

Course Introduction

Dear distance education learner, well come to the course **Management Accounting**. This course will enable you understand the basic knowledge and principle of the course. The types of courses are listed below. So you are expected to read the notes and practice the activities carefully. This course is composed of five Chapters. These are:

Chapter 1: Cost- Volume- Profit Analysis (CVP-Analysis)

Chapter 2: Master Budget

Chapter 3: Flexible Budgets

Chapter 4: Relevant Information and Decision Making: Marketing Decisions

Chapter 5: Standard Costing and Variance Analysis

Dear learner! Therefore, you are required to cover all Chapters to sit on the final exam. And, if you have points in the module that are not clear with, make them ready to be elaborated during the tutorial class arranged at your study center.

Course Objectives:

Up on completing the course the students able to

- Identify the role of the management accountant in the organization, and the major purposes of management accounting systems.
- Describe and apply the analysis of cost- volume-profit relationship
- Identify the purpose of the budgetary planning and control system and asses the behavioral implications of budget control and performance evaluation.
- Prepare master budget and explain Responsibility Accounting.
- Prepare static and flexible budget and evaluate the performance of the organizations
- Describe and distinguish between relevant and non relevant costs, and apply and evaluate the limiting factor and the relevant information for particular decision area
- Set the standard for cost and revenue and conduct variance analysis

Happy Reading

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CHAPTER ONE

COST- VOLUME- PROFIT ANALYSIS (CVP-ANALYSIS)

1.0. AIMS AND OBJECTIVES

Upon completing this unit, you should be able to:

- distinguish between contribution margin and gross margin
- prepare and interpret a contribution income statement
- compute a breakeven point in total birrs and total units using the contribution margin approach and the equation approach
- Prepare a cost-volume –profit graph, and explain how it is used.
- Applying CVP analysis to determine the effect on profit of changes in fixed expenses, variable expenses, sales prices, and sales volume.
- Explain the role of cost structure and operating leverage in CVP analysis.
- List and discuss the key assumption of CVP analysis.
- compute the breakeven point and prepare a profit-volume graph for multiproduct enterprise
- explain the effects of sales mix on profit
- calculate sales volume in total birr's and total units to reach a target profit

1.1. INTRODUCTION

☞ What is Cost-volume-profit (CVP) analysis?

Cost-volume-profit (CVP) analysis is one of the most powerful tool that help managers as they make decisions by facilitating quick estimation of net income at different levels of activity. In other words, it helps them to understand the interrelationship between cost, volume, and profit in an organization by focusing on interactions between the following five elements: prices of products, volume or level of activity, per unit variable costs, total fixed costs, and mix of products sold.

Because CVP analysis helps managers understand the interrelationship between cost, volume, and profit, it is a vital tool in many business decisions. These decisions include, for example, what products to manufacture or sell, what pricing policy to follow, what marketing strategy to employ, and what type of productive facilities to acquire.

1.2. THE BASICS OF CVP ANALYSIS

Contribution Margin versus Gross Margin

The form of income statement used in CVP analysis is shown in Exhibit 3.1, i.e., the projected income statement of Sample Merchandising Company for the month ended January 31, 20x3. This income statement is called contribution approach to income statement. The contribution income statement emphasizes the behavior of the costs and therefore is extremely helpful to manager in judging the impact on profits of changes in selling price, cost, or volume.

Exhibit 1.1

Sample Merchandising Company		
Projected Income Statement		
For the Month Ended January 31, 20x3		
	Total	Unit
Sales (10, 000 units)	Br. 150, 000	Br.15.00
Variable Expenses	<u>120, 000</u>	<u>12.00</u>
Contribution Margin	Br. 30, 000	<u>Br.3.00</u>
Fixed Expenses	<u>24, 000</u>	
Net Income	<u>Br. 6, 000</u>	

In the income statement here above, sales, variable expenses, and contribution margin are expressed on a per unit basis as well as in total. This is commonly done on income statements prepared for management's own use since it facilitates profitability analysis.

The contribution margin represents the amount remaining from sales revenue after variable expenses have been deducted. Thus, it is the amount available to cover fixed expenses and then to provide profit for the period. Notice the sequence here- contribution margin is used first to cover the fixed expenses, and then whatever remains goes toward profit. In the Sample Merchandising Company income statement shown above, the company has a contribution margin of Br. 30, 000. In this case, the first Br.24, 000 covers fixed expenses; the remaining Br. 6, 000 represents profit.

The per unit contribution margin indicates by how much birrs the contribution margin is increased for each unit sold. Sample Merchandising Company's contribution margin of Br.3.00 per unit indicates that each unit sold contributes Br.3.00 to covering fixed expenses and providing for a profit. If the firm had sold 5, 000 units, this would cover only Br.15, 000 of their fixed expenses (5, 000 units x Br.3.00 per unit). Therefore, the firm would have a net loss of Br.9, 000.

Contribution margin	Br.15, 000
Fixed expenses	<u>24, 000</u>
Net loss	<u>Br.(9, 000)</u>

If enough units can be sold to generate Br.24, 000 in contribution margin, then all of the fixed costs will be covered and the company will have managed to show neither profit nor loss but just cover all of its cost. To reach this point (called breakeven point), the company will have to sell 8, 000 units in a month, since each unit sold yield Br. 3.00 in contribution margin.

	Total	Per Unit
Sales (8, 000 units)	Br.120, 000	Br.15.00
Variable expenses	<u>96, 000</u>	<u>12.00</u>
Contribution margin	Br.24, 000	Br.3.00
Fixed expenses	<u>24,000</u>	
Net income	<u>Br. 0</u>	

Computations of the break-even point are discussed in detail later in this unit. For the moment, note that the breakeven point can be defined as the point where total sales revenue equals total expenses (variable plus fixed) or as the point where total contribution equals total fixed expenses.

Too often people confuse the terms contribution margin and gross margin. Gross margin (which is also called gross profit) is the excess of sales over the cost of goods sold (that is, the cost of the merchandise that is acquired or manufactured and then sold). It is a widely used concept, particularly in the retailing industry.

Contribution Margin Ratio (Cm-Ratio)

In addition to being expressed on a per unit basis, revenue, variable expenses, and contribution margin for Sample Merchandising Company can also be expressed on a percentage basis:

	<u>Total</u>	<u>Per Unit</u>	<u>Percentage</u>
Sales (8, 000 units)	Br.150, 000	Br.15.00	100%
Variable expenses	<u>120, 000</u>	<u>12.00</u>	<u>80%</u>
Contribution margin	Br.30, 000	Br.3.00	<u>20%</u>
Fixed expenses	<u>24,000</u>		
Net income	<u>Br. 6, 000</u>		

The percentage of the contribution margin to total sales is referred to as the contribution margin ratio (CM-ratio). This ratio is computed as follows:

$$\text{CM-ratio} = \frac{\text{Contribution Margin}}{\text{Sales}}$$

Contribution margin ratio = 1 – variable cost ratio. The variable-cost ratio or variable-cost percentage is defined as all variable costs divided by sales. Thus, a contribution margin of 30% means that the variable-cost ratio is 80%.

In the example here below, the contribution margin percent or contribution margin ratio, also called profit/volume ratio (p/v ratio) is 20%. This means that for each birr increase in sales, total contribution margin will increase by 20 cents (Br.1 sales x CM ratio of 40%). Net income will also increase by 20 cents, assuming that there are no changes in fixed costs.

At this illustration suggests, the impact on net income of any given birr change in total sales can be computed in seconds by simply applying the contribution margin ratio to birr change.

Once the break-even point has been reached, net income will increase by the unit contribution margin for each additional unit sales. If 8001 units are sold in a month, for example, then we can expect that the Sample Merchandising Company's net income for the month will be Br. 3, since the company will have sold 1 unit more than the number needed to break even:

	<u>Total</u>	<u>Per Unit</u>
Sales (8, 000 units)	Br.120, 015	Br.15.00
Variable expenses	<u>96, 012</u>	<u>12.00</u>
Contribution margin	Br.24, 003	Br.3.00
Fixed expenses	<u>24,000</u>	
Net income	<u>Br. 3</u>	

If 8002 units are sold (2 units above the breakeven point). Then we can expect that the net income for the month will be Br.9, and so forth.

1.3 BREAK EVEN ANALYSIS

The study of cost-volume-profit analysis is usually referred as break-even analysis. This term is misleading, because finding break-even point is often just the first step in planning decision. CVP analysis can be used to examine how various alternatives that a decision maker is considering affect operating income. The break-even point is frequently one point of interest in this analysis

Break-even point can be defined as the point where total sales revenue equals total expenses, i.e., total variable cost plus total fixed costs. It is a point where total contribution margin equals total fixed expenses. Stated differently, it is a point where the operating income is zero. There are three alternative approaches to determine break-even point: equation technique, contribution margin technique and graphical method.

Equation Technique. It is the most general form of break-even analysis that may be adapted to any conceivable cost-volume-profit situation. This approach is based on the profit equation. Income (or profit) is equal to sales revenue minus expenses. If expenses are separated into variable and fixed expenses, the essence of the income statement is captured by the following equation.

Profit= Sales revenue-Variable expenses-Fixed expenses

Profit (net income) is the 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 unit non-operating revenues and non-operating cost are assumed to be zero.

Thus, the above formula can be restated as follows

$$(P \times Q) - (V \times Q) - F = \text{Profit (Net income)}$$

where P=sales price

Q=break-even unit sales

V= variable expenses per unit

F=fixed expenses per period

NI= net income

At break-even point, net income=0 because total revenue equal total expenses.

That is, $NI=PQ-VQ-F$

$$0= PQ-VQ-F\text{.....equation (1)}$$

Contribution-Margin Technique. The contribution margin technique is merely a short version of the equation technique. The approach centers on the idea that each unit sold provides a certain amount of fixed costs. When enough units have been sold to generate a total contribution margin equal to the total fixed expenses, break-even point (BEP) will be reached. Thus, one must divide the total fixed costs by the contribution margin being generated by each unit sold to find units sold to break-even.

$$\text{BEP} = \frac{\text{Fixed expenses}}{\text{Unit contribution margin}}$$

Given the equation for net income, you can arrive at the above short cut formula for computing break-even sales in units as follows:

$$NI=PQ-VQ-F$$

$$0=Q (P-V)-F \text{ because at BEP net income equals zero.}$$

$$Q (P-V)=F\text{...divide both sides by (p-v)}$$

$$Q = \frac{F}{P-V} \text{ equation (2)}$$

There is a variation of this method that uses the CM ratio of the unit contribution margin. The result is the break-even point in total sales birrs rather than in total units sold.

$$\text{BEP (in sales birrs)} = \frac{\text{Fixed expenses}}{\text{CM ratio}} = \frac{F}{\frac{P-V}{P}}$$

This approach to break-even analysis is particularly useful in those situations where a company has multiple product lines and wishes to compute a single break-even point for the

company as a whole. More is said on this point in later section titled Sales Mix and CVP Analysis.

The contribution- margin and equation approaches are two equivalent techniques for finding the break-even point. Both methods reach the same conclusion, and so personal preference dictates which approach should be used.

Graphical Method: In the graphical method we plot the total costs and revenue lines to obtain their point of intersection, which is the breakeven point.

Total costs line. This line is the sum of the fixed costs and the variable costs. To plot fixed costs, draw a line parallel to the volume axis. To plot the total cost line, choose some volume of sale and plot the point representing total expenses (fixed and variable) at the activity level you have selected. After the point has been plotted, draw a line through it back to the point where the fixed expense line intersects the birrs axis (the vertical axis).

Total Revenue Line. Again choose some volume of sales to construct the revenue line and plot the point representing total sales birrs at the activity you have selected. Then draw a line through this point back to the origin.

The break-even point is where the total revenues line and the total costs line intersect. This is where total revenues just equal total costs.

Example (1) Zoom Company manufactures and sells a telephone answering machine. The company's income statement for the most recent year is given below:

	Total	Per Unit	Percent
Sales (20,000 units)	Br. 1,200,000	Br. 60	100
Variable expenses	<u>900,000</u>	<u>45</u>	<u>?</u>
Contribution Margin	Br. 300,000	Br. <u>15</u>	<u>?</u>
Fixed Expenses	<u>240,000</u>		
Net Income	<u>60,000</u>		

Based on the above data, answer the following questions.

Instructions:

- Compute the company's CM ratio and variable expense ratio.
- Compute the company's break-even point in both units and sales birrs. Use the above three approaches to compute the break-even.

- c. Assume that sales increase by Br. 400,000 next year. If cost behavior patterns remain unchanged, by how much will the company's net income increase?

Solution:

a. $CM - ratio = \frac{60-45}{60} = 0.25 (25\%)$

$$\text{Variable expense ratio} = 1 - CM\text{-ratio} = \frac{P-V}{P} = 1 - 0.25 = \frac{60 - 15}{60} = 0.75 (75\%)$$

b. Method 1: Equation Method

i) $Net\ Income\ (NI) = PQ - VQ - FC$

$$0 = Q(60-45) - 240,000$$

$$15Q = 240,000$$

$$Q = \frac{240,000}{15} = 16,000 \text{ units, at Br. 60 per unit, Br. 960,000}$$

ii) Let "X" be sales volume in birrs to breakeven

$$CM\text{-ratio} = 0.25$$

$$\text{Variable expense ratio} = 0.75$$

$$\text{Net Income} = \text{Total revenue} - \text{Total variable expense} - \text{total fixed cost}$$

$$0 = X - 0.75X - 240,000$$

$$0.25X = 240,000$$

$$X = \frac{240,000}{0.25}$$

$$X = \text{Br. 960,000}$$

Method 2. Contribution Margin Method

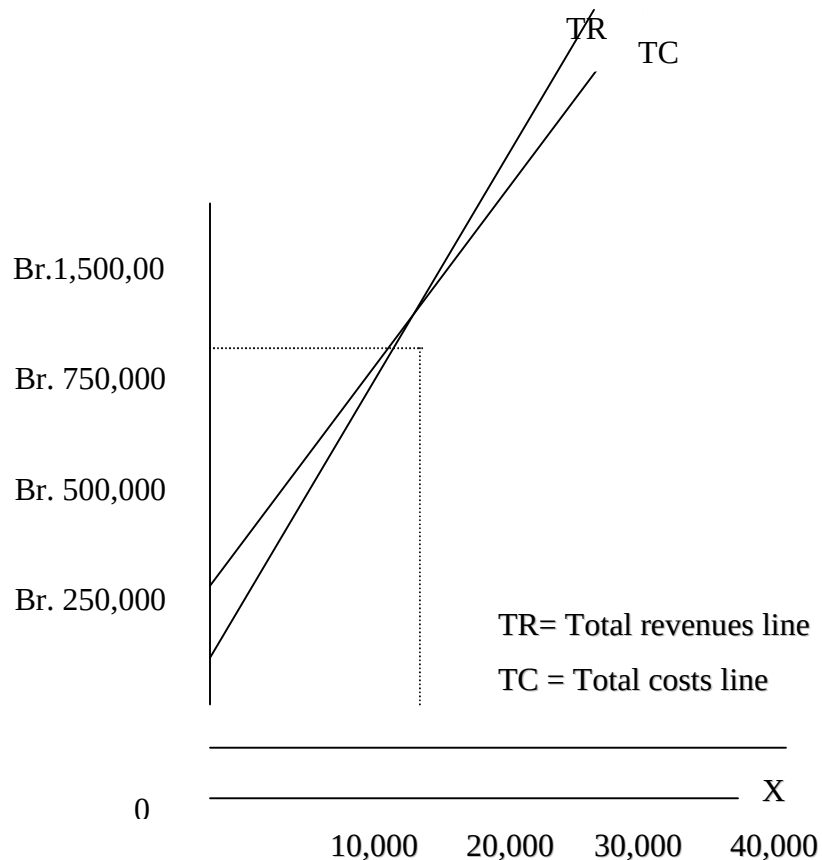
i) $BEP\ (in\ units) = \frac{\text{Fixed expenses}}{CM\ per\ unit}$

$$= \frac{\text{Br. 240,000}}{\text{Br. 60} - \text{Br. 45}} = 16,000 \text{ units}$$

ii) $BEP\ (in\ birrs) = \frac{\text{Fixed expenses}}{CM - ratio} = \frac{\text{Br. 240,000}}{0.25} = \text{Br. 960,000}$

Method 3. Graphical Method: To plot fixed costs, measure Br. 240,000 on the vertical axis and extend a line horizontally. Select a point (say, 20,000 units) and determine the total costs (the total of fixed and variable) at the selected activity level. The total costs at this output level are Br. 1,140,000 = Br. 240,000 + (20,000 X Br. 45). Then, starting from the selected point draw a line back to the origin where the fixed cost line touches the vertical axis. The break-even point (BEP) is where the total revenues line and the total costs line intersect. At this point, total revenues equal total costs. Refer Exhibit 3.2.

Exhibit 1.2 Cost-Volume-Profit Chart



c)

Increase in sales	Br. 400,000
Multiply by the CM ratio	<u>X 25%</u>
Expected increase in contribution margin	<u>Br. 100,000</u>

Since the fixed expenses are not expected to change, net income will increase by the entire Br. 100,000 increase in contribution margin.

☛ Activity question I

1. Name three approaches to break-even analysis?

.....

2. Contribution margin is the excess of sales over fixed costs.” Do you agree? Explain.

.....

1.4. APPLYING CVP ANALYSIS

1.4.1 Sensitivity “What If” Analysis

Sensitivity analysis is a “what if” technique that examine how a result will change if the original predicted data are not achieved or if an underlying assumption changes. In the context of CVP, sensitivity analysis answers such questions as, what will operating income be if the out put level decreases by a given percentage from the original reduction? And what will be operating income if variable costs per unit increase? The sensitivity analysis to various possible outcomes broadens managers’ perspectives as to what might actually occur despite their well-laid plans.

Example (1) Zena Concepts, Inc., was founded by Zemenu Adugna, a graduate student in engineering, to market a radical new speaker he had designed for automobiles sound system. The company’s income statement for the most recent month is given below:

	Total	Per Unit
Sales (400 speakers)	Br.100, 000	Br.250
Variable expenses	<u>60, 000</u>	<u>150</u>
Contribution margin	40, 000	<u>Br.100</u>
Fixed expenses	<u>35, 000</u>	
Net income	<u>Br.5, 000</u>	

Yohannes Tilahun, the senior accountant at Zena Concepts, wants to demonstrate the company’s president how the concepts developed on the preceding pages can be used in planning and decision-making. To this end, Yohannes will use the above data to show the effects of changes in variable costs, fixed costs, sales, and sales volume on the company’s profitability.

Changes in Fixed Costs and Sales Volume: Zena Concepts is currently selling 400 speakers per month (monthly sales of Br.100, 000). The sales manager feels that a Br.10, 000 increase

in the monthly advertising budget would increase monthly sales by Br.30, 000. Should the advertising budget be increased?

Expected contribution margin (Br.130, 000 x 40% CM ratio).....	Br.52, 000
Present contribution margin (Br.100, 000 x 40% CM ratio).....	<u>40, 000</u>
Incremental contribution margin.....	12, 000
Change in fixed costs (incremental advertising expense).....	<u>10, 000</u>
Increased net income.....	<u>Br. 2, 000</u>

Yes, based on the information above and assuming that other factors in the company don't change, the advertising budget should be increased.

Changes in Variable Costs and Sales Volume. Refer to the original data. Management is contemplating the use of high- quality components, which would increase variable costs by Br.10 per speaker. However, the sales manager predicts that the higher overall quality would increase sales to 480 speakers per month. Should the higher quality component be used?

The Br10 increase in variable costs will cause the unit contribution margin to decrease from Br.100 to Br90.

Expected total contribution margin (480 speakers xBr.90).....	Br.43, 200
Present total contribution margin (400 speakers xBr.100).....	<u>40, 000</u>
Increase in total contribution margin.....	<u>Br.3, 200</u>

Yes, based on the information above, the high-quality component should be used. Since the fixed will not change, net income will increase by the Br3, 200 increase in contribution margin shown above.

Change in Fixed Cost, Sales Price, and Sales Volume. Refer to the original data and recall that the company is currently selling 400 speakers per month. To increase sales, the sales manager would like to cut selling price by Br 20 per speaker and increase the advertising budget by Br 15, 000 per month. The sales manager argues that if these two steps are taken, unit sales will increase by 50%. Should the change be made?

A decrease of Br 20 per speaker in the selling price will cause the unit contribution margin to decrease from Br100 to Br 80.

Expected total contribution margin:(400-speakersx150%xBr80).....	Br.80, 000
Present total contribution margin (400 speakers x Br 100).....	<u>40,000</u>

Incremental contribution margin.....	8,000
Change in fixed costs:	
Incremental advertising expenses.....	<u>15,000</u>
Reduction in net income.....	<u>Br. (7,000)</u>

No, based on the information above, the changes should not be made.

Changes in Variable Cost, Fixed Cost, and Sales Volume. Refer to the original data. The sales manager would like to replace the sales staff on a commission basis of Br 15 per speaker sold, rather than on flat salaries that now total Br 6, 000 per month. The sales manager is confident that the change will increase monthly sales by 15%. Should the change be made?

Changing the sales staff from a salaried basis to a commission basis will affect both fixed and variable costs. Fixed costs will decrease by Br 6, 00, from Br 35, 000 to Br 29, 000. Variable costs will increase by Br 15, from Br 150 to Br 165, and the unit contribution margin will decrease from Br 100 to Br 80.

Expected total contribution margin (400speakers x 115% x Br85).....	Br.39, 100
Present total contribution margin (400 speakers x Br. 100).....	<u>40, 000</u>
Decrease in total contribution margin.....	(900)
Change in fixed costs:	
Salaries avoided if a commission is paid [to be added on Br.(900)].....	<u>6, 000</u>
Increase in net income.....	<u>Br.5, 100</u>

Yes based on the information above, the changes should be made. Again, the same answer can be obtained by preparing comparative income statements:

	<u>Present 400</u>		<u>Expected 460*</u>	
	<u>speakers per month</u>		<u>speakers per month</u>	
	Total	Per unit	Total	Per unit
Sales	Br100, 000	Br.250	Br 115, 000	Br 250
Variable costs.....	<u>60, 000</u>	<u>150</u>	<u>75, 900</u>	<u>165</u>
Contribution margin	40, 000	<u>Br.100</u>	39, 100	<u>Br 85</u>
Fixed expenses	<u>35, 000</u>		<u>29, 000</u>	
Net income	<u>Br 5, 000</u>		<u>Br 10, 100</u>	

*400 speakers x 115%= 460 speakers

Changes in Regular Sales Price. Refer the original data. The company has an opportunity to make a bulk sales of 150 speakers to wholesalers if an acceptable price can be worked out. This sale would not disturb the company's regular sales. What price per speaker should be quoted to the wholesaler if Zena Concepts wants to increase its monthly profits by Br 3, 000?

Variable cost per speaker.....	Br 150
Desired profit per speaker (Br3, 000÷150 speakers).....	<u>20</u>
Quoted price per speaker.....	<u>Br 170</u>

Notice that no element of fixed cost is included in the computation. This is because fixed costs are not affected by the bulk sale, so all of the additional revenue that is in excess of variable costs goes to increasing the profits of the company.

1.4.2 Target Net Profit Analysis

Managers can also use CVP analysis to determine the total sales in units and birrs needed to reach a target profit.

The method used for computing desired or targeted sales volume in units to meet the desired or targeted net income is the same as was used in our earlier breakeven computation.

Example (1) Tantu Company manufactures and sales a single product. During the year just ended the company produced and sold 60,000 units at an average price of Br.20 per unit. Variable manufacturing costs were Br 8 per unit, and variable marketing costs were Br 4 per unit sold. Fixed costs amounted to Br. 180,000 for manufacturing and Br.72, 000 for marketing. There was no year-end work-in-progress inventory. Ignore income taxes.

Instructions:

- Compute Tantu's breakeven point (BEP) in sales birrs for the year.
- Compute the number of sales units required to earn a net income of Br 180,000 during the year
- Tantu's variable manufacturing costs are expected to increase 10 % in the coming year. Compute the firm's breakeven point in sales birrs for the coming year.
- If Tantu's variable manufacturing costs do increase 10 %, compute the selling price that would yield the same CM-ratio in the coming year.

Solution:

i- The BEP using contribution margin technique can be calculated as:

$$\text{BEP (in birrs)} = \frac{\text{Fixed Expenses}}{\text{Cost -ratio}}$$

$$\begin{aligned} \text{BEP (in birrs)} &= \frac{\text{Br. } 180,000 + 72,000}{\frac{20-(8+4)}{20}} = \frac{\text{Br. } 252,000}{0.4} \\ &= \text{Br. } 630,000 \end{aligned}$$

ii- Target – net profit analysis can be approached using either of these two methods

- a. Equation method
- b. Contribution margin method

Equation Method. Managers use a targeted income as the starting point in decision which marketing and pricing strategies to use. The formula to determine a specific targeted income is an extension of the break-even formula. Here, instead of solving sales volume where profits are zero, you instead solve sales where profit equals some targeted amount. The equation for target income is:

TI = Total sales – Variable expenses – Fixed expenses

TI = PQ – VQ – FC

Where P= sales price

Q= sales unit to achieve the targeted income

V= unit variable costs

FC = fixed costs

For Tantu Company, the targeted sales volume in units would be determined as given below

TI = PQ – VQ – FC

180, 000 = 20Q – 12Q – 252, 000

8Q= 180, 000 + 252, 000

Thus, Q= $\frac{\text{Br. } 432, 000}{8} = \underline{\underline{54, 000 \text{ units}}}$

8

Target sales (in birrs) = Br.20 x 54,000=Br. 1, 080, 000

Alternatively computed,

Target income=PQ –VQ – FC

= Total CM* - FC

= CM-RATIO X S – FC

where S= Birr sales to achieve the target income

Target income= 0.4S – Br.252, 000

$$\text{Br. } 180,000 = 0.4S - \text{Br. } 252,000$$

$$0.4S = \text{Br. } 432,000$$

$$S = \frac{\text{Br. } 432,000}{0.4} = \underline{\text{Br. } 1,080,000}$$

Contribution Margin Approach. A second approach would be expanding the contribution margin formula to include the target income requirements. Thus, we can modify the formula given earlier for BEP computations as follows:

$$\text{Target sales (in units)} = \frac{\text{Fixed expenses} + \text{Target Profit}}{\text{Unit CM}}$$

This approach is simpler and more direct than using the CVP equation. In addition, it shows clearly that once the fixed costs are covered, the unit contribution is fully available for meeting profit requirements.

$$\begin{aligned} \text{Target sales in units (for Tantu Co.)} &= \frac{\text{Fixed expenses} + \text{Target Profit}}{\text{Unit CM}} \\ &= \frac{\text{Br. } 252,000 + 180,000}{\text{Br. } 8} \\ &= \underline{54,000 \text{ units}} \end{aligned}$$

$$\text{Target sales in birrs (for Tantu)} = \text{Br. } 20 \times 54,000 = \underline{\text{Br. } 1,080,000}$$

The total birr sales required to earn a target net profit is found by

$$\begin{aligned} \text{Target sales (in birrs)} &= \frac{\text{Fixed expenses} + \text{Target Profit}}{\text{CM-ratio}} \\ &= \frac{\text{Br. } 252,000 + \text{Br. } 180,000}{0.4} \\ &= \underline{\text{Br. } 1,080,000} \end{aligned}$$

1.4.3. The Margin of Safety

The margin of safety is the excess of budgeted (or actual) sales over the breakeven volume of sales. It states the amount by which sales can drop before losses begin to be incurred. In other words, it is the amount of sales revenue that could be lost before the company's profit would be reduced to zero. The formula for its calculations follows:

$$\text{Total sales} - \text{Break even Sales} = \text{Margin of safety}$$

The margin of safety can also be expressed in percentage form. This percentage is obtained by dividing the margin of safety in birr terms by total sales:

$$\frac{\text{Margin of safety in birrs}}{\text{Total sales}} = \text{Margin of safety}$$

Example (1): Consider the cost structure for ABC Company and XYZ in Exhibit 3-3

ABC Co. and XYZ Co.

Comparative Cost Structures

	ABC Co.		XYZ Co.	
	Amount	Percent	Amount	Percent
Sales	Br. 500,000	100	Br. 500,000	100
Variable costs	<u>100,000</u>	<u>20</u>	<u>300,000</u>	<u>60</u>
Contribution Margin	400,000	<u>80</u>	200,000	<u>40</u>
Fixed costs	<u>300,000</u>		<u>100,000</u>	
Net income	<u>Br. 100,000</u>		<u>Br. 100,000</u>	

The break even sales for each company may be computed as follows:

BEP (in birrs) = Fixed Costs

CM ratio

$$\text{BEP (ABC Co.)} = \frac{\text{Br.300, 000}}{0.8} = \underline{\text{Br.375, 000}}$$

$$\text{BEP (XYZ Co.)} = \frac{\text{Br.100, 000}}{0.4} = \underline{\text{Br.250, 000}}$$

The margin of safety for each company may be computed as:

Total sales - Break even Sales = Margin of safety

$$\text{ABC Co.'s: Br.500, 000- Br.375, 000} = \underline{\text{Br.125, 000}}$$

$$\text{XYZ Co.'s: Br.500, 000- 250,000} = \underline{\text{Br. 250,000}}$$

Note that the companies' sales revenues are the same (Br. 500,000) and their net incomes are the same (Br. 100,000) their individual margins of safety are different. This is because they have different cost structures, and consequently different breakeven. A higher breakeven sales amount for ABC Co. produces a lower margin of safety. For ABC Co., the Br.125, 000 margin of safety means that sales would have to diminish by more than this amount before the company suffers a loss. In effect the margin of safety is a buffer before losses are incurred. The same analysis applies to XYZ Co., except its buffer is Br. 250,000. At this

point, neither company is experiencing losses; thus it is difficult to say which company is better off. Because they are in different businesses the amounts computed as buffers may mean the companies' operating results are fine. A comparison within each company on a year-by-year basis may shed light on the possibility of impending difficulties.

The margin of safety may also be expressed as a percentage. The calculation is done by dividing the margin of safety (in birrs) by the total sales (in birrs). This, the calculation of the margins of safety percentage is:

$$\text{Margin of safety percentage} = \frac{\text{Margin of safety in birrs}}{\text{Total sales in birrs}}$$

$$\text{ABC Co.'s: } \frac{\text{Br. 125,000}}{\text{Br.500, 000}} = 25 \%$$

$$\text{XYZ Co.'s: } \frac{\text{Br. 250,000}}{\text{Br.500, 000}} = 50 \%$$

1.5. IMPACT OF INCOME TAXES ON CVP ANALYSIS

Thus far we have ignored income taxes. However, profit-seeking enterprises must pay income taxes on their profits. A firm's net income after tax, the amount of income remaining after subtracting the firm's income- tax expense, is less than its before- tax income. This fact is expressed in the following formula:

$$\text{NIAT} = \text{NIBT} (1 - \text{tax rate})$$

Where NIAT = net income after taxes

NIBT=net income before taxes

The requirement that companies pay income taxes affects their CVP relationships. To earn a particular after-tax net income will require greater before-tax income than if there were no tax.

Example (1) Hydro System Engineering Associates, Inc. provides consulting services to city water authorities. The consulting firm's contribution margin ratio is 20%, and its annual fixed expenses are Br. 120, 000. The firm's income-tax rate is 40%.

Instructions:

- Calculate the firm's break-even volume of service revenue.
- How much before-tax income must the firm earn to make an after-tax net income of Br. 48, 000?

- c. What level of revenue for consulting services must the firm generate to earn an after-tax income of Br.48, 000?
- d. Suppose the firm's income-tax rate rises to 45 percent. What will happen to break-even level of consulting service revenue?

Solutions:

a. Break-even sales= $\frac{\text{Fixed expenses}}{\text{CM-ratio}}$

$$= \frac{\text{Br.120, 000}}{0.2}$$

$$= \underline{\text{Br. 600, 000}}$$

b. NIBT = $\frac{\text{NIAT}}{1 - \text{tax rate}}$ = $\frac{\text{Br.80, 000}}{1 - 0.45}$

c. Target sales (in birrs)= $\frac{\text{FC} + \text{NIBT}}{\text{CM-ratio}}$ = $\frac{\text{Br.120, 000} + \text{Br.80, 000}}{0.2}$

$$= \underline{\text{Br.1, 000, 000}}$$

N.B. In the formula that we have seen previously for target sales volume computations, the target profit refers to the before-tax income.

d. BEP (in units) = $\frac{\text{Fixed expenses}}{\text{Unit CM}}$ = $\frac{\text{FC}}{\text{P} - \text{V}}$

BEP (in birrs) = $\frac{\text{Fixed expenses}}{\text{CM-ratio}}$ = $\frac{\text{FC}}{\frac{\text{P} - \text{V}}{\text{P}}}$

Thus, the change in income-tax rate has no effect on break-even sales.

1.6. CVP ANALYSIS WITH MULTIPLE PRODUCTS

1.6.1 Definition of Sales Mix

The term **sales mix** (also called revenue mix) is defined as the relative proportions or combinations of quantities of products that comprise total sales. If the proportions of the mix change, the CVP relationships also change. Thus, managers try to achieve the combination, or mix, that will yield the greatest amount of profit.

A shift in sales-mix from high-margin items to low-margin items can cause total profits to decrease even though total sales may increase. Conversely, a shift in the sales mix from low

margin items to high-margin items can cause the reverse effect-total profit may increase even though total sales decrease.

1.6.2 Sales Mix and CVP Analysis

To this point the discussion on CVP analysis focused on a firm that sells a single product; such a firm is generally unrealistic, existing only in the minds of textbook writers. This section of the unit examines the usefulness of the CVP technique for firms that deal in several products. In the general case the CVP equation could be presented as:

$$P_1Q_1 + P_2Q_2 + \dots + P_nQ_n - V_1Q_1 - V_2Q_2 - \dots - V_nQ_n - FC = NI$$

where P_i = Selling price per unit of product i

Q_i = Number units of i produced and sold

V_i = Unit variable cost of product i

FC = Fixed Cost Per Period

NC = Net Income

In a multi product firm, break-even analysis is somewhat more complex. The reason is that different products will have different selling prices, different costs, and different contribution margins.

Using contribution margin approach, the computation of the break-even point (BEP) in multi product firm follows:

$$\text{BEP (in units)} = \frac{\text{Total fixed expenses}}{\text{Weighted average CM}}$$

$$\text{BEP (in birrs)} = \frac{\text{Total Fixed Expenses}}{\text{CM – ratio}}$$

Weighted average unit contribution margin is the average of the several products' unit contribution margins, weighted by the relative sales proportion of each product.

For a company manufacturing and selling three products (X, Y and Z), with sales of mix of n_1, n_2 and n_3 , respectively, the break even point may be given by the following short cut formula:

$$\text{BEP (in units)} = \frac{\text{Total fixed costs}}{\frac{cm_1n_1 + cm_2n_2 + cm_3n_3}{n_1 + n_2 + n_3}}$$

where cm_i = Unit contribution margin for product i.

To prove the above formula, let us begin with general CVP equation for a company producing three products.

$$NI = P_1Q_1 + P_2Q_2 + P_3Q_3 - V_1Q_1 - V_2Q_2 - V_3Q_3 - FC$$

where NI = income

P_i = Unit sales price for product i

Q_i = Sales volume for product

V_i = Unit variable cost for product i

FC = Fixed cost per period

The difference between total sales and total variable costs for each product, i.e. $P_iQ_i - V_iQ_i$, equals their total contribution margin (TCM). The above general formula can be restated as follows:

$$NI = TCM_1 + TCM_2 + TCM_3 - FC$$

$$0 = TCM_1 + TCM_2 + TCM_3 - FC \text{ (NI equals zero at BEP)}$$

$$0 = CM_1Q_1 + CM_2Q_2 + CM_3Q_3 - FC$$

where CM_i = contribution margin per unit for product i

Q_i = sales volume for product i to break even

Given the sales mix X: Y: Z = $n_1 : n_2 : n_3$, and assuming that the company break-even at "Q" units, then

$$0 = CM_1 \frac{n_1}{n_1 + n_2 + n_3} Q + CM_2 \frac{n_2}{n_1 + n_2 + n_3} Q + CM_3 \frac{n_3}{n_1 + n_2 + n_3} Q - FC$$

$$0 = \frac{Q}{n_1 + n_2 + n_3} (CM_1n_1 + CM_2n_2 + CM_3n_3) - FC$$

$$FC = \frac{Q}{n_1 + n_2 + n_3} (CM_1n_1 + CM_2n_2 + CM_3n_3)$$

$$Q (CM_1n_1 + CM_2n_2 + CM_3n_3) = FC (n_1 + n_2 + n_3)$$

$$Q = \frac{FC (n_1 + n_2 + n_3)}{CM_1n_1 + CM_2n_2 + CM_3n_3}$$

$$Q = \frac{FC}{\frac{CM_1n_1 + CM_2n_2 + CM_3n_3}{n_1 + n_2 + n_3}} \dots\dots\dots \text{equation (1)}$$

Here in equation (1), the denominator, $\frac{CM_1n_1 + CM_2n_2 + CM_3n_3}{n_1 + n_2 + n_3}$, is the weighted average

$$\frac{CM_1n_1 + CM_2n_2 + CM_3n_3}{n_1 + n_2 + n_3}$$

contribution margin.

Similarly, the company's break-even sales in birrs would be calculated as

$$\begin{aligned}
 \text{BEP (in birrs)} &= \frac{\text{Fixed expenses}}{\text{CM - ratio}} \\
 &= \frac{\text{Fixed expenses}}{\frac{\text{Average CM}}{\text{Average Sales Price}}} \\
 &= \frac{\text{Fixed expenses}}{\frac{\text{Cm}_1\text{n}_1 + \text{Cm}_2\text{n}_2 + \text{Cm}_3\text{n}_3}{\text{n}_1 + \text{n}_2 + \text{n}_3}} \\
 &= \frac{\text{Fixed expenses}}{\frac{\text{P}_1\text{n}_1 + \text{P}_2\text{n}_2 + \text{P}_3\text{n}_3}{\text{n}_1 + \text{n}_2 + \text{n}_3}} \quad \dots\dots\dots \text{equation (2)} \\
 \text{BEP (in birrs)} &= \frac{\text{Fixed expenses}}{\frac{\text{Cm}_1\text{n}_1 + \text{Cm}_2\text{n}_2 + \text{Cm}_3\text{n}_3}{\text{p}_1\text{n}_1 + \text{p}_2\text{n}_2 + \text{p}_3\text{n}_3}}
 \end{aligned}$$

Here in equation (2), the denominator represents the contribution margin ratio.

Example (1) Topper Sports, Inc., produces high-quality sports equipment. The company's Racket Division Manufactures three tennis rackets – the Standard, the Deluxe, and the Pro- that are widely used in amateur play. Selected information on the rackets are given below:

	Standard	Deluxe	Pro
Selling price per racket	Br. 40.00	Br. 60.00	Br. 75.00
Variable expenses per racket:			
Production	22.00	27.00	40.45
Selling (5% of selling price)	2.00	3.00	3.75

All sales are made thorough the company's own retail outlets. The Racket Division has the following fixed costs:

Per Month

	Product Lines		
	Ethio-01	Ethio-02	Ethio-03
Sales price	Br.150	Br.80	Br.40
Variable costs	100	60	10
Units sales	3, 200 units	1, 600 units	4, 800 units

Fixed production costs.....Br. 120, 000

Advertising expenses..... 100, 000

Administrative salaries..... 50, 000

Total Br.270, 000

Sales, in units, for the month of May have been as follows:

	<u>Standard</u>	<u>Deluxe</u>	<u>Pro</u>	<u>Total</u>
Sales in units.....	2, 000	1, 000	5, 000	8, 000

Instructions:

- Compute the weighted- average unit contribution margin, assuming the above sales mix is maintained.
- Compute the Racket Division's break-even point in birrs for May.
- How many units of each product should the company sale in order to earn a Br.162, 000 incomes? Ignore income taxes.

Solution:

Method I: Equation method

Sales – variable expenses – fixed expenses = Net income (at BEP net income equals zero)

Sales – variable expenses – fixed expenses = zero

As given here above, for every unit of sales made in Deluxe we expect 5 units and 2 units of Pro and Standard, respectively. Therefore, let K=number of units of Deluxe to break-even, the break even sales for Standard and Pro will be 2K and 5K, respectively.

Sales – variable expenses – fixed expenses = zero

Total contribution margin - fixed expenses= zero

For three products, the formula for the net income would be:

$(TCM_1 + TCM_2 + TCM_3) - \text{fixed expenses} = \text{zero}$

Where TCM = total contribution margin

$16(2K) + 30(K) + 30.8(5K) - 270,000 = 0$

$216K = 270, 000$

$K = \frac{270, 000}{216} = \underline{1, 250 \text{ units}}$

216

Thus, the breakeven sales for each product line would be:

Standard racket = $2K = 2 \times 1, 250 = 2, 500$ units

Deluxe racket = K = 1, 250 units

Pro racket = 5K = 5 x 1, 250 = 6, 250 units

Topper Sports Inc., breakeven at 10, 000 units, i.e., 2, 500 + 1, 250 + 6, 250

Multiply unit sales to break even by the selling price of each product in order to determine break-even sales volume in total birrs

Racket		BEP in birrs
Standard	2, 500 x Br. 40	= Br.100, 000
Deluxe	1, 250 x Br. 60	= Br.75, 000
Pro	6, 250 x Br. 75	= Br. <u>468, 750</u>
Total.....		Br. <u>643, 750</u>

Method II. Contribution Margin Method

Sales mix, given above, for the three rackets Standard: Deluxe: Pro = 2: 1: 5

BEP (in units for Topper Sports)= $\frac{\text{Fixed Costs}}{\text{Cm}_1\text{n}_1 + \text{Cm}_2\text{n}_2 + \text{Cm}_3\text{n}_3}$ = Br.270, 000

$$\frac{16(2)+30(1)+30.8(5)}{n_1 + n_2 + n_3} = \frac{270,000}{2 + 1 + 5}$$

$$= \underline{10,000 \text{ units}}$$

Racket		BEP in units
Standard	10, 000 x 2/8	= 2, 500 units
Deluxe	10, 000 x 1/8	= 1, 250 units
Pro	10, 000 x 5/8	= <u>6, 250 units</u>
Total		<u>10, 000 units</u>

At this point it is possible to multiply break-even sales for each product by their corresponding sales price to arrive at a break-even sale of Br.643, 750 for the company as a whole. Or this break –even sales can be computed with the following short cut formula:

$$\begin{aligned} \text{BEP (in birrs for Topper Sports)} &= \frac{\text{Fixed expenses}}{\text{Cm}_1\text{n}_1 + \text{Cm}_2\text{n}_2 + \text{Cm}_3\text{n}_3} \\ &= \frac{Br.270, 000}{\frac{16(2)+30(1)+30.8(5)}{40(2)+60(1)+75(5)}} \\ &= \underline{Br. 270, 000} \end{aligned}$$

$$\begin{aligned}
 & \frac{216}{515} \\
 & = \text{Br. } \frac{270,000 \times 515}{216} \\
 & = \text{Br. } 643,750
 \end{aligned}$$

Example (2) Addis Marine Products Inc. plans to manufacture and sell accessories for recreational fishing craft and pleasure boats. Three of the principal product lines are manufactured at the Awassa plant. Operating data for the coming year is estimated as follows:

The total annual fixed cost on the three-product lines amount to Br. 840,000

Instructions:

- Assuming the above sales mix, determine the BEP (break-even point) for Addis Company during the coming year. Also determine the number of units of each product that should be sold to break even in units and in birrs.
- What volume of sales in birrs for each product must Addis Marine Products Inc. achieve to earn a net income of Br. 73,500 after taxes in the coming year? Assume the company is subject to a 30% income tax rate.
- Calculate the total sales volume in units and in birrs for each product so that Addis Company achieves 8.4% return on sales.
- Suggest any other alternative sales mix that can lower the Company's **BEP in units** holding the unit selling price, the unit variable cost and the total annual fixed costs constant.

Solutions:

$$\begin{aligned}
 \text{a. BEP (in units for Addis)} &= \frac{\text{Fixed Costs}}{\frac{\text{Cm}_1\text{n}_1 + \text{Cm}_2\text{n}_2 + \text{Cm}_3\text{n}_3}{\text{n}_1 + \text{n}_2 + \text{n}_3}} \\
 &= \frac{\text{Br.840, 000}}{\frac{50(2)+20(1)+30(3)}{2 +1+3}} = \frac{\text{Br.840, 000}}{\frac{210}{6}} \\
 &= \underline{\underline{24, 000 \text{ units}}}
 \end{aligned}$$

Product Lines	BEP in units	BEP in birrs
Ethio-01	$24,000 \times 2/6 = 8,000$ units	$8,000 \times 150 = \text{Br.1, 200,000}$
Ethio-02	$24,000 \times 1/6 = 4,000$	$4,000 \times 80 = 320,000$
Ethio-03	$24,000 \times 3/6 = \underline{12,000}$	$12,000 \times 40 = \underline{480,000}$
Total	<u>24,000 units</u>	<u>Br.2,000,000</u>

Or computed alternatively:

$$\begin{aligned}
 \text{BEP (in birrs for Addis)} &= \frac{\text{Fixed expenses}}{p_1n_1 + p_2n_2 + p_3n_3} \\
 &= \frac{\text{Br.840,000}}{\frac{50(2)+20(1)+30(3)}{150(2)+80(1)+40(3)}} \\
 &= \underline{\text{Br.2,000,000}}
 \end{aligned}$$

b. NIAT = Br.73, 500. This implies that NIBT = $\frac{73,500}{1-30\%} = \text{Br.105,000}$

$$\begin{aligned}
 \text{Target sales (in units)} &= \frac{\text{FC} + \text{NIBT}}{\text{Average CM}} = \frac{840,000 + 105,000}{\frac{50(2)+20(1)+30(3)}{2+1+3}} = \underline{27,000 \text{ units}}
 \end{aligned}$$

Product Lines	Target sales in units	Target sales in birrs
Ethio-01	$27,000 \times 2/6 = 9,000$ units	$9,000 \times 150 = \text{Br.1, 350,000}$
Ethio-02	$27,000 \times 1/6 = 4,500$	$4,500 \times 80 = 360,000$
Ethio-03	$27,000 \times 3/6 = \underline{13,500}$	$13,500 \times 40 = \underline{540,000}$
Total	<u>27,000 units</u>	<u>Br. 2,250,000</u>
Target Sales (in birrs for Addis) =	$\frac{\text{Fixed expenses} + \text{NIBT}}{p_1n_1 + p_2n_2 + p_3n_3} = \frac{\text{Br. 840,000} + 105,000}{\frac{50(2)+20(1)+30(3)}{150(2)+80(1)+40(3)}}$	$= \frac{\text{Br. 945,000}}{\frac{210}{500}} = \underline{\text{Br.2,250,000}}$

c. Total sales to achieve a target profit = Average P (Q)

Where P = sales price

Q = target sales in units

$$\text{Average P} = \frac{150(2)+80(1)+40(3)}{2+1+3} = \text{Br.} \frac{500}{6}$$

$$\text{Total sales} = \text{Average P (Q)} = \frac{500(Q)}{6}$$

$$\begin{aligned} \text{Net income} &= \text{Total sales} \times \text{Return on sales} \\ &= \frac{500(Q)}{6} \times 8.4\% \\ &= \underline{7Q} \end{aligned}$$

$$\text{Target sales (in units)} = \frac{\text{FC} + \text{NIBT}}{\text{Average CM}} = \frac{840,000 + 7Q}{\frac{50(2)+20(1)+30(3)}{2+1+3}}$$

$$\text{Thus, } Q = \frac{840,000 + 7Q}{\frac{50(2)+20(1)+30(3)}{2+1+3}}$$

$$Q = \frac{840,000 + 7Q}{\frac{210}{6}}$$

$$\frac{210}{6} Q = 840,000 + 7Q$$

$$210Q = 6(840,000) + 7Q$$

$$210Q = 5,040,000 + 7Q$$

$$168Q = 5,040,000$$

$$Q = \frac{5,040,000}{168}$$

$$Q = \underline{30,000 \text{ units}}$$

- d. In a multiproduct company, a switch or movement from less profitable product to more profitable product lowers break-even point in units keeping other things, i.e., sales prices, variable costs and fixed cost per period constant. The original sales mix was 2: 1:3 for Ethio-01, Ethio-02 and Ethio-03, respectively. Suggested sales mix here below reduces the company's break-even:

$$\text{Ethio-01: Ethio-02: Ethio-03} = 3:1:2$$

$$\text{Ethio-01: Ethio-02: Ethio-03} = 4:1:1$$

Check:

- a) BEP with Ethio-01: Ethio-02: Ethio-03=3:1:2

$$\text{BEP} = \text{Br.} \underline{840,000}$$

$$\frac{50(3)+20(1)+30(2)}{2+1+3}$$

$$= \underline{21,913 \text{ units}}$$

b) BEP with Ethio-01: Ethio-02: Ethio-03=4:1:1

$$\begin{aligned}\text{BEP} &= \text{Br.} \underline{840,000} \\ \frac{50(4)+20(1)+30(1)}{2+1+3} \\ &= \underline{20,160 \text{ units}}\end{aligned}$$

However, the suggested sales mix above may increase the company's break-even sales in terms of birrs.

1.7. UNDERLYING ASSUMPTIONS IN CVP ANALYSIS

For any CVP analysis to be valid, the following important assumptions must be reasonably satisfied within the relevant range.

1. Costs are linear (straight-line) through the entire relevant range, and they can be accurately divided into two variable and fixed elements. This implies the following more specific assumptions.
 - a. Total fixed expenses remain constant as activity changes, and the unit variable expense remains unchanged as activity varies.
 - b. The efficiency and productivity of production process and workers remain constant.
2. The behavior of total revenue is linear (straight-line). This implies that the price of the product or service will not change as sales volume varies within the relevant range.
3. In multiproduct companies, the sales mix remains constant over the relevant range.
4. In manufacturing firms, inventories do not change, i.e., the inventory levels at the beginning and end of the period are the same. This implies that the number units produced during the period equals the number of units sold.
5. The value of a birr received today is the same as the value of a birr received in any future year.

1.8. COST STRUCTURE AND OPERATING LEVERAGE

1.8.1 Cost Structure and Profitability

Cost structure refers to the relative proportion of fixed and variable costs in an organization. Highly leveraged companies are characterized by high fixed cost and low variable costs. In the contrary, low leveraged companies are characterized by lower fixed costs and higher

variable costs, which cost structure is better-high variable costs and low fixed costs, or the opposite? No categorical answer to this question is possible: we can simply note that there may be advantages either way, depending on the specific circumstances involved.

Example (1) Revenue and cost behavior relationships at two firms, A and B, follows:

	<u>Firm A</u>		<u>Firm B</u>	
	Amount	Percent	Amount	Percent
Sales	Br.100, 000	100	Br.100, 000	100
Less variable expenses	<u>60,000</u>	<u>60</u>	<u>30,000</u>	<u>30</u>
Contribution margin	40,000	<u>40</u>	70,000	<u>70</u>
Less fixed expenses	<u>30,000</u>		<u>60,000</u>	
Net income	<u>Br. 10,000</u>		<u>Br. 10,000</u>	

Firm A has higher variable costs because it is labor-intensive while Firm B has higher fixed costs as a result of its investment in machines. The question as to which firm has the better cost structure depends on many, factors including the long run trend in sales, year-to-year fluctuations in the level of sales and the attitude of the owners toward risk. If sales are expected to trend above Br. 100, 000 in the future, then Firm B has the better-cost structure. The reason is that its CM ratio is higher, and its profits will therefore increase more rapidly as sales increase. To illustrate, assume that each firm experiences a 10% increase in sales. The new income statement will be as follows:

	<u>Firm A</u>		<u>Firm B</u>	
	Amount	Percent	Amount	Percent
Sales	Br.110,000	100	Br.110,000	100
Less variable expenses	<u>66,000</u>	<u>60</u>	<u>33,000</u>	<u>30</u>
Contribution margin	44,000	<u>40</u>	77,000	<u>70</u>
Less fixed expenses	<u>30,000</u>		<u>60,000</u>	
Net income	<u>Br. 14,000</u>		<u>Br. 17,000</u>	

As we would expect, for the same birr increase in sales, Firm B has experienced a greater increase in net income due to its higher CM ratio.

What if sales can be expected to drop below Br.100, 000 from time to time? What are the break-even points of the two firms? What are their margins of safety? The computations

needed to answer these questions are carried out below using the contribution margin method.

	<u>Firm A</u>	<u>Firm B</u>
Fixed expenses	Br.30, 000	Br.60, 000
Contribution margin ratio	<u>÷ 40%</u>	<u>÷ 70%</u>
Breakeven in total sales birrs	<u>Br.75,000</u>	<u>Br.85,714</u>
Total current sales (a)	Br.100, 000	Br.100, 000
Break-even sales	<u>75,000</u>	<u>85,714</u>
Margin of safety in sales birrs (b)	<u>Br. 25,000</u>	<u>Br. 14,286</u>
Margin of safety as a percentage of sales (b) ÷ (a) ...	25.0%	14.3%

This analysis makes it clear that Firm A is less vulnerable to downturns than Firm B. We can identify two reasons why it is less vulnerable. First, due to its lower fixed expenses, Firm A has a lower break-even point and a higher margin of safety, as shown by the computations above. Therefore, it will not incur losses as quickly as Firm B in periods of sharply declining sales. Second, due to its lower CM ratio, Firm A will not lose contribution margin as rapidly as Firm B when sales fall off. Thus, Firm A's income will be less volatile. We saw earlier that this is a drawback when sales increase, but it provides more protection when sales drop.

To summarize, without knowing the future, it is not obvious which cost structure is better. Both have advantages and disadvantages. Firm B, with its higher fixed costs and lower variable costs, will experience wider swing in net income as changes take place in sales, with greater profits in good years and greater losses in bad years. Firm A, with its lower fixed costs and higher variable costs, will enjoy greater stability in net income and will be more protected from losses during bad years, but at the cost of lower net income in good years.

1.8.2 Operating Leverage

To the scientist, leverage explains how one is able to move a large object with a small force. To the manager, leverage explains how one is able to achieve a large increase in profits with only a small increase in sales and/or assets. One type of leverage that the manager uses to do this is known as operating leverage.

Operating leverage is a measure of the extent to which fixed costs are being used in an organization. It is greatest in companies that have a high proportion of fixed cost in relation to variable costs. Conversely, operating leverage is lowest in companies that have a low proportion of fixed costs in relation to variable costs. If a company has high operating leverage (that is, a high proportion of fixed costs in relation to variable costs), then profits will be very sensitive to changes in sales. Just a small percentage increase (or decrease) in sales can yield a large percentage increase (or decrease) in profits.

Operating leverage can be illustrated by returning to the data given above for the two firms, A and B. Firm B has a higher proportion of fixed costs in relation to its variable costs than does Firm A, although total costs are the same in the two firms at a \$100,000 sales level. We previously showed that with a 10% increase in sales (from \$100,000 to \$ 110,000 in each firm), the net income of Firm B increases by 70% (from \$10,000 to \$17,000), whereas the net income of Firm A increases by only 40% (from \$10,000 to \$14,000). Thus, for a 10% increase in sales, Firm B experiences a much greater percentage increase in profits than does Firm A. The reason is that Firm B has greater operating leverage as a result of the greater amount of fixed cost in its cost structure.

The **degree of operating leverage** at a given level of sales is computed by the following formula.

$$\frac{\text{Contribution margin}}{\text{Net income}} = \text{Degree of operating leverage (DOL)}$$

The degree of operating leverage is a measure, at a given level of sales, of how a percentage change in sales volume will affect profits. to illustrate, the degree of operating leverage for the two firms at a Br. 100, 000 sales would be as follows:

$$\begin{aligned}\text{Firm A: } & \frac{\text{Br.40, 000}}{\text{Br.10, 000}}=4 \\ \text{Firm B: } & \frac{\text{Br.70, 000}}{\text{Br.10, 000}}=7\end{aligned}$$

These figures tell us that for a given percentage change in sales we can expect a change four times as great in the net income of Firm A and a change seven times as great in the net income of Firm B. Thus, if sales increase by 10% then we can expect the net income of Firm

A to increase by four times this amount, or by 40%, and the net income of Firm B to increase by seven times this amount, or by 70%.

The degree of operating leverage is greater at sales levels near the break-even point and decreases as sales and profits rise. This can be seen from the tabulation below, which shows the degree of operating leverage for Firm A at various sales levels. [Data used earlier for Firm A are shown under column (3)]

Sales	Br.75, 000	Br.80, 000	Br.100, 000	Br.150, 000	Br.225, 000	
Less variable expenses	<u>45, 000</u>	<u>48, 000</u>	<u>60, 000</u>	<u>90, 000</u>	<u>135, 000</u>	
Contribution margin(a)	30, 000		32, 000	40, 000	60, 000	90, 000
Less fixed expenses	<u>30,000</u>	<u>30, 000</u>	<u>30, 000</u>	<u>30, 000</u>	<u>30, 000</u>	<u>30, 000</u>
Net income (b) ...	<u>Br. -0-</u>	<u>Br.2, 000</u>	<u>Br. 10, 000</u>	<u>Br.30, 000</u>		
	<u>Br.60, 000</u>					
Degree of Operating leverage (a)÷(b)	∞	16	4	2	1.5	

Thus, a 10% increase in sales would increase profits by only 15%(10% x 1.5) if the company were operating at a Br. 225, 000 sales level, as computed to the 40% increase we computed earlier at the Br.100, 000 sales level. The degree of operating leverage will continue to decrease the farther the company moves from its break-even point. At the break-even point, the degree of operating leverage will be infinitely large ($\text{Br.30, 000 contribution margin} \div \text{Br.0 net income} = \infty$)

A manager can use the degree of operating leverage to quickly estimate what impact various percentage changes in sales will have on profits, without the necessity of preparing detailed income statements. As shown by our examples, the effect of operating leverage can be dramatic. If a company is fairly near its break-even point, then even small increase in sales can yield large increase in profits. This explains why management often works very hard for only a small increase in sales volume. If the degree of operating leverage is 5, then a 6% increase in sales would translate into a 30% increase in profits.

Activity 2

1. Identify the major simplifying assumption that underlies CVP analysis

.....

2. What is meant by the margin of safety?

.....

? MODEL QUESTIONS

1. What is meant by a product's CM-ratio?

-
2. Super sales company is the exclusive distributor for a new product. The product sells for Birr 60 per unit and has a CM ratio of 40%. The company's fixed expenses are Br. 360,000 per year.

Instructions:

- A. What are the variable expenses per unit?
 - B. Using the equation method:
 - i. What is the break-even point in units and sales birrs?
 - ii. What sales level in units and in sales birrs is required to earn an annual profit of Br. 90,000?
 - iii. Assume that through negotiation with the manufacturer the Super Sales Company is able to reduce its variable expenses by Br. 6 per unit. What is the company's new break-even point in units and in sales birrs?
 - C. Repeat (b) above using the contribution margin method.
3. Company A's cost structure includes costs that are mostly variable, whereas company B's cost structure includes costs that are mostly fixed. In a time of increasing sales, which company will tend to realize the most rapid increase in profits? Explain.
 4. What does the term sales mix mean? CVP analysis includes some inherent simplifying assumptions. What assumption is usually made concerning sales mix?
 5. Compute the number of units of product that must be sold if the company is to breakeven in each of the independent situations described below
 - a) The contribution margin per unit of the product sold is Br.1.45. The fixed costs for the year are Br. 551,000.
 - b) The contribution margin is 35% of the revenue, and the fixed costs are Br.84, 000 a year. Each unit of product sells for Br.16
 - c) The fixed costs amount to Br. 146, 000 a year. Each unit sold contributes Br 5.00 to a recovery of fixed costs and to profit.

- d) The variable costs to manufacture and sell a certain line of product amount to 60% of the revenue. The fixed costs for the year are Br. 218, 000, and each unit of product sells for Br.5.45.
- e) Two product lines are sold; Product A and Product B. Sales are in the fixed ratio of 3 units of Product A for every 2 units of Product B. The fixed costs are Br. 169, 000 a year. Product A is sold for Br. 5.00 a unit, and the variable costs identified with the production and sales of each unit Product A amount to Br.4.00. Product B is sold for Br.15.00 a unit, and the variable costs identified with the production and sale of each unit of Product B amount to Br.10.00.

6. Cost behavior relationship at two firms, A and B, are given below:

	Firm A	Firm B
Sales price	Br.0.30 per unit	Br.0.30 per unit
Variable cost	0.10	0.25
Total fixed cost	Br.14, 000	Br.2, 000

Expected sales volume at both companies are 80, 000 units per year.

Instructions:

- a) Compute the budgeted profit at the expected sales volume of 80, 000 units.
- b) Discuss the effect on profits if volume falls to 70, 000 units for both firms.
- c) Discuss the effect on profits if volume rise to 90, 000 units for both firms.
- d) Comment on the riskiness of the two cost structures.

1.9 SUMMARY

An understanding of CVP relationships is necessary for successful management of any enterprise. CVP analysis provides a sweeping overview of the effects on profit of all kinds of changes in sales volume, expenses, product mix, and sales prices. Calculation of sales volume required to break-even or earns a target net profit provides an organization's management with valuable information for planning and decision-making.

Cost-volume-profit relationships are important enough to operating managers that some firms prepare a contribution income statement. This income statement format separates fixed and variable expenses, and helps managers discern the effects on profit from changes in volume. The contribution income statement also discloses an organization's cost structure, which is

relatively proportion of its fixed and variable costs. An organization's cost structure has an important impact on its CVP relationships. The cost structure of an organization defines its operating leverage, which determines the impact on profit of changes in sales volume.

➔ 1.10. ANSWERS

1.10.1 Activity questions

Activity questions-I

1. A) there are three approaches to break-even analysis
 - d. Equation approach
 - e. Contribution approach
 - f. Graphic approach
2. No, contribution margin is the excess of sales over total variable costs.

Activity questions -II

1. There are several assumptions underlying the simplify form of CVP analysis. The major assumptions are as follows:
 - i. Expenses may be classified into variable and fixed categories.
 - ii. Costs and revenues are linear throughout the entire relevant range.
 - iii. Efficiency and productivity of machine and workers will be unchanged.
 - iv. In multi-product companies, the sales mix will be constant.
 - v. In manufacturing companies, inventories do not change.
 - vi. It ignores the time value of money.
2. Margin of safety is the excess of budgeted (or actual) sales over the break-even volume of sales.

1.10.2 Answer to Model questions

1. CM-ratio refers to the percentage of contribution margin in total sales.

2. a) CM – ratio = $\frac{P-V}{P}$

$$40\% = \frac{60 - V}{60}$$

$$24 = 60 - V$$

$$V = \underline{\text{Br. 36}}$$

- b) i) $NI = PQ - VQ - FC$

$$0 = Q(60 - 36) - 360,000$$

$$Q = 360,000$$

24

$Q = 15,000$ units or at Br. 60 per unit, Br.900, 000

Let "X" be break-even sales in birr

Net income = Sales – Variable expenses – fixed expenses

$$0 = X - 0.6X - 360,000$$

$$0.4X = 360,000$$

$$X = \text{Br. } 900,000$$

$$\text{CM-ratio} = 40\% \Rightarrow \text{Variable cost ratio} = 1 - 0.4 = 0.6$$

ii) $\text{NI} = \text{PQ} - \text{VQ} - \text{FC}$

$$90,000 = Q(60 - 36) - 360,000$$

$$24Q = 450,000$$

$$Q = 18,750 \text{ units or at Br. 60 per unit, Br. } 1,125,000.$$

Let "X" be sales volume to achieve a target profit of Br. 90,000

NI = Sales – Variable expenses – Fixed expenses

$$90,000 = X - 0.6X - 360,000$$

$$0.4X = 450,000$$

$$X = \text{Br. } 1,125,000$$

iii) Break even point (in units) will be computed as follows

$$0 = Q(60 - 30) - 360,000$$

$$30Q = 360,000$$

$$Q = 12,000 \text{ units (or Br. } 720,000)$$

c) i. $\text{BEP (in units)} = \frac{360,000}{60 - 36} = 15,000 \text{ units}$

$$\text{BEP (in birrs)} = \frac{360,000}{0.4} = \text{Br. } 900,000$$

ii. Target sales (in units) = $\frac{360,000 + 90,000}{60 - 36} = 18,750 \text{ units}$

$$\text{Target sales (in birrs)} = \frac{360,000 + 90,000}{0.4} = \text{Br. } 1,125,000$$

iii. $\text{BEP (in units)} = \frac{360,000}{60 - 30} = 12,000 \text{ units}$

$$\text{BEP (in birrs)} = \frac{360,000}{\frac{60 - 30}{60}} = \text{Br. } 720,000$$

3. Company B's cost structure is highly leveraged. In highly leveraged companies – those with high fixed costs and low variable costs – small changes in sales volume result in large changes in net income. Consequently, such a cost structure realizes the most rapid increase in profits in a time of increasing sales.

4. **Sales mix** is the relative combination in which a company's products are sold. Sales mix computed by expressing the sales of each product as a percentage of total sales. In CVP analysis for multi-product company, sales mix remains constant.

5. a) $\text{BEP} = \frac{551,000}{1.45} = 380,000 \text{ units}$

b) $\text{BEP} = \frac{84,000}{16 - 10.4} = 15,000 \text{ units}$

c) $\text{BEP} = \frac{146,000}{25} = 25,200 \text{ units}$

$$\begin{aligned} \text{d) BEP} &= \frac{218,000}{0.40} = \underline{\underline{\text{Br.545,000}}} \\ \text{BEP} &= \frac{545,000}{5.45} = \underline{\underline{100,000 \text{ units}}} \\ \text{e) BEP} &= \frac{169,000}{\frac{1(3) + 5(2)}{3+2}} = \underline{\underline{65,000 \text{ units}}} \end{aligned}$$

6.

Activity level	Net Income	
	Firm A	Firm B
70,000 units	Br.0	Br.1,500
80,000 units	2,000	2,000
90,000 units	4,000	2,500

As sales volume falls by 10,000 units below the target, you will have the following

- i) Percentage changes in sales volume for both firms equal to -12.5% (-0.125). The negative sign indicates that the actual sales were below the expectation.

$$\% \text{ Change in sales} = \frac{70,000 \text{ units} - 80,000 \text{ units}}{80,000 \text{ units}} = \underline{\underline{-0.125}}$$
- ii) Percentage change in net income
 ➤ For Firm A = $\frac{0 - \text{Br.2,000}}{\text{Br.2,000}} = \underline{\underline{-1(-100%)}}$
 ➤ For Firm B = $\frac{\text{Br.1,500} - \text{Br.2,000}}{\text{Br.2,000}} = \underline{\underline{-0.25(-25%)}}$

As shown here above, when sales fall below 80,000 units, profit drop must sharply for the highly leveraged business.

When actual sales volume equals 90,000 units instead of the expected 80,000 units, you will have the following

- iii) Percentage changes in sales volume for both firms equal to 12.5% (0.125). The actual sales were above the expectation.

$$\% \text{ Change in sales} = \frac{90,000 \text{ units} - 80,000 \text{ units}}{80,000 \text{ units}} = \underline{\underline{0.125}}$$
- iv) Percentage change in net income
 ➤ For Firm A = $\frac{\text{Br.4,000} - \text{Br.2,000}}{\text{Br.2,000}} = \underline{\underline{1(100%)}}$
 ➤ For Firm B = $\frac{\text{Br.2,500} - \text{Br.2,000}}{\text{Br.2,000}} = \underline{\underline{0.25(25%)}}$

Based on the above analysis, you can see that if sales exceed 80,000 units, profit increases sharply for the highly leverage business. In brief, highly leveraged cost structure provides highest possible net income and the highest possible loss. Thus, such cost structure is generally more risky. Less leverage businesses are this much affected by changes in sales volume.

CHAPTER TWO

MASTER BUDGET

Contents

- 2.0. Aim and Objectives
- 2.1. Introduction
- 2.2. The Fundamentals of Budgeting
- 2.3. Principal Advantages of Budgeting
- 2.4. Budgeting and Human Behavior
- 2.5. The Master Budget-A Network of Interrelationships
 - 2.5.1 Components of Master Budget
 - 2.5.2 Preparing the Master Budget
- 2.6. Summary
- 2.7. Answers to Check Your Progress Questions

2.0. AIM AND OBJECTIVES

Upon completing this chapter, you should be able to:

- ✓ explain the fundamental elements of budget
- ✓ enumerate the principal advantages of budgeting
- ✓ understand the difficulty of sales forecasting
- ✓ diagram and explain the master budget interrelationships
- ✓ follow the principal steps in preparing a master budget
- ✓ prepare the operating budget and the supporting schedules
- ✓ prepare the financial budget
- ✓ Anticipate possible human relations problem caused by budgets.

2.1. INTRODUCTION

☞ What is a master budget? _____

Like many accounting terms, budgeting is used commonly in our everyday language. The news media discuss budgets of federal and state governments, and many people describe a variety of resource allocation decisions, ranging from vacation planning to the purchase of food and clothing, as budgeting. The purpose of this chapter is to introduce the framework for the budgeting process, define budgeting terms, enumerate the principal advantages of

budgeting, explain the concepts of responsibility accounting and participatory budgeting and provide a clear understanding of the concepts of budgeting. Although the primary emphasis in this chapter is on business budgeting, most of the concepts are also applicable to non-business activities.

2.2. THE FUNDAMENTALS OF BUDGETING

A budget is a comprehensive formal management plans expressed in quantitative terms, describing the expected operations of an organization over some future time period. *A budget deals with a specific entity, covers a specific future time period and is expressed in quantitative terms.*

Budget entity .The entity concept, so important in financial accounting, is essential to budgeting also. A specific budget must apply to a clearly defined accounting entity. For budgeting purpose the entity may consist of a small part of a business, a single activity, or a specific project. The concept of a budget entity applies to individuals as well. For example, a student interested in budgeting the cost of a first year's college education should not include in the budget the cost of three weeks vacation or the purchase of a Br. 5800 guitar. Although these two expenditures may be cost of the period, they are not college education expenses.

A budget entity can be as specific as a single project such as Addisalem's Langano trip or it can be a broad activity, such as the budget for an entire manufacturing firm, or for the Ethiopian government.

Future time period. Many financial figures are meaningless unless they are couched in some time references. For example, income statements are annual, quarterly, or monthly. A job offer of Br. 40,000 is of little value without knowing if the figure represents pay for a month, a year, a lifetime, or some other time period. We might assume the Br. 40,000 is annual salary. In accounting, however, time reference should be clearly stated.

Budgets should express the expected financial consequences of programs and activities planned for a specific period of time. Annual budget are widespread. In addition to annual budgets, budgets for many other time periods are prepared. The planning horizon for budgeting may vary from one day to many years. For example, master budget usually cover 1 month to 1year where as long-range plan are prepared for 2 to 10 years.

In planning for profits, managers must consider two time horizons: the short term and the long term.

Short-term planning is the process of deciding what objectives to pursue during a short, near-future period, usually one year, and what to do to achieve those objectives. The typical short-term budget covers one year and is broken down into monthly or quarterly units.

Another method frequently used to prepare a short-term budget is the ***continuous budget***. This kind of budget starts with an annual budget broken down into 12 monthly units. As each month arrives, it is dropped from the plan and replaced by a new month so that at any given time, the next 12 months are always shown. Thus, in a budgetary period covering January through December 20X4, when January 20x4 arrives, it would be dropped from the plan and replaced by January 20x5, thus creating a new budgetary period covering February 20x4 through January 20x5. Using this technique, a firm always has guidance for the full following year. When a continuous budget is not used, a firm will have guidance for only a month or two as it approaches the end of its budgetary period.

Long-term planning, also known as ***strategic planning***, is the process of setting long-term goals and determining the means to attain them. Short-term planning is concerned with operating details for the next accounting period, but long-term planning addresses broad issues, such as new product development, plant and equipment replacement, and other matters that require years of advance planning. For example, short-term planning in the automotive industry would be concerned with which and how many of the current year's models to manufacture, while long-range planning would focus on new model development and major changes, as well as equipment replacements and modifications. The time frame for long-range planning may extend as far as 20 years in the future, but its usual range is from 2 to 10 years. An important part of long-term planning is the preparation of ***the capital budget***, which details plans for the acquisition and replacement of major portions of property, plant, and equipment.

Quantitative plan. Often budgets contain materials describing the various programs and activities planned by the company. This chapter focuses primarily in the way that cost and revenue estimates of the activities are expressed by the budget. All planned projects or activities for the organization are reduced to the common denominator of money and other quantitative measures, such as units of input or output.

2.3. PRINCIPAL ADVANTAGES OF BUDGETING

As noted earlier, **a budget** is a detailed plan expressed in quantitative terms that specifies how resources will be acquired and used during a specific period of time. The act of preparing a budget is known as **budgeting**. The use of budgets to control a firm's activities is called **budgetary control**.

Companies realize **many benefits** from a budgeting program. Among these benefits are the following:

- Requires periodic planning.
- Fosters coordination, cooperation, and communication.
- Provides a framework for performance evaluation.
- Means of allocating resources.
- Satisfies legal and contractual requirements.
- Created an awareness of business costs.

Periodic Planning (Formalization of Planning). The most obvious purpose of a budget is to quantify a plan of action. The development of a quarterly budget for a Sheraton Hotel, for example, forces the hotel manager, the reservation manager, and the food and beverage manager to plan for the staffing and supplies needed to meet anticipated demand for the hotel's services.

To sum up, budgets forces managers to think a head to anticipate and prepare for the changing conditions. The budgeting process makes planning an explicit management responsibility.

Coordination, Cooperation and Communication. Planning by individual managers does not ensure an optimum plan for the entire organization. Therefore, any organization to be effective, each manager throughout the organization must be aware of the plans made by other managers. In order to plan reservations and ticket sales effectively, the reservation manager for Ethiopian Air Lines must know the flight schedules developed by the airline's route manager. The budget process pulls together the plans of each manager in an organization.

In a nutshell, a good budget process communicates both from the top down and from the bottom up. Top management makes clear the goals and objectives of the organization in its budgetary directives to middle and lower level managers, and also to all employees.

Employees and lower level managers inform top-level managers how they can plan to achieve the objectives.

Performance Evaluation or Framework for Judging Performance. Budgets are estimates of future events, and as such they serve as estimates of acceptable performance. Comparing actual result against budgeted results helps managers to evaluate the performance of individuals, departments, or entire companies.

Budgets are generally a better basis for judging actual results than is past performance. The major drawback of using historical results for judging current performance is that inefficiencies may be concealed in the past performance.

Means of Allocating Resources. Because we live in a world of limited resources, virtually all individuals and organizations must ration their resources. The rationing process is easier for some than for other. Each person and each organization must compare the costs and benefits of each potential project or activity and choose those that result in the most appropriate resource allocation decision.

Generally, organizations resources are limited, and budgets provide one means of allocating resources among competing uses. The city of Addis Ababa, for example, must allocate its revenue among basic life services (such as police and fire protection), maintenance of property and equipment (such as city streets, parks and vehicles) and other community services (such as programs to prevent alcohol and drug abuse).

Legal and Contractual Requirements. Some organizations are required to budget because of legal requirements. Others commit themselves to budgeting requirement when signing loan agreements or other operating agreements. For example, a bank may require a firm to submit an annual operating budget and monthly cash budget throughout the life of a bank loan. Local police department, for example, would be out of funds if the department decided not to submit a budget this year.

Cost Awareness. Accountants and financial managers are concerned daily about the cost implications of decisions and activities, but many other managers are not. Production managers focus on input, marketing manager's focuses on sales, and so forth. It is easy for people to overlook costs and cost-benefit relationships. At budgeting time, however, all managers with budget responsibility must convert their plans for projects and activities to

costs and benefits. This cost awareness provides a common ground for communication among the various functional areas of the organization.

2.4. BUDGETING AND HUMAN BEHAVIOR

If budgets are to benefit an organization, they need the support all the firm's employees. Lower –level workers and managers' attitudes toward budgets will be heavily influenced by the attitude of top management. Even with the support of top management, however, budgets –and the managers who implements them –can run into opposition.

Budgeting necessarily entails behavioral problems. These problems include the following: conflicting views, imposed budgets, budgets as checkup devices, and unwise adherence to budgets.

Conflicts. The problem of conflicts in budgeting can be illustrated by considering a matter of importance to almost any firm-inventory policy. The sales manager of a retail firm wants inventory to be as high as possible because it is easier to make sales if the goods are available to the customer immediately. For the same reason, the sales manager in a manufacturing firm also wants inventory immediately ready for delivery. A financial manager wants low inventories because of the costs associated with having inventory (storage, insurance, taxes, interest, and so on). In a manufacturing firm, the production manager is not interested in inventory per se, but in steady production, no interruptions for rush orders, no unplanned overtime, and other conditions that minimize production costs. Thus, three managers have different view on the desirable level of inventory. They will be evaluated by reference to how well they do their job, so each has an interest in the firm's inventory policy. In a conventional manufacturing environment, the conflict is resolved with great difficulty, if at all and the managerial accountant might be called in to help determine the best inventory level for the firm.

Imposed Budgets. Significant problems can result from the imposition of unachievable budgets. Managers can become discouraged and feel no commitment to meeting budgeted goals. Or perhaps they will take actions that seem to help achieve goals (such as scrimping on preventive maintenance to achieve lower costs in the short run) but are really harmful in the long run (when machinery breaks down and production must be halted altogether).

Budgets as “Checkup” Devices. Behavioral problems do not arise solely because of the procedure followed for developing budget allowances. Comparisons of budgeted and actual result and subsequent evaluation of performance also introduce difficulties. In ideal circumstances managers use actual results to evaluate their own performance, to evaluate the performance of other, and to correct elements of operations that seem to be out of control. The budget serves as a feedback device, it lets managers know the result of their actions. Having seen that something is wrong, they can take steps to correct it.

Unfortunately, budgets are often used more for checking up on manager; that is, the feedback function is ignored. Where this is the case, managers are constantly looking over their shoulders and trying to think of ways to explain unfavorable results. The time spent on thinking of ways to defend the results could be more profitably used to plan and control operations. Some evaluation of performance is necessary, but the budget ought not to be perceived as a club to be held over the heads of managers.

Unwise Adherence to Budgets. As noted earlier, the budgets set limits on cost incurrence, allowances beyond which managers are not expected to go. However, if managers’ view budgeted amounts as strict limits on spending, they may spend either too little or too much. For example, there are times when exceeding the budget benefits the firm. Suppose a sales manager believes that a visit to several important customers or potential customers will result in greatly increased sales. The sales manager will be reluctant to authorize the visit if it will result in exceeding the travel budget.

At the other extreme, a manager who has kept costs well under budget might be tempted to spend frivolously so that expenditures will reach the budgeted level. The manager may fear that the budget for the following year will be cut because of the lower costs for the current year, the manager might take an undesirable action-authorize an unnecessary trip-in order to protect personal interests.

2.5. THE MASTER BUDGET-A NETWORK OF INTERRELATIONSHIPS

2.5.1 Components of Master Budget

The **master budget** is the total budget package for an organization; it is the end product that consists of all the individual budgets for each part of the organization aggregated into one overall budget for the entire organization.

The two major components of master budget are the **operating budget** and the **financial budget**.

Operating budget. It focuses on income statement and its supporting schedules. It is also called **profit plan**. However, such budget may show a budgeted loss, or can be used to budget expenses in an organization or agency with no sales revenues.

Financial budget. It focuses on the effects that the operating budget and other plans will have on cash.

The usual master budget for a non-manufacturing company has the following components.

1. Operating budget includes: 2. Financial budget include:

- | | |
|------------------------------|-------------------------------------|
| a. Sales budget | a. Capital budget |
| b. Purchases budget | b. Cash budget |
| c. Cost of goods sold budget | c. Budgeted balance sheets |
| d. Operating expense budget | d. Budgeted statement of cash flows |

In addition to the master budget there are countless forms of special budgets and related reports. For example, a report might detail goals and objectives for improvements in quality or customer satisfaction during the budget period.

Exhibit 2-1 Preparation of Master Budget (Non manufacturing Company)

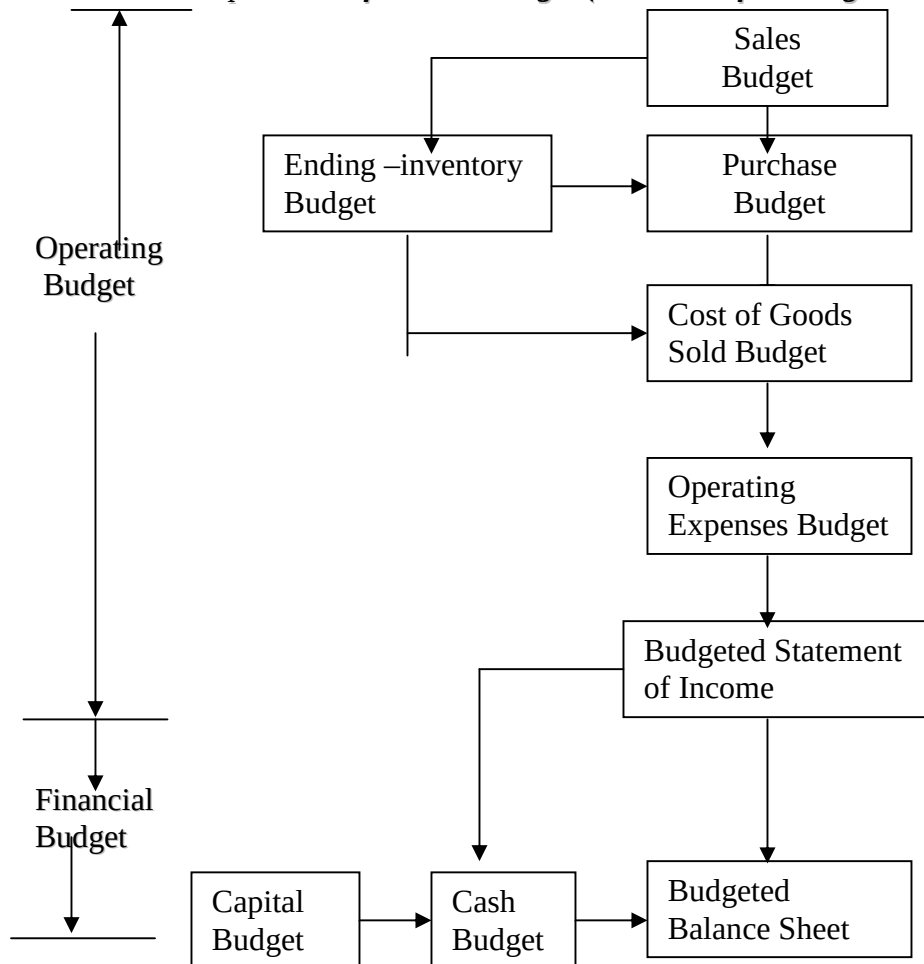


Exhibit 2-1 above show graphically the follow of process in development of the master budget for a non-manufacturing firm. The master budget example that follows should clarify the steps required to prepare the budget package. After studying the entire example, return to Exhibit 6-1 and follow the example through the flow diagram.

OPERATING BUDGET

The operating budget is composed of the income statement elements. A manufacturing business budgets both manufacturing and non-manufacturing activities. Below the various elements of the operating budget of a manufacturing firm have been discussed.

Sales Budget: The sales budget is the first budget to be prepared. It is usually the most important budget because so many other budgets are directly related to sales and are therefore largely derived from the sales budget. Inventory budgets, purchases budgets, personnel budgets, marketing budgets, administrative budgets, and other budget areas are all affected significantly by the amount of revenue that is expected from sales.

Sales budgets are influenced by a wide variety of factors, including general economic conditions, pricing decisions, competitor actions, industry conditions, and marketing programs. In an effort to develop an accurate sales budget, firms employ many experts to assist in sales forecasting.

The sales budget is usually based on a sales forecast. A sales forecast is a prediction of sales under a given conditions. The objective in forecasting sales is to estimate the volume of sales for the period based on all the factors, both internal and external to the business that could potentially affect the level of sales. The projected level of sales is then combined with estimated of selling prices to form the sales budget.

Sales forecasts are usually prepared under the direction of the top sales executive. Important factors considered by sales forecasters include:

- a) Past patterns of sales:** Past experience combined with detailed past sales by product line, geographical region, and type of customer can help predict future sales.
- b) Estimates made by the sales force:** A company's sales force is often the best source of information about the desires and plans of customers.
- c) General economic conditions:** Predictions for many economic indicators, such as gross domestic product and industrial production indexes (local and foreign), are published regularly. Knowledge of how sales relate to these indicators can aid sales forecasting.

d) Competitive actions: Sales depend on the strength and actions of competitors. To forecast sales, a company should consider the likely strategies and reactions of competitors, such as changes in their prices, products, or services.

f) Changes in the firm's prices: Sales can be increased by decreasing prices and vice versa. Planned changes in prices should consider effects on customer demand.

f) Changes in product mix: Changing the mix of products often can affect not only sales levels but also overall contribution margin. Identifying the most profitable products and devising methods to increase sales is a key part of successful management.

g) Market research studies: Some companies hire market experts to gather information about market conditions and customer preferences. Such information is useful to managers making sales forecasts and product mix decisions.

h) Advertising and sales promotion plans: Advertising and other promotional costs affect sales levels. A sales forecast should be based on anticipated effects of promotional activities.

Purchases Budget: After sales are budgeted, prepare the purchases budget. The total merchandise needed will be the sum of the desired ending inventory plus the amount needed to fulfill budgeted sales demand. The total need will be partially met by the beginning inventory; the remainder must come from planned purchases.

These purchases are computed as follows:

$$\begin{array}{rclcl} \text{Budgeted} & \text{Desired} & \text{Cost of} & \text{Beginning} & \\ \text{Purchases} & = & \text{Ending inventory} & + & \text{Goods Sold} & - & \text{Inventory} \end{array}$$

Budgeted cost of goods sold: For a manufacturing firm cost of goods sold is the production cost of products that are sold. Consequently, the cost of goods sold budget follows directly from the production budget. However, a merchandising firm has no production budget. The cost of goods sold budget comes directly from merchandise inventory and the merchandise purchases budget.

Operating Expense Budget: The budgeting of operating expenses depends on various factors. Month – to – month fluctuation in sales volume and other cost-drivers activities directly influence many operating expenses. Examples of expenses driven by sales volume include sales commissions and many delivery expenses. Other expenses are not influenced by sales or other cost-driver activity (such as rent, insurance, depreciation, and salaries) within appropriate relevant ranges and are regarded as fixed.

Budgeted Income Statement: The budgeted income statement is the combination of all of the preceding budgets. This budget shows the expected revenues and expenses from operations during the budget period.

A firm may have budgeted **non-operating items** such as interest on investments or gain or loss on the sale of fixed assets. Usually they are relatively small, although in large firms the birr amounts can be sizable. If non-operating items are expected, they should be included in the firm's budgeted income statement. Income taxes are levied on actual, not budgeted, net income, but the budget plan should include expected taxes; therefore, the last figure in the budgeted income statement is budgeted after tax net income.

FINANCIAL BUDGET

The second major part of the master budget is the financial budget, which consists of the capital budget, cash budget, ending balance sheet and the statement of changes in financial position. Although there are some differences in operating budgets of manufacturing, merchandising and service firms, very little difference exists among financial budgets of these entities.

Capital expenditure budget: Capital budgeting is the planning of investments in major resources like plant and equipment, and other types of long-term projects, such as employee education programs. The **capital expenditure budget or capital budget** describes the capital investment plans for an organization for the budget period. It contains some of the most critical budgeting decisions of the organizations.

Cash budget: The **cash budget** is a statement of planned cash receipts and disbursements. The cash budget is composed of four major sections:

- i. **The receipts section:** It consists of a listing of all of the cash inflows, except for financing, expected during the budget period. Generally the major source of receipts will be from sales.
- ii. **The disbursement section:** It consist of all cash payments that are planned for the budget period. These payments will include inventory purchases, wages and salary payments and so on. In addition, other cash disbursements such as equipment purchases, dividends, and other cash withdrawals by owners are listed.
- iii. **The cash excess or deficiency section:** The cash excess or deficiency section is computed as follows:

Cash balance, beginning	x x x
Add receipts	<u>x x x</u>
Total cash available before financing	x x x
Less disbursements	<u>x x x</u>
Excess (deficiency) of cash available over disbursements	<u><u>x x x</u></u>

If there is a cash deficiency during any budget period, the company will need to borrow funds. If there is cash excess during any budget period, funds borrowed in previous periods can be repaid or the idle funds can be placed in short-term or other investments.

- iv. **The financing section:** This section provides a detail account of the borrowing and repayments projected to take place during the budget period. It also includes a detail of interest payments that will be due on money borrowed.

Budgeted Balance Sheet: The budgeted balance sheet, sometimes called the ***budgeted statement of financial position***, is derived from the budgeted balance sheet at the beginning of the budget period and the expected changes in the account balance reflected in the operating budget, capital budget, and cash budget.

Budgeted Statement of Changes in Financial Position: The final element of the master budget package is the statement of changes in financial position. It has emerged as a useful tool for managers in the financial planning process. This statement is usually prepared from data in the budgeted income statement and changes between the estimated balance sheet at the beginning of the budget period and the budgeted balance sheet at the end of the budget period.

Activity question -I

- 1 What are the subunits of a master budget?

.....

2.5.2. Preparing the Master Budget

The master budget is a network consisting of many separate but interdependent budgets. This network is illustrated in Exhibit 6-1. The master budget can be a large document even for a small organization. The simple example that follows on the next page for Blue Nile Company's give some indication of the potential size and complexity of the master budget of a business. The example illustrates a ***fixed or static budget*** prepared for a single expected

level of activity. Flexible budgeting that involves various activity levels will be discussed later in the next unit.

Example 1:Blue Nile Company's newly hired accountant has persuaded management to prepare a master budget to aid financial and operating decisions. The planning horizon is only three months, January to March. Sales in December (20x3) were Br. 40, 000. Monthly sales for the first four months of the next year (20x4) are forecasted as follows:

January	Br. 50, 000
February	80, 000
March	60, 000
April	50, 000

Normally 60% of sales are on cash and the remainders are credit sales. All credit sales are collected in the month following the sales. Uncollectible accounts are negligible and are to be ignored.

Because deliveries from suppliers and customer demand are uncertain, at the end of any month Blue Nile wants to have a basic inventory of Br. 20, 000 plus 80% of the expected cost of goods to be sold in the following month. The cost of merchandise sold averages 70%of sales. The purchase terms available to the company are net 30 days. Each month's purchase are paid as follows:

50% during the month of purchase and,
50% during the month following the purchases.

Monthly expenses are:

Wages and commissions.....Br. 2, 500 + 15%of sales, paid as incurred.
Rent expense.....Br. 2, 000 paid as incurred.
Insurance expense.....Br.200 expiration per month.
Depreciation including truck.....Br.500 per month
Miscellaneous expense.....5% of sales, paid as incurred.

In January, a used truck will be purchased for Br. 3, 000 cash. The company wants a minimum cash balance of Br. 10, 000 at the end of each month. Blue Nile can borrow cash or repay loans in multiples of Br. 1, 000. Management plans to borrow cash more than necessary and to repay as promptly as possible. Assume that the borrowing takes place at the beginning, and repayment at the end of the months in question. Interest is paid when the related loan is repaid. The interest rate is 18% per annum. The closing balance sheet for the fiscal year just ended at December 31, 20x3, is:

Blue Nile Company
Balance Sheet
December 31, 20x3

ASSETS

Current assets:

Cash	Br. 10, 000	
Account receivable	16,000	
Merchandise inventory	48, 000	
Unexpired insurance	<u>1, 800</u>	Br.75, 800

Plant assets:

Equipment, fixture and other	Br.37, 000	
Accumulated depreciation	<u>12, 800</u>	<u>24, 200</u>

Total assets

Br.100, 000

LIABILITIES AND OWNERS' EQUITY

Liabilities:

Accounts payable	Br.16, 800	
Accrued wages and commissions payable	<u>4, 250</u>	Br.21, 050

Capital:

Owners' equity		<u>78, 950</u>
----------------	--	----------------

Total liabilities and owners' equity

Br.100, 000

Instructions:

1) Using the data given above, prepare the following detailed schedules for the first quarter of the year:

- a) Sales budget
- b) Cash collection budget
- c) Purchase budget
- d) Disbursement for purchases
- e) Operating expenses budget
- f) Disbursement for operating expenses

2) Using the budget data given above and the schedules you have prepared, construct the following pro forma financial statements

- a. Income statement for the first quarter of the year.
- b. Cash budget including receipts, payments, and effect of financing
- c. Balance sheet at March 31, 20x3.

STEPS IN PREPARATION OF MASTER BUDGET

1. a) Sales budget

	December*	January	February	March	Jan.-Mar. Total
Cash sales (40%)	Br.24, 000	Br.30, 000	Br.48, 000	Br.36, 000	Br.114, 000
Credit sales (60%)	<u>16, 000</u>	<u>20, 000</u>	<u>32, 000</u>	<u>24,000</u>	<u>76, 000</u>
Totals	Br. <u>40, 000</u>	Br. <u>50, 000</u>	Br. <u>80, 000</u>	Br. <u>60, 000</u>	Br. <u>190, 000</u>

*December sales are included in the schedule (a) because they affect cash collected in January.

b) Cash collection budget

	January	February	March
Cash sales of the month	Br.30, 000	Br.48, 000	Br.36, 000
Credit sales of last month	<u>16, 000</u>	<u>20, 000</u>	32, 000
Total cash collected	Br. <u>46, 000</u>	Br. <u>68, 000</u>	Br. <u>68, 000</u>

c) Purchase budget

	January	February	March	Jan.-Mar
Required ending inventory	Br.64, 800	Br.53, 600	Br.48, 000	
Cost of goods sold	<u>35, 000</u>	<u>56, 000</u>	<u>42, 000</u>	Br.133, 000
Total needed	Br.99, 800	Br.109, 600	Br.90, 000	
Beginning inventory	<u>48, 000</u>	<u>64, 800</u>	<u>53, 600</u>	
Purchases budget	Br. <u>51, 800</u>	Br. <u>44, 800</u>	Br. <u>36, 400</u>	

d) Disbursement for purchases

	January	February	March
50% of last month's purchase	Br.16, 800	Br.25, 900	Br.22, 400
50% of current month's purchase	<u>25, 900</u>	22, 400	<u>18, 200</u>
Total disbursement for purchase	Br. <u>42, 700</u>	Br. <u>48, 300</u>	Br. <u>40, 600</u>

e) Operating expense budget

	January	February	March	Jan.-Mar.
Wages and commissions	Br.10, 000	Br.14, 500	Br.11, 500	Br.36, 000
Rent expense	2, 000	2, 000	2, 000	6, 000
Insurance expense	200	200	200	600
Depreciation expense	500	500	500	1, 500
Miscellaneous expense	<u>2, 500</u>	<u>4, 000</u>	<u>3, 000</u>	<u>9, 500</u>
Total	Br. <u>15, 200</u>	Br. <u>21, 200</u>	Br. <u>17, 200</u>	Br. <u>53, 600</u>

Disbursement for operating expenses budget

	January	February	March
Wages and commissions	Br.14, 250	Br.14, 500	Br.11, 500
Rent expense	2, 000	2, 000	2, 000
Miscellaneous expense	<u>2, 500</u>	<u>4, 000</u>	3, 000
Total	Br. <u>18, 750</u>	Br. <u>20, 500</u>	Br. <u>16, 500</u>

2. a) Budget income statement

Blue Nile Company Budget Income Statement For the Quarter Ended, March 31, 20x3		
Sales (schedule 1(a))		Br.190, 000
Cost of goods sold (schedule 1(c))		
Gross profit		
Operating expenses		
Wages and commissions	Br.36, 000	
Rent expense	6, 000	
Insurance expense	1, 500	
Depreciation expense	600	
Miscellaneous expense	<u>9, 500</u>	<u>53, 600</u>
Operating income		3, 400
Interest expense*		<u>885</u>
Net income		<u>2, 515</u>

***Interest expense computation**

Paid interest = $11,000 \times 3/12 =$ 495

Accrued amount:

On the first batch borrowing:

$8,000 \times 0.18 \times 3/12 =$ 360

On the second batch borrowing:

$1,000 \times 0.18 \times 2/12 =$ 30

Total interest expense incurred **Br.885**

b) Cash budget including receipts, payments and effects of financing

	January	February	March
Beginning balance	Br.10, 000	Br.10, 550	Br.10, 750
Collections (Schedule1 (b))	<u>46, 000</u>	<u>68, 000</u>	<u>68, 000</u>
Cash available for the use (x)	<u>Br.56, 000</u>	<u>Br.78, 550</u>	<u>Br.78, 750</u>
Cash disbursements for:			
Purchases (Schedule 1(d))	42, 700	48, 300	40, 600
Operating expenses (Schedule1 (f))	18, 750	20, 500	16, 500
Truck purchases	<u>3, 000</u>	-	-
Total disbursement (y)	Br.64, 450	Br.68, 800	Br.57, 100
Minimum cash balance required	<u>10, 000</u>	<u>10, 000</u>	<u>10, 000</u>
Total cash needed	<u>Br.74, 450</u>	<u>Br.78, 800</u>	<u>Br.67, 100</u>
Cash excess (deficiency)	<u>Br.(18, 450)</u>	<u>Br.(250)</u>	Br.11, 650
Effects of financing			
Borrowing	19, 000	1, 000	-
Payment of the principal	-	-	(11, 000)
Payment of interest	-	-	(495)
Net effect of financing (z)	<u>Br.19, 000</u>	<u>Br.1, 000</u>	<u>Br.(11, 495)</u>
End cash balance (x+z-y)	<u>Br.10, 550</u>	<u>Br.10, 750</u>	<u>Br.10, 155</u>

c) Budgeted balance sheet

Blue Nile Company			
Budgeted Balance Sheet			
March 31, 20x3			
ASSETS			
Current assets			
Cash	Br. 10, 155		
Accounts receivable	24, 000		
Merchandise inventory	48, 000		
Unexpired insurance	<u>1, 200</u>	Br. 83, 355	
Plant assets			
Equipment, Fixture and others	40, 000		
Accumulated depreciation	<u>14, 300</u>		<u>25, 700</u>
Total assets			Br. <u>109, 055</u>
LIABILITIES AND OWNER'S EQUITY			
Liabilities			
Accounts payable	Br.18, 200		
Loan payable	9, 000		
Interest payable	<u>390</u>		
Total liabilities		Br.27, 590	
Capital			
Beginning owners' equity	Br.78, 950		
Net income	2, 515		
Ending capital balance			<u>81, 465</u>
Total equities			Br.<u>109, 055</u>

Activity question -II

1. What is sales forecasting?

.....
.....

2. What factors influence the sales forecast?

.....
.....

? MODEL QUESTIONS

1. Which is a better basis for judging actual results, budgeted performance of past performance? Why?
2. Why is the sales budget the starting point for master budget?
3. What purpose does a budgeted income statement serve?
4. “The principal purpose of the cash budget is to see how much cash the company will have in the bank at the end of the year.” Do you agree? Explain.

2.6. SUMMARY

The budget is a key tool for planning, control, and decision making in virtually every organization. Budgeting systems are used to forcing planning, to facilitate communication and coordination, to allocate resources, to control profit and operations, to evaluate performance and provide incentives. Various types of budgets are used to accomplish these objectives.

The comprehensive set of budgets that covers all phases of an organization's operations is called a master budget. The first step in preparing a master budget is to forecast sales of the organization's services or goods. Based on the sales forecast, operational budgets are prepared to plan production of services or goods and to outline the acquisition and use of material, labor, and other resources. Finally, a set of budgeted financial statements is prepared to show what the organization's overall financial condition will be if planned operations are carried out.

Since budgets affect almost everyone in the organization, they can have significant behavioral implications and can raise difficult ethical issues. One common problem in budgeting is the tendency of people to pad budgets. The resulting budgetary slack makes the budget less useful because the padded budget does not represent an accurate picture of expected revenue and expenses.

Participative budgeting is the process of allowing employees throughout the organization to have a significant role in developing the budget. Participative budgeting can result in greater commitment to meet the budget by those who participated in the process.

➔ 2.7 ANSWERS

2.7.1 Pre –test

1. Master budget is a company's overall financial plan for the coming year or other planning period, which usually includes an operating budget, a cash budget, and projected financial statements.

2.7.2 Activity Questions

Activity -I

1. The subunits (components) of the master budget may be classified as operating and financial budget.

➤ The operating budget

- a. Sales budget
- b. Purchase budget
- c. Operating expense budget
 - i. Marketing expense budget
 - ii. Administrative expense budget

d. Budgeted income statement

➤ The financial budget

- a. Capital budget
- b. Cash budget
- c. Budgeted balance sheet
- d. Budgeted statement of cash flow

Activity -II

1. Sales forecast refers to a formal prediction of the quantities expected to be sold in the coming year based on such factors as past sales, economic and seasonal conditions, pricing policies, and market research studies.

2. Factors that are considered in making a sales forecast include the following

- a) The company's past sales volume
- b) Unfilled back orders
- c) The company's pricing policy for the budget period
- d) The company's marketing plans for the budget period
- e) The company's market share

- f) Economic conditions in the industry, including expected industry sales and competitive conditions in the industry
- g) General economic conditions, including interest rates and expected increases in disposal income, gross national product, employment and prices.

2.7.3 Model questions

1. Budgeted goals and performance are generally a better basis for judging actual results than is past performance. The major drawback of using historical results for judging current performance is that inefficiencies may be concealed in the past's performance. Changes in economic conditions, technology, personnel, competition, and so forth also limit the usefulness of comparisons with the past.
2. The sales budget is the starting point in preparing the master budget because nearly all other items in the master budget, including production, purchases, inventories, and expenses depend on it in some way
3. A budgeted income statement is extremely important because it indicates how profitable the firm is expected to be. Each segment of the operating budget enhances planning and control, but it is the budgeted income statement that informs managers, in advance, whether the firm's operations for the coming year are expected to be profitable and how much the profit or loss is expected to be profitable and how much the profit or less is expected to be. If the projected operations are not satisfactory to management, altered strategies may be adopted to try to improve the results. Without budgeted income statement, managers would discover unsatisfactory results after they had occurred, when it would be too late to make necessary adjustments. In addition, managers can compare the budgeted income statement to the actual income statement to determine if significant variances exist and whether corrective action is warranted.
4. The preparation of cash budget enables a firm to plan and time such discretionary payouts as dividend payments and equipment purchases. It also facilitates the arrangement of financing activities, such as bank borrowing, well in advance of actual need, thus avoiding the costs and inefficiencies of crisis financing

CHAPTER THREE

FLEXIBLE BUDGETS

Contents

3.0	Aims and Objectives	
3.1		Introduction
3.2		Master Budget Versus Flexible Budget
3.3		Flexible Budget
3.3.1	Distinguishing Features of Flexible Budget	
3.3.2	Flexible Budgeting Process	
3.4		Summary
3.5		Answers to Check Your Progress Questions

3.0. AIMS AND OBJECTIVES.

Upon completing this unit, you should be able to:

- ✚ Distinguish between flexible budgets and master (static) budget
- ✚ Use flexible-budget formulas to construct a flexible budget based on the volume of sales
- ✚ Understand the performance evaluation relationship between master (static) budgets and flexible budgets
- ✚ Compute flexible-budget variance and sales activity variance.

3.1 INTRODUCTION

☞ What is flexible budget? _____

As we have seen in Unit 2, formal budgeting procedures result in comprehensive operational and financial plans for future periods. These budgets guide managers and employees as they make their daily decisions and as they try to anticipate future problems and opportunities.

3.2. MASTER BUDGET VERSUS FLEXIBLE BUDGET

All master budgets discussed in the previous unit are **static** or **inflexible** because they assume fixed level of activity. A master budget or static budget is prepared for only one activity level (for example one volume of sales activity).

This unit introduces flexible budgets, which are budgets designed to direct management to areas of actual financial performance that desire attention. Managers can apply this same basic process to control important areas of performance such as quality or customer service.

Example (1): Evergreen Company prepares a budget based on detailed expectation for the forthcoming month. Evergreen Company's plan tailored to a single sales level, i.e., 9,000 units. However, sales volume units turned out to be only 7, 000 units instead of the original 9, 000 units. Compute the master budget variance for each item given below.

Exhibit 3-1 Evergreen Company Performance Report

<i>Particulars</i>	<i>Actual</i>	<i>Master Budget</i>	<i>Master Budget Variances</i>
Units	<u>7,000 units</u>	<u>9,000 units</u>	<u>2,000 units U</u>
Sales	<u>Br. 217,000</u>	<u>Br. 279,000</u>	<u>Br. 62,000 U</u>
Variable Expenses			
* Manufacturing	Br. 151,270	Br. 189,000	Br. 37,730 F
* Selling	5,000	5,400	400 F
* Administrative	<u>2,000</u>	<u>1,800</u>	<u>200 U</u>
Total Variable Expense	<u>Br. 158,270</u>	<u>Br. 196,200</u>	<u>Br. 37,930 F</u>
Contribution Margin	<u>Br. 58,730</u>	<u>Br. 82,800</u>	<u>Br. 24,070 U</u>
Fixed Expenses			
* Manufacturing	Br. 37,300	Br. 37,000	300 U
*Selling & Administrative	<u>33,000</u>	<u>33,000</u>	<u>---</u>
Total Fixed Expenses	<u>Br. 70,300</u>	<u>Br. 70,000</u>	<u>300 U</u>
Operating Income (Loss)	<u>Br. (11,570)</u>	<u>Br. 12,800</u>	<u>Br. 24,370 U</u>

N.B. Master budget variance (static budget variance) is the variance of actual result from the master budget.

It is customary to label variances favorable (F) or unfavorable (U). The label indicates whether the target or the actual figure is larger. The way in which labels are applied depends on the item for which a variance is computed. If the item for which the variance is computed is **a revenue or profit item**, favorable variances are those for which actual is greater than the target; unfavorable variances are those for which actual is less than the target (or the budget).

If the item for which the variance is computed is **a cost or expense item**, favorable variances are those for which actual is less than the target. Therefore, if actual cost is greater than target cost, the variance will be labeled unfavorable.

3.3. FLEXIBLE BUDGET (DYNAMIC BUDGET)

Actual activity may differ significantly from budgeted activity because of an unexpected labor strike, cancellation of an order, an unexpected large new production contract, and other factors. When actual results differ considerably from plans, a fixed or static budget may not be particularly effective in supporting managers. In such cases several budgets prepared for a variety of activity levels may be more useful.

In contrast to the performance report based only on comparing the master budget to the actual results, a more useful benchmark for analysis is the flexible budget. A flexible budget (sometimes called *a variable budget*) is budget that can easily be adjusted for differences in the level of activity. It provides managers more useful information for planning and better basis for comparing performance than, a static or fixed budget.

In performance evaluation, a master budget is kept fixed or static to serve as a benchmark for evaluating performance. It shows revenues and costs at only the originally planned levels of activity. However, a flexible budget will be prepared at the actual activity level.

The flexible budget is identical to the master budget in format, but managers may prepare it for any level of activity.

3.3.1 Distinguishing Features of Flexible Budget

Flexible budgets have several desirable characteristics. They:

- Cover a range of activity
- Are dynamic
- Facilitate performance measurement.

Flexible Budget Cover a Range of Activity. Accurate predictions of activity levels are sometimes hard to make, and many managers find they make more effective decisions with the aid of flexible budgets. In developing a flexible budget one activity level at each extreme of the relevant range is selected, with one or more in between.

Flexible Budget Are Dynamic. Flexible budgets allow managers to adjust plans easily when activity level differs from the expected level. Such budgets address “what is” rather than “what was” or “what was expected”. This dynamic nature of flexible budget makes them a very useful decision making tool for management.

Flexible Budget Facilitate Performance Measurement. Measuring efficiency is an important role of performance report. Fixed budgets are useful for measuring effectiveness, i.e., achievement of goal. In some cases, however, fixed budgets do not identify the question, “what should the result be, given the actual level of activity”. In other words, the flexible-budget approach says, “Give me any activity level you choose, and I’ll provide a budget tailored to that particular level.” To summarize, whenever actual and budgeted activity are significantly different, a flexible budget variance report provides a better measure of efficiency than a report based on a fixed budget.

3.3.2 Flexible Budgeting Process

The following steps are needed to develop a flexible budget.

- i) Determine the range of activity the budget should cover (because cost behavior patterns may be different in different ranges of activity)
- ii) Determine the cost behavior pattern for each cost included in the budget.
- iii) Select the activity levels for which budgets will be prepared.
- iv) Prepared a flexible budget using the cost behavior data and the selected activity level.

Example (2): Evergreen Company is planning to use a flexible budgeting system to plan and control its operations. Evergreen made the following cost estimates for budgeting purposes:

Budget Formula Per Unit	
Sales	<u>Br. 31.00</u>
Variable Costs	
* Manufacturing	Br. 21.00
* Selling	0.60
* Administrative	<u>0.20</u>
Total Variable Costs	<u>Br. 21.80</u>
Contribution Margin	<u>Br. 9.20</u>
Budget Formula Per Month	
Fixed Costs	
* Manufacturing	Br. 37,000
* Selling and administrative	<u>33,000</u>
Total fixed costs	<u>Br. 70,000</u>

Required:

- a) Prepared a flexible budget for the next month using 7,000, 8,000, and 9,000 units as activity level. Evergreen Company's cost functions or flexible budget formulas are believed to be valid within the range of 7,000 to 9,000 units.
- b) At what level of activity does the company breakeven?

Exhibit 3.2 Evergreen Co. Flexible Budget

	Flexible Budgets For Various Activity Levels		
	7,000 units	8,000 units	9,000 units
Sales	<u>Br. 217,000</u>	<u>Br. 248,000</u>	<u>Br. 279,000</u>
Variable Costs			
* Manufacturing	Br. 147,000	Br. 168,000	Br. 189,000
* Selling	4,200	4,800	5,400
* Administrative	<u>1,400</u>	<u>1,600</u>	<u>1,800</u>
Total Variable Costs	<u>Br. 152,600</u>	<u>Br. 174,400</u>	<u>Br. 196,200</u>
Contribution margin	<u>Br. 64,400</u>	<u>Br. 73,600</u>	<u>Br. 82,800</u>
Fixed costs			
* Manufacturing	Br. 37,000	Br. 37,000	Br. 37,000
* Selling and administrative	<u>33,000</u>	<u>33,000</u>	<u>33,000</u>
Total fixed costs	<u>Br. 70,000</u>	<u>Br. 70,000</u>	<u>Br. 70,000</u>
Operating income (loss)	<u>Br. (5,600)</u>	<u>Br. 3,600</u>	<u>B. 12,800</u>

$$\begin{aligned} \text{BEP (in units)} &= \frac{\text{Total fixed costs}}{\text{Unit Contribution Margin}} = \frac{\text{Br. } 70,000}{31-21.8} \\ &= 7609 \text{ units (approximation)} \end{aligned}$$

$$\begin{aligned} \text{BEP (in birrs)} &= \frac{\text{Total fixed costs}}{\text{CM-ratio}} = \frac{\text{Br. } 70,000}{9.2/31} \\ &= \text{Br. } 235,873 \text{ (approximation)} \end{aligned}$$

Comparing the flexible budget to actual results accomplishes an important performance evaluation purpose. There are basically two reasons why actual results might not have conformed to the master budget:

- (i) Sales and other cost-driver activities were not the same as originally forecasted.
- (ii) Revenues or variable costs per unit and fixed costs per period were not as expected.

Activity question -I

1. What is a static budget?

Flexible Budget Variances: Any variances between the flexible budget and actual results cannot be due to activity levels. These variances between the flexible budget and actual results are called flexible budget variances and must be due to departure of actual costs or revenues from flexible-budget formula amounts.

Activity level variances: Any differences or variances between the master budget and the flexible budget are due to activity levels. These differences are called activity-level variances.

The sum of the activity level variances and the flexible budget variances equal the total of the master budget variances.

Example (3): Refer the data given in example (1) and (2). Prepare a condensed table showing the static (master) budget variance, the sales activity variance, and the flexible-budget variance.

Exhibit 3.3 Evergreen Co. Summary of Performance

	Actual Results	Flexible Budget	Master Budget	Flexible Budget Variance	Sales Activity Variances
Units	7,000	7,000	9,000	-	2,000 U
Sales	Br. 217,000	Br. 217,000	Br. 279,000	-	Br. 62,000 U
Variable costs	158,270	152,600	196,200	Br. 5,670 U	43,600 F
Contribution margin	Br. 58,730	Br. 64,400	Br. 82,800	Br. 5,670 U	Br. 18,400 U
Fixed Costs	70,300	70,000	70,000	300 U	-
Operating Income (loss)	Br. (11,570)	Br. (5,600)	Br. 12,800	Br. 5,970 U	Br. 18,400 U

*U or F indicates whether the variances are unfavorable or favorable, respectively.

Total master budget variance (TMBV) = ALF + FBV

Where TMBV = Total Master Budget Variance

ALF = Activity Level Variance

FBV = Flexible Budget Variance

Thus, the total master budget variance for Evergreen Co. amounts to Br. 24,370 unfavorable (Br. 5970 U + Br. 18400 U). The sum of the activity-level variances here equals sales-activity variances because sales are the only activity used as a cost driver.

Managers use comparisons between actual results, master budgets, and flexible budgets to evaluate organizational performance. When evaluating performance, it is useful to

distinguish between effectiveness-the degrees to which a goal, objective, or target is met- and efficiency-the degree to which inputs are used in relation to a given level of outputs.

Performance may be effective, efficient, both, or neither. For example, Evergreen Co. set a master budget objective of manufacturing and selling 9,000 units. Only 7,000 units were actually made and sold, however. Performance, as measured by sales-activity variances, was ineffective because the sales objective was not met.

Was Evergreen's performance efficient? Managers judge the degree of efficiency by comparing actual outputs achieved (7,000 units) with actual inputs (such as the cost of direct materials and direct labor). The less input used to produce a given output, the more efficient the operation. Evergreen was inefficient in its use of a number of inputs. Later in this Chapter, direct material, direct labor and variable and fixed overhead flexible-budget variances will be discussed in detail.

Flexible-budget variances measure the efficiency of operations at the actual level of activity. The flexible-budget variances shown in column (4) of Exhibit 7.3 total Br. 5,970 unfavorable. The total flexible-budget variance arises from sales prices received and the variable and fixed costs incurred. Evergreen Co. had no difference between actual sales price and the flexible-budgeted sales price, so the focus is on the differences between actual costs and flexible-budgeted costs at actual 7,000-unit level of activity.

Sales-activity variances measure how effective managers have been in meeting the planned sales objective. In Evergreen Co., sales activity fell 2,000 units short of the planned level. The sales-activity variances (totaling Br. 18,400 U) are unaffected by any changes in unit prices or variable costs. Why? Because the same budgeted unit prices and variable costs are used in constructing both the flexible and master budgets. Therefore, all unit prices and variable costs are held constant in columns (2) and (3) of Exhibit 3.3

? MODEL QUESTIONS

1. What is a flexible budget, and identify the major features or characteristics of a flexible budget?
2. The cost formula for Swan Company's overhead costs is given below. The costs cover a range of 8, 000 to 10, 000 machine hours.

Overhead Costs	Cost Formula
Supplies	Br.0.20 per machine hour
Indirect materials	Br.10, 000 plus Br.0.25 per machine hour
Utilities	Br. 0.15 per machine hour.
Maintenance	Br. 7, 000 plus Br. 0.10 per machine hour
Depreciation	Br. 8, 000

Instruction: Prepare a flexible budget in increments of 1, 000 machine hours

3.4. SUMMARY

A budget prepared for a single level of activity, a static budget, is useful for planning purposes but cannot usually be used for controlling operations because in most cases, a firm will not actually prepare at an exact planned level. For comparison and control purposes, the actual level of operations must be compared to a budget prepared for that specific level. Many firms, therefore, prepare a flexible budget consisting of a series of static budgets within the firm's relevant range. Other firms wait until the level of production is known and then prepare a flexible budget for that level.

3.5. ANSWERS

3.5.1 Activity Questions

Activity -I

1. A static budget is a budget geared toward only one level of activity. Performance evaluation using static budget is made through comparing actual results against budget costs at the original budget activity level.

3.5.2 Model questions

- 1) Flexible budget is geared toward all levels of activity within the relevant range, rather than toward only one level of activity. It is dynamic in nature rather than static. A flexible budget
 - a) Cover a range of activity
 - b) Is dynamic in nature
 - c) Facilitate performance evaluation

2.

	Machine- Hours		
	8, 000	9,000	10, 000
Overhead costs			
Variable costs:			
Supplies	Br.1, 600	Br, 1, 800	Br.2, 000
Indirect labor	2, 000	2, 250	2, 500
Utilities	1, 200	1, 350	1, 500
Maintenance	<u>800</u>	<u>900</u>	<u>1, 000</u>
Total variable costs	<u>Br.5, 600</u>	<u>Br.6, 300</u>	<u>Br.6, 300</u>
Fixed costs:			
Indirect labor	Br.10, 000	Br.10, 000	Br.10, 000
Maintenance	7,000	7, 000	7, 000
Depreciation	<u>8, 000</u>	<u>8, 000</u>	<u>8, 000</u>
Total fixed costs	<u>Br.25, 000</u>	<u>Br.25, 000</u>	<u>Br.25, 000</u>
Total costs	<u>Br.30, 100</u>	<u>Br.31, 300</u>	<u>Br.32, 000</u>

CHAPTER FOUR

RELEVANT INFORMATION AND DECISION MAKING: MARKETING DECISIONS

Contents

- 4.0 Aims and Objectives
- 4.1 Introduction
- 4.2 The Accountant's Role in Decision Making
- 4.3 The Concept of Relevance
- 4.4 Alternative Choice Decision
 - 4.4.1 Special Order Decision
 - 4.4.2 Addition or Deletion of Departments/Product Lines
 - 4.4.3 Optimal Use of Limited Resources
- 4.5 Summary
- 4.6. Answers to Questions

4.0 AIMS AND OBJECTIVES

Upon on completing this unit, you should be able to:

- ✎ Describe six steps in the decision- making process and the management accountant's role in that process.
- ✎ explain the relation between quantitative and qualitative analyses in decision making
- ✎ Discriminate between relevant ad irrelevant information for making decisions.
- ✎ identify relevant costs and benefits, giving proper treatment to sunk costs, opportunity costs and unit costs
- ✎ Analyze data by the contribution approach to support a decision for accepting or rejecting special sales order.
- ✎ Analyze data by the relevant-information approach to support a decision for adding or deleting a product line.
- ✎ Compute a measure of product profitability when production is constrained by a scare resource.

4.1 INTRODUCTION

Decision-making is a fundamental part of management. Managers are constantly faced with problems of deciding what product to sell, what production method to use, whether to make or buy component parts, what prices to charge, what channels of distribution to use, whether to accept special orders at special prices, and so forth. This unit covers the role of management accounting information in a variety of marketing decisions. The next examines product decisions.

4.2 THE ACCOUNTANTS'S ROLE IN DECISION MAKING

The management accountant's role in the decision-making process is to provide relevant information to the managers who make the decisions. Production managers typically make the decisions about alternative production processes and schedules, marketing managers make pricing decisions, and specialists in finance usually are involved in decisions about major acquisitions of equipment. All of these managers require information pertinent to their decisions. The management accountant's role is to provide information relevant to the decisions faced by managers throughout the organization. Thus, the management accountant needs a good understanding of the decisions faced by those managers.

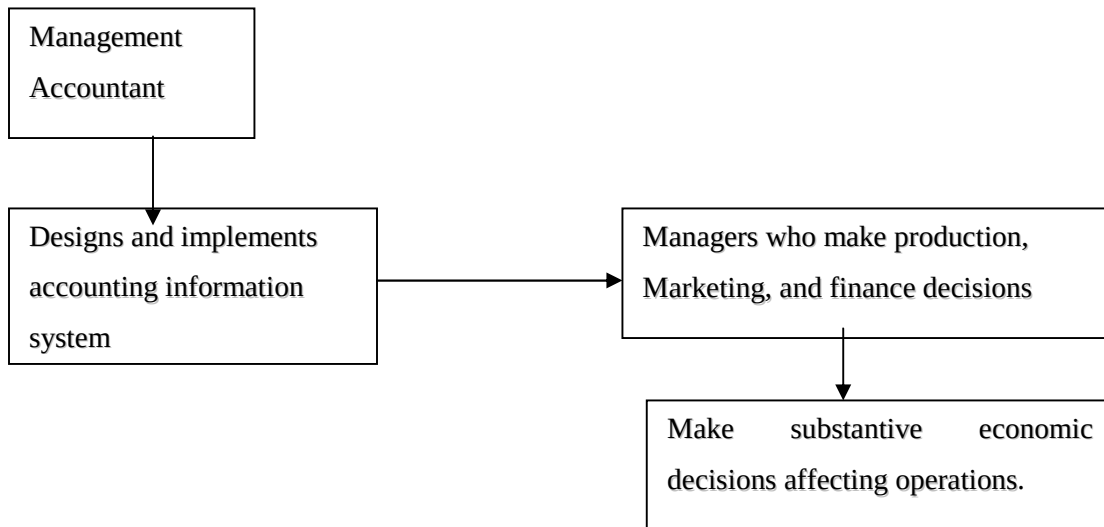


Exhibit 4-1 Accountant's Role in Decision Making

STEPS IN THE DECISION MAKING PROCESS

It should be recalled that the management process involves the following five functions of management – planning, organizing, staffing, leading, and controlling. In all these functions there is a decision making process that is the nucleus of each function. In any decision making process information, qualitative and quantitative, is vital. In business firms, financial information is the backbone among others. This information is provided by an accounting system. Both internal and external users of accounting information make various decisions that affect the operations of a firm based on accounting reports. Decision making process involves basically the following activities.

Defining the Decision Problem. This is the most important phase of decision-making process because all other activities in the process depend on this phase. If one does not have a clear understanding of the specific problem he/she may spend valuable time and energy in identifying alternatives and gathering probably irrelevant data. Moreover, incorrectly defined problems waste time and resources. That is why it is usually said that defining a problem is solving 50 percent of the problem.

Specify the criterion. Once a decision problem has been defined or clarified; the manager should specify the criterion upon which a decision will be made. Is the objective to maximize profit, increase market share, minimize cost, or improve public service? Sometimes the objectives are in conflict, as in a decision problem where production cost is to be minimized but product quality must be maintained. In such cases, one objective is specified as the decision criterion. For example, cost minimization. The other objective is established as a constraint for example, product quality must not fall below one defective part in 1,000 manufactured units.

Identify Possible Alternatives: Decision- making is selecting between two or more alternatives. If a machine breakdown, what are the alternative courses of action? The machine can be repaired or replaced, or a replacement can be leased. But perhaps repair will turn out to be more costly than replacement. Determining the possible alternatives is a critical step in the decision process.

Develop Decision Model: A decision model is a simplified representation of the choice problem. Unnecessary details are stripped away, and the most important elements of the

problem are highlighted. Thus, the decision model brings together the elements listed above: the criterion, the constraints, and the alternatives.

Gathering Relevant Information: Decision makers may desire different types of information to assist them in making decisions. Some of this information could be subjective or objective, internal or external to the organization, historical (past) data, or future (expected) ones. Selecting data pertinent to decisions is one of the management accountant's most important roles in an organization.

Although the management accountant often is involved in the above four steps, he or she is chiefly responsible in collecting data.

Making the Decision: Once the decision model is formulated and the pertinent data are collected, the appropriate manager makes a decision.

4.3 THE CONCEPT OF RELEVANCE

Accountants have an important role in the decision-making process, not as a decision maker but as collectors and reporters of relevant information. What makes information relevant to a decision problem? Relevant information is the predicted future costs and revenues that will differ among the alternatives. These two criteria are discussed here under:

Bearing on the Future: To be relevant to a decision, cost or benefit information must involve a future event. Relevant information is a prediction of the future, not a summary of the past. Historical (past) data have no bearing on a decision. Such data can have an indirect bearing on a decision because they may help in predicting the future. But past figures, in themselves, are irrelevant to the decision itself. Why? Because decision-making affects future, but not past. Nothing can alter what has already happened.

Different under Competing Alternatives: Relevant information must involve future costs or benefits that differ among the alternatives. Costs or benefits that are the same across all the available alternatives have no bearing on the decision. For example, if management is evaluating the purchase of either a manual or an automated drill press, both of which require skilled labor costing Br. 10 per hour, the labor rate is not relevant because it is the same for both alternatives.

Example (1) Marina Company, a manufacturer of a line of ashtrays, is thinking of using aluminum instead of copper in the manufacture of its product. Historical direct material cost were Br. 0.30 per unit. The company expected future costs for aluminum is Br 0.20 and it is

unchanged for copper. Direct labor cost were Br. 0.70 per unit and will not be affected by the switch in materials. The analysis in a nutshell is as follows.

	<u>Copper</u>	<u>Aluminum</u>	<u>Difference</u>
Direct material	Br. 0.30	Br. 0.20	Br. 0.10
Direct labor	0.70	0.70	-

Required: Given the above-summarized data identify the relevant data for the decision on hand.

Solution:

The cost of copper and direct labor costs used for this comparison probably came from historical cost records on the amount paid most recently for copper and direct laborers, respectively. Past or historical costs are relevant to the decision only if they are expected to continue in the future, or are used as the basis for predicting the future costs.

In the foregoing analysis, the material cost (the expected future cost of copper compared with the expected future cost of aluminum) is the only relevant cost. The material cost met both criteria for relevant information.

That is, bearing on the future and an element of difference between the alternatives. However, the direct – labor cost will continue to be Br. 0.70 per unit regardless of the material used. It is irrelevant because the second criterion – an element of difference between the alternatives – is not met.

Therefore we can safely exclude direct labor. There is no harm in including irrelevant items in a formal analysis, provided that they are included properly. However, confining the reports to the relevant items provides greater clarity and time savings for busy managers.

ACCURACY AND RELEVANCE

Information used for decision-making would be both relevant and accurate. However, the cost of such information exceeds its benefits. As a result, accountants often trade off relevance versus accuracy.

Relevant information must be reasonably accurate but not precisely so. Precise but irrelevant is worthless for decision – making. On the other hand, imprecise but relevant information can be useful. A university president’s salary, for example, may be Br. 60,000 per year; but this may have no bearing on the question of whether to buy or rent data processing

equipment. In contrast, sales predictions for a new product may be subjected to great error, but they still are helpful to the decision of whether to manufacture the product or not.

The degree to which information is relevant or precise often depends on the degree to which it is qualitative or quantitative. Qualitative aspects are those for which measurement in birrs and cents is difficult and imprecise. Quantitative aspects, on the other hand, are those for which measurement is easy and precise. To summarize, relevance is more crucial than precision in decision – making. Thus, a qualitative aspect may easily carry more weight than a measurable (quantitative) aspect.

WHY ISOLATE RELEVANT INFORMATION?

Why is it important for the management accountant to isolate the relevant costs and benefits in a decision analysis? The reasons are twofold.

First, generating information is a costly process. The management accountant can simplify and shorten the data gathering process by focusing on only relevant information.

Second, people can effectively use only a limited amount of information. If a manager is provided with irrelevant revenues and costs, these figures can cause information overload, and decision-making effectiveness of the manager declines.

4.4 ALTERNATIVE CHOICE DECISIONS

Many of the decisions described in this unit are frequently referred to as alternative choice decision. Alternative choice decisions are situations with two or more courses of action from which the decision maker must select the best alternative.

The variety of alternative choice decisions is limitless. Some business example follows:

- Should we accept a special order for a product below our normal selling price?
- Should we raise the price of a product or maintain the current price?
- Should we make or buy a component part?
- Should we sell a joint product at the split off point or process it further?
- Should we keep our copying machine or acquire a faster one?

The analyses of these and other types of alternative choice decisions are aided by relevant cost and benefit data. The discussions that follow illustrate a variety of to each decision. The first marketing decision for which we examine relevant information is the special sales order.

4.4.1 Special Order Decisions

Potential customers seeking a special deal will frequently approach firms directly with their proposal. For example, a discount department store chain planning a big spring sale offers to make a large one-time purchase of a firm's product but wants a reduced price. Or a foreign buyer is interested in a firm's product and also requests a reduced selling price. In each case management must decide whether to accept or reject the special sales order at a reduced selling price. In brief, a special order is a one-time order that is not considered part of the company's normal on going business.

In general, a special order is profitable as long as the incremental revenue from the special order exceeds the incremental costs of the order. The incremental revenue in this decision will be the price per unit offered by the potential customer times the number of units to be purchased. The incremental costs will be the amount of the expected cost increase if the offer is accepted. The incremental cost usually includes variable manufacturing costs of producing the units. Since the units being sold in the special order are not being sold through the firm normal distribution channel, the firm may or may not incur variable selling and administrative expenses in conjunction with the special order.

The incremental costs usually do not include fixed manufacturing costs. Although the fixed costs must be incurred to permit production, the amount of fixed costs incurred by the firm usually will not increase if the special order offer is accepted. For the same reason, other fixed expenses, such as fixed selling and administrative expenses, are usually not relevant in the special order price.

However, management must also be assured that it has sufficient capacity to produce the special order without affecting normal sales. When there is *no excess capacity*, the opportunity cost of using the firm's facilities for the special order are also relevant to the decision. The opportunity cost would be the contribution margin forgone on regular sales that have to be reduced to accommodate the special order. The relevant costs to accept the special order, therefore, would include a forgone contribution margin on regular sales that could not be made in addition to the incremental costs associated with the special order that have already been discussed.

Example (1) Consider the following details of the income statement of Samson Company for the year just ended December 31, 20 x 3.

Sales (1,000,000 units)	Br. 20,000,000
Manufacturing cost of goods sold	<u>15,000,000</u>
Gross margin	Br. 5,000,000
Selling and administrative expenses	<u>4,000,000</u>
Operating income	Br. <u><u>1,000,000</u></u>

Samson's fixed manufacturing costs were Br. 3 million and its fixed selling and administrative costs were Br. 2.9 million.

Near the end of the year, Ethio Company offered Samson Br. 13 per unit for 100,000 unit special order. The special order would not affect Samson's regular business in any way. Furthermore, the special sales order would not affect total fixed costs and would not require any additional variable selling and administrative expenses.

Instruction: Should Samson accept or reject the special order? By what percentage the operating income decreases or increases if the order had been accepted? Assume that the company would utilize its idle manufacturing capacity to accept the special order.

Solution:

There are two approaches to costs on income statement.

1. Absorption/financial approach
2. Contribution approach

An absorption approach is a costing technique that considers all factory overheads (both variable and fixed) to be product costs that become an expense in the form of manufacturing cost of goods sold as sales occur.

A contribution approach is a method of internal reporting (management accounting) that emphasizes the distinction between variable and fixed costs for the purpose of better decision.

Financial Approach		Contribution Approach	
Sales	xxx	Sales	xxx
Cost of goods sold	<u>xxx</u>	Variable costs	<u>xxx</u>
Gross profit	xxx	Contribution margin	xxx
Selling and Administrative expenses	<u>xxx</u>	Fixed costs	<u>xxx</u>
Operating income	<u>xxx</u>	Operating income	<u>xxx</u>

Exhibit 4-2 Approaches to costs on income statement

The correct analysis to the above problem employs the contribution approach to income statement, not the financial approach. The fallacy in the case of the later approach is that it treats a fixed cost, i.e., fixed manufacturing cost as if it were variable.

Exhibit 4-3 The correct analysis

	Without special order 1,000,000 units	Effect of special order 100,000 units	With special order 1,100,000 units
Sales	<u>Br. 20,000,000</u>	<u>Br. 1,300,000</u>	<u>Br. 21,300,000</u>
Variable expenses			
Manufacturing	Br. 12,000,000	Br. 1,200,000	Br. 13,200,000
Selling and Administrative	<u>1,100,000</u>	=	<u>1,100,000</u>
Total variable expenses	<u>Br. 13,100,000</u>	<u>Br. 1,200,000</u>	<u>Br. 14,300,000</u>
Contribution Margin	<u>Br. 6,900,000</u>	<u>Br. 100,000</u>	<u>Br. 7,000,000</u>
Fixed expenses			
Manufacturing	Br. 3,000,000	-	Br. 3,000,000
Selling and administrative	<u>2,900,000</u>	=	<u>2,900,000</u>
Total fixed expenses	<u>Br. 5,900,000</u>	=	<u>Br. 5,900,000</u>
Operating income	<u>Br. 1,000,000</u>	<u>Br. 100,000</u>	<u>Br. 1,100,000</u>

The accountant's role in decision making is primarily that of a technical expert on cost analysis, i.e., collecting and reporting relevant information. However, many managers want the accountant to recommend the proper decision, the final choice always rests with the operating executives.

Recommendation: Based on the relevant data, Samson Company should accept the special order because it brings an additional income of Br. 100,000 for company and as a result the operating income increase by 10% if the order had been accepted.

Income with special order	Br. 1,100,000
Income without special order	1,000,000
Additional income if the order had been accepted	<u>Br. 100,000</u>

$$\% \Delta NI = \frac{\Delta NI}{NI_0}$$

Where $\% \Delta NI$ = Percentage change in income.

ΔNI = Change in income.

NI_0 = Income if the special order had not been accepted.

$$\% \Delta NI = \frac{\Delta NI}{NI_0} = \frac{\text{Br. 100,000}}{\text{Br. 1,000,000}} = 0.1 \text{ or } 10\%$$

Exhibit 4-4. The Incorrect Analysis

	Without Special order 1,000,000 units	Incorrect effect of special order 100,000 units	With special order 1,100,000 units
Sales	Br. 20,000,000	Br. 1,300,000	Br. 21,300,000
Manufacturing COGs*	15,000,000	1,500,000	16,500,000
Gross margin	Br. 5,000,000	Br. (200,000)	Br. 4,800,000
Selling & administrative expenses	4,000,000	-	4,000,000
Operating income	<u>Br. 1,000,000</u>	<u>Br. (200,000)</u>	<u>Br. 800,000</u>

*COGs denote cost of goods sold.

Here above, the analysis treats the fixed manufacturing COGs as if it were variable. Refer the effect of the special order on manufacturing COGs; it amounted to Br. 1,500,000 that include Br. 300,000 fixed cost. However, the special sales order would not affect the total fixed costs. *Example (2)* Lucy Company has the capacity to produce 15,000 units per month. Current regular production and sales are 10,000 units per month at a selling price of Br. 15 each. Based on the current production level, the following costs are to be incurred per unit:

Direct materials	Br. 5.00
Direct labor	3.00
Variable factory overhead (FOH)	0.75
Fixed FOH	1.50
Variable selling expense	0.25
Fixed administrative expense	1.00

Lucy Company has received special order from a customer that wants to purchase 4,000 units at Br. 10 each. There would be no selling expense in connection with this special order.

Instructions:

- Should Lucy Company accepts or rejects the special order? Why or Why not? Assume that the special order should not disturb regular business.
- Suppose that the special order was for 8,000 units instead of 4,000 units. Thus, regular business would be reduced by 3,000 units to accept the special order because production capacity cannot be expanded in the short run. What would be the overall profit of the firm if it accepts this order?

- c. Refer the data given in requirement (b) above. At what selling price per unit from the customer would the Lucy Company be economically indifferent between accepting and rejecting the offer?

Solutions:

a. Here, the incremental costs (variable manufacturing costs) are the only relevant costs. The special order would have no effect on the company's variable selling expenses. Since the existing fixed costs would not be affected by the order, they are not incremental costs and are therefore not relevant. The incremental net operating income from accepting the special order can be computed as follows:

	<u>Per unit</u>	<u>Total</u>
Incremental revenue	<u>Br. 10.00</u>	<u>Br. 40,000</u>
Incremental costs:		
Variable costs		
Direct material	5.00	20,000
Direct labor	3.00	12,000
Factory overhead	<u>0.75</u>	<u>3,000</u>
Total variable costs	<u>Br. 8.75</u>	Br. 35,000
Fixed costs		<u>0</u>
Total incremental costs		<u>Br. 35,000</u>
Incremental net operating income		<u>Br. 5,000</u>

Accepting the special order will increase costs by Br. 8.75 per unit produced. The offered price of Br. 10 per unit exceeds the Br.8.75 incremental variable costs, implying that the special order will provide a positive contribution to profits. The contribution margin earned on the order will be Br. 1.25 per unit, so for the 4,000 units special order, the firm should be Br. 5,000 (Br. 1.25 x 4,000) better off by accepting the special order.

$$\text{Unit variable cost} = 5 + 3 + 0.75 + 0.25 = \text{Br. } \underline{9.00}$$

$$\text{Unit fixed costs} = 1.50 + 1.00 = \text{Br. } \underline{2.50}$$

$$\text{Total fixed costs} = 2.50 \times 10,000 = \underline{\text{Br. } 25,000}$$

$$\text{Income} = \text{Total sales} - \text{Total variable cost} - \text{Total fixed costs}$$

$$\text{Income (for 10,000 units of regular sale)} = [10,000(15-9)] - 25,000 = \underline{\text{Br. } 35,000}$$

$$\text{Income with special order (for 14,000 unit)} = 35,000 + 5,000 = \text{Br. } 40,000$$

$$\text{Income without special order} = \underline{35,000}$$

$$\text{Advantage of accepting the special order} = \underline{\text{Br. } 5,000}$$

b. In this case, the company has no sufficient capacity to produce the special order without affecting normal sales. Therefore, the relevant costs to use in evaluating the special order include an opportunity cost. The opportunity cost is the contribution margin forgone on regular sales. The net relevant costs to accept the special order would now be the total of Br. 70,000 variable manufacturing costs and a forgone contribution margin of Br. 18,000. The total cost of accepting the special order, Br. 88,000, exceed the offered selling price of Br. 80,000.

Incremental revenue		Br. 80,000
Incremental cost		
• Variable costs *	Br. 70,000	
• Opportunity costs	<u>18,000</u>	<u>88,000</u>
Decremental net operating income		<u>Br (8,000)</u>
Incremental revenue = $10 \times 8,000 = \underline{\text{Br. } 80,000}$		
Variable costs = $8,000 (5 + 3 + 0.75) = \underline{\text{Br. } 70,000}$		
Opportunity cost = $3,000 [15 - (5 + 3 + 0.75 + 0.25)] = \underline{\text{Br. } 18,000}$		

Note that special order would not require the Br. 0.25 variable selling expenses. The normal sales however, require the Br. 0.25 variable selling expenses.

The above analysis may be presented as tabulated here below:

	A WITHOUT SPECIAL ORDER 10,000 units	B EFFECT OF SPECIAL ORDER ON REGULAR SALES 3,000 units	C EFFECT OF SPECIAL ORDER 8,000 units	(A – B) + C WITH SPECIAL ORDER 15,000 units
Sales	<u>Br. 150,000</u>	<u>Br. 45,000</u>	<u>Br. 80,000</u>	<u>Br. 185,000</u>
Variable expenses				
Direct	Br. 50,000	Br. 15,000	Br. 40,000	Br. 75,000
material	30,000	9,000	24,000	45,000
Direct labor	7,500	2,250	6,000	11,250
Factory	<u>2,500</u>	<u>750</u>	<u>-</u>	<u>1,750</u>
overhead				
Selling				
Total variable costs	<u>Br. 90,000</u>	Br. 27,000	<u>Br. 70,000</u>	<u>Br. 133,000</u>
Contribution margin	<u>Br. 60,000</u>	<u>Br. 18,000</u>	<u>Br. 10,000</u>	<u>52,000</u>
Fixed expenses				
Factory	Br. 15,000	-	-	Br. 15,000
overhead	<u>10,000</u>	<u>-</u>	<u>-</u>	<u>10,000</u>
Administrative				
Total fixed expenses	Br. 25,000	-	-	Br. 25,000
Operating income (loss)	<u>Br. 35,000</u>	<u>Br. 18,000</u>	<u>Br. 10,000</u>	<u>Br. 27,000</u>

Recommendation. Lucy Company should not accept the special order because it has a net Br. 8,000 disadvantage.

Income with special order = Br. 27,000

Income without special order = 35,000

Disadvantage of accepting the special order Br. (8,000)

c. In requirement (b) above the company will be economically indifferent between accepting and rejecting the special sales order if the contribution to profit from the special order equals a contribution margin forgone from regular sales. Therefore, the offer “p” will make Lucy Company equally attractive between two alternatives as computed here under:

$$P(8,000) - 8,000(8.75) = 18,000$$

$$P(8,000) = 18,000 + 70,000$$

$$P(8,000) = 88,000$$

$$P = \frac{88,000}{8,000}$$

$$P = \underline{\underline{\text{Br. 11}}}$$

Thus, assuming an offer of Br. 11 instead of Br. 10, the company will be indifferent between accepting and rejecting the special order in requirement (b) above.

Activity question -I

1. What are relevant costs in the decision making process?
2. “All future costs are relevant in decision making.” Do you agree? Why?

4.4.2 Deletion or Addition of Products or Departments

Decisions relating to whether old product lines or other segments of a company should be dropped and new ones added are among the most difficult that a manager have to make. In such decisions, many factors must be considered that are both qualitative and quantitative in nature. Ultimately, however, any final decision to drop an old segment or to add a new one is going to hinge primarily on the impact the decision will have on net operating income. To assess this impact, it is necessary to make a careful analysis of the costs involved. To this end, let us try to distinguish the difference between avoidable and unavoidable fixed expenses.

Fixed costs are divided into two categories, avoidable and unavoidable. Avoidable costs are costs that will not continue if an ongoing operation is changed, deleted or eliminated. These costs are relevant costs in decision-making. Examples of avoidable costs include departmental salaries and other costs that could be avoided by not operating the specific department. Unavoidable costs are costs that continue even if a subunit or an activity is eliminated and are not relevant for decision. The reason for this is that such costs are not affected by a decision to delete a particular activity. Unavoidable costs include many **common costs**, which are defined as those costs of facilities and services that are shared by users. Examples are store depreciation, heating, air conditioning, and general management expenses.

Example (1) Eyoha Department Store has three major departments: groceries, general merchandise, and drugs. Management is considering dropping groceries, which have consistently shown a net loss. The following table reports the present annual net income (in thousands).

	DEPARTMENTS			
	Groceries	General merchandise	Drugs	Total
Sales	Br. 1,000	Br. 800	Br. 100	1,900
Variable COGS* & Expenses	<u>800</u>	<u>560</u>	<u>60</u>	<u>1,420</u>
Contribution margin	<u>Br. 200</u>	<u>Br. 240</u>	<u>Br. 40</u>	<u>Br. 480</u>
Fixed expenses				
Avoidable	Br. 150	Br. 100	Br. 15	Br. 265
Unavoidable	<u>60</u>	<u>100</u>	<u>20</u>	<u>180</u>
Trial fixed expenses	<u>Br. 210</u>	<u>Br. 200</u>	<u>Br. 35</u>	<u>Br. 445</u>
Operating income (loss)	<u>Br. (10)</u>	<u>Br. 40</u>	<u>Br. 5</u>	<u>Br. 35</u>

*COGS denote cost of goods sold.

Instructions:

- Which alternative would you recommend if the only alternatives to be considered are dropping or continuing the grocery department? Assume that the total assets would be unaffected by the decision and the space made available by dropping groceries would remain idle.
- Refer the income statement presented above. However, assume that the space made available by dropping groceries could be used to expand the general merchandise department. The space would be occupied by merchandise that would increase sales by Br. 500,000, generate a 30% contribution margin percentage and have additional avoidable fixed costs of Br. 70,000. Should Eyoha discontinue grocery and expand merchandise department?

a)

	A Total before change	B Effect of dropping grocery	A – B Total after change
Sales	Br. 1,900	Br. 1,000	Br. 900
Variable COGS and Expenses	<u>1,420</u>	<u>800</u>	<u>620</u>
Contribution margin	<u>Br. 480</u>	<u>Br. 200</u>	<u>Br. 280</u>
Fixed expenses			
• Avoidable	Br. 265	Br. 150	Br. 115
• Unavoidable	<u>180</u>	<u>-</u>	<u>180</u>
Total fixed expenses	<u>Br. 445</u>	<u>Br. 150</u>	<u>Br. 295</u>
Operating income (loss)	<u>Br. 35</u>	<u>Br. 50</u>	<u>Br. (15)</u>

Income with grocery department	= Br. 35,000
Loss assuming grocery is eliminated =	<u>(15,000)</u>
Disadvantage of discontinuing grocery =	Br. <u>(50,000)</u>

Notice that all of the grocery's variable expenses are avoidable. If the grocery department is discontinued, the Br. 60,000 of the fixed expenses will continue. Eyoha Department Store will incur these expenses regardless of its decision about that particular department.

Recommendation: Dropping grocery and leaving the vacated facilities idle would be worse. Groceries bring in contribution margin of Br. 200,000, which is Br. 50,000 more than the Br. 150,000 fixed expenses that would be saved by closing the grocery department.

b)

	A Total before change	B Effect of Dropping Groceries	C Effect of Expanding General Merchandise	(A – B) + C Total after Change
Sales	Br. 1,900	Br. 1000	Br. 500	Br. 1,400
Variable COGS and Expense	<u>1,420</u>	<u>800</u>	<u>350</u>	<u>970</u>
Contribution margin	<u>Br. 480</u>	<u>Br. 200</u>	<u>Br. 150</u>	<u>Br. 430</u>
Fixed expenses				
o Avoidable	Br. 265	Br. 150	Br. 70	Br. 185
o Unavoidable	<u>180</u>	<u>—</u>		<u>180</u>
			=	
Total fixed expenses	<u>Br. 445</u>	<u>Br. 150</u>	<u>Br. 70</u>	<u>Br. 365</u>
Operating income (loss)	<u>Br. 35</u>	<u>Br. 50</u>	<u>Br. 80</u>	<u>Br. 65</u>

Effect of expanding general merchandise:

Incremental revenue	= Br. 500,000
Incremental cost	
o Variable cost = (1-0.30) x 500,000	= (350,000)
o Fixed cost	= <u>(70,000)</u>
Incremental income	<u>Br. 80,000</u>

N.B. All birrs in the exhibit above are in thousands.

Recommendation: The conclusion in (a) will be correct if and only if the space made available by dropping grocery would be idle. As the above analysis shows, dropping grocery and using the vacated space to expand general merchandise is recommendable. The Br. 80,000 increase in operating income of general merchandise more than offset the Br. 50,000

decline from eliminating groceries, providing an overall increase in operating income of Br. 30,000, i.e., Br. 65,000 less Br. 35,000.

Example (2) Selam's Home Center has two departments, A and B. The most recent income statement for the company follows:

	Department		
	A	B	Total
Sales	Br. 1,000,000	Br. 4,000,000	Br. 5,000,000
Variable expenses	<u>300,000</u>	<u>1,600,000</u>	<u>1,900,000</u>
Contribution margin	700,000	2,400,000	Br. 3,100,000
Fixed expenses	<u>900,000</u>	<u>1,800,000</u>	<u>2,700,000</u>
Operating income	<u>Br. (200,000)</u>	<u>Br. 600,000</u>	<u>Br. 400,000</u>
(loss)			

A study indicates that Br. 370,000 of the fixed expenses being charged to department A are sunk costs and allocated costs that will continue even if department A is dropped. In addition, the elimination of department A would result in a 10% decrease in the sales of department B. If department A is dropped, what will be the effect on the income of the company as a whole?

Solution:

Sunk costs are costs that have already been incurred and that can't be avoided regardless of which course of action a manager may decide to take. Thus, sunk costs are unavoidable costs. Put differently, these costs have no relevance to future events and must be ignored in decision-making.

Effect of dropping department A on B

Decremental revenue = 10% x 4,000,000	= Br.400, 000
Decremental costs	
• Variable cost = $\frac{(1,600,000}{4,000,000} \times 400,000)$	= (160,000)
• Fixed cost	<u>0 -</u>
Decremental income	<u>Br. 240,000</u>

Total fixed costs of department A	= Br. 900,000
Unavoidable fixed costs	<u>370,000</u>
Avoidable fixed costs of department A	<u>Br. 530,000</u>

	X Total before change	Y Effect of dropping A on B	Z Effect of dropping A	X – Y – Z
Sales	Br. 5,000	Br. 400	Br. 1,000	Br. 3,600
Variable expenses	<u>1,900</u>	<u>160</u>	<u>300</u>	<u>1,440</u>
Contribution margin	Br. 3,100	Br. 240	Br. 700	Br. 2,160
Fixed expenses	<u>2,700</u>	<u>-</u>	<u>530</u>	<u>2,170</u>
Operating income (loss)	<u>Br. 400</u>	<u>Br. 240</u>	<u>Br. 170</u>	<u>Br. (10)</u>

* All birr amounts are in thousands.

Income with department A	Br. 400,000
Loss if department A is dropped	<u>(10,000)</u>
Disadvantage of dropping department A	<u>Br. (410,000)</u>

Recommendation: Dropping department A would be worse because it has a net Br. 410,000 disadvantage.

4.4.3. Optimal Use of Limited Resources

Managers are routinely faced with the problem of deciding how scarce resources are going to be utilized. A **scarce resource or a limiting factor** refers to any factor that restrict or constraint the production or sale of a product or service. It include the following, among others, labor hours, machine hours, square feet of floor space, cubic meters of display space .A department store, for example, has a limited amount of floor space and therefore cannot stock every product that may be available. A manufacturing firm has a limited number of machine- hours and a limited number of direct labor-hours at its disposal. When capacity becomes pressed because of scarce resource, the firm is said to have a **constraint**.

When a plant that makes more than one product is operating at capacity, managers often must decide which orders to accept. The contribution margin technique also applies here, because the product to be emphasized or the order to be accepted is the one that makes the biggest total profit contribution per unit of the limiting factor. Fixed cost are usually unaffected by such choices.

In such kind of decision, the contribution margin technique must be used wisely. Managers sometimes mistakenly favor those products with the biggest contribution margin or gross margin per sales birr, without regard to scarce resources.

Example (1): Wajo Company has two product: a plain cellular phone and a fancier cellular phone with many special features. Unit data follow:

	<i>Plain Phone</i>	<i>Fancy Phone</i>
Selling price	Br.80	Br.120
Variable costs	<u>64</u>	<u>84</u>
Contribution margin	<u>Br.16</u>	<u>Br.36</u>
Contribution margin ratio	20%	30%

Instructions:

- a) Which product is more profitable? On which should the firm spend its resources? Assume that sales are restricted by demand for only a limited number of phones.
- b) Now suppose that annual demand for phones of both types is more than the company can produce in the next year and the major constraint is the availability of time on a processing machine. Plain Phone requires one hour of processing on the machine, Fancy Phone requires three hours of processing. Which product is more profitable? Assume that only 10, 000 machine hours of capacity are available.

Solution:

- a) Under this circumstance, the limiting factor is units of sale. Thus, the more profitable product is the one with the higher contribution margin per unit. The fancier cellular phone appears to be more profitable than the plain phone. It has Br.36 per unit contribution margin as compared to Br.16 per unit for the plain model, and it has a 30% CM ratio as compared to 20% for the plain model.
- b) To maximize total contribution margin, a firm should not necessarily promote those products that have the highest contribution margins. Rather, total contribution margin will be maximized by promoting those products or accepting those that provide the highest unit contribution margin in relation to scarce resources of the firm.

In requirement (b) above, for instance, the productive capacity is the limiting factor because only 10, 000hours of capacity is available. To answer this question, the manager should look at the contribution per unit of the scarce resource. This figure is computed by dividing the contribution margin for a unit of product by the amount of

the scarce resource it requires. These calculations are carried out below for the plain and fancy phones.

	Model	
	Plain Phone	Fancy Phone
Contribution margin (CM) per unit (a)	Br.16	Br.36
Machine hours required per unit (b)	1 hour	3 hours
CM per unit of the scarce resource (a÷b)	Br.16 per machine hour	Br. 12 per machine hour

With this data in hand, it is easy to decide which product is less profitable and should be de-emphasized. Each hours of processing time on the machine that is devoted to the plain phone results in an increase of Br.16 in contribution margin and profits. The comparable figure for the fancier phone is only Br.12 per hour. Therefore, the plain model should be emphasized in this situation. Even though the fancier model has the larger per unit contribution margin and the larger CM ratio, the plain model provides the larger contribution margin in relation to scarce resource.

? MODEL QUESTIONS

1. What is the advantage of the contribution approach as compared with the absorption approach?
2. Distinguish between quantitative and qualitative factors in decision-making. Give examples.
3. Ganchu 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 8, 000 units per month is as follows:

Direct	
materials.....	Br.2.50
Direct labor.....	3.00
Variable manufacturing overhead.....	0.50
Fixed manufacturing overhead.....	4.25
Variable selling and administrative expenses.....	1.50
Fixed selling and administrative expenses.....	2.00

The normal selling price is Br.15 per unit. The company's capacity is 10, 000 units per month. An order has been received for 2, 000 units at a price of Br12 per unit. This order would not disturb regular sales. If the order is accepted, by how much will the monthly profits be increased or decreased? The order would not change the company's fixed cost and would not require any additional variable selling and administrative expenses.

4.5. SUMMARY

The accountant is responsible for seeing that relevant, timely data are available to guide management in all of its decisions, including those that relate to special, non-routine situations. Reliance by management on irrelevant data can lead to incorrect decisions, reduced profitability, and inability to meet stated objectives. All future costs that make difference between the alternatives under consideration are relevant.

The concept of cost relevance has wide application. In this unit, we have observed its use in special order decisions, in discontinuance of product-line decisions, and in decision relating to the effective use of economic resources. This list does not include all of the possible applications of the relevant cost concept. Indeed, any decision involving costs hinges on the proper identification and use of those costs that are relevant, if the decision is to be made properly. For this reason, we shall continue to focus on the concept of cost relevance in the following unit, where we consider production decisions.

➔4.6 ANSWERS

4.6.1 Activity Questions

1. In the decision making process, any future cost that differs among alternatives and will influence the outcome is a relevant cost.
2. No, only future cost that differs between the alternatives in a decision situation is a relevant cost as far as that decision is concerned.

4.6.2 Model questions

- 1) The contribution format focuses on cost behavior (fixed and variable), whereas the absorption format reports costs by business functions. The contribution approach makes it easier for managers to evaluate the effects of changes in demand on income and thus it is better for decision-making
- 2) Quantitative factors are outcomes that are measured in numerical terms. Examples include the cost of direct materials, direct manufacturing labor, and marketing. Other quantitative factors are non financial that is, they can be measured numerically, but are not expressed in financial terms. Reduction in product-development time for a manufacturing company is an example of quantitative, non-financial factors. Qualitative factors are outcomes that cannot be measured in numerical terms. Employee morale is an example.

- 3) Effect of the special order:

Incremental revenue (2000 x Br.12).....	Br.24, 000
Incremental costs	
Direct materials (2000 x Br.2.50).....	Br.5, 000
Direct Labor (2, 000 x Br.3.00).....	6, 000
Variable overhead (2, 000 x Br.0.50)....	<u>1,000</u>
Incremental income.....	<u>Br.12, 000</u>

Recommendation: It is better for Ganchu Company to accept the special order because it increases net income of the company by Br.12, 000.

CHAPTER FIVE

STANDARD COSTING AND VARIANCE ANALYSIS

Contents

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5.1 Introduction

5.2 Purpose of Standard Costs

5.3 The Standard Cost System

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5.0 AIMS AND OBJECTIVES

Many companies for planning and controlling operations use standard cost accounting systems. Standards are useful in detailed planning, cost control, performance measurement, and pricing decisions.

Upon completing this unit, you should be able to:

- ✎ Explain the nature of standard costs.
- ✎ Distinguish among ideal, basic, normal and attainable standards.
- ✎ Describe the types and purposes of standard costs.
- ✎ Explain how direct materials standards and direct labor standards are set.
- ✎ Compute the direct materials price and quantity variances and explain their significance.
- ✎ Compute the direct labor rate and efficiency variances and explain their significance.
- ✎ Compute the manufacturing overhead variances.
- ✎ Explain several methods for determining the significance of cost variances.

5.1. INTRODUCTION

Standard Costs Defined. Standard costs are carefully predetermined costs created by management and used as a basis for comparison with actual costs. Like all standards, standard costs are measure of achievement. Consequently, managers must use care to ensure that the standards are appropriate measures of performance that encourage attainment of organizational goals.

Types of standards. Different firms may fix different standards and the same firm may adopt different standards at different points of time. This difference in standards arises due to the variation in circumstances or conditions under which standards are fixed. On the basis of circumstances, the standards may be classified as under:

Ideal standard: A standard is said to be an ideal if it is based on ideal conditions of work. It reflects the most optimistic expectations of management. Ideal standards (also called **perfection standards**) can be achieved only with perfect operating conditions. It presupposes most favorable conditions of work and rules out any possibility of loss arising out of abnormal conditions such as break-down of machines, failure of power, employee error, labor strikes, changes in government policy, defective raw material, inventory shortage, etc. In brief, it assumes no production problems of any sort. Some managers believe that perfection (or ideal) standards motivate employees to achieve the lowest cost possible. They claim that since the standard is theoretically attainable, employees will have an incentive to come as close as possible to achieving it.

Other managers and many behavioral scientists disagree. They feel that ideal standards discourage employees, since they are so unlikely to be attained. Moreover, setting unrealistically difficult standards may encourage employees to sacrifice product quality to achieve lower cost.

Basic standard: It is a fixed standard that provide a framework for comparing performance over a period of years. They are sometimes called **long-range standards** because once created, they are used for several years or longer. Since a basic standard remains unchanged, it does not suggest, “what the cost for the year ought to be?” Therefore, it cannot be used for valid comparisons as rapidly rising resource costs and changing production technology often make basic standards difficult to use. As a result, not many firms use basic standards.

Normal standard: Normal standards can also be termed as **historical standards** as it is based on the average performance in the past years. It can be fairly a satisfactory standard if the performance in the past has been fairly stable. In case of constantly improving efficiency or erratic performance, the normal standards will fail to serve the purpose. It suffers from all the defects of an arithmetic average based on a series of items that include few extreme items.

Attainable standard: It is one that can be attained under the conditions and circumstances prevailing within the organization. Currently attainable standards are the most commonly used standards. They represent benchmarks for efficient production in the current environment. Currently attainable standards are not as stringent as ideal standards because they allow for normal production problems, such as equipment maintenance, downtime, random employee errors, and occasional inventory shortages. Still, currently attainable standards represent desirable information. Currently attainable standards are also called *practical standards*.

Are Standards the Same As Budgets?

Standards and budgets are very similar. The major distinction between the two terms is that a standard is a unit amount, whereas a budget is a total amount. Suppose that the standard cost for materials is Br. 12 per unit and 1,000 units are to be manufactured during a budget period, then the budgeted cost of materials would be Br. 12,000 (Br. 12 x 1,000). In effect, a standard can be viewed as the budgeted cost for one unit of product.

5.2 PURPOSES OF STANDARD COSTS

Cost information may be used for many different purposes. It should be noted that cost information that serves one purpose might not be appropriate for another. Therefore, the purpose for which cost information is to be used should be clearly defined before procedures are developed to accumulate cost data. Standard costs may be used for the following purposes:

Cost control: Monitoring and controlling the cost of production, marketing, and administrative activities are among the primary functions of managers. Cost control is not merely the minimization of costs; it is identifying costs with their benefits and ensuring that the costs are justified, given the benefits derived. Standard costs provide a useful framework for cost control.

Typically, standards are expressed in terms of one unit of output. When standards are expressed in terms of a single unit of output, they can be used to measure cost with standard costs as frequently as desired – monthly, weekly, daily, or for each work shift. As long as production output can be measured and actual cost accumulated, cost performance can be measured.

Product pricing: The selling price of a unit and the cost per unit are usually closely related. The cost data are readily available under standard costing system and the price can be quoted on the basis of standard costs without fear of under or over pricing. Standard cost is the predetermined normal cost of normal output and as such forms basis for price fixation.

Estimating budgets: Standard costs and budgets are similar, because they both represent planned costs for a specific period. Standard costs are very useful when developing a budget, since they form the building blocks of a total cost goal (or budget). Budgets, in effect, are standard costs multiplied by the volume or activity level expected.

Performance appraisal: Employee performance evaluation is a difficult task involving many different variables, some of which are subjective and therefore difficult to use in comparing employees. When standards are established for performance evaluation, they provide tangible measures that can be applied uniformly to all personnel. For example, the standard labor time for performing various production activities may be used to evaluate the efficiency of employees. Similarly, production department supervisors may be evaluated on how close their department came to achieving standards. Standards can be effective in performance evaluation if employees have a clear understanding of the standards and the way they are used. In addition, employees must be given timely reports evaluating their performance. The timely reports are possible because the standards are readily available for quick comparison and reporting.

Simplify performance reports. The performance reports presented in the form of variance analysis are simple to understand as they clearly distinguish between favorable and unfavorable variances. The busy top management can concentrate on significance variances and take appropriate action in the matter.

Record Keeping: Detailed record keeping may be reduced when standard costs are used in conjunction with actual costs. For example, when materials are kept at standard cost, the materials ledgers need only keep track of quantities.

Cost awareness: Accountants and financial managers are aware of the costs associated with the activities of the business, because they deal with them daily. Many other employees, however, have little or no awareness of costs. They may be concerned with increasing daily production, improving employee morale, and improving production efficiency, all of which have an impact on costs, but many employees do not understand the cost consequences of

these activities. Standard costs and standard cost performance reports inform employees about the cost implications of their actions. Such cost awareness may result in better employee efforts at cost control.

5.3 THE STANDARD COST SYSTEM

Three fundamental activities in a standard cost system are:

1. Standard setting.
2. Accumulation of actual costs.
3. Variance analysis.

Standard setting: The first step in a standard cost system is the creation of the standards to be used as a basis for measuring performance. Standard setting is an important activity because poorly conceived standards result in inappropriate measures of performance. Standard setting is not a one – time activity. As resource costs and production methods change, revision of the standard is necessary. In many firms standards are evaluated on a regular basis, such as annually or every 6 months.

Management accountants typically use two methods for setting standards: analysis of historical data and task analysis.

Historical data: Often the immediate past is the best indicator of the near future. Firms that have been producing the same product using the same production technology for a number of years may base their standards on their historical experience. They may use the techniques discussed in Unit II to determine the past relationship between input usage and output produced or between input purchases and input prices. The past relationships and prices are then used as standards. However, the management accountant often will need to adjust these predictions to reflect movements in price levels or technological changes in the production process.

Task analysis: Another way to set cost standards is to analyze the process of manufacturing a product to determine what it should cost. The emphasis shifts from what the product did cost in the past to what it should cost in the future. In using task analysis, the management accountant typically works with engineers who are intimately familiar with the production process. Together they conduct studies to determine how much direct material should be required and how machinery should be used in the production process. Time and motion studies are conducted to determine how long each step performed by direct laborers should take.

Accumulation of actual costs: A standard cost system does not eliminate the need for accumulating actual production costs. Actual costs are compared with standard costs to determine variances. In manufacturing, actual costs are accumulated in a job order or a process costing system. With nonmanufacturing activities, actual costs are also accumulated and compared with standards established for nonmanufacturing activities.

Variance analysis: A variance occurs when actual costs differ from standard costs. Variances are expressed in total birr amounts and separated into specific classifications to facilitate cost analysis and control. Variance analysis is a systematic process of identifying variances and reporting them to management.

5.3.1 Setting the Standards

As discussed earlier, an integral part of any standard cost system is the setting of standards. Establishment of standards for direct materials and direct labor will be presented here under, along with variance analysis to these two basic cost elements of manufacturing.

DIRECT MATERIALS STANDARDS

Direct materials cost standards may be divided into:

1. Quantity (usage) standards.
2. Price standards.

Quantity (usage) standards: It refers to predetermined specifications of the quantity of direct materials that should go into the production of one finished unit under normal conditions. If more than one direct material is required to complete a unit, individual standards must be computed for each direct material. The number of direct materials required to complete one unit can be developed from engineering studies, analyses of past experiences, and /or tests runs under controlled conditions.

The engineering department is normally responsible for setting quantity standards because it is generally responsible for designing production processes for making a product. Many manufacturing companies have separated departments that are assigned the responsibility for setting standards.

Price standards: It refers to prices at which direct materials should be purchased. The cost accounting department and /or the purchasing department are normally responsible for setting materials price standards because they have ready access to price data and should

have knowledge of market conditions. If more than one direct material is used in a production process, a standard unit price must be computed for each one.

DIRECT LABOR STANDARDS

Direct labor cost standards may be divided into:

1. Efficiency (time or usage) standards.
2. Rate (wage) standards.

Efficiency standards: These are predetermined performance standards of the cost of direct labor that should go into production, under normal conditions, of one finished unit. Time – and – motion studies is very helpful in developing direct labor efficiency standards. In these studies, an analysis is made of procedures to be followed by workers, and the conditions (space, temperature, equipment, tools, lighting, etc.) under which the worker must perform assigned tasks. Procedures and conditions are closely related; and therefore, a change in one is usually accompanied by a change in the other. For example, the introduction of an additional piece of equipment to an assembly line would require a change in the procedures followed by workers. When either the situations or procedures are changed, a new standard should be developed. Time – and – motion studies must be performed for all steps in the production process.

Staff specialists are usually given the responsibility for setting direct labor efficiency standards. Staff specialists should have a thorough knowledge of the production process used by the factory in addition to knowledge of the techniques of time – and – motion studies. Many companies have departments devoted solely to the establishment of direct labor efficiency standards.

Rate standards: These are predetermined wage rates for a period. The cost accounting, engineering, or personnel departments are normally responsible for setting direct labor rate standards, because they usually have access to the data required to set standards.

5.3.2 Standard Cost Variance Analysis

Variances are the differences arising when actual results do not equal the standard because of either external or internal factors. Management has little control over internal factors. Therefore, external factors (uncontrollable variances) should be separated from internal factors (controllable variances). Variance analysis is a valuable technique for separating the two. It is defined as the systematic evaluations of variances to provide managers with useful

information for measuring efficiency and improving performance. Variance analysis is performed in order to answer two general questions:

1. What is the amount of difference between actual and standard cost?
2. Why did the difference occur?

The first question deals with the measurement of the variance, which is basically a computation process. Accountants accumulate actual cost data and compare them with the standards to find the variances.

The second question addresses the cause of the variance. Often the question of why the variance occurred is the more difficult of the two questions to answer. Sometimes variances result from a complex interaction of human and physical variables.

In this section, the discussion emphasis primarily on the computation of several specific variances. The more complex issue of explaining their cause is beyond the scope of this course.

Variances can be computed for all three of the basic cost elements – direct materials, direct labor, and manufacturing overhead. The computation for materials and labor is quite similar. Manufacturing overhead variances require different and somewhat more complex situations.

DIRECT MATERIAL VARIANCES

Direct materials variances may be divided into:

1. Quantity (usage) variance.
2. Price variance.

Material Quantity Variance: The material quantity variance measures the amount of variance caused by using more or less materials than standard. Direct materials quantity variance is favorable when the actual quantity used is less than the standard quantity allowed and is unfavorable when more materials are used than standard. The formula for the variance can be expressed as follows:

$$MQV = (AQ - SQ) \times SP$$

Where MQV = direct materials quantity variance

AQ = actual quantity used

SQ = standard quantity allowed

SP = standard unit price

Standard quantity allowed is the amount of direct materials that should have been used to produce the actual unit output of the period. And it is equal to the predetermined quantity of direct materials that should go into one finished unit multiplied by the number of units produced.

$$\text{Standard quantity of Materials allowed} = \frac{\text{Actual output Achieved}}{\text{per unit of output}} \times \text{materials allowed}$$

Material quantity variance highlights deviations between the quantity of material actually used and the standard quantity allowed. Thus, it makes sense to compute this variance at the time the material is used in production.

The production department or cost center that controls the input of direct materials into the production process is usually assigned the responsibility for this variance.

Material Price Variance: The material price variance measures the amount of variances from standard that occurs because the price paid for raw materials is different from the standard cost. If the actual materials cost is greater than standard, the price variance is unfavorable. A favorable variance occurs if the cost of materials is less than standard. The equation of the material price variance is

$$\text{MPV} = (\text{AP} - \text{SP}) \times \text{AQ}$$

Where MPV = direct materials price variance

AP = actual price or unit cost

SP = standard price

AQ = actual quantity purchased.

As stated above, the direct material price variance is based on the actual quantity purchased because deviations between the actual and standard price relate to the purchasing function in the firm.

Management has little control over price variances, especially when they result from rising prices. However, the purchasing department may have some control over prices by ordering in economical quantities, and /or finding suppliers who offer the same quality of goods at lower prices.

Note that: The sum of the direct material usage and price variances equals the **total direct material flexible budget variance (MFBV)**.

$$\text{MFBV} = \text{MQV} + \text{MPV}$$

Example (1) National Company produces a single product. For the first quarter of the year, the following data were collected:

Units produced (finished products)	10,000 units
Direct materials quantity standard	4 units of direct materials per unit of finished product
Direct materials used in production	39,000 units
Direct materials purchased	50,000 units
Direct materials standard cost	Br. 2.00 each
Actual direct materials cost	Br. 2.10 each.

Instruction: For materials used in the production, compute the following variances for the quarter:

- Direct materials quantity and price variances.
- Direct materials flexible budget variance.

Identify each variance as favorable (F) and unfavorable (U).

Solutions:

- i) Direct materials quantity variance

$$\begin{aligned}\text{Standard materials allowed (SQ)} &= \text{Actual} \times \text{Materials allowed} \\ &\quad \text{Out put} \quad \text{per unit.} \\ &= 10,000 \times 4 = \underline{40,000 \text{ units}}\end{aligned}$$

$$\begin{aligned}\text{MQV} &= (\text{AQ} - \text{SQ}) \times \text{SP} \\ &= (39,000 - 40,000) \times 2.00 \\ &= \underline{\text{Br. (2,000) F}}\end{aligned}$$

A favorable (F) variance indicates that direct materials quantity used was less than the standard quantity allowed.

- ii) Direct materials price variance

$$\begin{aligned}\text{MPV} &= (\text{AP} - \text{SP}) \times \text{AQ} \\ &= (2.10 - 2.00) \times 50,000 \\ &= \underline{\text{Br. 5,000 U}}\end{aligned}$$

An unfavorable (U) direct materials price variance resulted because the actual unit cost was greater than the standard unit cost.

- b. Direct materials flexible budget variance (MFBV)

$$\begin{aligned}\text{MFBV} &= \text{MQV} + \text{MPV} \\ &= \text{Br. (2,000) F} + \text{Br. 5,000 U} \\ &= \underline{\text{Br. 3,000 U}}\end{aligned}$$

DIRECT LABOR VARIANCES

The computation of direct labor variances is very similar to that of direct materials variances. However, there are some differences between labor and materials in setting variances, in the controllability of the variances, and in the timing of the variance reports. Consequently, labor and materials variances are treated separately.

Direct labor variances may be divided into

1. Efficiency variance.
2. Rate variance.

Labor Efficiency Variance: The labor efficiency variance identifies the amount of total labor variance caused by using more or less than the standard quantity. The term efficiency expresses the idea that the labor is used favorably if fewer hours than standard are used to make a product. Conversely, labor is used inefficiently if more labor hours than standard are used. The equation for the direct labor efficiency is

$$\text{LEV} = (\text{AH} - \text{SH}) \times \text{SR}$$

Where LEV = direct labor efficiency variance

AH = actual hours worked

SH = standard hours allowed

SR = standard wage rate.

Standard hours allowed is equal to the number of direct labor hours that should be worked in the production of one finished unit multiplied by the number of units production.

The supervisor of the department or cost center in which the work performed is usually held responsible for direct labor efficiency variances if procedures and conditions remain constant (for example, if no new procedures or equipment were introduced).

Labor Rate Variance: It isolates the portion of the total labor variance that is caused by the actual labor rate's being different from the expected (standard) labor rate. It is computed in the same way as the material price variance. The formula is:

$$\text{LRV} = (\text{AR} - \text{SR}) \times \text{AH}$$

Where LRV = direct labor rate variances

AR = actual wage rate

SR = standard wage rate

AH = actual hours worked

As in the case of the direct materials price variances, management has very little control over rate variances. However, some companies hold the supervisor of the department or cost center where the work is performed responsible if, for example, workers with a high rate were used in a particular process and as a result, the greatest worker loss efficiency was achieved.

Note that the sum of the direct labor usage and rate variances equals *the direct labor flexible – budget variances (LFBV)*.

$$LFBV = LEV + LRV$$

Exhibit 5– 1 presents the analysis of direct material and direct labor variances in a format that deserves close study.

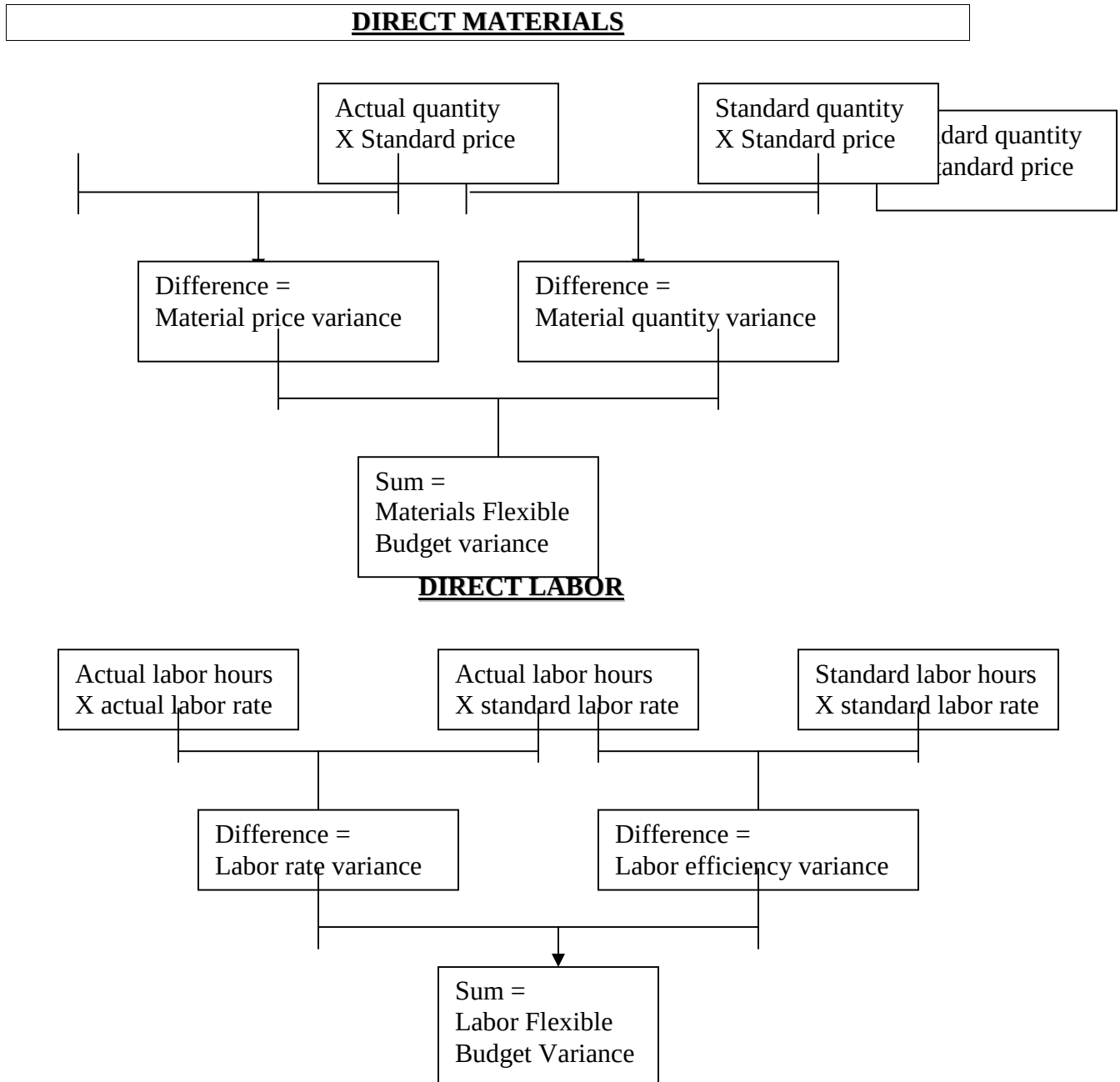


Exhibit 5 – 1 Analysis of Direct Labor and Direct Material Variances

👉 **Activity question -I**

1. Explain why the quantity purchased is used in computing the direct material price variance, but the actual quantity consumed is used in computing the direct material quantity variance.

.....

Example (1) Beza Mills, Inc., a large producer of men's and women's clothing, began production on April 1. The company uses standard costs for all of its products. The standard costs and actual costs for April are given below for one of the company's product lines.

STANDARDS			
	Standard inputs expected per unit of output	Standard price expected per unit of input	Standard cost expected per unit of output
Direct material	5 pounds	Br. 2	Br. 10
Direct labor	½ hour	16	8

During April, the company produced 7,000 units of product. However, 9,000 units were scheduled for production. The following activity was recorded relative to the product line during this period:

Direct material: 36,800 pounds of material were purchased and used at an actual unit price of Br. 1.90.

Direct labor: 3,750 hours of labor were used at an actual hourly rate (price) of Br. 16.40.

There was no inventory of materials on hand to start the period.

Instructions:

- a. Compute the direct material price and quantity variances for April.
- b. Compute the direct labor rate and usage variances for April.
- c. Compute the sales activity and master budget variances for both direct materials and direct labor.

Indicate whether each variance is **favorable** (F) or **unfavorable** (U).

Solutions:

- a. i) Direct material price variances

$$\begin{aligned}\text{MPV} &= (\text{AP} - \text{SP}) \times \text{AQ} \\ &= (1.90 - 2) \times 36,800 \\ &= \underline{\text{Br. (3,680)F}}\end{aligned}$$

ii. Direct material quantity variances

$$\begin{aligned}\text{Standard material allowed (SQ)} &= \text{Actual Output} \times \text{Materials allowed per unit of output.} \\ &= 7,000 \times 5 \\ &= \underline{35,000} \text{ pounds} \\ \text{MQV} &= (\text{AQ} - \text{SQ}) \times \text{SP} \\ &= (36,800 - 35,000) \times 2 \\ &= \underline{\text{Br. 3,600 U}}\end{aligned}$$

iii. Materials flexible budget variances (MFBV)

$$\begin{aligned}\text{MFBV} &= \text{MPV} + \text{MQV} \\ &= (3680) \text{ F} + 36000 \text{ U} \\ &= \underline{(80) \text{ F}}\end{aligned}$$

b) i) Labor rate variances

$$\begin{aligned}\text{LRV} &= (\text{AR} - \text{SR}) \times \text{AH} \\ &= (16.40 - 16) \times 3,750 \\ &= \text{Br. } \underline{1500 \text{ U}}\end{aligned}$$

ii) Labor efficiency variances

$$\begin{aligned}\text{Standard hours allowed (SH)} &= \text{Actual Output} \times \text{hours allowed per unit of output} \\ &= 7,000 \times \frac{1}{2} \\ &= \underline{3500 \text{ hours}}\end{aligned}$$

$$\begin{aligned}\text{LEV} &= (\text{AH} - \text{SH}) \times \text{SR} \\ &= (3,750 - 3,500) \times 16 \\ &= \text{Br. } \underline{4,000 \text{ U}}\end{aligned}$$

i) Labor flexible budget variances (LFBV)

$$\begin{aligned}\text{LFBV} &= \text{LRV} + \text{LEV} \\ &= 1500 \text{ U} + 4000 \text{ U} \\ &= \underline{\text{Br. 5,500 U}}\end{aligned}$$

$$\text{Flexible Budget} = \text{Actual output Achieved} \times \text{Input allowed per unit of output} \times \text{Standard unit price of input}$$

$$\begin{aligned}\text{Master Budget} &= \text{Original Planned Output} \times \text{Input allowed per unit of output} \times \text{standard unit price of input}\end{aligned}$$

$$\mathbf{MBV = FBV + ALV}$$

Where: MBV = master budget variance

FBV = flexible budget variance

ALV = activity level variance.

Refresh your memory of MBV, FBV and ALV from the previous unit.

Exhibit 5 – 2 Actual and Budgeted Costs for Direct Materials and Direct Labor.

	Actual cost	Static budget	Flexible Budget	FBV	ALV	MBV
Direct materials	Br. 69,920	Br. 90,000	Br. 70,000	Br. 80 F	Br. 20,000 F	Br. 20,080 F
Direct labor	61,500	72,000	56,000	5,500 U	16,000 F	11,500 F

MBV = Actual cost – Static budget

FBV = Actual cost – Flexible Budget

ALV = Master Budget – Flexible Budget

Supporting computations:

Actual costs:

Direct materials = Br. 1.90 x 36,800 = Br. 69,920

Direct labor = Br. 16.40 x 3,750 = Br. 61,500

Static budgets

Direct materials = 9,000 x 5 x 2 = Br. 90,000

Direct labor = 9,000 x ½ x 16 = Br. 72,000

Flexible budget (budgets for the actual activity levels)

Direct materials = 7,000 x 5 x 2 = Br. 70,000

Direct labor = 7,000 x ½ x 16 = Br. 56,000

Example (2) Summarized manufacturing cost data from the records of Ethio Products Company are given below:

Direct materials: Purchased, 130,000 units at an actual cost of Br. 546,000. Standard cost of 130,000 units, Br. 520,000. Used 98,000 units of direct materials in production. Only 95,000 units should have been used.

Direct labor: The standard labor rate is Br. 2 per hour. The company operated at 40,000 direct labor hours but produced a quantity of product that should have been produced in 35,000 direct labor hours. All but 2,000 of the direct labor hours were paid for at the standard rate and the 2,000 hours were paid for at the rate of Br. 3.25 per hour.

Instructions: Compute the following

- Direct material price variance
- Direct material usage variance
- Direct labor rate variance
- Direct labor efficiency variance.

Solution:

- a. Direct material price variance

$$AP = \frac{\text{Br. } 546,000}{130,000 \text{ units}} = \text{Br. } \underline{4.20}$$

$$SP = \frac{\text{Br. } 520,000}{130,000 \text{ units}} = \text{Br. } \underline{4.00}$$

$$\begin{aligned} MPV &= (AP - SP) \times AQ \\ &= (4.20 - 4.00) \times 98,000 \\ &= \underline{\text{Br. } 19,600 \text{ U}} \end{aligned}$$

- b. Direct materials usage variance

$$\begin{aligned} MQV &= (AQ - SQ) \times SP \\ &= (98,000 - 95,000) \times 4.00 \\ &= \underline{\text{Br. } 12,000 \text{ U}} \end{aligned}$$

- c. Direct labor rate variance

$$LRV = (AR - SR) \times AH$$

The actual labor hour used totaled 40,000 hours. Of which 38,000 hours are paid at the standard rate. Therefore, AH, in the formula here above, can be taken as 2,000 hours i.e., the excess of 38,000 over 40,000.

$$\begin{aligned} LRV &= (3.25 - 2.00) \times 2,000 \\ &= \underline{\text{Br. } 2,500 \text{ U}} \end{aligned}$$

OR computed alternatively

$$\begin{aligned} LRV &= [(3.25 - 2.00) \times 2,000] + [(2.00 - 2.00) \times 38,000] \\ &= 2,500 \text{ U} + 0 \\ &= \underline{\text{Br. } 2,500 \text{ U}} \end{aligned}$$

- d. Direct labor efficiency variance

$$\begin{aligned} LEV &= (AH - SH) \times SR \\ &= (40,000 - 35,000) \times 2 \\ &= \underline{\text{Br. } 10,000 \text{ U}} \end{aligned}$$

Example (3) Lucy Company produces a single product. The company has set standards as follows for materials and labor:

	<u>Direct Materials</u>	<u>Direct Labor</u>
Standard quantity or hours per unit	? Pounds	2.5 hours
Standard price or rate	? Per pound	Br. 9 per hour
Standard cost per unit	?	Br. 22.50

During the past month, the company purchased 6,000 pounds of direct materials at a cost of Br. 16,500. All of these materials were used in the production of 1,400 units of product. Direct labor cost totaled Br. 28,545 for the month. The following variances have been computed:

Material quantity variance	Br. 1,200 U
Total materials variance	300 F
Labor efficiency variance	4,500 F

F and U denote favorable and unfavorable variances, respectively.

Instructions:

- a. For direct materials used in production, compute the following
 - i. The standard price per pound.
 - ii. The standard quantity allowed for materials for the month's production.
 - iii. The standard quantity of materials allowed per unit of product.
- b. For labor employed in production,
 - i. Compute the actual direct labor cost per hour for the month
 - ii. Compute the labor rate variance.

Solutions:

- a. i. Total material variance (TMV) = Material flexible budget variance (MFBV)

$$\text{MFBV} = \text{MQV} + \text{MPV}$$

$$(300) \text{ F} = 1200 \text{ U} + \text{MPV}$$

$$\text{MPV} = \underline{\text{Br. 1,500 F}}$$

$$\text{Actual material purchase price} = \frac{\text{Br. 16,500}}{6,000 \text{ pounds}} = \underline{\text{Br. 2.75 / lb}}$$

$$\text{lb} = \text{pound}$$

$$\text{MPV} = (\text{AP} - \text{SP}) \times \text{AQ}$$

$$(1,500) \text{ F} = (2.75 - \text{SP}) \times 6,000$$

$$\underline{(1,500)} = 2.75 - \text{SP}$$

$$6,000$$

$$(0.25) = 2.75 - \text{SP}$$

$$\text{SP} = \underline{\text{Br. 3.00 / lb}}$$

- ii. $\text{MQV} = (\text{AQ} - \text{SQ}) \times \text{SP}$

$$1,200 \text{ U} = (6,000 - \text{SQ}) \times 3$$

$$\underline{1,200} = 6,000 - \text{SQ}$$

$$3$$

$$\text{SQ} = 6,000 - 400$$

$$\text{SQ} = \underline{5,600 \text{ pounds}}$$

- iii. Standard quantity of materials allowed per unit of product = $\frac{5,600}{1,400} = \underline{4 \text{ pounds}}$

- b. i.) $\text{LEV} = (\text{AH} - \text{SH}) \times \text{SR}$

$$(4,500) = [\text{AH} - (1,400 \times 2.5)] \times 9$$

$$\underline{(4,500)} = [\text{AH} - (1,400 \times 2.5)]$$

$$9$$

$$\begin{aligned}
 (500) &= AH - 3,500 \\
 AH &= \underline{3,000 \text{ hours}} \\
 \text{Actual labor cost} &= AH \times AR \\
 \text{Br. } 28,545 &= 3,000 \times AR \\
 AR &= \frac{\text{Br. } 28,545}{3,000} \\
 &= \underline{\text{Br. } 9.515} \\
 \text{ii) LRV} &= (AR - SR) \times AH \\
 &= (9.515 - 9) \times 3,000 \\
 &= \underline{\text{Br. } 154.5 \text{ U}}
 \end{aligned}$$

5.3.2 MANUFACTURING OVERHEAD VARIANCES

The flexible overhead budget is the management accountant's primary tool for the control of manufacturing overhead costs. At the end of each accounting period, the management accountant uses the flexible overhead budget to determine the level of overhead that should have been incurred, given the actual level of activity. Then the accountant compares the overhead cost in the flexible budget with the actual overhead costs incurred. The management accountant then computes separate overhead variances, each of which conveys separate information useful in controlling overhead costs.

However, many organizations believe that it is not worthwhile to monitor individual overhead items. Therefore, overhead variances often are not subdivided the flexible budget variances- the complexity of the analysis may not be worth the effort.

Nevertheless, in some cases it may be worthwhile to subdivide the flexible-budget overhead variances, especially those for *variable overhead*. Part of the variable overhead flexible budget variance is related control of the cost driver and part to the control of overhead spending itself. When actual cost driver activity differs from the standard amount for the actual output achieved, a **variable overhead efficiency variance (VOEV)** will occur. Whenever actual cost driver activity exceeds that allowed for the actual output achieved, overhead efficiency variances will be unfavorable and vice versa. In essence this efficiency variance tells management the cost of not controlling the use of cost driver activity. The remainder of the flexible budget variance measures control overhead spending itself, given actual cost driver activity.

The variable overhead efficiency variance is a measure of the difference between the actual activity of a period and the standard activity allowed, multiplied by the variable part of the predetermined overhead rate. The formula for the variance can be expressed as follows:

$$\text{VOEV} = (\text{AH} - \text{SH}) \times \text{VOHR}$$

Where: AH = actual direct labor hours

SH = standard direct labor hours allowed

VOHR = standard variable overhead rate per hour

As its name implies, the variable overhead spending variance (VOHSV) measures deviations in amounts spent for overhead inputs such as lubricants and utilities. The formula for the variance can be expressed as follows:

$$\text{VOHSV} = \text{AH} (\text{AR} - \text{SR})$$

Where: AH = actual direct labor hours used

AR = actual variable overhead rate

SR = standard variable overhead (VOH) rate

$$\text{VOHSV} = \text{AH} (\text{AR} - \text{SR})$$

$$\text{VOHSV} = (\text{AH} \times \text{AR}) - (\text{AH} \times \text{SR})$$

$$= \text{Actual variable overhead} - (\text{actual direct labor hours used} \times \text{standard VOH rate})$$

Example (4) Wale Company uses standard costs and a flexible budget to control its manufacture of fine chocolates. Operating data for the past week are summarized as follows: (lb = pound)

- a) Finished units produced: 5, 000 units of chocolates.
- b) Direct materials: purchases, 8,000 lbs @ Br15 per lb; standard price is Br.16 per lb. Used 5, 400 lbs allowed per case produced, 1lb.
- c) Direct labor: actual hours, 8, 000 hours @ Br.30.50. standard allowed per good case produced, 11/2 hours. Standard price per direct labor, Br.30
- d) Variable manufacturing overhead: actual costs Br. 88, 000. Budget formula is Br.10 per standard direct labor hour.

Instructions:

- a. Material purchase price variance
- b. Material usage variance
- c. Direct labor rate variance
- d. Direct labor usage variance
- e. Variable overhead efficiency variance.
- f. Variable overhead spending variance.

Solutions:

- a. $MPV = (AR - SP) \times AQ$
 $= (15 - 16) \times 8,000 = \text{Br. } \underline{(8000) F}$
- b. $MUV = (AQ - SQ) \times SP$
 $= (5,400 - 5,000) \times 16 = \text{Br. } \underline{6,400 U}$
- c. $LRV = (AR - SR) \times AH$
 $= (30.5 - 30) \times 8,000 = \text{Br. } \underline{4,000 U}$
- d. $LEV = (AH - SH) \times SR$
 $= (8000 - 7500) \times 30 = \text{Br. } \underline{15,000 U}$
- e. $VOHEV = (AH - SH) \times \text{VOH rate}$
 $= (8,000 - 7,000) \times 10 = \text{Br. } \underline{5,000 U}$
- f. $VOHSV = \text{actual variable overhead} - (SR \times AH)$
 $= \text{Br. } 88,000 - (10 \times 8,000)$
 $= \text{Br. } \underline{8,000 U}$

? MODEL QUESTIONS

1. Distinguish between quantity standard and price standard?
2. List the advantages of a standard costing system.
3. Distinguish between standard and budget?
4. What is variance?

5.4 SUMMARY

Estimated costs are useful for planning purposes. However, they are based on historical costs and thus may contain inefficiencies based on past performance. For this reason, they may not be useful for controlling costs. In contrast, standard costs are carefully predetermined to reflect what costs ought to be rather than they were in prior periods.

Using standard costs, a firm can evaluate the efficiency of each segment's operations. Efficiency is a measure of whether an objective was accomplished with a minimum amount of effort and cost. Standard costs are especially suited for measuring efficiency, but they may also help in measuring effectiveness—that is, whether an objective was actually achieved.

Standard costs are used for controlling through the use of performance reports, critical cost analysis when the standards are set, pricing, inventory valuation, budget preparation, and simplified record keeping.

A standard cost refers to the cost of one unit of product. In contrast, a budget cost is the estimated number of units to produce multiplied by the standard cost. Budgeted costs are useful for planning, but they are only useful for controlling when the actual production is exactly as anticipated. When actual production differs from anticipated production, the

standard quantity allowed must be used instead. The standard quantity allowed is the standard for quantity for one unit multiplied by the actual number of units produced. This figure then must then be converted to the total standard cost, which is the standard quantity allowed multiplied by the standard unit price of direct material or direct labor.

Comparing an actual cost for direct materials or direct labor its total standard cost merely indicated that a variance exists. It does not explain why the variance arose or where its source might lie. Thorough, variance analysis, a total variance is segmented in to its price (rate) and quantity (efficiency) components which when classified as either favorable or unfavorable can provide the additional information managers need to decide where potential problems may lie and what action may be needed.

➔5.5. ANSWERS

5.5.1. Activity Questions

1. The direct material price variance is based on the actual quantity purchased because deviations between the actual and standard price relate to the purchasing function in the firm.

5.5.2. Model questions

1. Quantity (usage) standards refer to predetermined specifications of the quantity of input that should go into the production of one finished unit under normal conditions. Price standards refer to prices at which input should be purchased (paid).
2. Standard costs may be used for the following purposes:
 - a) Cost control
 - b) Product pricing
 - c) Estimating budgets
 - d) Performance appraisal
 - e) Simplify performance reports
 - f) Record Keeping Cost awareness
3. Standard costs are carefully predetermined costs created by management and used as a basis for comparison with actual costs. A standard is a unit amount, whereas a budget is a total amount.
4. Variances are the differences arising when actual results do not equal the standard because of either external or internal factors.

