market-size Variance = [Actual market size – Budgeted market size] * budgeted market share * budgeted contribution margin Per unit

= (62,500 units - 60,000 units) * 0.20 * $32 per unit = **$16,000 F**

The market-size variance is favorable because actual market size increased 4.17% [(62,500 – 60,000) ÷ 60,000 = 0.417, or 4.17%] compared to budgeted market size.

Input Variance

Direct material Mix and yield variances

When calculating material variances using variance analysis, one issue that can arise is that a product involves the use of more than one type of material.

If different materials are not interchangeable, then separate price and usage variances can be calculated. However, if substitution of one material for another can occur, then it is more useful to calculate mix and yield variances.

Direct material Mix variances

Direct Material Mix Variance is the measure of difference between the cost of standard proportion of materials and the actual proportion of materials consumed in the production process during a period.

A **mix** variance is used to monitor the cost of material. For instance; if more of an expensive material and less of a cheap material has been used by the company, then the overall cost will be higher and the variance adverse.

Direct Material Mix Variance: = (Actual Mix Quantity - Standard Mix Quantity) x Standard Price

Yield variances

A **yield** variance measures the efficiency of turning the inputs into outputs. If the yield variance is adverse, it suggests that actual output is lower than the expected output. This could be due to labor inefficiencies, higher waste, inferior materials, or using a cheaper mix with a lower yield.

Direct Material Yield Variance= (Actual Yield - Standard Yield) x Standard Material Cost Per Unit

Example:
Mesebo Cement Factory manufactured 10,000 bags of cement during the month of January. Consumption of raw materials during the period was as follows:

Material	Quantity Used	Standard Mix Per Bag	Actual Price	Standard Price
Limestone	100 tons	11 KG	$75/ton	$70/ton
Clay	150 tons	14 KG	$21/ton	$20/ton
Sand	250 tons	26 KG	$11/ton	$10/ton

Required: - A. computes Material Mix Variance?
C. Material yield variance?

A. solution

Step 1: Calculate the total consumption of raw materials

Total Raw Materials Consumption (100 + 150 + 250) = 500 tons

Step 2: Calculate the Standard Mix

Limestone:	500 tons units	x	11 / 51	=	108 tons
Clay:	500 tons units	x	14 / 51	=	137 tons
Sand:	500 tons units	x	26 / 51	=	255 tons

Total Quantity under Standard Usage (11 + 14 + 26) = 51 KG per bag

Step 3: Calculate the Variance

Material Usage Variance = [Actual Mix - Standard Mix (Step 2)] x Standard Price

Limestone:	(100 - 108)	x	$70	=	**($560)**	**Favorable**
Clay:	(150 - 137)	x	$20	=	**$260**	**Adverse**
Sand:	(250 - 255)	x	$10	=	**($50)**	**Favorable**
Total Usage Variance					**($350)**	**Favorable**

B. solution

Step 1: Calculate the Standard(budgeted) Yield for the total materials input

500 tons of materials should have yielded **9,804 bags**

Standard Yield = 500 tons x 1000 / 51 KG = 9,804 bags; i.e. 1 tone = 1000 kg

Step 2: Calculate the Standard Cost of materials per bag

Total material cost of 1 bag of cement:

Limestone:	11 KG	x	$70	=	$770
Clay:	14 KG	x	$20	=	$280
Sand:	26 KG	x	$10	=	$260
Total					**$1,310 per bag/ 1000**

Step 3: Calculate the Total Yield Variance

Material Usage Variance = [Actual Yield - Standard Yield (Step 1)] x Standard Cost / Unit (Step 2)

Actual Yield - Standard Yield = 10,000 - 9,804 (Step 1) = 196 bags

Total Material Yield Variance = 196 bags x $1.31 (Step 2)

= **$256.76 Favorable**

Step 4: Calculate the Material Wise Yield Variances

Individual material yield variance can be calculated in a similar way to the total yield variance.

Materials:	Actual Yield - Standard Yield (Step 3)	x	Standard Cost per bag (Step 2)	=	Yield Variance
Limestone:	196 bags	x	$770/1000	=	**$150,920**
Clay:	196 bags	x	$280/1000	=	**$54,880**
Sand:	196 bags	x	$260/1000	=	**$50,960**
					$256.76

Productivity Measurement

Productivity measures the relationship between actual inputs used (both quantities and costs) and actual outputs produced. The lower the inputs for a given quantity of outputs or the higher the outputs for a given quantity of inputs, the higher the productivity. Measuring productivity improvements over time highlights the specific input-output relationships that contribute to cost leadership

Partial Productivity Measures

Partial productivity, the most frequently used productivity measure, compares the quantity of output produced with the quantity of an individual input used. In its most common form, partial productivity is expressed as a ratio:

$$\text{Partial productivity} = \frac{\text{Quantity of output produced}}{\text{Quantity of input used}}$$

The higher the ratio, the greater the productivity.

Consider direct materials productivity at Chipset in 2011.

Direct materials

$$\text{partial productivity} = \frac{\text{Quantity of CX1 units produced during 2011}}{\text{Quantity of direct materials used to produce CX1 in 2011}}$$

$$= \frac{\text{1,150,000 units of CX1}}{\text{2,900,000 sq. cm. of direct materials}}$$

$$= 0.397 \text{ units of CX1 per sq. cm. of direct materials}$$

Answer/solve the following Questions

1. Explain why a favorable sales-quantity variance occurs.
2. How can the sales-quantity variance be decomposed further?
3. Explain how the direct materials mix and yield variances provide additional information about the direct materials efficiency variance
4. Soda-King prepared the budget for 2011 assuming a 12% market share based on total sales in the western region of the United States. The total soft drinks market was estimated to reach sales of 20 million cartons in the region. However, actual total sales volume in the western region was 27.5 million cartons.

Required:

1. Calculate the market-share and market-size variances for Soda-King in 2011. (Calculate all variances in terms of contribution margin.) Comment on the results.
2. The Detroit Penguins play in the American Ice Hockey League. The Penguins play in the Downtown Arena (owned and managed by the City of Detroit), which has a capacity of 15,000 seats (5,000 lower-tier seats and 10,000 upper-tier seats). The Downtown Arena charges the Penguins a per-ticket charge for use of its facility. All tickets are sold by the Reservation Network, which charges the Penguins a reservation fee per ticket. The Penguins' budgeted contribution margin for each type of ticket in 2012 is computed as follows:

	Lower-Tier Tickets	Upper-Tier Tickets
Selling price	$35	$14
Downtown Arena fee	10	6
Reservation Network fee	5	3
Contribution margin per ticket	$20	$5

The budgeted and actual average attendance figures per game in the 2012 season are as follows:

	Budgeted Seats Sold	Actual Seats Sold
Lower tier	4,000	3,300
Upper tier	6,000	7,700
Total	10,000	11,000

There was no difference between the budgeted and actual contribution margin for lower-tier or upper-tier seats.

The manager of the Penguins was delighted that actual attendance was 10% above budgeted attendance per game, especially given the depressed state of the local economy in the past six months.

Required:

1. Compute the sales-volume variance for each type of ticket and in total for the Detroit Penguins in 2012. (Calculate all variances in terms of contribution margins.)

2. Compute the sales-quantity and sales-mix variances for each type of ticket and in total in 2012

CHAPTER FIVE

Decision Making and Relevant Information

Information and the Decision Process

Managers usually follow a *decision model* for choosing among different courses of action. A **decision model** is a formal method of making a choice that often involves both quantitative and qualitative analyses. Management accountants analyze and present relevant data to guide managers' decisions.

Consider a strategic decision facing management at Precision Sporting Goods, a manufacturer of golf clubs: Should it reorganize its manufacturing operations to reduce manufacturing labor costs? Precision Sporting Goods has only two alternatives: Do not reorganize or reorganize. Reorganization will eliminate all manual handling of materials. Current manufacturinglabor consists of 20 workers—15 workers operate machines, and 5 workers handlematerials. Each worker works 2,000 hours annually.Reorganization is predicted to cost $90,000 each year (mostly for new equipmentleases). Production output of 25,000 units as well as the selling price of $250, the directmaterial cost per unit of $50, manufacturing overhead of $750,000, and marketingcosts of $2,000,000 will be unaffected by the reorganization.

The managers of Precision Sporting Goods are applied Five-Step Decision- Making Process to make the decision

Step 1: Identify the Problem and Uncertainties- Should Precision Sporting Goods reorganize its manufacturing operations to reduce manufacturing labor costs? An important uncertainty is how the reorganization will affect employee morale.

Step 2: Obtain Information -the management should have to obtain Historical Costs and Other Information Historical hourly wage rates are $14 per hour. However, a recently negotiated increase in employee benefits of $2 per hour will increase wages to $16 per hour. The reorganization of manufacturing operations is expected to reduce the number of workers from 20 to 15 by eliminating all 5 workers who handle materials. The reorganization is likely to have negative effects on employee morale.

Step 3: Make Predictions about the Future -under the existing do-not reorganize alternative, costs are predicted to be $640,000(20 workers * 2,000 hours per worker per year * $16 per hour), and under the reorganize alternative, costs are predicted to be $480,000 (15 workers * 2,000

hours per worker per year * $16 per hour). Recall, the reorganization is predicted to cost $90,000 per year.

Step 4: Make Decisionsby Choosing among Alternatives- Managers compare the predicted benefits calculated in Step 3

($640,000 - $480,000 = $160,000 against the cost of the reorganization ($90,000) along with other considerations (such as likely negative effects on employee morale). Management chooses the reorganize alternative because the financial benefits are significant and the effects on employee morale are expected to be temporary and relatively small.

Step 5: Implement the Decision, EvaluatePerformance,and Learn

The Concept of Relevance

Relevant Costs and Relevant Revenues

Relevant costs are *expected future costs,* and **relevant revenues** are *expected futurerevenues* that differ among the alternative courses of action being considered.Revenues and costs that are *not relevant* are said to be *irrelevant*. It is important to recognize that to be relevant, costs and revenues *must*:

Occur in the future—every decision deals with selecting a course of action based on its expected future results.

Differ among the alternative courses of action—costs and revenues that do not differ will not matter and, hence, will have no bearing on the decision being made.

Key Features of Relevant Information

- Past (historical) costs may be helpful as a basis for making *predictions*. However, past costs themselves are always irrelevant when making *decisions*.
- Different alternatives can be compared by examining differences in expected total future revenues and expected total future costs.
- Not all expected future revenues and expected future costs are relevant. Expected future revenues and expected future costs that do not differ among alternatives are irrelevant and, hence,can be eliminated from the analysis. The key question is always, “What difference will an action make?”
- Appropriate weight must be given to qualitative factors and quantitative nonfinancial factors.

Qualitative and Quantitative Relevant Information

Managers divide the outcomes of decisions into two broad factors: *quantitative* and *qualitative*.

Quantitative factors are outcomes that are measured in numerical terms.Some quantitative factors are financial; they can be expressed in monetary terms.Examples include the cost of direct materials, direct manufacturing labor, and marketing. Other quantitative factors are nonfinancial; they can be measured numerically, butthey are not expressed in monetary terms. Reduction in new product-development time and the percentage of on-time flight arrivals are examples of quantitative nonfinancialfactors.

Qualitative factors are outcomes that are difficult to measure accurately in numerical terms. Employee morale is an example.

An Illustration of Relevance

One-Time-Only Special Orders

One type of decision that affects output levels is accepting or rejecting special orders when there is idle production capacity and the special orders have no long-run implications. We use the term **one-time-only special order** to describe these conditions.

Example 1: Surf Gear manufactures quality beach towels at its highly automated Burlington, North Carolina, plant. The plant has a production capacity of 48,000 towels each month. Current monthly production is 30,000 towels. The company assumes all costs can be classified as either fixed or variable with respect to a single cost driver (units of output). As a result of a strike at its existing towel supplier, Azelia, a luxury hotel chain, has offered to buy 5,000 towels from Surf Gear in August at $11 per towel. No subsequent sales to Azelia are anticipated. Fixed manufacturing costs are based on the 48,000-towel production capacity. That is, fixed manufacturing costs relate to the production capacity available and not the actual capacity used. If Surf Gear accepts the special order, it will use existing idle capacity to produce the 5,000 towels, and fixed manufacturing costs will not change. No marketing costs will be necessary for the 5,000-unit one-time-only special order. Accepting this special order is not expected to affect the selling price or the quantity of towels sold to regular customers. Should Surf Gear accept

Azelia's

	Total	Per Unit
Units sold	30,000	
Revenues	$600,000	$20.00
Cost of goods sold (manufacturing costs)		
Variable manufacturing costs	225,000	7.50[b]
Fixed manufacturing costs	135,000	4.50[c]
Total cost of goods sold	360,000	12.00
Marketing costs		
Variable marketing costs	150,000	5.00
Fixed marketing costs	60,000	2.00
Total marketing costs	210,000	7.00
Full costs of the product	570,000	19.00
Operating income	$ 30,000	$ 1.00

offer?

The relevant revenues and costs are the expected future revenues and costs that differ as a result of accepting the special offer evenues of $55,000 **($11 per unit * 5,000 units)** and variable manufacturing costs of $37,500 ($7.50 per unit* 5,000 units). The fixed manufacturing costs and all marketing costs (*including variable marketing costs*) are irrelevant in this case because these costs will not change in total whether the special order is accepted or rejected. Surf Gear would gain an additional $17,500 (relevant revenues, $55,000 –$37,500 relevant costs) in operating income by accepting the special order.

Potential Problems in Relevant-Cost Analysis

Managers should avoid two potential problems in relevant-cost analysis.

First, they must watch for incorrect general assumptions, such as *all variable costs are relevant and all fixed costs are irrelevant.*

Second, unit-cost data can potentially mislead decision makers in two ways:When irrelevant costs are included and when the same unit costs are used at different output levels.

The best way for managers to avoid these two potential problems is to keep focusing on:

(1) total revenues and total costs (rather than unit revenue and unit cost) and

(2) the relevance concept. Managers should always require all items included in ananalysis to be expected total future revenues and expected total future costs that differ among the alternatives.

In sourcing-versus-Outsourcing and Make-versus-Buy Decisions

Outsourcing is purchasing goods and services from outside vendors rather than producingthe same goods or providing the same services within the organization, which is **insourcing**.

For example, Kodak prefers to manufacture its own film (insourcing) but has IBM do its data processing (outsourcing). Honda relies on outside vendors to supply some component parts but chooses to manufacture other parts internally.

Decisions about whether a producer of goods or services will insource or outsource are also called **make-or-buy decisions**. Surveys of companies indicate that managers consider quality, dependability of suppliers, and costs as the most important factors in the make-or-buy decision. Sometimes, however, qualitative factors dominate management's make-or-buy decision.

Example 2: The Soho Company manufactures a two-in-one video system consisting of a DVD player and a digital media receiver (that downloads movies and video from internet sites such as NetFlix). Columns 1 and 2 of the following table show the expected total and per-unit costs for manufacturing the DVD-player of the video system. Soho plans to manufacture the 250,000 units in 2,000 batches of 125 units each. Variable batch-level costs of $625 per batch vary with the number of batches, not the total number of units produced.

	Expected Total Costs of Producing 250,000 Units in 2,000 Batches Next Year (1)	Expected Cost per Unit (2) = (1) ÷ 250,000
Direct materials ($36 per unit * 250,000 units)	$ 9,000,000	$36.00
DL ($10 per unit *250,000 units)	2,500,000	10.00
VMOH cost of powerand utilities ($6 per unit * 250,000 units)	1,500,000	6.00
Mixed batch-level MOH cost of materials Handling and setup [$750,000 + ($625 per batch * 2,000 batches)]	2,000,000	8.00
Fixed MOH costs of plantlease, insurance, And administration	3,000,000	12.00
Total manufacturing cost	$18,000,000	$72.00

Broadfield, Inc., a manufacturer of DVD players, offers to sell Soho 250,000 DVD players next year for $64 per unit on Soho's preferred delivery schedule.Assume that financial factors will be the basis of this make-or-buy decision.Should Soho make or buy the DVD player?

Solution:

Based on the given information the company should buy DVD players because the expected $72-per-unit cost of making the DVD player is more than the $64 per unit to buy it. But For the moment, suppose:

(a) the capacity now used to make the DVD players will become idle next year if the DVD players are purchased and

(b) the $3,000,000 of fixed manufacturing over head will continue to be incurred next year regardless of the decision made. Assume the $750,000 in fixed salaries to support materials handling and setup will not be incurred if the manufacture of DVD players is completely shut down.

	Total Relevant Cost		**Relevant Costs Per Unit**
Relevant Items	**Make**	**Buy**	**Make**
Buy			
Outside purchase of parts		$16,000,000	
$64			
Direct materials	$ 9,000,000		$36
Direct manufacturing labor	2,500,000		10
Variable manufacturing overhead	1,500,000		6
Mixed (variable and fixed) materialshandling and setup overhead	2,000,000		8
Total relevant costs	$15,000,000	$16,000,000	$60
$64			
Difference in favor of making DVD players	**$1,000,000**		**$4**

A common term in decision making is *incremental cost*. An **incremental cost** is the additional total cost incurred for an activity.

The incremental cost of making DVD players is the additional total cost of $15,000,000 that Soho will incur if it decides to make DVD players. Similarly, the incremental cost of buying DVD players from Broadfield is the additional total cost of $16,000,000 that Soho will incur if it decides to buy DVD players. A **differential cost** is the difference in total cost between two alternatives.

Opportunity Costs and Outsourcing

In the simple make-or-buy decision, we assumed that the capacity currently used to make DVD players will remain idle if Soho purchases the parts from Broadfield. Often, however, the released capacity can be used for other, profitable purposes. In this case, the choice Soho's managers are faced with is not whether to make or buy; the choice now centers on how best to use available production capacity.

Example 3: Suppose that if Soho decides to buy DVD players for its video systems from Broadfield, then Soho's best use of the capacity that becomes available is to produce 100,000 Digiteks, a portable, stand-alone DVD player. From a manufacturing standpoint, Digiteks are similar to DVD players made for the video system. With help from operating managers, Soho's management accountant estimates the following future revenues and costs if Soho decides to manufacture and sell Digiteks:

Incremental future revenues……. $8,000,000

Incremental future costs

Direct materials……. $3,400,000

Direct manufacturing labor……. 1,000,000

Variable overhead (such as power, utilities)…….. 600,000

Materials-handling and setup overheads ……500,000

Total incremental future costs ……..$5,500,000

Incremental future operating income…….**$2,500,000**

Because of capacity constraints, Soho can make either DVD players for itsvideo-system unit or Digiteks, but not both.

Which of the following two alternatives should Soho choose?

1. Make video-system DVD players and do not make Digiteks
2. Buy video-system DVD players and make Digiteks

Solution:

The future incremental costs of buying video-system DVD players from an outside supplier ($16,000,000) exceed the future incremental costs of making video-system DVD players in-

house ($15,000,000). Soho can use the capacity freed up by buying video-system DVD players to gain $2,500,000 in operating income (incremental future revenues of $8,000,000 minus total incremental future costs of $5,500,000) by making and selling Digiteks. The *net relevant* costs of buying video-system DVD players and making and selling Digiteks are $16,000,000 – $2,500,000 = $13,500,000.

Product-Mix Decisions with Capacity Constraints

We now examine how the concept of relevance applies to **product-mix decisions**—the decisions made by a company about which products to sell and in what quantities.

These decisions usually have only a short-run focus, because they typically arise in the context of **capacity constraints** that can be relaxed in the long run. In the short run, for example, BMW, the German car manufacturer, continually adapts **the mix of its different models of cars** (for example, 325i, 525i, and 740i) to fluctuations in selling prices and demand.

To determine product mix, a company maximizes operating income, **subject to constraints such as capacity and demand**. Throughout this section, we assume that as short run changes in product mix occur, the *only costs that change are costs that are variable* with respect to the number of units produced (and sold). Under this assumption, the analysis of individual product contribution margins provides insight into *the product mix that maximizes operating income.*

Example 4: Power Recreation assembles two engines, a snowmobile engine and a boat engine, at its Lexington, Kentucky, plant.

	Snowmobile Engine	**Boat Engine**
Selling price	$800	$1,000
Variable cost per unit	560	625
Contribution margin per unit	$240	$375
Contribution margin percentage ($240 ÷ $800; $375 ÷ $1,000)	30%	37.5%

Assume that only 600 machine-hours are available daily for assembling engines. Additional capacity cannot be obtained in the short run. Power Recreation can sell as many engines as it produces. The constraining resource, then, is machine-hours. It takes two machine-hours to produce one snow mobile engine and five machine-hours to produce one boat engine. What product mix should Power Recreation's managers choose to maximize its operating income?

Solution:

In terms of contribution margin per unit and contribution margin percentage, boat engines are more profitable than snowmobile engines. The product that Power Recreation should produce and sell, however, is not necessarily the product with the higher individual contribution margin per unit or contribution margin percentage. Managers should choose the product with *the highest contribution margin per unit of the constraining resource (factor).* That's the resource that restricts or limits the production or sale of products.

	Snowmobile Engine	**Boat Engine**
Contribution margin per unit	$240	$375
Machine-hours required producing one unit	2 machine-hours	5 machine-hours
Contribution margin per machine-hour		
$240 per unit ÷ 2 machine-hours/unit	$120/machine-hour	
$375 per unit ÷ 5 machine-hours/unit		$75/machine-hour
Total contribution margin for 600 machine-hours		
$120/machine-hour * 600 machine-hours	**$72,000**	
$75/machine-hour * 600 machine-hours		$45,000

Therefore, choosing to produce and sell snow mobile engines maximizes *total* contribution margin ($72,000 versus $45,000 from producing and selling boat engines) and operating income.

Customer Profitability (Dropping a Customer, Adding a Customer, Closing or Adding Branch Offices or Segments)

Not only must companies make choices regarding which products and how much of each product to produce, they must often make decisions about *adding or dropping a product line or a business segment.* Similarly, if the cost object is a customer, companies must make decisions about adding or dropping customers (analogous to a product line) or a branch office (analogous to a business segment). We illustrate relevant-revenue andrelevant-cost analysis for these kinds of decisions using customers rather than products as the cost object.

Example 5: Allied West, the West Coast sales office of Allied Furniture, a wholesaler of specialized furniture, supplies furniture to three local retailers: Vogel, Brenner, and Wisk. The Expected revenues and costs of Allied West by customer for the upcoming year using its activity-based costing system are given below. Allied West assigns costs to customers based on the activities needed to support each customer. Information on Allied West's costs for different activities at various levels of the cost hierarchy follows:

- Furniture-handling labor costs vary with the number of units of furniture shipped to customers.
- Allied West reserves different areas of the warehouse to stock furniture for different customers. For simplicity, assume that furniture-handling equipment in an area and depreciation costs on the equipment that Allied Westhas already acquired are identified with individual customers (customerlevelcosts). Any unused equipment remains idle. The equipment has a oneyearuseful life and zero disposal value.
- Allied West allocates rent to each customer on the basis of the amount ofwarehouse space reserved for that customer.
- Marketing costs vary with the number of sales visits made to customers.
- Sales-order costs are batch-level costs that vary with the number of salesorders received from customers; delivery-processing costs are batch-levelcosts that vary with the number of shipments made.
- Allied West allocates fixed general-administration costs (facility-level costs)to customers on the basis of customer revenues.

- Allied Furniture allocates its fixed corporate-office costs to sales offices onthe basis of the square feet area of each sales office. Allied West then allocatesthese costs to customers on the basis of customer revenues.

	Customer			
	Vogel	Brenner	Wisk	Total
Revenues ……	$500,000	$300,000	$400,000	$1,200,000
Cost of goods sold ……	370,000	220,000	330,000	920,000
Furniture-handling labor ……	41,000	18,000	33,000	92,000
Furniture-handling equipment Cost written off as depreciation ……	12,000	4,000	9,000	25,000
Rent ……	14,000	8,000	14,000	36,000
Marketing support……	11,000	9,000	10,000	30,000
Sales-order and delivery processing……..	13,000	7,000	12,000	32,000
General administration……...	20,000	12,000	16,000	48,000
Allocated corporate-office costs……	10,000	6,000	8,000	24,000
Total costs……	491,000	284,000	432,000	1,207,000
Operating income ……..	**$ 9,000**	**$16,000**	**$ (32,000)**	**$ (7,000)**

To determine what to do, Allied West's managers must answer the question, what are the relevant revenues and relevant costs? Information about the effect of dropping the Wisk account follows:

- ✓ Dropping the Wisk account will save cost of goods sold, furniture-handling labor,marketing support, sales-order, and delivery-processing costs incurred on the account.

- ✓ Dropping the Wisk account will leave idle the warehouse space and furniture handling equipment currently used to supply products to Wisk.
- ✓ Dropping the Wisk account will have no effect on fixed general-administration costsor corporate-office costs.

Should Allied West drop the Wisk account?

Should it add a fourth customer, Loral?

Should Allied Furniture close down Allied West?

Should it open another sales office, Allied South, whose revenues and costs are identical to those of Allied West?

Additional information

ADD customer

Suppose that in addition to Vogel, Brenner, and Wisk, Allied West's managers are evaluating the profitability of adding a customer, Loral. Loral has a customer profile much like Wisk's. Suppose Allied West's managers predict revenues and costs of doing business with Loral to be the same as the revenues and costs described under the Wisk column.

Allied West would have to acquire furniture-handling equipment for the Loral account costing $9,000, with a one-year useful life and zero disposal value. If Loral is added as a customer, warehouse rent costs ($36,000), general-administration costs ($48,000), and *actual total* corporate-office costs will not change. Should Allied West add Loral as a customer?

Analysis:

(Incremental Incremental reve Loss in Revenues) nues(costs) from and Incremental addining loral Savings in

.	Costs from Dropping Wisk (1)	(2)
Revenues		$(400,000) $400,000
Cost of goods sold		330,000 (330,000)
Furniture-handling labor		33,000 (33,000)
Furniture-handling equipment cost written off as depreciation		0 (9,000)
Rent		0 0
Marketing support		10,000 (10,000)
Sales-order and delivery processing		12,000 (12,000)
General administration		0 0
Corporate-office costs		0 0
Total costs		385,000 (394,000)
Effect on operating income (loss)	**$ (15,000)**	**$ 6,000**

Close Allied west's

Given Allied West's expected loss of $7,000, should it be closed for the year? Assume that closing Allied West will have no effect on total corporate-office costs and that there is no alternative use for the Allied West space.

Open Branch

Now suppose Allied Furniture has the opportunity to open another sales office, Allied South, whose revenues and costs would be identical to Allied West's costs, including a cost of $25,000 to acquire furniture-handling equipment with a one-year useful life and zero disposal value. Opening this office will have no effect on total corporate-office costs.

Irrelevance of Past Costs and Equipment- Replacement Decisions

Past (historical or sunk) costs are irrelevant to decision making. That's because a decision cannot change something that has already happened. We now apply this concept to decisions about replacing equipment. We stress the idea that book value—original cost minus accumulated depreciation—of existing equipment is a past cost that is irrelevant.

Example 6: East Company, a manufacturer of aircraft components, is considering replacing a metal-cutting machine with a newer model. The new machine is more efficient than the old machine, but it has a shorter life. Revenues from aircraft parts ($1.1 million per year) will be unaffected by the replacement decision. Here are the data the management accountant prepares for the existing (old) machine and the replacement (new) machine:

	Old Machine	New Machine
Original cost…….	$1,000,000	$600,000
Useful life……...	5 years	2 years
Current age…….	3 years	0 years
Remaining useful life…….	2 years	2 years
Accumulated depreciation……	$600,000	not acquired yet
Book value…….	$400,000	Not acquired yet
Current disposal value (in cash) ……	$40,000	Not acquired yet
Terminal disposal value (in cash 2 years from now)	$0	$0
Annual operating costs (maintenance, Energy, repairs, and so on) ……	$800,000	$460,000

East Corporation uses straight-line depreciation. To focus on relevance, we ignore the time value of money and income taxes.

Should East replace its old machine?

	Two Years Together		
	Keep	Replace	Difference
	(1)	(2)	(3) = (1) – (2)
Cash operating costs ……	$1,600,000	$ 920,000	$680,000
Current disposal value of old machine……..	—	(40,000)	40,000
New machine, written off periodically As depreciation…….	—	600,000	(600,000)

Total relevant costs …….	$1,600,000	$1,480,000	$120,000

Decision? What do you think is the decision based on the data?

Exercises:

1. Boa Mining Company currently is operating at less than 50% of practical capacity. The management of the company expects sales to drop below the present level of 10,000 tons of ore per month very soon. The sales price per ton is $3 and the variable cost per ton is $2. Fixed costs per month total $10,000.

Management is concerned that a further drop in sales volume will generate a loss and accordingly is considering temporarily suspending operations until demand in the metals markets rebounds and prices once again rise. Management has implemented a cost reduction program over the past year, but at this point suspension of operations appears to be the only viable alternative. Management estimates that suspension of operations would reduce fixed costs from $10,000 to $4,000 per month.

Required:

A. Why does management believe that the fixed costs will persist at $4,000 even though the mine is temporarily closed?

B. At what sales volume per month will the company be indifferent between continuing to operate the mine and closing it?

2. Future Company makes 40,000 units per year of a part it uses in the products it manufactures. The unit product cost of this part is computed as follows:

Direct materials	$23.40
Direct labor	22.30
Variable manufacturing overhead	1.40
Fixed manufacturing overhead	24.60
Unit product cost	$71.70

An outside supplier has offered to sell the company all of these parts it needs for $59.20 a unit. If the company accepts this offer, the facilities now being used to make the part could be used to make more units of a product that is in high demand. The additional contribution margin on this other product would be $352,000 per year. If the part were purchased from the outside supplier, all of the direct labor cost of the part would be avoided. However, $21.90 of the fixed manufacturing overhead cost being applied to the part would continue even if the part were purchased from the outside supplier. This fixed manufacturing overhead cost would be applied to the company's remaining products.

Required:

A. How much of the unit product cost of $71.70 is relevant in the decision of whether to make or buy the part?

B. What is the net total dollar advantage (disadvantage) of purchasing the part rather than making it?

C. What is the maximum amount the company should be willing to pay an outside supplier per unit for the part if the supplier commits to supplying all 40,000 units required each year?

3. Jambo Company produces a single product. The cost of producing and selling a single unit of this product at the company's normal activity level of 40,000 units per month is as follows:

Direct materials..... $38.80
Direct labor $9.70
Variable manufacturing overhead $2.30
Fixed manufacturing overhead $18.10
Variable selling & administrative expense $1.70
Fixed selling & administrative expense $8.80

The normal selling price of the product is $81.10 per unit.

An order has been received from an overseas customer for 3,000 units to be delivered this month at a special discounted price. This order would have no effect on the company's normal sales and would not change the total amount of the company's fixed costs. The variable selling and administrative expense would be $0.20 less per unit on this order than on normal sales. Direct labor is a variable cost in this company.

Required:

A. Suppose the company has ample idle capacity to produce the units required by the overseas customer and the special discounted price on the special order is $75.30 per unit. By how much would this special order increase (decrease) the company's net operating income for the month?

B. Suppose the company is already operating at capacity when the special order is received from the overseas customer. What would be the opportunity cost of each unit delivered to the overseas customer?

C. Suppose the company does not have enough idle capacity to produce all of the units for the overseas customer and accepting the special order would require cutting back on production of 1,000 units for regular customers. What would be the minimum acceptable price per unit for the special order?

4. Western Co. manufactures and sells medals for winners of athletic and other events. Its manufacturing plant has the capacity to produce 15,000 medals each month; current monthly production is 12,750 medals. The company normally charges $120 per medal. Cost data for the current level of production are shown below:

Variable costs:

Direct materials..... $624,750
Direct labor $306,000
Selling and administrative $15,300

Fixed costs:

Manufacturing $506,175
Selling and administrative $123,675

The company has just received a special one-time order for 700 medals at $83 each. For this particular order, no variable selling and administrative costs would be incurred. This order would also have no effect on fixed costs.

Required:

Should the company accept this special order? Why?

5. Gluth Company makes three products in a single facility. These products have the following unit product co

	Products		
	A	*B*	*C*
Direct materials	$22.50	$22.40	$29.20
Direct labor	13.60	11.40	12.50
Variable manufacturing overhead	3.00	3.40	4.50
Fixed manufacturing overhead	19.20	20.10	26.50
Unit product cost	$58.30	$57.30	$72.70

Additional data concerning these products are listed below.

	Products		
	A	*B*	*C*
Mixing minutes per unit	3.30	1.70	1.80
Selling price per unit	$74.70	$76.10	$87.50
Variable selling cost per unit	$1.80	$2.40	$2.90
Monthly demand in units	4,000	2,000	4,000

The mixing machines are potentially the constraint in the production facility. A total of 23,200 minutes are available per month on these machines. Direct labor is a variable cost in this company.

Required:

A. How many minutes of mixing machine time would be required to satisfy demand for all four products?

B. How much of each product should be produced to maximize net operating income? (Round off to the nearest whole unit.)

6. Wright, Inc. produces three products. Data concerning the selling prices and unit costs of the three products appear below:

	Product		
	C	*D*	*E*
Selling price	$90	$30	$60
Variable costs	$35	$10	$20
Fixed costs	$45	$15	$30
Tapping machine time (minutes)	5	4	2

Fixed costs are applied to the products on the basis of direct labor hours. Demand for the three products exceeds the company's productive capacity. The tapping machine is the constraint, with only 2,400 minutes of tapping machine time available this week.

Required:

A. Given the tapping machine constraint, which product should be emphasized? Support your answer with appropriate calculations.

B. Assuming that there is still unfilled demand for the product that the company should emphasize in part (a) above, up to how much should the company be willing to pay for an additional hour of tapping machine time?

CHAPTER SIX

Pricing Decisions and Cost Management

6.1 Major Influences on Pricing Decisions

How companies price a product or a service ultimately depends on the demand and supply for it. Three factors that influence demand and supply are customers, competitors, and costs.

6.1.1 Customers

Customers influence price through their effect on the demand for a product or service, based on factors such as the features of a product and its quality. As the Tata Motors example illustrates, companies must always examine pricing decisions through the eyes of their customers and then manage costs to earn a profit.

6.1.2 Competitors

No business operates in a vacuum. Companies must always be aware of the actions of their competitors. At one extreme, alternative or substitute products of competitors hurt demand and force a company to lower prices. At the other extreme, a company without a competitor is free to set higher prices. When there are competitors, companies try to learn about competitors' technologies, plant capacities, and operating strategies to estimate competitors' costs—valuable information when setting prices.

Because competition spans international borders, fluctuations in exchange rates between different countries' currencies affect costs and pricing decisions. For example, if the yen weakens against the U.S. dollar, Japanese products become cheaper for American consumers and, consequently, more competitive in U.S. markets.

6.1.3 Costs

Costs influence prices because they affect the supply. The lower the cost of producing a product, the greater the quantity of product the company is willing to supply. Generally, as companies increase supply, the cost of producing an additional unit initially declines but eventually increases. Companies supply products as long as the revenue from selling additional units exceeds the cost of producing them. Managers who understand the cost of producing products set prices that make the products attractive to customers while maximizing operating income.

6.2 Costing and Pricing for the Short Run and long run

6.2.1 Costing and Pricing for the Short Run

Short-run pricing decisions typically have a time horizon of less than a year and include decisions such as (a) pricing a one-time-only special order with no long-run implications and (b) adjusting product mix and output volume in a competitive market.

Long-run pricing decisions have a time horizon of a year or longer and include pricing a product in a market where there is some flexibility in setting prices.

Consider a short-run pricing decision facing the management team at Astel Computers. Astel manufactures two brands of personal computers (PCs)—Desk point, Astel's top-of-the-line product, and Provalue, a less-powerful Pentium chip-based machine. Datatech Corporation has asked Astel to bid on supplying 5,000 Provalue computers over the last three months of 2010. After this three-month period, Datatech is unlikely to place any future sales orders with Astel. Datatech will sell Provalue computers under its own brand name in regions and markets where Astel does not sell Provalue. Whether Astel accepts or rejects this order will not affect Astel's revenues,neither theunits sold or the selling price— from existing sales channels.

Relevant Costs for Short-Run Pricing Decisions

Before Astel can bid on Datatech's offer, Astel's managers must estimate how much it will cost to supply the 5,000 computers. The relevant costs Astel's managers must focus on include all direct and indirect costs throughout the value chain that will change in total by accepting the one-time-only special order from Datatech. Astel's managers outline the relevant costs as follows:

Direct materials ($460 per computer * 5,000 computers)…….. $2,300,000

Direct manufacturing labor ($64 per computer * 5,000 computers)…….. 320,000

Fixed costs of additional capacity to manufacture Provalue…….. 250,000

Total costs……$2,870,000

The relevant cost per computer is $574 ($2,870,000 ÷ 5,000). Therefore, any selling price above $574 will improve Astel's profitability in the short run. What price should Astel's managers, bid for the 5,000-computer order?

Strategic and Other Factors in Short-Run Pricing

Based on its market intelligence, Astel believes that competing bids will be between $596 and $610 per computer, so Astel makes a bid of $595 per computer. If it wins this bid, operating income will increase by $105,000 (relevant revenues, $595* 5,000 = $2,975,000 minus relevant costs, $2,870,000). In light of the extra capacity and strong competition, management's strategy is to bid as high above $574 as possible while remaining lower than competitors' bids.

What if Astel were the only supplier and Datatech could undercut Astel's selling prices in Astel's current markets? The relevant cost of the bidding decision would then include the contribution margin lost on sales to existing customers. What if there were many parties eager to bid and win the Datatech contract? In this case, the contribution margin lost on sales to existing

customers would be irrelevant to the decision because the existing business would be undercut by Datatech regardless of whether Astel wins the contract.

In contrast to the Astel case, in some short-run situations, a company may experience strong demand for its products or have limited capacity. In these circumstances, a company will strategically increase prices in the short run to as much as the market will bear.

We observe high short-run prices in the case of new products or new models of older products, such as microprocessors, computer chips, cellular telephones, and software.

Effect of Time Horizon on Short-Run Pricing Decisions

Two key factors affect short-run pricing.

1. Many costs are irrelevant in short-run pricing decisions. In the Astel example, most of Astel's costs of R&D, design, manufacturing, marketing, distribution, and customer service are irrelevant in the short-run pricing decision, because these costs will not change whether Astel wins or does not win the Datatech business. These costs will change in the long run and therefore will be relevant.

2. Short-run pricing is opportunistic. Prices decreased when demand is weak and competition is strong and increased when demand is strong and competition is weak. As we will see, long-run prices need to be set to earn a reasonable return on investment.

6.2.2 Costing and Pricing for the Long Run

Long-run pricing is a strategic decision designed to build long-run relationships with customers based on stable and predictable prices. A stable price reduces the need for continuous monitoring of prices, improves planning, and builds long-run buyer–seller relationships. But to charge a stable price and earn the target long-run return, a company must, over the long run, know and manage its costs of supplying products to customers.

As we will see, relevant costs for long-run pricing decisions include all future fixed and variable costs.

Alternative Long-Run Pricing Approaches

How should managers at Astel use product cost information to price Provalue in 2012?

Two different approaches for pricing decisions are as follows:

1. Market-based
2. Cost-based, which is also called cost-plus

The market-based approach to pricing starts by asking, “Given what our customers want and how our competitors will react to what we do, what price should we charge?” Based on this price, managers control costs to earn a target return on investment. The cost-based approach to pricing starts by asking, “Given what it costs us to make this product, what price should we charge that will recoup our costs and achieve a target return on investment?”

Companies operating in competitive markets (for example, commodities such as steel, oil, and natural gas) use the market-based approach. The items produced or services provided by one company is very similar to items produced or services provided by others. Companies in these markets must accept the prices set by the market.

Companies operating in less competitive markets offer products or services that differ from each other (for example, automobiles, computers, management consulting, and legal services), can use either the market-based or cost-based approach as the starting point for pricing decisions. Some companies first look at costs because cost information is more easily available and then consider customers or competitors: the cost-based approach. Others start by considering customers and competitors and then look at the costs: the market-based approach. Both approaches consider customers, competitors, and costs. Only their starting points differ. Management must always keep in mind market forces, regardless of which pricing approach it uses. For example, building contractors often bid on a cost-plus basis, but then reduce their prices during negotiations to respond to other lower-cost bids.

Companies operating in markets that are not competitive favor cost-based approaches.

That’s because these companies do not need to respond or react to competitors’ prices. The margin they add to costs to determine price depends on the value customers place on the product or service.

Market-based approach

Target Costing for Target Pricing

Market-based pricing starts with a target price. A target price is the estimated price for a product or service that potential customers are willing to pay. This estimate is based on an understanding of customers’ perceived value for a product or service and how competitors will price competing products or services. This understanding of customers and competitors is becoming increasingly important for three reasons:

1. Competition from lower-cost producers is continually restraining prices.

2. Products are on the market for shorter periods of time, leaving less time and opportunity to recover from pricing mistakes, loss of market share, and loss of profitability.
3. Customers are becoming more knowledgeable and incessantly demanding products of higher and higher quality at lower and lower prices.

Cost-Plus Pricing

Instead of using the market-based approach for long-run pricing decisions, managers sometimes use a cost-based approach. The general formula for setting a cost-based priceadds a markup component to the cost base to determine a prospective selling price.

Because a markup is added, cost-based pricing is often called cost-plus pricing, with the plus referring to the markup component. Managers use the cost-plus pricing formula as a starting point. The markup component is rarely a rigid number. Instead, it is flexible, depending on the behavior of customers and competitors. The markup component is ultimately determined by the market.

Cost-Plus Target Rate of Return on Investment

We illustrate a cost-plus pricing formula for Provalue II assuming Astel uses a 12% markup on the full unit cost of the product when computing the selling price.

Cost base (full unit cost of Provalue II)……. $720.00
Markup component of 12% (0.12 * $720) …….86.40
Prospective selling price ……..$806.40

How is the markup percentage of 12% determined? One way is to choose a markup to earn a target rate of return on investment. The target rate of return on investment is the target annual operating income divided by invested capital. Invested capital can be defined in many ways. In this chapter, we define it as total assets—that are, long-term assets plus current assets. Suppose Astel's (pretax) target rate of return on investment is 18% and Pro-value II's capital investment is $96 million. The target annual operating income for Pro-value II is as follows:

Invested capital…….. $96,000,000
Target rate of return on investment ……..18%
Target annual operating income (0.18 * $96,000,000)……. $17,280,000
Target operating income per unit of Provalue II ($17,280,000 ÷ 200,000 units)….. $ 86.40

This calculation indicates that Astel needs to earn a target operating income of $86.40 on each unit of Provalue II. The markup ($86.40) expressed as a percentage of the full unit cost of the product ($720) equals 12% ($86.40 ÷ $720).

Do not confuse the 18% target rate of return on investment with the 12% markup percentage.

- ✓ The 18% target rate of return on investment expresses Astel's expected annual operating income as a percentage of investment.
- ✓ The 12% markup expresses operating income per unit as a percentage of the full product cost per unit.

Astel uses the target rate of return on investment to calculate the markup percentage.

Questions:

1. What are the three major influences on pricing decisions?
2. "Relevant costs for pricing decisions are full costs of the product." Do you agree? Explain.
3. Give two examples of pricing decisions with a short-run focus.
4. How is activity-based costing useful for pricing decisions?
5. Describe two alternative approaches to long-run pricing decisions.
6. What is a target cost per unit?
7. Short-run pricing, capacity constraints. Colorado Mountains Dairy, maker of specialty cheeses, produces a soft cheese from the milk of Holstein cows raised on a special corn-based diet. One kilogram of soft cheese, which has a contribution margin of $10, requires 4 liters of milk. A well-known gourmet restaurant has asked Colorado Mountains to produce 2,600 kilograms of a hard cheese from the same milk of Holstein cows. Knowing that the dairy has sufficient unused capacity, Elise Princiotti, owner of Colorado Mountains, calculates the costs of making one kilogram of the desired hard cheese:

Milk (8 liters $2.00 per liter)	$16
Variable direct manufacturing labor	5
Variable manufacturing overhead	4
Fixed manufacturing cost allocated	6
Total manufacturing cost	$31

Required:

1. Suppose Colorado Mountains can acquire all the Holstein milk that it needs. What is the minimum price per kilogram it should charge for the hard cheese?

2. Now suppose that the Holstein milk is in short supply. Every kilogram of hard cheese produced by Colorado Mountains will reduce the quantity of soft cheese that it can make and sell. What is the minimum price per kilogram it should charge to produce the hard cheese?

Chapter Seven

Decentralization and Transfer Pricing

In decentralized organizations, much of the decision-making power resides in its individual subunits. In these cases, the management control system often uses transfer prices to coordinate the actions of the subunits and to evaluate their performance.

Benefits of Decentralization

Supporters of decentralizing decision making and granting responsibilities to managers of subunits advocate the following benefits:

1. Creates greater responsiveness to needs of a subunit's customers, suppliers, and employees. Good decisions cannot be made without good information. Compared with top managers, subunit managers are better informed about their customers, competitors, suppliers, and employees, as well as about local factors that affect performance, such as ways to decrease costs, improve quality, and be responsive to customers. Eastman Kodak reports that two advantages of decentralization are an "increase in the company's knowledge of the marketplace and improved service to customers."

2. **Leads to gains from faster decision making by subunit managers.** Decentralization speeds decision making, creating a competitive advantage over centralized organizations. Centralization slows decision making as responsibility for decisions creeps upward through layer after layer of management. Interlake, a manufacturer of materials handling equipment, cites this benefit of decentralization: "We have distributed decision-making powers more broadly to the cutting edge of product and market opportunity." Interlake's materials-handling equipment must often be customized to fit customers' needs. Delegating decision making to the sales force allows Interlake to respond faster to changing customer requirements.

3.**Increases motivation of subunit managers.**

Subunit managers are more motivated and committed when they can exercise initiative. "Decentralization Creativity Productivity."

4.**Assists management development and learning.**

Giving managers more responsibility helps develop an experienced pool of management talent to fill higher-level management positions. The company also learns which people are unlikely to be successful top managers. According to Tektronix, an electronics instruments company, "Decentralized units provide a training ground for general managers and a visible field of combat where product champions can fight for their ideas."

5.**Sharpens the focus of subunit managers, broadens the reach of top management**.

In a decentralized setting, the manager of a subunit has a concentrated focus. The head of Yahoo Japan, for example, can develop country-specific knowledge and expertise (local advertising trends, cultural norms, payment forms, etc.) and focus attention on maximizing Yahoo's profits in Japan.

Costs of Decentralization

Advocates of more-centralized decision making point to the following costs of decentralizing decision making:

1. **Leads to suboptimal decision making.** This cost arises because top management has given up control over decision making. If the subunit managers do not have the necessary expertise or talent to handle this responsibility, the company, as a whole, is worse off. Even if subunit managers are sufficiently skilled, suboptimal decision making— also called incongruent decision making or dysfunctional decision making—occurs when a decision's benefit to one subunit is more than offset by the costs to the organization as a whole. This is most prevalent when the subunits in the company are highly interdependent, such as when the end product of one subunit is used or sold by another subunit.

2**.Focuses manager's attention on the subunit rather than the company as a whole.**
Individual subunit managers may regard themselves as competing with managers of other subunits in the same company as if they were external rivals. This pushes them to view the relative performance of the subunit as more important than the goals of the company. Consequently, managers may be unwilling to assist when another subunit faces an emergency (as in the Nintendo example) or share important information.

3.**Results in duplication of output**. If subunits provide similar products or services, their internal competition could lead to failure in the external markets. The reason is that divisions may find it easier to steal market share from one another, by mimicking each other's successful products, rather than from outside firms. Eventually, this leads to confusion in the minds of customers, and the loss of each division's distinctive strengths.

4. **Results in duplication of activities**. Even if the subunits operate in distinct markets, several individual subunits of the company may undertake the same activity separately. In a highly decentralized company, each subunit may have personnel to carry out staff functions such as human resources or information technology. Centralizing these functions helps to streamline and use fewer resources for these activities, and eliminates wasteful duplication.

A transfer price is the price one subunit (department or division) charges for a product or service supplied to another subunit of the same organization. If, for example, a car manufacturer has a separate division that manufactures engines, the transfer price is the price the engine division charges when it transfers engines to the car assembly division.

The transfer price creates revenues for the selling subunit (the engine division in our example) and purchase costs for the buying subunit (the assembly division in our example), affecting each subunit's operating income. These operating incomes can be used to evaluate subunits' performances and to motivate their managers. The product or service transferred between subunits of an organization is called an intermediate product. This product may either be further

worked on by the receiving subunit (as in the engine example) or, if transferred from production to marketing, sold to an external customer.

The rationale for transfer prices is that subunit managers (such as the manager of the engine division), when making decisions, need only focus on how their decisions will affect their subunit's performance without evaluating their impact on company-wide performance. In this sense, transfer prices ease the subunit managers' information-processing and decision-making tasks. In a well-designed transfer pricing system, a manager focuses on optimizing subunit performance (the performance of the engine division) and in so doing optimizes the performance of the company as a whole.

Four criteria to evaluate

Transfer pricing:

(1) Transfer prices should promote goal congruence.

(2) Should induce managers to exert a high level of effort. Subunits selling a product or service should be motivated to hold down their costs; subunits buying the product or service should be motivated to acquire and use inputs efficiently.

(3) Should help top management evaluate the performance of individual subunits.

(4) If top management favors a high degree of decentralization, transfer prices should preserve a high degree of subunit autonomy in decision making.

Calculating Transfer Prices

There are three broad categories of methods for determining transfer prices:

1. **Market based transfer prices.** Top management may choose to use the price of a similar product or service publicly listed in, say, a trade association Web site. Also, top management may select, for the internal price, the external price that a sub unit charges to outside customers.
2. **Cost-based transfer prices**. Top management may choose a transfer price based on the cost of producing the product in question. Examples include variable production cost, variable and fixed production costs, and full cost of the product. Full cost of the product includes all production costs plus costs from other business functions (R&D, design, marketing, distribution, and customer service).
3. **Hybrid transfer prices.** Hybrid transfers prices take into account both cost and market information. Top management may administer such prices, for example by specifying a transfer price that is an average of the cost of producing and transporting the product internally and the market price for comparable products. At other times, a hybrid transfer price may take the form where the revenue recognized by the selling unit is different from the cost recognized by the buying unit. The most common form of hybrid prices arise via negotiation—the subunits of a company are asked to negotiate the transfer price between them and to decide whether to buy and sell internally or deal with external parties. The eventual transfer price is then the outcome of a bargaining process between selling and buying subunits.

An Illustration of Transfer Pricing

Horizon Petroleum has two divisions, each operating as a profit center. The transportation division purchases crude oil in Matamoros, Mexico, and transports it from Matamoros to Houston, Texas. The refining division processes crude oil into gasoline. For simplicity, we assume gasoline is the only salable product the Houston refinery makes and that it takes two barrels of crude oil to yield one barrel of gasoline.

Variable costs in each division are variable with respect to a single cost driver: barrels of crude oil transported by the transportation division, and barrels of gasoline produced by the refining division. The fixed cost per unit is based on the budgeted annual fixed costs and practical capacity of crude oil that can be transported by the transportation division and the budgeted fixed costs and practical capacity of gasoline that can be produced by the refining division. Horizon Petroleum reports all costs and revenues of its non-U.S. operations in U.S. dollars using the prevailing exchange rate.

- ✓ The transportation division has obtained rights to certain oil fields in the Matamoros area. It has a long-term contract to purchase crude oil produced from these fields at $72 per barrel. The division transports the oil to Houston and then "sells" it to the refining division. The pipeline from Matamoros to Houston has the capacity to carry 40,000 barrels of crude oil per day.
- ✓ The refining division has been operating at capacity (30,000 barrels of crude oil a day), using oil supplied by Horizon's transportation division (an average of10,000 barrels per day) and oil bought from another producer and delivered to the Houston refinery (an average of 20,000 barrels per day at $85 per barrel).
- ✓ The refining division sells the gasoline it produces to outside parties at $190 per barrel.

Transfer prices from the transportation division to the refining division under each of the three methods are as follows:

Solution:

1. **Market-based** transfer price of $85 per barrel of crude oil based on the competitive market price in Houston.

2. Cost-based transfer prices at, say, 105% of full cost, where full cost is the cost of the crude oil purchased in Matamoros plus the transportation division's own variable and fixed costs 1.05 * ($72 + $1 + $3) = $79.80.

3. **Hybrid transfer price** of, say, $82 per barrel of crude oil, which is between the market based and cost-based transfer prices.

Horizon Petroleum's total operating income from purchasing, transporting, and refining the 100 barrels of crude oil and selling the 50 barrels of gasoline is the same, $1,200, regardless of the internal transfer prices used.

Operating Income	= Revenues	- Cost of crude oil purchases in Matamoros	- Transportation Division costs	- Refining Division costs

= ($190 * 50 barrels of gasoline) - ($72 * 100 barrels of crude oil) - ($4 * 100 barrels of crude oil) - ($14 * 50 barrels of gasoline)

= $9,500 - $7,200 - $400 - $700 = **$1,200**

Note further that under all three methods, summing the two division operating incomes equals Horizon Petroleum's total operating income of $1,200.

Exercise:

1. Name three benefits and two costs of decentralization.
2. "Organizations typically adopt a consistent decentralization or centralization philosophy across all their business functions." Do you agree? Explain.
3. "Transfer pricing is confined to profit centers." Do you agree? Explain.
4. What are the three methods for determining transfer prices?
5. What properties should transfer-pricing systems have?
6. "All transfer-pricing methods give the same division operating income." Do you agree? Explain
7. Under what conditions is a market-based transfer price optimal?
8. What is one potential limitation of full-cost-based transfer prices
9. Give two reasons why the dual-pricing system of transfer pricing is not widely used.
10. "Cost and price information play no role in negotiated transfer prices." Do you agree? Explain.
11. "Under the general guideline for transfer pricing, the minimum transfer price will vary depending on whether the supplying division has unused capacity or not." Do you agree? Explain
12. The Mornay Company manufactures telecommunications equipment at its plant in Toledo, Ohio. The company has marketing divisions throughout the world. A Mornay marketing division in Vienna, Austria, imports 10,000 units of Product 4A36 from the United States. The following information is available

U.S. income tax rate on the U.S. division's operating income	35%
Austrian income tax rate on the Austrian division's operating income	40%
Austrian import duty	15%
Variable manufacturing cost per unit of Product 4A36	$ 550
Full manufacturing cost per unit of Product4A36	$ 800
Selling price (net of marketing and distribution costs) in Austria	$1,150

Suppose the United States and Austrian tax authorities only allow transfer prices that are between the full manufacturing cost per unit of $800 and a market price of $950, based on comparable imports into Austria. The Austrian import duty is charged on the price at which the

product is transferred into Austria. Any import duty paid to the Austrian authorities is a deductible expense for calculating Austrian income taxes due.

Required

1. Calculate the after-tax operating income earned by the United States and Austrian divisions from transferring 10,000 units of Product 4A36 (a) at full manufacturing cost per unit and (b) at market price of comparable imports. (Income taxes are not included in the computation of the cost-based transfer prices.)
2. Which transfer price should the Mornay Company select to minimize the total of company import duties and income taxes? Remember that the transfer price must be between the full manufacturing cost per unit of $800 and the market price of $950 of comparable imports into Austria. Explain your reasoning.