UNIT I: MASTER BUDGET

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1.0. INTRODUCTION

The purpose of this chapter is to introduce the master budget or financial plan. This topic includes an important set of concepts and techniques that represent the major planning device for an organization, as well as the foundation for a traditional standard cost performance evaluation and control system. The chapter includes six sections. The first section provides a discussion of the underlying concepts of financial planning and budgeting including the various types of budgets. This section also includes a diagram of the master budget that provides an overview of the overall budgeting process. Sections two and three include short, but important discussions of the purposes and benefits of budgeting and the limitations and problems involved in budgeting. The assumptions upon which the budget is based are briefly described in section four. The techniques used to prepare a master budget are discussed and illustrated in section five. This is the longest section and includes a discussion of where the

budget director obtains the budget information as well as how the information is used to complete the various schedules and sub-budgets involved. The last section includes a simplified, but fairly comprehensive example.

1.1. LEARNING OBJECTIVES

After you have read and studied this chapter, you should be able to:

- ✓ Discuss the concept of financial performance including the elements involved
- ✓ Outline the main parts of a master budget including the sequence in which they are developed.
- ✓ Discuss the purposes and benefits of the master budget.
- ✓ Discuss the limitations and problems associated with the master budget.
- ✓ Briefly describe the assumptions underlying the master budget.
- ✓ Discuss the sources of the various information needed for the master budget.
- ✓ Prepare the operating budget and supporting schedules
- ✓ Prepare a financial budget

1.2. BUDGETING CONCEPTS

Budgeting involves planning for the various revenue producing and cost generating activities of an organization. The importance of budgeting is emphasized by an old saying, "Failing to plan, is like planning to fail." Budgeting is essentially financial planning, or planning for financial performance. Financial performance depends on revenue and cost. Revenue is provided from sales of merchandise by

retailers, sales of products, harvested, mined, constructed, formed, processed or assembled by farms, mining companies, construction companies and manufacturers and from sales of various services by firms involved in activities such as banking, insurance, accounting, law, medical care, food distribution, repair and entertainment. In addition to producing revenue, all of these companies generate three types of costs including discretionary, engineered and committed costs. Various costs fall into one of these three categories based on the cause and effect relationships involved. Although there are a variety of ways to define costs, categorizing costs in terms of the cause and effect relationships is a prerequisite for understanding the different types of budgets that are introduced in this chapter. These three cost concepts are summarized and discussed in more detail below.

TYPE OF COST	CAUSE & EFFECT OR COST BENEFIT RELATIONSHIP	COST BEHAVIOR	EXAMPLES
Discretionary	**Relationships are difficult or impossible to define**	**Fixed, Variable, and mixed in the short term**	**Cost administrative and support services such as employee training, advertising, sales promotion, legal advice, and research and maintenance**
Engineered	**Relationships are relatively easy to define**	**Variable in the short run**	**Direct resources used in production activities such as material and direct labor and many indirect resources such as electric power**

Committed	**Relationships can be estimated but not defined precisely**	**Fixed in the short run**	**Cost of establishing and maintaining the readiness to conduct business, such as the cost associated with plant and equipment**

1.2.1. Discretionary Costs

Many activities are viewed as beneficial to an organization, even thought the benefits obtained, or value added by performing the activities cannot be defined precisely, either before or after the activity is completed. The costs of the inputs, or resources required to perform such activities are referred to as discretionary costs. These costs are discretionary in the sense that management must choose the desired level of the activity based on intuition or experience because there is no well-defined cause and effect relationship between cost and benefits. Discretionary costs are usually generated by service or support activities. Examples include employee training, advertising, sales promotion, legal advice, preventive maintenance, and research and development. The value added by each of these activities is intangible and difficult, if not impossible to measure, where value added refers to the benefits obtained by either internal or external customers. In terms of cost behavior, discretionary costs may be fixed, variable or mixed.

1.2.2. Engineered Costs

Engineered costs result from activities with reasonably well defined cause and effect relationships between inputs and outputs and costs and benefits. Direct material costs provide a good example. Engineers can specify precisely how many parts (inputs) are required to generate a specific output such as a microcomputer, a coffee maker, an automobile, or a television set. Direct labor also falls into the

engineered cost category as well as indirect resources that vary with product specifications and production volume. Although the cause and effect relationships are not as precise for indirect resources, these relationships can be established using statistical techniques such as regression and correlation analysis. A key difference between discretionary costs and engineered costs is that the value added by the activities associated with engineered costs is relatively easy to measure. Engineered costs are variable in terms of cost behavior.

1.2.3. Committed Costs

Committed costs refer to the costs associated with establishing and maintaining the readiness to conduct business. The benefits obtained from these expenditures are represented by the company's infrastructure. For example, the costs associated with the purchase of a franchise, a patent, drilling rights and plant and equipment create long-term obligations that fall into the committed cost category. These costs are mainly fixed in terms of cost behavior and expire to become expenses in the form of amortization and depreciation.

1.3. TYPES OF BUDGETS

Four types of budgets are used for planning and controlling the various types of costs discussed above. These four techniques are summarized in ----------

BUDGET TYPES AND CHARACTERISTICS

TYPE OF BUDGET	CHARACTERISTICS OF THE TECHNIQUE	TYPE OF COST OR EXPENDITURE	EXAMPLES
APPROPRIATION BUDGET	A maximum amount is established for certain expenditures based on management judgment	Discretionary costs	Employee training, advertising, sales promotion and research and development.
FLEXIBLE BUDGET	A static amount (a) is established for fixed costs and a variable rate (b) is determined per activity measure for variable costs, i.e., Y = a + bX	The static amount (a) includes both discretionary and committed costs while the flexible part (b) includes engineered costs per X value.	The static part: salaries, depreciation, property taxes and planned maintenance. The flexible part: direct material, direct labor and variable overhead. Also, some costs related to sales reps such as sales commissions and travel.
CAPITAL BUDGET	Decisions concerning potential investments are made using discounted cash flow techniques.	Committed costs	New plant and equipment

MASTER BUDGET	A comprehensive plan is developed for all revenue and expenditures.	Discretionary, engineered and committed costs.	All revenue and expenditures for any company.

1.3.1. Appropriation Budgets

The oldest type of budget is referred to as an appropriation budget. Appropriation budgets place a maximum limit on certain discretionary expenditures and may be either incremental, priority incremental, or zero based. Incremental budgets are essentially last year's budget amount plus an increment, i.e., small increase. Priority incremental budgets also involve an increase, but require managers to prioritize, or rank discretionary activities in terms of their importance to the organization. The idea is for the manager to indicate which activities would be changed if the budget were increased or decreased. The technique is expensive to use because zero based budgets theoretically require justification for the entire budget amount. When it was popular, a more typical approach was to justify the last twenty percent of the budget, i.e., use eighty percent based budgeting.

From a control perspective, appropriation budgets are effective in limiting the amount of expenditure, but create a behavioral bias to spend to the limit. Establishing a maximum amount for expenditure encourages spending to the limit because spending below the limit implies that something less than the maximum appropriation was needed. Spending below the limit might result in a budget cut in future periods. Since nearly every manager views a budget reduction in their discretionary costs as undesirable, there are frequently crash efforts at the end of a budget period to spend up to the limit.

1.3.2. Flexible Budgets

Flexible budgets are based on a cost function such as $Y = a + bX$, where Y represents the budgeted cost, or dependent variable. The

constant "a" represents a static amount for fixed costs and the constant "b" represents the rate of change in Y expected for a unit change in the independent variable X. The expression " bX" is the flexible part of the budget cost function. The flexible budget technique is used for planning and monitoring all types of costs. The static amount "a" includes both discretionary and committed costs, while the flexible part "bX" includes various types of engineered costs. The flexible characteristic of the technique enables the flexible budget to play a key role in both financial planning and performance evaluation.

1.3.3. Capital Budgets

Capital budgets represent the major planning device for new investments. Discounted cash flow techniques such as net present value and the internal rate of return are used to evaluate potential investments. Capital budgets are part of a somewhat more encapsulating concept referred to as investment management. Investment management involves the planning and decision process for the acquisition and utilization of all of the organization's resources, including human resources as well as technology, equipment and facilities. The concept of investment management includes the discounted cash flow methods, but is more comprehensive in that the organization's portfolio of interrelated investments is considered as well as the projected effects of not investing.

1.3.4. Master Budgets

The fourth type of budget is referred to as the master budget or financial plan. The master budget is the primary financial planning mechanism for an organization and also provides the foundation for a traditional financial control system. More specifically, it is a comprehensive integrated financial plan developed for a specific period of time, e.g., for a month, quarter, or year. This is a much broader concept than the first three types of budgeting. The master

budget includes many appropriation budgets (typically in the administrative and service areas) as well as flexible budgets, a capital budget and much more. A diagram illustrating the various parts of a master budget is presented in ----------

DIAGRAM OF MASTER BUDGET OF A NON MANUFACTURING COMPANY

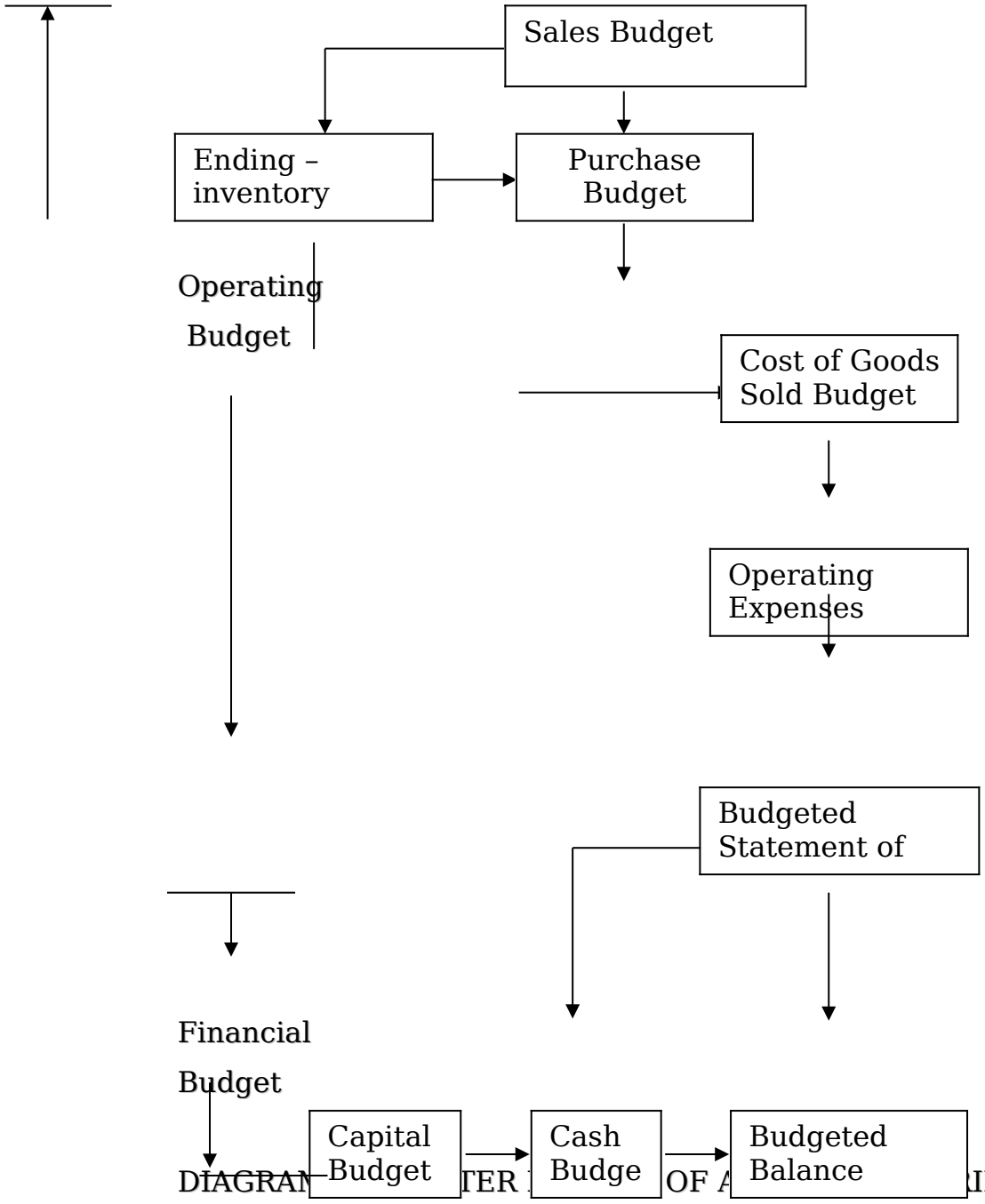
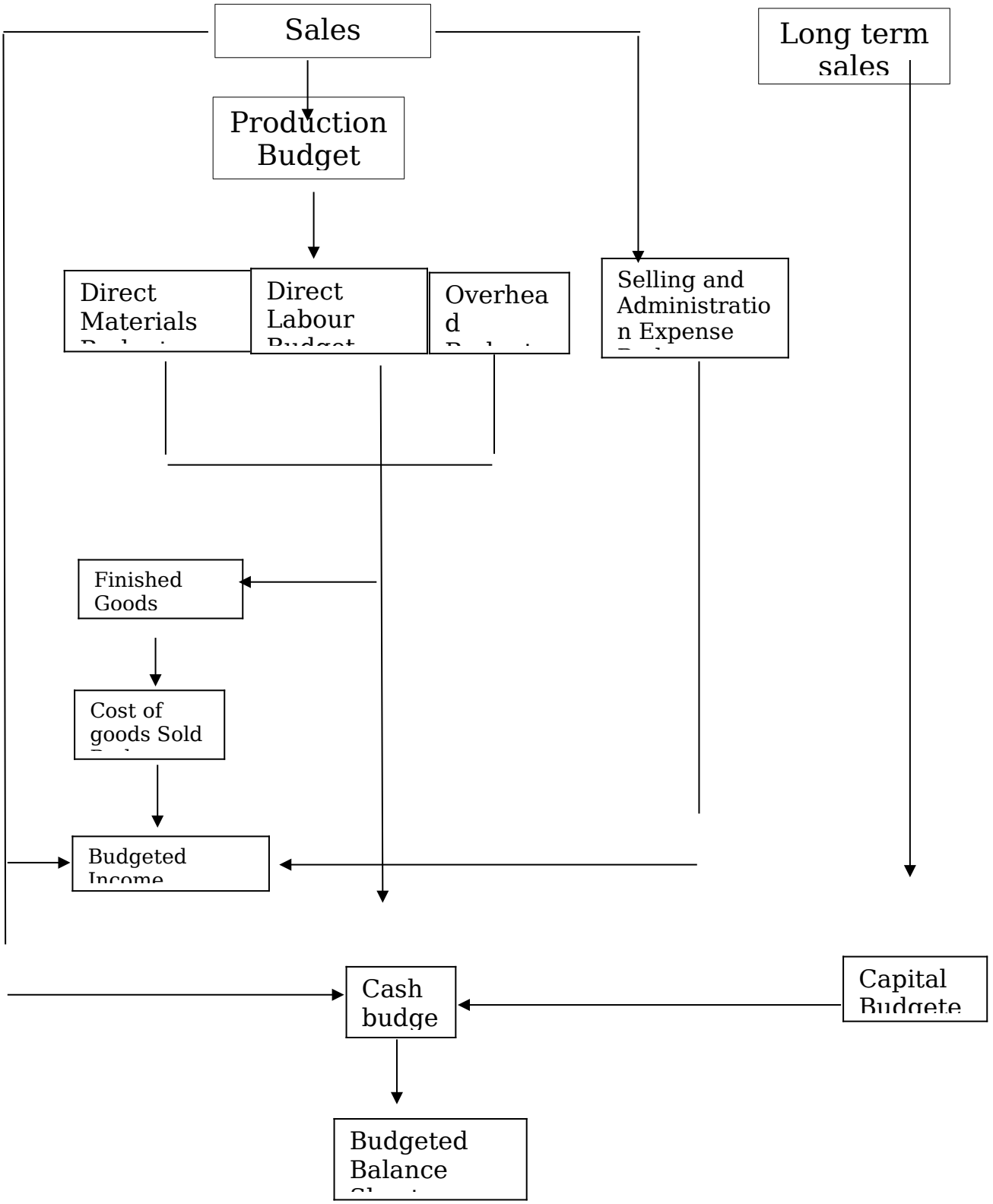


DIAGRAM OF MASTER BUDGET OF A NON MANUFACTURING COMPANY


Sales
Long term sales
Production Budget
Direct Materials
Direct Labour
Overhead
Selling and Administration Expense
Finished Goods
Cost of goods Sold
Budgeted Income
Cash budge
Capital Budgete
Budgeted Balance

The master budget has two major parts including the operating budget and the financial budget. The operating budget begins with the sales budget and ends with the budgeted income statement. The financial budget includes the capital budget as well as a cash budget, and a budgeted balance sheet. The main focus of this chapter is on the various parts of the operating budget and the cash budget. The budgeted balance sheet is covered briefly, but not emphasized. In the next section, we consider the purposes, benefits, limitations and assumptions of the master budget.

1.4. THE PURPOSES AND BENEFITS OF THE MASTER BUDGET

There are a variety of purposes and benefits obtained from budgeting. Consider the following:

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

b. Integrates and Coordinates

The master budget is the major planning device for an organization. Thus, it is used to integrate and coordinate the activities of the various functional areas within the organization. For example, a comprehensive plan helps ensure that all the needed inputs (equipment, materials, labor, supplies, etc.) will be at the right place at the right time when needed, just-in-time if possible. It also helps insure

that manufacturing is planning to produce the same mix of products that marketing is planning to sell.

c. Communicates and Motivates

Another purpose and benefit of the master budget is to provide a communication device through which the company's employees in each functional area can see how their efforts contribute to the overall goals of the organization. This communication tends to be good for morale and enhance jobs satisfaction. People need to know how their efforts add value to the organization and its' products and services. The behavioral aspects of budgeting are extremely important.

c. Promotes Continuous Improvement

The planning process encourages management to consider alternatives that might improve customer value and reduce costs.. The financial plan and subsequent financial performance measurements reflect the financial expectations and consequences of those efforts.

d. Guides Performance

The master budget also provides a guide for accomplishing the objectives included in the plan. The budget becomes the basis for the acquisition and utilization of the various resources needed to implement the plan. Perfection of the guidance aspect of budgeting can significantly reduce the amount of uncertainty and variability in the company's operations.

e. Facilitates Evaluation and Control

The master budget provides a method for evaluating and subsequently controlling performance. We will develop this idea in considerable detail in the following chapter. Performance evaluation and control is a very powerful and very controversial aspect of budgeting.

f. 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.

1.5. LIMITATIONS AND PROBLEMS

There are several limitations and problems associated with the master budget that need to be considered by management. These problems involve uncertainty, behavioral bias and costs.

a. Uncertainty

Budgeting includes a considerable amount of forecasting and this activity involves a considerable amount of uncertainty. Uncertainty affects both sides of the financial performance dichotomy, but uncertainty on the revenue side presents a more serious limitation for planning. The sales budget is frequently based on a forecast supported by a variety of assumptions about the economy, and the actions of competitors, suppliers, and customers. The uncertainty associated with sales forecasting creates a greater problem than uncertainty on the cost side because the other parts of the budget are derived from the sales forecast.

b. Costs

A third problem or limitation is that budgeting requires a considerable amount of time and effort. Many companies maintain a twelve-month budget on a continuous basis by adding a future month as the current month expires. While this does not create a major expenditure for large or medium sized organizations, smaller companies may find it difficult to justify the costs involved. Many small, potentially profitable firms, do not plan effectively and eventually fail as a result. Cash flow problems are common, e.g., not having enough cash available (or accessible through a line of credit with a bank) to pay for merchandise or raw materials or to meet the payroll. Many of these problems can be avoided by preparing a cash budget on a regular basis.

c. Budgeting And Human Behavior

Budgets can have a significant behavioral effect. Whether that effect is positive or negative depends to large extent on how budgets are used. **Positive behavior** occurs when the goals of individual managers and employees are aligned with the goal of the organization and the manager has the drive to achieve them. The alignment of managerial and organizational goals is often referred to as goal congruence.

If budgets is improperly administered, the may result in **dysfunctional behaviour**, a behavior that is in basic conflict with the goals of the organization. If budgets are to benefit an organization, they need the support all the firm's employees. The behavioral 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.

1.6. THE ASSUMPTIONS OF THE MASTER BUDGET

Typically, the following simplifying assumptions are made when preparing a master budget:

1.) Sales prices are constant during the budget period,
2.) Variable costs per unit of output are constant during the budget period,

3.) Fixed costs are constant in total and

4.) Sales mix is constant when the company sells more than one product.

These assumptions facilitate the planning process by removing many of the economic complexities.

Learning Activity 1.

1. Identify the basic purposes of budgeting for an organization
   .....
   .....
   .....
2. What is master budget?
   .....
   .....
   .....
3. What dysfunctional behavioral implications will have the budgeting process if it is not well administered?
   .....
   .....
   .....

1.7. PREPARING A MASTER BUDGET

The master budget is the comprehensive financial plan for the organization as a whole; it is made up of a various 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.

1.7.1. The Operating Budget

Preparing an Operating Budget is a sequential process of developing nine sub-budgets. Except for one or two exceptions the sub-budgets must be prepared in the following order: sales, production, direct materials, direct labor, factory overhead, ending inventory, cost of goods sold, selling & administrative and income statement Each part is described below.

1.7.1. 1. Sales Budget

The Sales budget is the starting point in preparing the master budget. As shown earlier, all other items in the master budget, including production, purchase, inventories, and expenses, depend on it in some way. Manufacturing and merchandising companies forecast sales of their goods. Service giving companies, like, hotels forecast the number of rooms that will be occupied during various seasons.

Sales forecasting All companies have two things in common when it comes to forecasting sales of services or goods: Sales forecasting is a critical step in the budgeting process, and it is very difficult to do it accurately. Sales forecasting is the process of predicting sales of services or goods. Various procedures are used in sales forecasting, and the final forecast usually combines information from many different sources. Many firms have a top management level market research staff whose job is to coordinate the company's sales forecasting efforts. Among the major factors considered when forecasting sales are:

1. Past sales levels and trends
2. General economic trends.
3. Economic trends in the company's industry.
4. Other factors expected to affect sales in the industry.
5. Political and legal events.
6. The intended pricing policy of the company.
7. Planned advertising and product promotion.

8. Expected actions of competitors.

Developing a sales budget involves the following calculations

Budgeted Sales $ = (Budgeted Unit Sales)(Budgeted Sales Prices)

Current Period Cash Collections = Current Period Cash Sales + Current Period Credit Sales Collected in Current Period + Prior Period Credit Sales Collected in Current Period

These calculations are relatively simple, but where does the budget director obtain this information? Well, sales forecasting is a marketing function. Sales estimates are frequently generated by the company's sales representatives who discuss future needs with customers (wholesalers and retailers). Statistical forecasting techniques can also be used to make estimates of expected future sales, considering the company's previous sales performance and various assumptions about the future economic climate, and the actions of competitors and consumers. Pricing is also a marketing function, but many prices are based on costs plus a markup (the supply function) and consideration of what consumers are willing and able to pay for the product (the demand function).

The information needed to develop an equation for collections is provided by the finance department and is normally based on past experience. These calculations are somewhat more involved than they appear to be in the equation above because of the effects of cash discounts and the time lags between credit sales and collections. Cash discounts are frequently used to speed up cash inflows. This puts the funds back to work sooner and reduces the need for short term loans. However, even with a generous cash discount for prompt payment, collections for credit sales are typically spread out over several months.

1.7.1.2. Production Budget

Preparing a production budget includes consideration of the desired inventory change as follows:

Units To Be Produced = Budgeted Unit Sales + Desired Ending Finished Goods - Beginning Finished Goods

The desired ending inventory is usually based on the next period's sales budget. Considerations involve the time required to produce the product, (i.e., cycle time or lead time) as well as setup costs and carrying costs. In a just-in-time environment the desired ending inventory is relatively small, or theoretically zero in a perfect situation. In the examples and problems in this chapter, the ending finished goods inventory is stated as a percentage of the next period's (month's) unit sales.

1.7.1.3. Direct Material Budget

The direct materials budget includes five separate calculations.

a. Quantity of Material Needed for Production
= (Units to be Produced)(Quantity of Material Budgeted per Unit)

The quantity of material required per unit of product is determined by the industrial engineers who designed the product. Materials requirements are frequently described in an engineering document referred to as a "bill of materials".

b. Quantity of Material to be purchased

= Quantity of Material Needed for Production + Desired Ending Material - Beginning Material

This calculation is more involved than equation 3b appears to indicate because it includes information for two future periods. The desired ending materials quantity is normally based on the next period's

(month's) materials needed for production and this amount depends on the third period's budgeted unit sales. Of course inventories of raw materials (just like finished goods) are kept to a minimum in a JIT environment. Factors that influence the desired inventory levels include the reliability of the company's suppliers, as well as ordering and carrying costs.

c. Budgeted Cost of Material Purchases

= (Quantity of Material to be Purchased)(Budgeted Material Prices)

This amount is needed to determine cash payments. Once the quantity to be purchased has been determined, the cost of purchases is easily calculated. Budgeted material prices are provided by the purchasing department.

d. Cost of Material Used

= (Quantity needed for Production)(Budgeted Material Prices)

The cost of materials used is needed in the cost of goods sold budget below.

e. Cash Payments for Direct Material Purchases

= Current Period Purchases Paid in Current Period + Prior Period Purchases Paid in Current Period

The information needed to determine budgeted cash payments is provided by accounting, (accounts payable) and is usually based on past experience. Normally the budget should reflect a situation where the company pays promptly to take advantage of all cash discounts allowed, thus 3e may be equal to 3c.

1.7.1.4. Direct Labor Budget

Fewer calculations are needed for direct labor than for direct materials because labor hours cannot be stored in the inventory for future use. Time can be wasted, but not postponed.

a. Direct Labor Hours Needed For Production

= (Units to be Produced)(D.L. Hours Budgeted per Unit)

The amount of direct labor time needed per unit of product is determined by industrial engineers. Estimates are frequently made using a technique referred to as motion and time study. This involves measuring each movement required to perform a task and then assigning a precise amount of time allowed for these movements. The cumulative time measurements for the various tasks required to produce a product provide the estimate of a standard time per unit.

b. Budgeted Direct Labor Cost

= (D.L. Hours needed for Production)(Budgeted Rates Per Hour)

The budgeted rates per hour for direct labor are provided by the human resource department. Frequently the labor (union) contract provides the source for this information.

1.7.1.5. Factory Overhead Budget

The factory overhead budget is based on a flexible budget calculation. More specifically, the calculation is as follows:

a. Budgeted Factory Overhead Costs

= Budgeted Fixed Overhead + (Budgeted Variable Overhead Rate)(D.L. Hours needed for Production from 4a)

The calculation for cash payments reflects one of the differences between cash flows and accrual accounting. Since some costs, like depreciation, do not involve cash payments in the current period, these costs must be subtracted from the total overhead costs to determine the appropriate amount.

b. Cash Payments for Overhead

= Budgeted Factory Overhead Cost - Depreciation and other costs that do not require cash payments

Multiplying the total overhead rate by the number of direct labor hours needed for production provides the standard or applied overhead costs.

1.7.1.6. Ending Inventory Budget

The dollar amount for the ending inventory of finished goods is needed below to determine cost of goods sold. The dollar amounts for ending direct materials and finished goods are needed for the balance sheet.

a. Ending Direct Materials

= (Desired Ending Materials from 3b)(Budgeted Prices)

b. Ending Finished Goods

= (Desired Ending Finished Goods)(Budgeted Unit Cost)

1.7.1.7. Cost Of Goods Sold Budget

Cost of goods sold is needed for the income statement. One method of determining budgeted COGS involves accumulating the amounts from the previous sub-budgets as follows.

a. Budgeted Total Manufacturing Cost

= Cost of Direct Material Used (from 3d.) + Cost of Direct Labor Used (from 4b.)

+ Total Factory Overhead Costs (from 5a.)

b. **Budgeted Cost of Goods Sold**

= Budgeted Total Manufacturing Cost (from 7a.)

+ Beginning Finished Goods (from previous ending or calculate from 2 and 6b)

- Ending Finished Goods (from 6c or calculate from 2 and 6b)

This is the same approach used in Chapter 2 to determine cost of goods sold, but when developing a budget we typically assume no change in Work in Process. Therefore, budgeted cost of goods manufactured is equal to budgeted cost of goods sold.

1.7.1.8. Selling & Administrative Expense Budget

The preparation of the selling and administrative expense budgets is very similar to the approach used for factory overhead.

a. Budgeted Selling and Administrative Expenses

= Budgeted Fixed Selling & Administrative Expenses + (Budgeted Variable Rate as a Proportion of Sales $)(Budgeted Sales $)

c. Cash Payments for Selling & Administrative Expenses

= Budgeted Selling & Administrative Expenses - Depreciation and other cost which do not require cash payments

1.7.1.9. Budgeted Income Statement

Preparing the budgeted income statement involves combining the relevant amounts from the sales, cost of goods sold and selling & administrative expense budgets and then subtracting interest, bad debts and income taxes to obtain budgeted net income. In a comprehensive practice problem, the applicable amount for interest expense may need to be calculated from information associated with the cash budget. Bad debt expense is based on the expected proportion of uncollectible stated in the information related to cash collections.

a. Budgeted Sales $ - Budgeted Cost of Goods Sold

= Budgeted Gross Profit

b. Budgeted Gross Profit - Budgeted Selling & Administrative Expenses

= Operating Income

c. Operating Income - Interest Expense - Bad Debts Expense

= Net Income Before Taxes

d. Net Income Before Taxes - Income Taxes

= Net Income After Taxes

1.7.2. The Financial Budget

The financial budget includes the cash budget, the capital budget and the budgeted balance sheet. The cash budget and budgeted balance sheet are discussed below.

1.7.2.1. Cash Budget

a. Budgeted Cash Available

= Beginning Cash Balance + Budgeted Cash Collections from 1

b. Budgeted Cash Excess or Deficiency

= Budgeted Cash Available - Budgeted Cash Payments

c. Ending Cash Balance

= Cash Excess or Deficiency + Borrowings - Repayments including Interest

1.7.2.2. Budgeted Balance Sheet

Preparing the budgeted balance sheet involves accumulating information from the previous period's balance sheet, the various operating sub-budgets, the cash budget and other accounting records.

ASSETS

a. Current Assets:

Cash (from the cash budget - c)

Accounts Receivable (from the sales budget and previous balance sheet)

Direct materials (from the ending inventory budget-a)

Finished goods (from the ending inventory budget -c)

b. Long Term Assets:

Land (from previous balance sheet and budgeted activity)

Buildings (from previous balance sheet and budgeted activity)

Equipment (from previous balance sheet and budgeted activity)

Accumulated depreciation (from the accounting records)

Total Assets

LIABILITIES

c. Current Liabilities:

Accounts Payable (from various operating sub-budgets)

Taxes Payable (from income statement)

d. Long term Liabilities

Total Liabilities

SHAREHOLDERS EQUITY

e. Common Stock (from previous balance sheet and budgeted activity)

f. Retained Earnings (from previous balance sheet and income statement)

Total Shareholders' Equity

Total Liabilities and Shareholders' Equity

EXAMPLES AND PRACTICE PROBLEMS

The following examples and end of chapter practice problems will help you become familiar with the master budget concepts and techniques. The examples and practice problems are simplified to facilitate the learning process. The first example below and most of the practice problems assume that only one period is involved and that only one product is produced from a single direct material. Of course these assumptions are not realistic, but they allow us to prepare budgets by hand in a timely manner to develop an understanding of the budgeting process.

PREPARATION OF MASTER BUDGET (Merchandising Company)

EXAMPLE 1. YZ 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:

YZ Company

Balance Sheet

December 31, 20x3

ASSETS

Current assets:

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

Plant assets:

Equipment, fixture and other	Br.37, 000	
Accumulated depreciation	12, 800	Br.24, 200

Total assets Br.100,000

LIABILITIES AND OWNERS' EQUITY

Liabilities:

Accounts payable	Br.16, 800	
Accrued wages and commissions payable	4, 250	Br.21, 050

Capital:

Owners' equity	78, 950

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:

1) Sales budget
2) Cash collection budget
3) Purchase budget
4) Disbursement for purchases
5) Operating expenses budget
6) 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%)	16,000	20,000	32,000	24,000	76,000
Totals	Br.40,000	Br.50,000	Br.80,000	Br.60,000	Br.190,000

*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	16,000	20,000	32,000

Total cash collected	Br.46, 000	Br.68, 000	Br.68, 000

c). Purchase budget

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

d). Disbursement for purchases

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

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	2, 500	4, 000	3, 000	9, 500
Total	Br.15, 200	Br.21, 200	Br.17, 200	Br.53, 600

f). 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	2, 500	4, 000	3, 000
Total	Br.18, 750	Br.20, 500	Br.16, 500

g) Budget income statement

YZ 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)**)		133,000
Gross profit		57,000
Operating expenses		
Wages and commissions	Br.36, 000	
Rent expense	6, 000	
Insurance expense	600	
Depreciation expense	1,500	
Miscellaneous expense	9, 500	53, 600
Operating income		3, 400
Interest expense*		885

Net income		2, 515

*__Interest expense computation__

Paid interest = 11, 000*0.18 * 3/12= 495

Accrued amount:

On the first batch borrowing:

8, 000 * 0.18* 3/12= 360

On the second batch borrowing:

1, 000 * 0.18 * 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)**)	46, 000	68, 000	68, 000
Cash available for the use (**x**)	Br.56, 000	Br.78, 550	Br.78, 750
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	3, 000	-	-
Total disbursement (**y**)	Br.64, 450	Br.68, 800	Br.57, 100
Minimum cash balance required	10, 000	10, 000	10, 000
Total cash needed	Br.74, 450	Br.78, 800	Br.67, 100
Cash excess (deficiency)	Br.(18, 450)	Br. (250)	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**)	Br.19, 000	Br.1, 000	Br.(11, 495)

c) Budgeted balance sheet

YZ Company

Budgeted Balance Sheet

March 31, 20x3

ASSETS

Current assets		
Cash	Br. 10, 155	
Accounts receivable	24, 000	
Merchandise inventory	48, 000	
Unexpired insurance	1, 200	Br. 83, 355
Plant assets		
Equipment, Fixture and others	40, 000	
Accumulated depreciation	14, 300	25, 700
Total assets		**Br. 109, 055**

LIABILITIES AND OWNER'S EQUITY

Liabilities		
Accounts payable	Br.18, 200	
Loan payable	9, 000	
Interest payable	390	
Total liabilities		Br.27, 590
Capital		
Beginning owners' equity	Br.78, 950	
Net income	2, 515	
Ending capital balance		81, 465
Total equities		
Br.109, 055		

PREPARATION OF MASTER BUDGET (Manufacturing Company)

Example (2) Great Company manufactures and sells a product whose peak sales occur in the third quarter. Management is now preparing detailed budgets for 20x4- the coming year and has assembled the following information to assist in the budget preparation:

The company's product selling price is Br. 20 per unit. The marketing department has estimated sales in units as follows for the next six quarters.

	20x4 Quarters	**20x5 Quarters**
Quarter 1	10000	15000
Quarter 2	30000	15000
Quarter 3	40000	
Quarter 4	20000	

Sales are collected in the following pattern: 70% of sales are collected in the quarter in which the sales are made and the remaining 30% are collected in the following quarter. On January1, 20x4, the company's balance sheet showed Br.90, 000 in account receivable, all of which will be collected in the first quarter of the year. Bad debts are negligible and can be ignored.

The company maintains an ending inventory of finished units equal to 20% of the next quarter's sales. The requirement was met on December 31, 20x3, in that the company had 2, 000 units on hand to start the new year.

Fifteen pounds of raw materials are needed to complete one unit of product. The company requires an ending inventory of raw materials on hand at the end of each quarter equal to 10% of the following quarter's production needs of raw materials. This requirement was met on December 31, 20x3 in that the company had 21, 000 pounds of raw materials to start the New Year.

The raw material costs Br.0.20 per pound. Raw material purchases are paid for in the following pattern: 50% paid in the quarter the purchases are made, and the remainder is paid in the following quarter. On January 1,20x4, the company's balance sheet showed Br.25, 800 in accounts payable for raw material purchases, all of which be paid for in the first quarter of the year.

Each unit of Great's product requires 0.8 hour of labor time. Estimated direct labor cost per hour is Br.7.50.

Variable overhead is allocated to production using labor hours as the allocation base as follows:

Indirect materials	Br.0.40
Indirect labor	0.75
Fringe benefits	0.25
Payroll taxes	0.10
Utilities	0.15
Maintenance	0.35

Fixed overhead for each quarter was budgeted at Br. 60, 600. Of the fixed overhead amount, Br. 15, 000 each quarter is depreciation. Overhead expenses are paid as incurred.

The company's quarterly budgeted fixed selling and administrative expenses are as follows:

	20X4 Quarters			
	1	2	3	4
Advertising	Br.20, 000	Br.20, 000	Br.20, 000	Br.20, 000
Executive salaries	55, 000	55, 000	55, 000	55, 000
Insurance	-	1, 900	37,750	-
Property taxes	-	-	-	18, 150
Depreciation	10, 000	10, 000	10, 000	10, 000

The only variable selling and administrative expense, sales commission, is budgeted at Br.1.80 per unit of the budgeted sales. All selling and administrative expenses are paid during the quarter, in cash, with exception of depreciation. New equipment purchases will be made during each quarter of the budget year for Br. 50, 000, Br. 40, 000, & Br.20, 000 each for the last two quarter in cash, respectively. The company declares and pays dividends of Br.8, 000 cash each quarter. The company's balance sheet at December 31, 20x3 is presented below:

ASSETS

Current assets:		
Cash	Br. 42, 500	
Accounts Receivable	90, 000	
Raw Materials Inventory (21, 000 pounds)	4, 200	
Finished Goods Inventory (2, 000 units)	26, 000	
Total current assets		Br.162, 700
Plant and Equipment:		
Land	Br.80, 000	
Building and Equipment	700, 000	
Accumulated Depreciation	(292, 000)	
Plant and Equipment, net		488, 000
Total assets		
Br.650, 700		

LIABILTIES AND STOCKHOLDERS' EQUITY

Current liabilities:		
Accounts payable (raw materials)		Br.25, 800
Stockholders' equity:		
Common stock, no par	Br.175, 000	
Retained earnings	449, 900	
Total stockholders' equity		624, 900

Total liabilities and stockholders' equity Br.650, 700

The company can borrow money from its bank at 10% annual interest. All borrowing must be done at the beginning of a quarter, and repayments must be made at the end of a quarter. All borrowings and all repayments are in multiples of Br. 1,000.

The company requires a minimum cash balance of Br.40, 000 at the end of each quarter. Interest is computed and paid on the principal being repaid only at the time of repayment of principal. The company whishes to use any excess cash to pay loans off as rapidly as possible.

Instructions: Prepare a master budget for the four-quarter period ending December 31. Include the following detailed budget and schedules:

1. a) A sales budget, by quarter and in total
   b) A schedule of budgeted cash collections, by quarter and in total
   c) A production budget
   d) A direct materials purchase budget
   e) A schedule of budgeted cash payments for purchases by quarter and in total
   f) A direct labor budget
   g) A manufacturing overhead budget
   h) Ending finished goods inventory budget
   i) A selling and administrative budget
2. A cash budget, by quarter and in total
3. A budgeted income statement for the four- quarter ending December 31, 20x4
4. A budgeted balance sheet as of December 31, 20x4.

a. Sales budget

Great CO

Sales Budget

For the year ended Dec. 20x5

			Quarter		
	1	2	3	4	Year
Budgeted sales in units	10,000	30,000	40,000	20,000	100,00
Selling price per unit	X $20	X $20	X $20	X $20	X $20
Total Sales	$ 200,000	$ 600,000	$ 800,000	$ 400,000	$ 2,000,000

b) Schedule of Expected Cash Collections

Great Co.

Cash collection Budget

For the year ended Dec. 20x5

	Quarter				
	1	2	3	4	Total
30% of the previous quarter sales	Br. 90, 000	Br.60, 000	Br.180, 000	Br.240, 000	Br.570, 000
70% of the current quarter sales	140, 000	420, 000	560, 000	280, 000	1, 400, 000
Total collections	Br.230, 000	Br.480, 000	Br.740, 000	Br. 520, 000	Br.1, 970, 000

c) Production Budget

After the sales budget has been prepared, the production requirements for the forth-coming budget period can be determined and organized in the form of a production budget. Sufficient goods will have to be available to meet sales and provide for the desired ending inventory. A portion of these goods will already exist in the form of a beginning

inventory. The remainder will have to be produced. Therefore, production needs can be determined as follows:

Budgeted sales in units xxxx
Add desired ending inventory.....xxxx
Total needs.....xxxx
Less beginning inventory.....xxxx
Required production.....xxxx

The schedule given below shows the production budget for Great Company. Note that the desired level of the ending inventory influences production requirements for a quarter. Inventories should be carefully planned. Excessive inventories tie up funds and create storage problems. Insufficient inventories can lead to lost sales or crash production efforts in the following period

	Quarter				Total
	1	2	3	4	
Expected sales(units)	10, 000	30, 000	40, 000	20, 000	100, 000
Add: Desired Ending Inventory	6, 000	8, 000	4, 000	3, 000 →	3, 000
Total needs	16, 000	38, 000	44, 000	23, 000	103, 000
Lees: Beginning Inventory	2, 000	6, 000	8, 000	4, 000	2, 000
Units to be produced	14, 000	32,000	36, 000	19, 000	101, 000

d) Direct Materials Budget

Returning to Great Company's budget data, after the production requirements have been computed, a direct materials budget can be prepared. The direct materials budget details the raw materials that

must be purchased to fulfill the production budget and to provide for adequate inventories. The required purchases of raw materials are computed as follows:

Raw materials needed to meet the production schedule…….xxxx
Add desired ending inventory of raw materials……. ……. .xxxx
Total raw materials needs……. xxxx
Less beginning inventory of raw materials……. … xxxx
Raw materials to be purchased……. xxxx

	Quarter				Total
	1	2	3	4	
Production needs(pounds)	210, 000	480, 000	540, 000	285, 000	1, 515, 000
Add: Desired ending inventory	48, 000	54, 000	28, 500	22, 500	22, 500
Total needs	258, 000	534, 000	568, 500	307, 500	1, 537, 500
Less: Beginning inventory	21, 000	48, 000	54, 000	28, 500	21, 000
Raw materials to be purchased(pounds)	237, 000	486, 000	514, 500	279, 000	1, 516,500

Raw Materials to be purchased (in birrs)

	1	2	3	4	Total
Raw materials to be purchased	237, 000	486, 000	514, 500	279, 000	1, 516, 500
Raw materials cost per pound	x Br.0.20	x Br.0.20	x Br.0.20	x Br.0.20	x Br.0.20
Total	Br.47, 400	Br.97, 200	Br.102, 900	Br.55, 800	Br.303, 300

e) Schedule of Expected Cash Disbursements (for Materials Purchase)

	Quarter				Total
	1	2	3	4	
50% of the previous quarter	Br. 25, 800	Br.23, 700	Br.48, 600	Br.51, 450	Br.149, 550
50% of the current quarter	23, 700	48, 600	51, 450	27, 900	151, 650
Total cash disbursement	Br.49, 500	Br.72, 300	Br.101, 050	Br.79, 350	Br.301, 200

f) Direct Labor Budget

The direct labor budget is also developed from the production budget. Direct labor requirements must be computed so that the company will know whether sufficient labor time is available to meet production needs. By knowing in advance just what will be needed in the way of labor time throughout the budget year, the company can develop plans to adjust the labor force as the situation may require. Firms that neglect to budget run the risk of facing labor shortage or having to hire and lay off at awkward times. Erratic labor policies lead to insecurity and inefficiencies on the part of employees.

To compute direct labor requirements, the number of units of finished product to be produced each produced each period (month, quarter, and so on) is multiplied by the number of direct labor-hours required to produced a single unit. Many different types of labor may be involved. If so, then the computation should be by type of labor needed. The labor requirements can then be translated into expected direct labor costs. How this is done will depend on the labor policy of the firm. In schedule given below, the management of Great Company has assumed that the direct labor force will be adjusted as the work requirement change from quarter to quarter (for example as units produced changes from l4, 000 units in quarter 1 to 32, 000 units in quarter 2 for Great Company, the direct labor work force will be fully adjusted to the workload, i.e., total hours of direct labor time needed). In that case, the

total direct labor cost is computed by simply multiplying the direct labor-hour required by the direct labor rate hour as was done in the schedule here under.

	Quarter				Total
	1	2	3	4	
Direct labor time needed	11, 200	25, 600	28, 800	15, 200	80, 800
Direct labor cost per hour	x Br.7.50	x Br.7.50	x Br.7.50	x Br.7.50	x Br.7.50
Total direct labor cost	Br.84, 000	Br.192, 000	Br.216, 000	Br.114, 000	Br.606, 000

g) Manufacturing Overhead (MOH) Budget

The manufacturing overhead budget provides a schedule of all costs of production other than direct materials and direct labor. These costs should be broken down by cost behavior for budgeting purposes and a predetermined overhead rate developed. This rate will be used to apply manufacturing overhead to units of product throughout the budget period.

A computation showing budgeted cash disbursement for manufacturing overhead should be made for use in developing the cash budget. Since some of the overhead costs do not represents cash outflows, the total budgeted manufacturing overhead costs must be adjusted the determine the cash disbursement for manufacturing overhead. At Great Company, the only significant non cash manufacturing overhead cost is depreciation. Any depreciation charges included in manufacturing overhead must be deducted from the total in computing expected cash payments, since depreciation is a non-cash charge.

	Quarter				Total
	1	2	3	4	
Variable overhead	Br.22, 400	Br.51, 200	Br.57, 600	Br.30, 400	Br.161, 600
Fixed overhead	60, 600	60, 600	60, 600	60, 600	242,400
Total MOH	Br.83, 000	Br.111, 800	Br.118, 200	Br.91, 000	Br.404, 000
Less: Depreciation	15, 000	15, 000	15, 000	15, 000	60, 000
Cash disbursements for MOH	Br.68, 000	Br.96, 800	Br.103, 200	Br.76, 000	Br.344, 000

h) Ending Finished Goods Inventory Budget

After completing schedules (a) to (g), the company had all of the data needed to compute unit product costs. This computation was needed for two reasons: first, to know how much to charge as cost of goods sold on the budgeted income statement; and second, to know what amount to put on the balance sheet inventory account for unsold units.

The carrying cost of the unsold units is computed on the ending finished goods inventory budget

Budgeted Finished Goods Inventory 3, 000
Unit product cost Br.13 Ending
Finished Goods Inventory in birrs Br.39, 000

Production cost per unit

	Quantity (unit)	**Cost**	**Total**
Direct materials	15 pounds	Br.0.20 per pound	Br.3
Direct labor	0.8 hours	7.50 per hour	6
Manufacturing overhead	0.8 hours	5.00 per hour	4

Unit product cost Br.13

MOH rate= Total MOH = 404, 000 = Br.5.00
Direct labor hours 80, 800

	Quarter				Total
	1	2	3	4	
Variable selling expenses	Br.18, 000	Br.54, 000	Br.72, 000	Br.36, 000	Br.180, 000
Fixed selling & administrative expenses					
Advertising	20, 000	20, 000	20, 000	20, 000	80, 000
Executive salaries	55, 000	55, 000	55, 000	55, 000	220, 000
Insurance	-	1, 900	37, 750	-	39, 650
Property taxes	-	-	-	18,150	18,150
Depreciation	10, 000	10, 000	10, 000	10, 000	40, 000
Total budgeted selling & administrative expenses	Br.103, 000	Br.140, 900	Br.194, 750	Br.139, 150	Br.577, 800

i) Selling and Administrative Expenses Budget

Disbursement for Selling & Administrative Expenses

	Quarter				Total
	1	2	3	4	
Budgeted Selling & Administrative	Br.103, 000	Br.140, 900	Br.194, 750	Br.139, 150	Br.577, 800
Less: Depreciation	10, 000	10, 000	10, 000	10, 000	40, 000
Total Cash Disbursements	Br.93, 000	Br.130, 900	Br.184, 750	Br.129, 150	Br.537, 800

2. a) Cash Budget

	Quarter				Total
	1	2	3	4	
Cash balance, beginning	Br.42, 500	Br.40, 000	Br.40, 000	Br.40, 500	Br.42, 500
Add : Collection from customers	230, 000	480, 000	740, 000	520, 000	1, 970, 000
Total cash available before financing	272, 500	520, 000	780, 000	560, 500	2, 012, 500
Less: Disbursements for					
Direct materials	49, 500	72, 300	100,050	79, 350	301,200
Direct labor	84, 000	192, 000	216,000	114, 000	606,000
Manufacturing overhead	68, 000	96, 800	103,200	76, 000	344,000
Selling & Administrative	93, 000	130, 900	184,750	129, 150	537,800
Equipment purchases	50, 000	40, 000	20,000	20,000	130,000
Dividend	8, 000	8, 000	8, 000	8, 000	32,000
Total disbursements	352, 500	540,000	632,000	426,500	1,951,000
Minimum cash balance	40, 000	40, 000	40, 000	40, 000	40, 000
Total need	392, 500	580, 000	672, 000	466, 500	1, 991,000
Excess (deficiency) of cash available over total need	(120, 000)	(60, 000)	108, 000	94, 000	21, 500
Financing:					
Borrowing(at beginning)	120,000	60, 000	-	-	180, 000
Repayments(at ending)	-	-	(100, 000)	(80,000)	(180,000)

Interest(at 10% per annum)	-	-	(7,500)	(6,500)	(14,000)
Total financing	120, 000	60, 000	(107,500)	(86,500)	(14,000)
Cash balance, ending	**Br.40,000**	**Br.40, 000**	**Br.40, 500**	**Br.47, 500**	**Br.47, 500**

b) Budgeted Income Statement

Great Company

Budgeted Income Statement

For the Year Ended December31, 20x4

Sales [100, 000units at Br.20 Schedule 1(a)]	Br.2, 000, 000
Cost of Goods Sold	
[100, 000 units at Br.13 Schedule1 (h)]	1, 300, 000
Gross Margin	700, 000
Selling & Administrative Expenses [Schedule 1 (i)]	577, 800
Net Operating Income	122, 200
Interest Expense [Schedule 2(a)]	14, 000
Net Income	**Br. 108, 200**

c) Budgeted Balance Sheet

Great Company

Budgeted Balance Sheet

December31, 20x4

ASSETS

Current assets:	
Cash [Schedule 2(a)]	Br. 47, 500
Accounts Receivable	120, 000
Raw Materials Inventory	4, 500
Finished Goods Inventory	39, 000

Total current assets		Br.211, 000
Plant and Equipment:		
Land	Br.80, 000	
Building and Equipment	830, 000	
Accumulated Depreciation	(392, 000)	
Plant and Equipment, net		518, 000
Total assets		Br.729, 000

LIABILTIES AND STOCKHOLDERS' EQUITY

Current liabilities:		
Accounts payable (raw materials)		Br.27, 900
Stockholders' equity:		
Common stock, no par	Br.175, 000	
Retained earnings	526, 100	
Total stockholders' equity		701, 100
Total liabilities and stockholders' equity		Br.729, 000

Learning activity 2.

Exercise two:

Young Corporation produces Tin the projected sales for the first quarter of the coming year and the beginning and ending inventory data are as follows:

Unit sales	100000
Unit price	Br. 15
Units, beginning inventory	8,000
Units, targeted ending inventory	12000

The Tin is moulded and then painted. Each Tin requires 4 kg

of metal, which costs 2.50 per kg. the beginning inventory of raw materials is 4000 kg, young wants to have 6000 kg of metal in inventory at the end of the quarter. Each Tin produced requires 30 Minutes of direct labour time, which is billed at Br. Per hour.

Required:

1. Prepare the a sales budget for the first quarter
2. Prepare production budget for the first quarter
3. Prepare a direct materials purchase budget for the first quarter
4. Prepare a direct labour budget for the first quarter.

1.8 SUMMARY

Budgeting is the creation of plan of action expressed in financial terms. Budgeting plays a key role in planning, control, and decision-making. Budgets, among other things, force planning, serve to improve communication and coordination, allocates scarce recourses and used to evaluate performance.

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 budget financial statements are prepared to show what the organization's overall financial condition will be if planned operations are carried out.

The success of a budgetary system depends on how seriously human factors are considered. To discourage dysfunctional behaviour, organizations should avoid overemphasizing budgets as a control mechanism and use a participative budgeting process.

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.

Budgeting systems ate costly. They are needed because it is believed and assured that the systems will help organizations make better collective operating and financial decisions.

Check your progress question

1. CZ is a merchandising company engaged in the purchasing and selling of electrical appliances. You as a management accountant have been asked to prepare a complete master budget for your store for June, July and August, so you gather the following data as of may 31, 2005:

Cash	$ 21,000	Accounts Payable	$ 340,000
Inventory	300,000	Owners' equity	362,000
Accounts receivable	261,000	Total liabilities and	
Net furnitures and fixtures	120,000	owners'	equity
702,000			
Total Assets	702,000		

Recent and projected sales

April	$200,000
May	250,000
June	500,000
July	300,000
August	300,000
September	200,000

Credit sales are 90% of total sales. Credit accounts are collected 80% in the month following the sale and 20% in the next following month. Assume that bad debts are negligible and can be ignored. The average gross profit on sales is 40%.

The policy is to acquire enough inventories each month to equal the following month's projected sales. All purchases are paid for in the month following purchase.

Salaries, wages and commissions average 20% of sales: all other variable expenses are 4% of sales. Fixed expenses for rent, property taxes, and miscellaneous payroll and other items are $ 40,000 monthly. Assume that these variable and fixed expenses require cash disbursements each month. Depreciation is $ 2,000 monthly.

In June, $ 40,000 is going to be disbursed for fixtures acquired in May. The May 31 balance of accounts payable includes this amount.

Assume that a minimum cash balance of $ 20,000 is to be maintained. Also assume that all borrowings are effective at the beginning of the month and all repayments are made at the end of the month of repayment. Interest is paid only at the repaying principal. Interest rate is 12% per annum: round interest computation to the nearest ten dollars.

Required

Prepare a budgeted income statement for the coming quarter, a budgeted statement of monthly cash receipts and disbursements (for the next 3 months), and a budgeted balance sheet for August 30, 2005. All operations are evaluated on a before income tax basis. (Ignore income taxes).

2. The following data relates to the operations of Good Life Ltd. a retail store:

Sales plan 2006	
May	Br. 60,000
June	80,000
July	100,000
August	120,000

a. Selling price per unit Br. 10
b. Cost of goods per unit is Br.6. Variable operating expenses are 20% of sales
c. Inventory is maintained at 150% of the next month's sales in units.
d. Fixed operating expenses are Br. 180,000 per year allocated for each month proportionately

Required:

A. Prepare a purchase budget in Br. for July 2006
B. Prepare a budget income statement for July 2006

3. Information pertaining to **Brothers' co.** sales revenue as per the plan follows:

	November 2005	**December 2005**	**January 2006**	**February\ 2006**
Cash sales	Br. 80000	Br. 80000	Br. 50000	Br. 40000
Credit sales	24000	320000	170000	120000

Management estimates that 5% of credit sales are uncollectible. Of the credit sales that are collectible, 70% are collected in the month of sale and the remainder in the month following the sale. Purchases of inventory each month are 60% of the next month's projected total sales. All purchases of inventory are on account; 30% are paid in the month of purchase and the remainder is paid in the month following the purchase.

Required:

A. What are budgeted cash collections in December 2005 form November 2005 credit sales.

B. What are total budgeted cash receipts in January 2006?

C. Prepare a schedule for budgeted cash payments for purchases for December 2005 and January 2006.

4. Gorgeous Retail Company has the following data

Part of the trial balance at March 1 showed:

	Debit	Credit
Cash	Br. 12,000	
Account receivable	39,000	
Allowance for bad debt		Br.4, 800
Merchandise inventory	24,000	
Account payable (Merchandise)		18,000

The company's purchase are payable with in 10 days. Assume that one –third of the purchases of any month are due and paid in the following month.

The unit invoice cost of the merchandise purchased is Br. 10. At the end of each month, the company's policy is to have an inventory equal to 50% of the following month's unit sales.

Past experience indicates that 60% of the billings will be collected during the month of sale, 30% in the following month, 6 % in the next following month and 4% will be uncollectible.

Sales data are as follows:

Selling price per unit	Br. 30
January actual sales revenue	30000
February actual sales revenue	90000
March estimated sales revenue	72000
April estimated sales revenue	54000
May estimated sales revenue	96000
Total sales expected for the year	900,000

The company's fiscal year begins January 1. Exclusive of bad debts, the total budgeted selling and administrative expenses for the year are estimated at Br. 141,000 of which Br. 42000 is fixed expenses (inclusive of a Br. 18,000 annual depreciation charge). These fixed expenses are incurred uniformly throughout the year. The balance of selling and administrative expense varies with sales. Expenses are paid as incurred.

Required: prepare a cash budget for March and April. (Provide a supporting schedule of cash collection.

1. 9 ANSWER KEY TO LEARNING ACTIVITY QUESTIONS

Learning Activity 1.

1. Forces periodic planning
   Fosters coordination, integration and communication
   Promotes continuous improvement
   Guides performance
   Facilitates evaluation and control
   Create cost awareness
2. 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.
3. Problem of conflict due to conflicting interest between departments.
   Imposed budget problem
   Use of Budget as check up device for individual performance
   Unwise adherence to budget

Learning activity 2.

1. Sales budget

Units……100000
X unit price …… Br. 15
Sales Br. 1500000

2. Production budget

Sales (in units)	100000
Desired ending inventory	12000
Total needs	112,000
Less: beginning inventory	(8,000)
Units to be produced	104,000

3. Direct materials budget

Units to be produced	104,000
Direct materials per unit (kg)	x 4
Production needs (kg)	416,000
Desired ending inventory (kg)	6,000
Total needs (kg)	422,000
Less: Beginning inventory (kg)	(4,000)
Materials to be purchased (kg)	418,000
Cost per kg	X Br. 2.50
Total purchased cost	Br. 1,045,000

4. Direct labour budget

Units to be produced	104,000
Labour: Time per unit	x 0.5
Total hours needed	Br. 2000
Cost per hour	x Br. 9
Total direct labour cost	Br. 468,000

UNIT II. FLEXIBLE BUDGETS

Contents:

2.0. Introduction

2.0. Learning objectives
2.1. Master Budget Versus Flexible Budget
2.2. Flexible budget preparation
2.3. Flexible budget approach for variance analysis
2.4 Chapter Summery
2.5 Answer Key for learning activity and check your progress questions

2.0. INTRODUCTION

We have learned in Chapter I that managers quantify their plans in the form of budget and formal budgeting procedures result in comprehensive operational and financial budgets 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. In this chapter we focuses on how managers use flexible budgets as aids for planning and controlling. Recall that a key element of control system is feedback –the comparison of actual performance with planned performance. This chapter also provides an overview of how budgeting helps performance evaluation.

This chapter will have three basic sections: master budget Vs flexible budget, flexible budget preparation and use of flexible budget for variance analysis.

2.1. LEARNING OBJECTIVES

Upon a successful completion of this chapter, you should be able to:

- Distinguish between flexible budgets and master (static) budget
- Understand the performance evaluation relationship between master (static) budgets and flexible budgets
- Prepare flexible budgets for planning and controlling purpose
- Use the flexible budget approach to compute sales volume variances and flexible budget variances.

2.2 MASTER BUDGET (STATIC BUDGETS) VS FLEXIBLE BUDGET

2.2.1. A static budget

All master budgets discussed in the previous chapter are **static or inflexible** because they assume fixed level of activity. By definition a static budget is not adjusted or altered after it is drawn up, ***regardless of changes in volume, cost drivers, or other conditions during the budget period***. In other words a static budget prepared for only one activity level (for example one volume of sales activity). Because static budgets depend on a particular level of activity, they are not sufficiently informative when it comes to preparing performance report.

To illustrate suppose Evergreen Company prepares a budget based on detailed expectation for the forthcoming month. Evergreen Company's planned to produce and sale 9,000 units. However, actual production and sales volume units turned out to be only 7, 000 units instead of the original 9,000 units. A performance report comparing the actual production costs and sales amount with the planned is given in Exhibit 2-1.

Exhibit 2-1: Evergreen Company Performance Report

Particulars	**Actual**	**Master Budget**	**Master (static) Budget Variances**
Units	7,000 units	9,000 units	2,000 units U
Sales	Br. 217,000	Br. 279,000	Br. 62,000 U
Variable Expenses			
*	Br.	Br.	Br. 37,730 F

Manufacturing	151,270	189,000	
* Selling	5,000	5,400	400 F
* Administrative	2,000	1,800	200 U
Total Variable Expense	Br. 158,270	Br. 196,200	Br. 37,930 F
Contribution Margin	Br. 58,730	Br. 82,800	Br. 24,070 U
Fixed Expenses			
* Manufacturing	Br. 37,300	Br. 37,000	300 U
*Selling & Administrative	33,000	33,000	---
Total Fixed Expenses	Br. 70,300	Br. 70,000	300 U
Operating Income (Loss)	**Br. (11,570)**	**Br. 12,800**	**Br. 24,370 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.

Now according to the report, unfavorable variance occurred for the operating income. However, there is something fundamentally wrong with the report. Actual unit level of 7000 units results are compared with a planned result for 9000units. Under normal circumstances we would expect lesser income at lower activity level.

To create a meaningful performance report, actual revenues and costs and expected revenues and costs must be compared at the same level of activity. Since actual activity level often differs from planned activity level, some method is needed to compare what the planned revenues and costs should have been for the actual activity level. That is a flexible budget.

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.

2.2.2 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. 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.

2.2.3. Distinguishing Features of Flexible Budget

Flexible budgets have several desirable characteristics. They include:

i. Cover a range of activity

ii. Are dynamic
iii. 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 other words flexible budgets can help managers deal with uncertainty by allowing them to see the expected outcomes for range of activity. It can be used to generate financial results for a number of plausible scenarios.

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." Whenever actual and budgeted activity is significantly different, a flexible budget variance report provides a better measure of efficiency than a report based on a fixed budget.

To summarize, flexible budget can be useful either before or after the period in question. It can help managers choose a level of operations (expected level of activity) and prepare the budget. It can also be helpful at the end of the period when managers are trying to analyze actual results.

Learning Activity-1

1. What is a static budget?

……

……

2. What is a flexible budget? Identify its major features?

……

……

2.3. 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 and revenue 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.

Let's prepare a flexible budget for the Evergreen Company, which is planning to use a flexible budgeting system to plan and control its operations. Evergreen made the following cost and revenue estimates for budgeting purposes:

Budget Formula Per Unit	
Sales	Br. 31.00
Variable Costs	
* Manufacturing	Br. 21.00
* Selling	0.60
* Administrative	0.20
Total Variable Costs	Br. 21.80

Contribution Margin	Br. 9.20
Budget Formula Per Month	
Fixed Costs	
* Manufacturing	Br. 37,000
* Selling and administrative	33,000
Total fixed costs	Br. 70,000

Instruction: 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. At what level of activity does the company breakeven?

Exhibit 2.2 Evergreen Company Flexible Budget

	Flexible Budgets For Various Activity Levels		
	7,000 units	**8,000 units**	**9,000 units**
Sales	Br. 217,000	Br. 248,000	Br. 279,000
Variable Costs			
* Manufacturing	Br. 147,000	Br. 168,000	Br. 189,000
* Selling	4,200	4,800	5,400
* Administrative	1,400	1,600	1,800
Total Variable Costs	Br. 152,600	Br. 174,400	Br. 196,200
Contribution margin	Br. 64,400	Br. 73,600	Br. 82,800
Fixed costs			
* Manufacturing	Br. 37,000	Br. 37,000	Br.

			37,000
*Selling and administrative	33,000	33,000	33,000
Total fixed costs	Br. 70,000	Br. 70,000	Br. 70,000
Operating income (loss)	**Br. (5,600)**	**Br. 3,600**	**B. 12,800**

2.4. VARIANCE ANALYSIS-FLEXIBLE BUDGET APPROACH

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

Flexible Budget Variances: - the difference or variances between the flexible budget and actual results for actual activity level achieved. This variance cannot be due to activity levels and must be due to departure of actual costs or revenues from flexible-budget formula amounts.

Activity level variances: - (also known as Sales Volume Variance) is the difference or variances between the master budget amount and the flexible budget amounts. This difference is due to activity (sales) levels. Unit selling prices, unit variable costs and fifed costs are held constant between the master budget and the flexible budget for actual activity level.

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

To illustrate, refer the data given in for Evergreen Company. Exhibit 2.3 shows a condensed result of the static (master) budget variance, the sales activity variance, and the flexible-budget variance.

Exhibit 2.3 Evergreen Company 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. 279000	-	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 quantity 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. In the next 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 2.3 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 2.3.

Note that, in addition to the above, all variances are affected by the care used in formulating credible budgeting or standard amounts.

In the next chapter will show how analysis uses standards to subdivide these variances (flexible budget variance) into price and efficiency components.

Learning Activity-2

1. List out the steps for preparing flexible budget.
2. The following data pertains to X-company budget for April:

   Selling price per unit……Br. 180

   Variable Costs per unit:

   Direct Materials…… 60

   Direct Labor …….. 16

   Factory overhead …… 12

   Marketing and administrative …….. 11

   Fixed costs:

   Manufacturing …….. 276,000

   Marketing and administrative …….. 434,000

Required:

a. Prepare a flexible budget for April, showing expected results at each of three levels of volume: 10000 units, 12000 units and 14000 units.
b. Prepare a variance analysis table (as Exhibit 2.3) assuming the company originally planned and has actual sales volume of 10000 units and actual result as follows:

   Sales …….. Br. 1850000

   Variable costs ……. 1120000

   Fixed costs …….. 705,000

2.4 SUMMARY

The budget that provides a firm with a capability to compute expected revenues and costs for range of activity is called a flexible budget. Flexible budgeting has three major uses:

- It can be used to prepare the budget before the fact for the expected level of activity
- Because flexible budgeting can determine what revenues and costs should be at various levels of activity, the budget can be used after the fact to compute what costs should have been for the actual level of activity. Once expected costs are known for the actual level

of activity, a performance report that compares those expected revenues and costs to actual revenues and costs can be prepared

- It can help the managers deal with uncertainty by allowing them to see the expected outcomes for a range of activity.

Flexible budgeting is the key to providing the frequent feedback that managers need to exercise control and effectively carry out the plans of an organization.

Variance analysis using flexible budget enables the managers to separate the effects of sales volume from other explanations of why the static (master) budget was not achieved. We have identified flexible budget variance and activity level variance. The activity level variance measures the organizations effectiveness and the flexible budget variance is often a measure of efficiency though it is also affected by changes in prices and unit costs.

Check your progress question

1. Define flexible budget and how it differs from a static budget. What is the deficiency of a static budget on performance analysis?
2. Zenit Plc. developed a new perfume called "virgin". At the beginning of the year, Zenit budgeted the following manufacturing costs based on production of 100000 bottles of Virgin:

Direct materials	Br. 400,000
Direct lab our.....	230,000
Variable overhead	310,000
Fixed overhead.....	440,000
Total manufacturing costs	Br. 1,380,000

Demand for Virgin was disappointing and by the end of the year production had been 75000 bottles. Actual costs were as follows:

Direct materials	Br. 315,000
Direct lab our.....	176,250
Variable overhead	255,000
Fixed overhead.....	400,000
Total manufacturing costs	Br. 1,146,250

Required:

a. Prepare a performance report comparing actual costs with the flexible budget amounts for actual production of 75000 bottles. Include column for variances.
b. Prepare a flexible budget for production for the following levels of activity: 50000, 100000 and 150000 bottles of Virgin.

3. Budgeted overhead costs for two different levels of activity follow:

	Direct labour hours	
	1000	2000
Maintenance	Br. 10000	Br. 16000
Depreciation	5000	5000
Supervision	15000	15000
Supplies	1400	2,800
Power	750	1500
Others	8,100	8,200

Required: Prepare a flexible budget for an activity level of 1,650 direct labour hours.

4. ZM transportation company executives have had trouble interpreting performance for a number of years. The company has used a budget based on detailed expectations for the forthcoming quarter. For example, the condensed performance report for the recent quarter for a western branch was:

	Budget	**Actual**	**Variance**
Revenue	Br. 10,000,000	Br. 9,500,000	Br. 500,000 U
Fuel	1,000,000	986,000	14,000 F
Repairs& maintenance	100,000	98,000	2,000 F
Supplies	200,000	196,000	4,000 F

Variable payroll	5,700,000	5,500,000	200,000 F
Total variable costs	7,000,000	6,780,000	220,000 F
Supervision	200,000	200,000	---
Rent	200,000	200,000	---
Depreciation	1,600,000	1,600,000	---
Other fixed costs	200,000	200,000	---
Total fixed costs	2,200,000	2,200,000	---
Total costs	9,200,000	8,980,000	220,000 F
Operating income	Br. 800,000	Br,520,000	Br.280,000 U

Although the branch manager was upset about the unfavorable revenue variance, he was happy that his cost performance was favorable; otherwise his operating income would be even worse.

His immediate supervisor, the vice president for operations, was totally unhappy and remarked: “I can see some merit in comparing actual performance with budgeted performance with budgeted performance, because we can see whether actual revenue coincided with our best guess for budget purposes. But I can’t see how this performance report helps me evaluate the cost control performance of the department head.”

Required:

a. Prepare flexible budget for ZM at revenue levels of Br. 9,000,000, Br. 10,000,000 and Br. 11,000,000.
b. Express the flexible budget for costs in formula form.
c. Prepare a condensed contribution –format income statement showing the static (master) budget variance, the sales volume

variance, and the flexible-budget variance. Use the format used in the chapter.

2.5. ANSWER KEY TO LEARNING ACTIVITY QUESTIONS AND CHECK YOUR PROGRESS QUESTIONS

Learning Activity –1

1. A static budget is a budget that does not adjusted or altered after it is drawn up, regardless of changes in volume, cost drivers, or other conditions during the budget period.

2. A flexible budget (sometimes called a variable budget) is budget that can easily be adjusted for differences in the level of activity.

Flexible budgets have several desirable features. They include:

a. Cover a range of activity
b. Are dynamic
c. Facilitate performance measurement.

Learning activity –2:

1. 1. Determine the range of activity the budget should cover (because cost behavior patterns may be different in different ranges of activity)
2. Determine the cost and revenue behavior pattern for each cost included in the budget.
3. Select the activity levels for which budgets will be prepared.
4. Prepared a flexible budget using the cost behavior data and the selected activity level.

2. a.

	Budget Per unit	Flexible Budgets For Various Activity Levels		
		10,000 units	**12,000 units**	**14,000 units**
Sales	180	Br. 1,800,000	Br. 2,160,000	Br. 2,520,000
Variable Costs				
Direct material	60	Br. 600,000	Br.	Br. 840,000

			720,000	
Direct labour	16	160,000	192,000	224,000
Factory overhead	12	120,000	144,000	168,000
Marketing & Administrative	11	110,000	132,000	154,000
Total Variable Costs	99	Br. 990,000	Br. 1,188,000	Br. 1,386,000
Contribution margin	81	Br. 810,000	Br. 972,000	Br. 1,134,000
Fixed costs				
* Manufacturing		Br. 276,000	Br. 276,000	Br. 276,000
*Selling and administrative		434,000	434,000	434,000
Total fixed costs		Br. 710,000	Br. 710,000	Br. 710,000
Operating income (loss)		**Br. 100,000**	**Br. 262,000**	**Br. 424,000**

b.

	Actual Results	**Flexible Budget**	**Master Budget**	**Flexible Budget Variance**	**Sales Activity Variances**
Units	10,000	10,000	12,000	-	2,000 U
Sales	Br. 1850000	Br. 1800000	Br.2160000	50000F	Br. 360000 U
Variable	1120	990	1188	**Br.1300**	198000 F

costs	000	000	000	**00U**	
Contributio n margin	Br. 730000	Br. 810000	Br. 972000	Br. 80000U	Br. 162000U
Fixed Costs	7050 00	710,0 00	710, 000	5000F	-
Operating Income (loss)	**Br.2500 0**	**Br. 100000**	**Br. 262000**	**Br.7500 0U**	**Br.16200 0U**

UNIT III: STANDARDS FOR CONTROL AND VARIANCE ANALYSIS

Contents

3.0 Aims and Objectives
3.1 Introduction
3.2 Overview of standards for control
3.3 standards for control
3.4 Purposes of standard costs
3.5 The standard cost system
- 3.5.1 Setting the standards
- 3.5.2 Standard costs variance analysis
  - 3.5.2.1 Direct Material Variances
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  - 3.5.2.3 Manufacturing over heads variances
- 3.5.3 Measuring mix and yield variances

3.6 Summary
3.7 Exam type questions
3.8 Answers to check your progress exercises

3.0. INTRODUCTION

Many organizations, specially manufacturing companies use standard cost accounting systems for planning and controlling operations.

Standards are useful in detailed planning, cost control, performance measurement, and pricing decision. This unit examines how standards are set for material, labour, and manufacturing overheads. It illustrated the calculation of material, labour and manufacturing overheads variances and their analysis and interpretation.

3.1. AIMS AND OBJECTIVES

After completing this unit you should be able to:

- explain the nature of standard costs.
- describe the types and purposes of standard costs
- 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

3.2 OVERVIEW OF STANDARDS FOR CONTROL

Standards are mostly used in manufacturing organizations with the objectives of attaining strong control over costs.

3.3 STANDARDS FOR CONTROL

Standard cots are defined as, 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:

a) 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 pre-supposes 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.

b) 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 charging production technology often make basic standards difficult to use. As a result, not many firms use basic standards.

c) 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.

d) 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.

3.4 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:

i. 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.

ii. 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.

iii. 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.

iv. Performance evaluation: 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.

v. 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.

vi. 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 tack of quantities.

vii. 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.

Learning Activity 1

1. What are standards?

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2. What are the basic types of standards?

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3 What are the basic purposes of standard costs?

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3.5 THE STANDARD COST SYSTEM

Three fundamental activities in a standard cost system are:

- setting the standards
- Accumulation of actual costs.
- Variance analysis

Setting Standards: 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.

i. 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 various cost estimation techniques to determine the past relationship between in put 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.

ii. 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 non-manufacturing activities, actual costs are also accumulated and compared with standards established for non-manufacturing 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.

3.5.1 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.

1. 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.

2. 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.

1. Efficiency (time or usage standards) 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.

2. Rate (wage) 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.

3.5.2 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 form 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: What is the amount of difference between actual and standard cost? 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.

3.5.2.1 Direct Material Variances

Direct materials variances may be divided into:

- Quantity (usage) variance.
- 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) x 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 out put 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.

Standard quantity of Materials allowed = Actual out put Achieved x materials allowed per unit of out put

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

MPV = (AP – SP) x AQ

Where MPV = direct materials price variance

AP = actual price or unit cost

SP = standard price

AQ = actual quantity purchase.

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).

MFBV = MQV + MPV

Learning Activity 3

1. What are the methods used by management accountants in setting standards?

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2. When does variance occur?

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3. What are the two standards relating to Material and the two standards relating to labour?

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4. What questions does a variance analysis try to answer?

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Illustration 1

Romeo company is engaged in producing a single product called MO1. The following data has been taken from the first six months production report:

Material standards:

Quantity of material needed per unit of MO1

2 units

Standard price per unit of material used $4

Actual data:

Units of MO1 produced (finished products) during the six months 20,000 units

Actual quantity of materials used in the production

38,000 units

Actual direct material cost per unit of input $4.5

Actual direct materials purchased 39 ,000 Units

Requirements:

Based on the information given above you are required to:

1. compute Direct materials quantity and price variances.
2. compute Direct materials flexible budget variance
3. Identify each variance as favorable (F) and unfavorable (U).

Solution:

1. Direct material quantity variance

Standard materials allowed (SQ) = Actual x Materials allowed

Out put per unit.

(20,000 x 2) units

= 40,000 units

And there fore,

MQV = (AQ – SQ) x SP

(38,000 – 40,000) $4

= $8,000 F

The reason why the variance is labeled favorable is because less material have been used than it was supposed to be used.

2. Direct materials price variance

MPV = (AP – SP) x AQ

($4.5 – $4) x 39,000 Units

= $19,500 U

The reason why the variance is unfavorable is because the actual cost of material is greater than the standard cost that was supposed to be incurred.

3. Direct Material flexible budget variance

MFBV = MQV + MPV

$8,000 F + $19500 U

$11,500 U

3.5.2.2 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

i. Efficiency variance.

ii. Rate variance.

i. 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

LEV = (AH – SH) x 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 unit's 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).

ii. 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:

LRV = (AR – SR) x 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

Illustration 2

Assume in the illustration1 of the previous section that Romeo company reported the following labour related data for the first six months of production:

Direct labour standards:

Direct labour needed per unit of MO1	2 hours
Standard rate per Direct labour hour	$10

Actual data:

Units produced During the six months	20,000 Units
Direct labour used	39,000 hrs
Direct labour cost incurred actually	$11 Per hr

Requirements:

Based on the given information your are required to:

1. Compute the direct labour efficiency and direct labour rate variances.
2. Compute direct labour flexible budget variance
3. Indicate weather the variances are Favorable or unfavorable

Solution:

1. Labor efficiency variances

Standard hours allowed (SH) = Actual Output x hours allowed per unit of output

20,000 x 2hrs

40,000 hrs

LEV = (AH – SH) x SR

(39,000 – 40,000) x $ 10 per hour

= $10,000 F

The labour efficiency variance is favorable because the actual labour used is less than what is allowed.

2. Direct labour rate variance

LRV = (AR – SR) x AH

($11- $10) x 39,000 hrs

= $39,000 U

This variance is unfavorable because the actual labour rate incurred is greater than what was supposed to be incurred.

3. Direct Labour Flexible Budget Variance (DLFBV)

LFBV = LRV + LEV

$10,000 F + $39,000 U

= $28,000 U

Learning Activity 3.

1. Under what circumstances do the following variances be Favorable or Unfavorable?

   A. material price variance

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   B. Material quantity variance

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   C. Labour Efficiency variance

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   D. Labour Rate Variance

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   E, Material Flexible Budget Variance

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F. Labour Flexible Budget Variance

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2. Margo company reported the following variances in certain production year end:
   - Material price variance $ 3000 F
   - Direct labour Efficiency variance $500 U
   - Material flexible budget variance $2000 U
   - Direct labour Flexible budget variance $100 F

   Calculate the following:
   i. Material usage variance
   ii. Labour rate variance
   iii. Indicate each of the above variances as Favorable and Unfavorable

3.5.2.3 Manufacturing Overhead Variances

In the previous section we have seen the two very important cost components of an out put, direct material and direct labour, how standards are set and how the variations of actual quantity or price be analyzed from the standards allowed. Another very important cost component of a product is a manufacturing Over head or a factory over heads.

The flexible overhead budget is the manufacturer'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 accountant then computes separates overhead variances, each of which conveys separate information useful in controlling overhead costs.

Nevertheless, many manufacturing organizations believe that it is not worthwhile to monitor individual overhead items like indirect material, indirect labour, depreciation, factory supplies...etc. Therefore, overhead variances often are not

subdivided the flexible budget variances- the complexity of the analysis may not be worth the effort.

However , in some cases it may be useful to subdivide the flexible-budget overhead variances, especially those for variable overhead. Part of the variable overhead flexible budget variance is related to the control of cost driver and part of it 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 has been 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 following are the formulae used to compute the two overheads variance:

i. The variable overhead efficiency variance (VOEV)

The variable over head 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:

VOEV =(AH-SH) X VOHR

Where: AH =actual direct labor hours

SH = standard direct labor hours allowed

VOHR = standard variable overhead rate per hour

ii. The variable overhead spending variance (VOHSV)

As its name indicates, it measures deviations in amounts spent for overhead inputs such as spare parts and utilities. The formula for the variance can be expressed as follows:

VOHSV = AH (AR-SR)

Where: AH= actual direct labor hours used

AR= actual variable overhead rate

SR = standard variable overhead (VOH) rate

OR

VOHSV = AH (AR-SR)

VOHSV =(AH x AR)– (AH x SR)

= Actual variable overhead – (actual direct labor hours used x standard VOH rate)

Illustration 3

DADA manufacturing Company produces a best quality product called Maximo and uses standard costs and a flexible budget to control its manufacturing costs. Operating data for the quarter are summarized as follows:

- Finished units produced: 15, 000 units
- Standard direct labour allowed per units of out put produced, 1.5 hours.
- Variable manufacturing overhead: actual costs $ 170, 000. Budget formula is Br.10 per standard direct labor hour.

Requirements:

Compute the following:

a. Variable overhead efficiency variance.
b. Variable overhead spending variance.
c. Indicate weather the variances are favorable or unfavorable

Solutions:

a. VOHEV = (AH –SH) X VOH rate

AH = 18,000 hours
SH =1. 5 hours per unit x 15,000 units
= 22,500 hours
=(18, 000 - 22,500)x $10
= $45,000 F

b. VOHSV =actual variable overhead-(SRX AH)

= $170, 000 –($10 X18,000)
= $ 10,000 F

3.5.3 Measuring Mix, Yield And Productivity Variances

Standard Costs and Variances

Calculation of a standard cost is based on physical standards, two types of which are often discussed: **basic** and **current**. A basic standard is a yard stick against which both expected and actual performances arte compared. It is similar to an index number against which all later results are measured. **Current standards** are of three types: expected actual standard, normal standard and theoretical standard. these things have been discussed in detail in the previous section.

Materials and labor costs are generally based on normal, current conditions, allowing for alterations of prices and rates and tempered

by the desired efficiency level. Factory overhead is based on normal conditions of efficiency and volume. This subsection's major objective however, is to discuss and illustrate the measurement of mix yield and productivity variances.

Material Mix Variance

It is common for more than one material to be required in a production process. In a cotton fabric, for example, cotton from many parts of the world with the hope that the new mix and its costs will contribute to improved profits. The proportion or ratio of one material to another material is called the mix. In many cases, the new mix is accompanied by either a favorable or unfavorable yield of the final product.

A mix variance shows the change in cost that results from changing the proportions of materials added to the production mix. It measures the effect of using a different combination of materials.

Material mix variance is calculated by measuring the difference in cost, at standard prices, between the actual mix of quantities used and the standard mix of the total quantity used.

Material Yield Variance

Yield can be defined as the amount of prime product manufactured from a given amount of materials. The yield variance is the result of obtaining a yield different from the one expected on the basis of input.

A yield variance measures whether a change in mix affected the yield and shows the difference in cost that result if the actual yield (out put) varies from the standard quantity of yield determined for a given input of materials.

Illustration 4

Chechen Company uses a standard cost system. The standard product and cost specification for 1, 000 pounds (lbs) of chewing gum are as follows:

Material	Quantity	Unit Cost
A	800 lbs	Br.0.25 per lb
B	200 lbs	0.40
C	200 lbs	0.10

Materials records indicate:

Material	Beg. Inventory	Purchases in January	End. Inventory
A	10, 000 lbs	162, 000 lbs @ Br.0.24	15, 000 lbs
B	12, 000	30, 000 0.42	4, 000 lbs
C	15, 000	32, 000 0.11	11, 000 lbs

To convert 1, 200 lbs of raw materials into 1, 000 lbs of finished product require 20 direct labor hours at Br.9 per hour, or Br.0.18 per lb of finished product. Actual direct labor hours and cost for January are 3, 800 hours at Br.34, 656.

Actual production for January is 200, 000 lbs of chewing gum. Expected production for this month totaled 192, 500 units.

Factory overhead is applied on a direct labor hour basis at a rate of Br5 per hour (Br.3 fixed, Br.2 variable), or Br0.10 per pound of finished product. Normal overhead is Br.20, 000, with 4, 000 direct labor hours. Actual overhead for the month is Br.22, 000.

The standard cost per pound of finished chewing gum is:

Materials	Br.0.30 per lb
Labor	0.18
Factory overhead	0.10
Total	Br.0.58

Requirements:

a. Compute the materials purchase price, mix, and yield variances and the materials quantity variances for each material.

b. Compute the labor rate, efficiency, and yield variance.

Solution:

a. Material Variances

Material purchase price variances for each material

Material	Purchased Quantity	Unit Cost Variation	Price Variance
A	162, 000	Br.(0.01)	Br.1, 620 F
B	30, 000	0.02	600U
C	32, 000	0.01	320U
		Net materials purchase price variance	Br.700 F

Weighted average of standard materials cost of input:

Material	Quantity	X	Unit Cost =	Total
A	800		Br.0.25	Br.200
B	200		0.40	80
C	200		0.10	20
Input	1, 200 lbs			Br.300

Weighted average per unit of input= $\frac{300}{1,200}$ = Br0.25 per lb

Weighted average per unit of output= $\frac{300}{1,000}$ = Br 0.30 per lb

Actual quantities at individual standard materials costs:

Material	Quantity Used	x	Stdcost		
A	157, 000	X	0.25	Br.39, 250	
B	38, 000	X	0.40	15, 200	
C	36, 000	X	0.10	3, 600	Br.58, 050

	231, 000 lbs	
Actual quantity at weighted average of std materials cost of input	(231, 000 lbs x 0.25)	57, 750
Materials mix variance		Br.300 U

The influence of individual raw materials on the total materials mix variance can be computed in the following manner:

Material	Actual Quantity	Actual Qty Using Std Formula	Qty Variation	Std Cost	Material Mix Variance
A	157,000 lbs	154, 000 lbs	3, 000	0.5	750
B	38, 000	38, 500	(500)	0.40	200F
C	36, 000	38, 500	(2, 500)	0.10	250F
	231,000	231, 000	-0-		300 U

Actual quantity using standard formula for each material

Actual Qty Using Std Formula = Std Formula x Total Actual Qty

Material A= 800/1, 200 X 231, 000= 154, 000 lbs

Material B = 200/1, 200 X 231, 000 = 38, 500 lbs

Material C = 200/1, 200 X 231, 000 = 38, 500 lbs

The material yield variance is computed as follows:

Actual quantity (input) at weighted average of standard material cost….	57, 750

Actual output quantity at weighted average of standard material cost (200,000lbs X Br.0.30)…. 60, 000*

Materials yield variance Br. 2, 250F

*Alternatively computed:

60, 000 = Input needed to produce the actual output x 0.25

= 240, 000 X 0.25

= Br.60, 000

Note that the total of the mix and yield variance for material equal the quantity variance. Thus, the material quantity variance will be Br.1, 950 F, i.e. 300 U + 2, 250 F.

The influence of individual raw materials on the total materials quantity variance (MQV) can be computed in the following manner:

MQV (material A) = (157, 000-160, 000) X 0.25 = Br. 750 F

MQV (material B) = (38, 000-40, 000) X 0.40 = 800 F

MQV (material C) = (36, 000-40, 000) X 0.10 = 400F

Total material quantity variance Br. 1, 950 F

b. Labor Variance

The labor variances are the following:

i. Rate variances
ii. Efficiency variances, and
iii. Yield variances

The computations of these variances for January are as follows:

1. Computation of labor rate variance variances:

LRV= (AR-SR) X AH = (AR X AH) – (SR X AH)

Actual labor costs Br.34, 656

Actual hr x SR = 3, 800 X 9 34, 200

Labor rate variance Br.456 U

2. Computation of labor efficiency variance variances:

LRV= (AR-SR) X AH = (9.12* -9) X 3, 800 = Br.456 U

*9.12 = 34, 656
3, 800

AH X SR = 3, 800 X 9= Br.34, 200

SH for expected output x SR= 3, 850* X 9 = 34, 650

Labor efficiency variance Br. 450 F

*SH for expected output = 192, 500 X 20 = 3, 850 hrs
1,000

3. Computation of labor yield variance variances:

SH for expected output x SR = 3, 850 X 9 = Br.34, 650

SH for actual output X SR = 4, 000 X 9 = 36, 000

Labor yield variance Br. 1, 350F

The labor yield variance identifies the portion of the labor efficiency variance attributable to obtaining an unfavorable or favorable yield. The favorable labor efficiency of Br.450 is the portion of the traditional labor efficiency variance that is attributable to factors other than yield.

The traditional labor efficiency variance (LEV) is given by:

LEV = (AH-SH) X SR

= (3, 800 – 4, 000) X 9

= Br. 1, 800 F

Learning Activity 4

1. When a company uses only one type of material input, it is possible to measure and analyze mix and yield variances. True/False
2. What is the sum of material mix and yield variances?

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4. Define material yield variance.

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3.6 SUMMARY

- Standard cots are carefully predetermined costs created by management and used as a basis for comparison with actual costs. Mangers and accountants make use of standard costs for planning and controlling their manufacturing and service giving operations. Standards are useful in detailed planning, cost control, performance measurement, and pricing decision
- The major types of standards used by many organizations are: Ideal standards, basic standards, attainable standards, and normal standards. Standards are used to attain the following objectives of firms: Better cost control, Product pricing, estimating budgets, performance evaluation, simplify performance reporting, record keeping and cost awareness.
- The three fundamental activities in standard cost system are the following: standard setting, actual cost accumulation and variance analysis. To set standards accountants and managers make use of historical data or task analysis. Variances are deviations of actual cost incurred or quantity used from the standards allowed.
- The major standards relating to direct material are: Direct material quantity standards and direct material price standards. Standards relating to direct labour are: direct labour efficiency standards (usage standards) and direct labour rate standards.

- Variances are deviations of actual costs or actual quantity used from the standards set or allowed. Variances relating to material are: material quantity variance and material price variance. Variances relating to labour are labour efficiency variance and Labour rate variance.
- Material usage variance occurs when actual material quantity used varies from the standard quantity allowed. Material price variance occurs when actual price of material vary from the standard price allowed. Labour usage (efficiency) variance occurs when actual labour hours used varies from the standard hours allowed. Labour price variance occur when actual wage paid vary from the standard wage allowed.
- The sum of material usage variance and material price variance is material flexible variance. The sum of labour rate variance and labour efficiency variance is labour flexible budget variance.
- The flexible overhead budget is the manufacturer'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 accountant then computes separates overhead variances, each of which conveys separate information useful in controlling overhead costs.
- The variable over head 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 variable overhead spending variance measures deviations in amounts spent for overhead inputs such as spare parts and utilities

- The proportion or ratio of one material to another material is called the mix. In many cases, the new mix is accompanied by either a favorable or unfavorable yield of the final product. A mix variance shows the change in cost that results from changing the proportions of materials added to the production mix. It measures the effect of using a different combination of materials.
- Yield is defined as the amount of prime product manufactured from a given amount of materials A yield variance measures whether a change in mix affected the yield and shows the difference in cost that result if the actual yield (out put) varies from the standard quantity of yield determined for a given input of materials

3.7 EXAM TYPE EXERCISES

1. Mambo Manufacturing Firm Gave you the following standards relating to Material and Labour for its only product called YA3:

Table 1

	Quantity Standards Per unit of out put	Cost standards per unit of input	Cost standard per Unit of out put
Direct Material	5 Kilo Grams	$2 per kg	$10
Direct Labour	4 hours	$4 per hour	$16

Additional information:

- The company has produced 15,000 units of YA3 in the first quarter of production
- 5.5 kg of materials per unit of YA3 have been actually used in the production
- The actual material cost Per kilo gram of in put was $1.9
- 55,000 hours of Direct labour have been actually used with an actual rate of $4.10 per hour

Requirements:

A. Compute the following variances
   i. Direct material quantity variance
   ii. Direct material price variance
   iii. Direct material flexible budget variance
   iv. Direct labour efficiency variance
   v. Direct labour rate variance
   vi. Direct labour flexible budget variance

B. Indicate weather the above variances are Favorable or unfavorable

2. The Maria Company produces Teacups. Each teacup requires the following direct materials and direct labor:

	Standard Quantity per unit of input	Price (Rate)	Standard Cost
Direct material	12 kgs	$1.20 per kgs	$ 14.40
Direct labor	0.75 hour	11.00 per hour	8.25

During December 2001, the following was determined:

a) There was no work in process or direct materials inventory at the beginning or end of March, and 10,000 tea cups were manufactured.
b) The total direct materials variance was $ 8, 000favorable, and the materials quantity variance was $ 4, 800 unfavorable.
c) The direct labor cost for the month amounted to $ 90,000 and the direct labor rate variance was $. 2,205favorable

Requirements

i. How much kgs of materials were actually used?
ii. What was the actual price per hour paid?
iii. What was the actual cost of the direct materials purchased?

iv. How many hours were actually worked?

3. The Buskin Company manufactures redwood picnic tables. Each table requires the following direct materials and direct labor:

	Standard Quantity	Price (Rate)	Standard Cost
2" clear redwood	12 bd.ft.*	Br.1.20 per bd. ft.	Br. 14.40
Direct labor	0.75 hour	11.00 per hour	8.25

bd. ft.=board feet

During March 20x3, the following was determined:

a) There was no work in process or direct materials inventory at the beginning or end of March, and 9, 000 tables were manufactured.
b) The total direct materials variance was Br 8, 325 favorable, and the materials quantity variance was Br 2, 700 unfavorable.
c) The direct labor cost for the month amounted to Br. 77, 760 and the direct labor rate variance was Br. 1, 440 favorable.
d) Bolts and screws are considered indirect materials.

Instructions:

i. How many board feet of lumber were manufactured?
ii. What was the price paid per board foot?
iii. What was the actual cost of the direct materials purchased?
iv. How many hours were actually worked?
v. What was the hourly rate of pay?

4. The Chambers Company manufactures a product with the following standard costs:

Direct materials (20 yards at Br.2 per yard)..... Br40
Direct labor (2 hours at Br.16 per hour)..... 32

The following transactions occurred during the month of July 20x2:

a) Production of finished goods amounted to 3, 000 units

b) There were no beginning or ending inventories of direct materials or work in process.

c) Purchases of direct materials were 68, 000 yards at Br 1.60 per yard.

d) The direct labor cost was for 8, 500 hours at Br. 14 per hour.

Instructions:

i. Compute the materials price and quantity variances, and indicate if they are favorable or unfavorable.

ii. Compute the labor rate and efficiency variances, and indicate if they are favorable and unfavorable.

5. The Prince Company manufactures redwood outdoor furniture sets. The direct material consists of one item, 2" x 4" redwood. Screw and bolts may be ignored.

The following information is available for the month of April 20x3:

a) Two thousands sets of furniture were produced. There are no beginning or ending inventories.

b) The actual cost of lumber purchased amounted to Br. 327, 240 for 202, 000 board feet of redwood. The materials price variances amounted to Br. 4, 040 unfavorable, and the materials quantity variance amounted to Br. 3, 200 unfavorable.

c) The direct labor payroll for the month amounted to Br. 193, 520, and the labor rate variance was Br. 4, 720 unfavorable. The labor efficiency variance was Br. 3, 200 favorable. The actual hours worked were 11, 800.

Instructions:

i. The standard cost of the board foot of lumber.

ii. The standard quantity of board feet per set of furniture.

iii. The actual cost per board feet

iv. The standard rate per hour of direct labor.

v. The standard quantity of hours needed per one set of furniture.

3.8 ANSWERS TO LEARNING ACTIVITY QUESTIONS

Learning Activity 1.

1. Standards are carefully predetermined costs created by management and used as a basis for comparison with actual costs,
2. The basic types of standards are: Ideal standards, normal standards, basic standards, and attainable standards.
3. The basic purposes of standard costing are: cost control, performance evaluation, product pricing, cost awareness, estimating budgets, simplifying performance reports.

Learning Activity 2.

1. The two methods used in setting standards are: task analysis and analysis of historical data
2. Variances occur when the actual cost incurred vary from the standard cost planned to be incurred.
3. The tow standards relating to the material are material price standard and material quantity standards; the two standards relating to the labour are ; labour usage standard and labour rate standards.

4. The two questions that the variance analysis try to answer are: What is the amount of difference between actual and standard cost? Why did the difference occur?

Learning Activity 3

#1

A. Material price variance will be favorable when the actual price per unit used is less than the standard price allowed and vice versa.
B. Material quantity variance is favorable when actual material used is less than the standard quantity allowed and vice versa

C. When actual labour hours used is less than the standard hours allowed and vice versa.

D. When the actual rate per hour is less than the standard rate per hour

#2

i. material flexible budget variance = MQV + MPV

$2,000 U= MQV + $3000 F

MQV = $2,000 U + $3,000 U

$5,000U

iii. Labour Flexible Budget Variance = LEV + LRV

100 F = 500U + LRV

LRV = 500 U + 100U

= 600 U

Learning Activity 4

1. False
2. The sum of material mix and yield variances is material Quantity variance
3. The material yield variance is defined as the result of obtaining a yield different from the one expected on the basis of input.

UNIT IV: COST VOLUME PROFIT (CVP) ANALYSIS

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4.0 INTRODUCTION

Managers often classify costs as fixed and variable when making decisions that affect the volume of out put. The managers want to know how such decisions will affect costs and revenues. They realize that many factors in addition to the volume of out put will affect costs. Yet, a useful starting point in their decisions process to specify the relation ship between the volume of out put and costs and revenues.

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. Thus, CVP analysis examines the behavior of three different factors: cost-volume-profit and further, the total revenues, and the total costs, and operating income as changes occur in the out put level, selling prices, variable costs, or fixed costs.

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.

4.1 OBJECTIVES

Up on the completing of this unit, you should be able to:

- Distinguish between contribution margin and gross margin
- Prepare and interpret a contribution income statement
- Calculate Break –Even sales volume in total dollars and total units
- Construct a cost volume profit graph
- Apply CVP analysis to determine the effect on profit changes in fixed expenses, variable expenses, selling prices, and sales volume.
- Explain the roll of cost structure and operating leverage in CVP analysis
- Identify the limiting assumptions that underlie cost-volume analysis
- Explain the effect of sales mix on profit

4.2. THE BASIC OF CVP ANALYSIS

The concept is so pervasive in managerial accounting that it touches on virtually every thing that the manager does. Because its wide range of usefulness, CVP analysis undoubtedly the best tool for a manager, who is discovering the untapped profit potential that may exist in an organization. Because CVP analysis helps managers understand the interrelationship between cost, volume, and profit, it is vital tool in many business decisions.

Contribution Margin Vs Gross Margin

The form of income statement used in CVP analysis is shown in Exhibit 5.1, i.e., the projected income statement of ABC Merchandising Company for the month ended January 31, 20x6. This income statement is called contribution approach to income statement. The contribution income statement emphasizes the behavior of the costs and there fore is extremely helpful to manager in judging the impact on profits of changes in selling price, cost, or volume.

Exhibit 5.1

ABC Merchandising Company
Projected Income Statement
For the Month Ended January 31,20x6

	Total	Unit
Sales (10, 000 units)	Br. 200,000	Br.20.00
Variable Expenses	160, 000	16.00
Contribution Margin	Br. 40, 000	Br.4.00
Fixed Expenses	32, 000	
Net Income	Br. 8,000	

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 ABC Merchandising Company income statement shown above, the company has a contribution margin of Br. 40, 000. In this case, the first Br.32, 000 covers fixed expenses; the remaining Br. 8, 000 represents profit.

The per unit contribution margin indicates by how much birrs the contribution margin is increased for each unit sold. ABC Merchandising Company's contribution margin of Br.4.00 per unit indicates that each unit sold contributes Br.4.00 to covering fixed expenses and providing for a profit. If the firm had sold 5, 000 units, this would cover only Br.20, 000 of their fixed expenses (5, 000 units x Br.4.00 per unit). Therefore, the firm would have a net loss of Br.12, 000.

Contribution margin	Br.20, 000
Fixed expenses	32, 000
Net loss	Br.(12,000)

If enough units can be sold to generate Br.32, 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 break even point), the company will have to sell 8, 000 units in a month, since each unit sold yield Br. 4.00 in contribution margin.

	Total	Per Unit
Sales (8, 000 units)	Br.160,000	Br.20.00
Variable expenses	128,000	16.00
Contribution margin	Br.32, 000	Br.4.00
Fixed expenses	32,000	
Net income	Br. 0	

Computations of the break-even point are discussed in detail later in this unit. For the moment, note that the break even 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.

In most cases 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.

When we compare the gross margin with the contribution margin:

Gross Margin = Sales price - Cost of goods sold

Contribution margin = Sales price - all variable expenses

In addition to being expressed on a per unit basis, revenue, variable expenses, and contribution margin for ABC Merchandising Company can also be expressed on a percentage basis as shown in the following income statement:

	Total	**Per Unit**	**Percentage**
Sales (10, 000 units)	Br.200, 000	Br.20.00	100%
Variable expenses	160, 000	16.00	80%
Contribution margin	Br.40, 000	Br.4.00	20%
Fixed expenses	32, 000		
Net income	Br. 8, 000		

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 20% means that the variable-cost ratio is 80%.

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% .

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 ABC Merchandising Company's net income for the month will be Br. 4, since the company will have sold 1 unit more than the number needed to break even:

	Total	per Unit
Sales (8, 001 units)	Br.160, 020	Br.20.00
Variable expenses	128, 016	16.00
Contribution margin	Br.32, 004	Br.4.00
Fixed expenses	32,000	

4.3. BREAK-EVEN ANALYSIS

The study of cost-volume-profit analysis is usually referred as break-even analysis. The term break-even analysis is interpreted in a narrow as well as broad sense. Using its narrow sense, it is concerned with finding out the break-even profit.

Break even point is the point of out put at which total revenue is equal to total expenses9 total variable and fixed expenses). In a broad sense the break even analysis means a system of analysis that can be used to determine the probable profit at any level of operations.

In other words break-even point is a point at which the operating income is zero. There are three alternative methods 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

The above formula can be restated as follows

NI = (P XQ)-(VxQ)-F

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……equation (1)

PQ = VQ – FC

Revenue = Total cost

Contribution-Margin Technique. This 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 because at BEP net income equals zero.

Q (P-V)=F…divide both sides by (p-v)

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

This is a short cut formula that helps to compute the break even sales in units. 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.

$$\text{BEP (in sales birrs)} = \frac{\text{Fixed expenses}}{} = \frac{F}{}$$

$$\text{CM ratio} \qquad \frac{P-V}{P}$$

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.

Graphical Method: **The graphical representation of break-even point (cost-volume –profit analysis) is known as break-even chart. Break-even chart is a graph showing the amount of fixed, variable cost and total revenue at different volumes of operations.**
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 Birr 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) XYZ Company manufactures and sells a telephone answering machine. The company’s income statement for the most recent year is given below:

	Total	Per Unit
Sales (20,000 units)	Br. 1,600,000	Br. 40
Variable expenses	120,000	30
Contribution Margin	Br. 400,000	Br. 10
Fixed Expenses	240,000	
Net Income	Br. 160,000	

Required: Based on the above data, answer the following questions.

Instructions:

a. Compute the company's CM ratio and variable expense ratio.
b. 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. 600,000 next year. If cost behavior patterns remain unchanged, by how much will the company's net income increase?

Solution:

a. CM – ratio = $\frac{40-30}{40} = 0.25\ (25\%)$

Variable expense ratio = 1 – CM-ratio = $1-\frac{P-V}{P}$

$= 1-0.25 = 1-\frac{40-10}{} = 0.75\ (75\%)$

b. Method 1: **Equation Method**

i) Net Income (NI) = PQ – VQ – FC

0 = Q (40-30) – 240,000

10Q = 240,000

Q = $\frac{240,000}{10}$

Q = 24,000 units, at Br. 40 per unit, Br. 960,000

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

CM- ratio = 0.25

Variable expense ratio = 0.75

Net Income = Total revenue – Total variable expense – total fixed cost

0 = X – 0.75X-240, 000

0.25X = 240,000

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

X = Br. 960,000

Method 2. **Contribution Margin Method**

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

= Br. $\frac{240,000}{\text{Br. 40– Br. 30}}$

= 24,000 units

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

= Br. $\frac{240,000}{0.25}$

= 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 + (30,000 X Br. 30). 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 5.2.

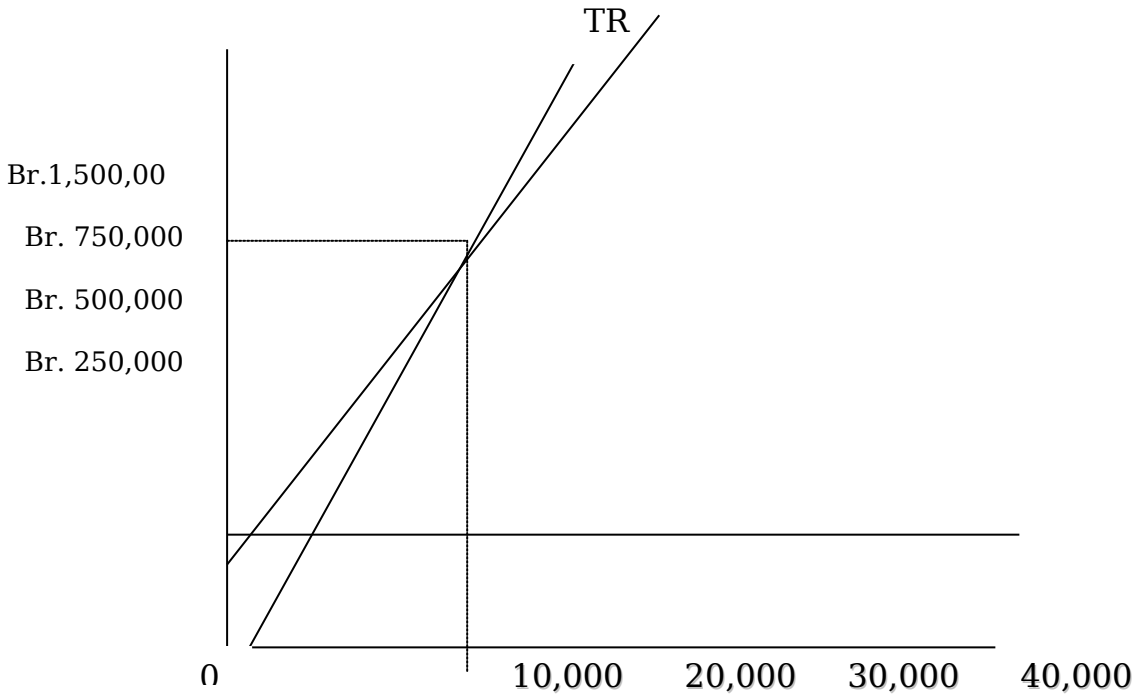


Exhibit 5.2 Cost-Volume-Profit Chart

c)

Increase in sales	Br. 600,000
Multiply by the CM ratio	**X 25%**
Expected increase in contribution margin	Br. 150.000

Since the fixed expenses are not expected to change, net income will increase by the entire Br. 150,000 increase in contribution margin.

Learning activity 1

1. Name the three approaches to break even analysis.

---

2. Contribution margin is excess of sales over fixed cost. Do you agree? Explain.

---

3. What is meant by the product's contribution margin ratio?

---

4. Alem company is the exclusive distributor for a new product. The product sales for Birr 100 per unit and has a contribution margin ratio of 30%. The company's fixed expenses are Birr 300 per year.

Required:

a. What are the variable expenses per unit?

b. Using the equitation method

i. What are the break-even points in units and sales birrs?

ii. What sales levels in units and sales birrs is required to earn an annual

Profit of birr 90,000?

iii. Assume that through negotiation with the manufacturer the company is able to reduce ist variable expenses by Birr 10 per unit. What is the company's breakeven point in units and in sales birrs?

c. Repeat (b) above using the contribution margin method.

4.4 APPLYING CVP ANALYSIS

4.4.0 Overview

To apply cvp analysis, managers usually resort to some simplifying assumptions. The major simplification is to classify costs either as variable or fixed with respect to a single measure of the volume of out put or activity. The study of the effect of out put volume on revenues (sales) expenses, (costs) and net income is a critical activity in a decision making process for the management of a company.

4.4.1 Objectives

Upon completion of this section, you should e able to:

- explain the effect of changing out put (activity level) on sales, variable expenses, fixed costs and overall net income of the firm.
- Understand the meaning and the application of sensitivity analysis.
- Know the ways used to make target net profit analysis
- Understand the meaning and roll of margin of safety

4.4.2 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) Assume GG Company's income statement for the month ended January 31/2005.

	Total	Per Unit
Sales (1000 units)	Br.250, 000	Br.250
Variable expenses	200, 000	200
Contribution margin	50, 000	Br.50
Fixed expenses	30, 000	
Net income	Br.20, 000	

The senior accountant of the company 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, the accountant 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: The Company is currently selling 1000 units per month (monthly sales of Br.250, 000). The sales manager feels that a Br.8, 000 increases in the monthly advertising budget would increase monthly sales by Br.50, 000. Should the advertising budget be increased?

Expected contribution margin (Br.300, 000 x 20% CM ratio)..... Br.60, 000
Present contribution margin (Br.250, 000 x 20% CM ratio)..... 50, 000
Incremental contribution margin..... 10, 000
Change in fixed costs (incremental advertising expense)..... 8, 000
Increased net income..... Br. 2, 000

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 units. However, the sales manager predicts that the higher overall quality

would increase sales to 1100 units 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.50 to Br 40.

Expected total contribution margin (1100 units x Br.90).....Br.44, 000

Present total contribution margin (1000 units xBr.50)..... 50, 000 Increase in total contribution margin..... Br.(6, 000)

No, based on the information above, the high-quality component should not be used. Since the change will reduce net income by Birr 26, 000 (20,000 lost income from original operation and resulted loss 6000 due to change.)

Change in Fixed Cost, Sales Price, and Sales Volume. Refer to the original data and recall that the company is currently selling 1000 units per month. To increase sales, the sales manager would like to cut selling price by Br 10 per units 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 10 per units in the selling price will cause the unit contribution margin to decrease from Br. 50 to Br. 40.

Expected total contribution margin: (1000unitsx150%xBr 40) ... Br. 60,000

Present total contribution margin(1000 units x Br 50)..... 50,000

Incremental contribution margin..... .....10, 000

Change in fixed costs:

Incremental advertising expenses..... 15, 000

Reduction in net income.....Br. (5, 000)

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 units 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, 000, from Br 30, 000 to Br 24, 000. Variable costs will increase by Br 15, from Br 200 to Br 165, and the unit contribution margin will decrease from Br 50 to Br 35.

Expected total contribution margin (1000 units x 115% x Br 35) Br.40,250

Present total contribution margin (1000 units x Br. 50)..... 50, 000

Decrease in total contribution margin..... (9,750)

Change in fixed costs:

Salaries avoided if a commission is paid

[to be added on Br.(9,750)]..... 6, 000

Increase in net income..... Br.(3,750)

No based on the information above, the changes should not be made, because it will reduce the net income by Birr 23,750

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

Variable cost per speaker..... Br 200

Desired profit per speaker (Br3, 000÷150 units)..... 20

Quoted price per speaker..... Br 220

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.

4.4.3 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) Selam 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

Required:

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

Solution:

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

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

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

= Br. 630,000

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

i. Equation method

ii. 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 Selam 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= Br.432, 000 = 54, 000 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

Br. 180, 000=0.4S- Br.252, 000

0.4S= Br.432, 000

S= Br. 432, 000 = Br.1, 080, 000

0.4

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:

Target sales (in units) = Fixed expenses + Target Profit

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.

Target sales in units (for Selam Co.) = Fixed expenses + Target Profit

Unit CM

= Br.252, 000+180, 000

Br. 8

=54, 000 units

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

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

Target sales (in birrs) = Fixed expenses + Target Profit

CM-ratio

Target sales in birrs (for Tantu) = Br.252, 000 + Br. 180, 000

0.4

= Br. 1, 080, 000

4.4.4 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:

Total sales - Break even Sales = 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 as follows:

Margin of safety in birrs = Margin of safety ratio x Total sales

Example (1): Consider the cost structure for ABC Company and XYZ in Exhibit 5.3

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	100,000	20	300,000	60
Contribution Margin	400,000	80	200,000	40
Fixed costs	300,000		100,000	
Net income	Br. 100,000		Br. 100,000	

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

BEP (in birrs) = Fixed Costs / CM ratio

BEP (ABC Co.) = Br.300, 000 / 0.8 = Br.375, 000

BEP (XYZ Co.) = Br.100, 000 / 0.4 = Br.250, 000

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

Total sales - Break even Sales = Margin of safety

ABC Co.'s: Br.500, 000- Br.375, 000 = Br.125, 000

XYZ Co.'s: Br.500, 000- 250,000 = 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 points. 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.

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:

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

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

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

4.5 THE IMPACT OF INCOME TAX 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:

a. Calculate the firm's break-even volume of service revenue.
b. 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= $\frac{\text{Fixed expenses}}{\text{CM-ratio}}$

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

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

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

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

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

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) = $\frac{\text{Fixed expenses}}{\text{Unit CM}} = \frac{FC}{P - V}$

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

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

4.6 CVP ANALYSIS WITH MULTIPLE PRODUCTS

4.6.0 Overview

With multiple product cvp analysis, a managerial accountant can investigate the impact on profit change in:

. Sales volume
. Price
. Variable cost
. Fixed cost
. The sales mix

4.6.1 Objectives

Up on completion of this section you should be able to:

- Understand the meaning of sales (product) mix
- Understand the effect of sales mix on the firm's CVP analysis
- Develop different formulas to compute the break even volume in units and birrs for different sales mix

4.6.2 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.

4.6.3 Sales Mix and CVP Analysis

The concept of CVP analysis had been developed in the context of a single product firm. Since single product firms are virtually non-existent this section of the unit examines the usefulness of CVP technique for firms that deal with several products. In such a case the cvp equation can be expanded as follows:

P1Q1 + P2Q2+...+PnQn – V1Q1 – V2Q2-...VnQn-FC = NI

where Pi = Selling price per unit of product i

Qi = Number units of i produced and sold

Vi = Unit variable cost of product i

FC = Fixed Cost Per Period

NI = 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 n1,n2 and n3, 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 cmi = Unit contribution margin for product i.

$$Q = \frac{FC}{\frac{Cm_1n_1 + Cm_2n_2 + Cm_3n_3}{n_1 + n_2 + n_3}} \quad \text{..... equation (1)}$$

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 contribution margin.

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

$$\text{BEP (in birrs)} = \frac{\text{Fixed expenses}}{\text{CM – ratio}} = \frac{\text{Fixed expenses}}{\frac{\text{Average CM}}{\text{Average Sales Price}}}$$

$$= \frac{\text{Fixed expenses}}{\frac{Cm_1n_1 + Cm_2n_2 + Cm_3n_3}{n_1 + n_2 + n_3}} = \frac{\text{Fixed expenses}}{\frac{P_1n_1 + P_2n_2 + P_3n_3}{n_1 + n_2 + n_3}}$$

$$\text{BEP (in birrs)} = \frac{\text{Fixed expenses}}{\frac{Cm_1n_1 + Cm_2n_2 + Cm_3n_3}{p_1n_1 + p_2n_2 + p_3n_3}} \quad \text{..... equation (2)}$$

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 – X, Y and Z . Selected information on production and sales of the products are as follows:

	X	Y	Z
Selling price per Unit	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 production Division has the following fixed costs:

	Per Month
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:

	X	Y	Z	Total
Sales in units.....	2, 000	1, 000	5, 000	8, 000

Instructions:

a. Compute the weighted- average unit contribution margin, assuming the above sales mix is maintained.
b. Compute the Racket Division's break-even point in birrs for May.
c. How many units of each product should the company sales 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 in made Y we expect 5 units and 2 units of X and Z, respectively. Therefore, let
K=number of units of Y to break-even, the break even sales for X and Z will be 2K and 5K, respectively.
Sales – variable expenses – fixed expenses = O
Total contribution margin - fixed expenses= O
For three products, the formula for the net income would be:
(TCM1 + TCM2 + TCM3) – fixed expenses = O
Where TCM = total contribution margin

16(2K) + 30(K) + 30.8(5K) – 270,000 = 0
216K =270, 000

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

Thus, the breakeven sales for each product line would be:
X =2K=2 x 1, 250= 2, 500 units
Y = K = 1, 250 units
Z =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
X	2, 500 x Br. 40	= Br.100, 000
Y	1, 250 x Br. 60	= Br.75, 000
Z	6, 250 x Br. 75	= Br.468, 750
	Total.....	Br.643, 750

Method II. Contribution Margin Method

Sales mix, given above, for the three rackets X : Y : Z = 2: 1: 5

$$\text{BEP (in units for Topper Sports)} = \frac{\text{Fixed Costs}}{\frac{Cm1n1 + Cm2n2 + Cm3n3}{n1 + n2 + n3}}$$

$$= \frac{Br.270, 000}{\frac{16(2)+30(1)+30.8(5)}{2+1+5}}$$

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

Racket		BEP in units
X	10, 000 x 2/8	= 2, 500 units
Y	10, 000 x 1/8	= 1, 250 units
Z	10, 000 x 5/8	= 6, 250 units
Total		10, 000 units

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

$$\text{BEP (in birrs for Topper Sports)} = \frac{\text{Fixed expenses}}{\frac{Cm1n1 + Cm2n2 + Cm3n3}{p1n1 + p2n2 + p3n3}}$$

$$= \frac{Br.270, 000}{\frac{16(2)+30(1)+30.8(5)}{40(2)+60(1)+75(5)}}$$

$$= \text{Br. } \frac{270,000}{216}$$

$$= \text{Br. } \frac{270,000 \times 515}{216}$$

$$= \text{Br. } \frac{643,750}{}$$

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:

	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

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

Instructions:

a) 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.
b) 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.
c) Calculate the total sales volume in units and in birrs for each product so that Addis Company achieves 8.4% return on sales.

Solutions:

a. BEP (in units for Addis)= $\frac{\text{Fixed Costs}}{\frac{Cm1n1 + Cm2n2 + Cm3n3}{n1 + n2 + n3}}$

$$= \text{Br.}\frac{840,000}{\frac{50(2)+20(1)+30(3)}{2+1+3}}$$

$$= \text{Br.}\frac{840,000}{\frac{210}{6}}$$

$$= 24,000 \text{ units}$$

Product Lines	**BEP in units**	**BEP in birrs**
Ethio-01	24, 000 x 2/6 = 8,000 units	8,000 x 150 =Br.1, 200,000
Ethio-02	24, 000 x 1/6 = 4, 000	4, 000 x 80 = 320, 000
Ethio-03	24, 000 x 3/6 = 12, 000	12, 000 x 40= 480, 000
Total	24 , 000 units	Br.2, 000, 000

Or computed alternatively:

BEP (in birrs for Addis) = $\frac{\text{Fixed expenses}}{\frac{Cm1n1 + Cm2n2 + Cm3n3}{p1n1 + p2\,n2 + p3n3}}$

$$= \text{Br.}\frac{840,000}{\frac{50(2)+20(1)+30\,(3)}{150(2)+80(1)+40(3)}}$$

$$= \text{Br.}2,000,000$$

b. NIAT = Br.73, 500. This implies that NIBT= Br.10, 500

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

Product Lines	**Target sales in units**	**Target sales in birrs**
Ethio-01	27, 000 x 2/6 = 9, 000 units	9, 000 x150 =Br.1, 350,000
Ethio-02	27, 000 x 1/6 = 4, 500	4, 500 x 80 = 360, 000
Ethio-03	27, 000 x 3/6 = 13, 500	13, 500 x 40= 540, 000
Total	27 ,000 units	Br. 2, 250, 000

Target Sales (in birrs for Addis) = $\frac{\text{Fixed expenses +NIBT}}{\text{Cm1n1 + Cm2n2 + Cm3n3}}$

$\text{p1n1 + p2 n2 + p3n3}$

$= \text{Br. } \frac{840,000 + 105,000}{\frac{50(2)+20(1)+30(3)}{150(2)+80(1)+40(3)}}$

$= \text{Br. } \frac{945,000}{210}$

500

Br.2, 250, 000

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

Where P =sales price

Q= target sales in units

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

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

Net income =Total sales x Return on sales

$=\frac{500(Q) \times 8.4\%}{6}$

$$= \frac{7Q}{}$$

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

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

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

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

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

$$210Q = 5,040,000 + 42Q$$

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

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

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

4.7 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. 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
2. The behavior of total expense is linear over the relevant range. This implies the following more specific assumptions:

    - ✓ Expenses can be categorized as fixed, variable, or semi variable costs. Total fixed costs remain constant as activity changes and unit variable expenses remain constant as activity varies.

- ✓ The efficiency and productivity of the production process and the workers remain constant.

3. Total variable cost vary with the volume output but prices of variable costs such as wage rate, price of materials, and supplies will be unchanged.

4. Multi product companies, the sales mix remains constant over the relevant range.

5. 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.

6. The value of a birr received today is the same as the value of a birr received in any future year.

4.8 COST STRUCTURE AND OPERATING LEVERAGE

4.8.0 overview

Costs are associated with all types of organizations- business, non-business, services, retail, …etc. Generally, the kinds of costs that are incurred and the way in which theses costs are classified will depend on the type of organization involved. Thus, cost items variable or fixed are analyzed and grouped according to their common characteristics and the effect of each on the operating leverage of the particular company.

4.8.1 Objective

Up on the completion of this section you should be able to:

- Understand the cost structure of the firm
- Explain the basics of cost structure
- Explain the role of cost structure on the firm's profit stability
- Define operating leverage
- Understand the relationships between operating leverage and the firm's profitability

4.8.2 Cost Structure And Profit Stability

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, follow:

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

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:

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

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.

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

4.8.3 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.

Contribution margin = Degree of operating leverage (DOL)
Net income

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:

$$\text{Firm A: Br.}\frac{40,000}{10,000} = 4$$

$$\text{Firm B: Br.}\frac{70,000}{10,000} = 7$$

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:- VC	45, 000	48, 000	60, 000	90, 000	135, 000
CM (a)	30, 000	32, 000	40, 000	60, 000	90, 000
Less:-FC	30,000	30, 000	30, 000	30, 000	30, 000
NI (b)	–0-	2, 000	10, 000	30, 000	60, 000
DOL (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 father the company moves from its break-even point. At the break-even point, the degree of operating leverage will be infinitely large (Br.30, 000 contribution margin÷Br.0 net income=∞)

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.

Learning Activity II

1. Identify the major simplifying assumptions that underlies CVP analysis

……
……
……
……..

2. What is meant by the margin of safety?

……
……

3. Company A's cost structure includes costs that are mostly variable, where as 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 made concerning sales mix?

……
……
……

5. Compute the number of units of product that must be sold if the company is to break even in each of the independent situations described below.

a. The contribution margin per unit of the product sold is Birr 1.45 and the fixed costs for the year are Birr 551,000
b. The contribution margin is 35% of total revenue, and the fixed costs for the year are Birr 84,000 a year. Each unit of product sells for Birr16.
c. The fixed costs amount to Birr 146,000 a year. Each units sold contributes Birr 5 to cover fixed costs and to profit.

d. The variable costs to manufacture and sells a certain line of product amount to 60% of the revenue. The fixed costs for the year are Birr 218,000, and each unit of product sells for Birr 5.45.
e. Two product lines are sold: product A & product B. Sales are in 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 Birr 5 a unit, and the variable costs identified with the production and sales of each unit of product A amounts to Birr 4. Product B is sold for Birr 15 a unit, and the variable costs identified with the production and sales of each unit of product B amounts to Birr 10.

6. Cost Behavior relation ships at two firms, A and B are given below:

	firm A	firm B
Sales price	Birr 0.30 per unit	Br. 0.30 per unit
Variable costs	0.10 per unit	0.25 per unit
Total fixed costs	Birr 14 000	Birr,2000 Expected sales volume 80,000 unit	80,000 units

Required

a. Compute the Budgeted profit at the expected sales volume of 80,000 units
b. Discuss the effect on profit if volume falls to 70,000 units for both firms
c. Discuss the effects on profits if volume rises to 90,000 units for both firms
d. Comment on the riskiness of the two cost structure.

4.9 SUMMARY

An understanding of cost-volume-profit relation ships 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.

Cost-volume-profit relation ships 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 concern on profits from changes in volume. The contribution income statement also discloses an organization’s cost structure, which is relatively proportion of fixed and variable costs. The cost structure of organizations defines its operating leverage, which determines the impact on profit of changes in the sales volume.

4.10 ANSWERS TO LEARNING ACTIVITY QUESTIONS

Learning activity I.

1. The three approaches to break-even analysis are:

- Equation technique

- Contribution technique
- Graphical approach

2. No, contribution margin is the excess of sales over total variable costs

3. CM-Ratio refers to the percentage of contribution margin in total uses.

4. a) CM Ratio = $\frac{p-v}{p}$

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

$= 24 - 60 - v$

$V = \underline{36}$

b) i) NI = PQ-VQ-FC

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

$Q = \frac{360}{24}$

Q= **15,000** units or at Br60/unit = **Br900,000**

Let X be break even sales in Br

NI = sales – variable expense – fixed expenses.

O = x – 0.6x-36.n

0.4x = 36,000

$X = \frac{36,000}{0.4}$ = **Br 900, 000**

Cm Ratio = 40% variable cost Rati0 = 60%

c ii) NI = PQ – VQ - FC

90,000 = Q (60-36) – 360, m

24Q = 450,000

$Q = \frac{456,000}{}$ = **18, 750 units** or at Birr **1,125,000** Birr

24

Let “X” be sales volume to achieve a target profit of birr 90,000

NI = sales – variable expenses – fixed expenses

90,000 = x – 0.6x – 360,000

0.4x = 450 unit

x = 450, unit

0.4

x = 1,125,000 birr

iii) BEP (in units)

O = Q (60-30) – 360,000

30 Q = 360,000

Q = 360,000

30

Q = 12000 units

c. i) BEP (in units) = 360,000 = **15,000** units

60-36

BEP (in birr) = 360,000 = **birr 900,000**

0.4

ii) Target sales in units = 360,000 + 90,000 = **18,750 units**

60-36

Target sales in birr = 360,000 + 90,000 = birr **1,125,000**

0.4

iii) BEP (in units) = 360,000 = 12,000 units

30

BEP in birr = 360 = 720,000

0.5

Learning Activity II

1. There are several assumptions underlying the CVP analysis. The major assumptions are as follows
   - Expenses may be classified in to variable and fixed categories
   - Costs and revenues are linear throughout the entire relevant range

- Efficiency and productivity of machine and workers will be unchanged.
- In multi-product companies, inventories do not change.

2. Margin of safety is the excess of budgeted (or actual) sales over the Break-even volume of sales.
3. Company B's cost structure is highly leveraged. In highly leveraged companies-those with high fixed cost & low variable costs-small changes in sales volume will result in large change 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 proportion of the companies' product to be sold. Sales mix is computed by expressing the sales of each product as a percentage of total sales.
5. a) BEP = $\frac{551{,}000}{1.45}$ = **380,000** units

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

   c) BEP = $\frac{146{,}000}{5}$ = **25,200** units

   d) BEP = $\frac{218{,}000}{0.4}$ = **Br 545,000**

   BEP = $\frac{545{,}000}{5.45}$ = **100,000** units

   e) BEP = $\frac{169{,}000}{\frac{1(3)+5(2)}{3+2}}$ = **65,000** units

4.11 MODEL EXAMINATION QUESTIONS

1. Ethio Food Services Company operates and services snack vending machines located in restaurants, gas stations factories etc. the

machines are rented from the manufacturer. In addition, Ethio must rent the space occupied by its machines. The following expenses and revenue relationships pertain to a contemplated expansion program of 20machines

Fixed monthly expenses follow;-

Machine rental; 20machine @Br26.75	Br. 535
Space rental: 20 locations @Br 14.40	288
Part time wages to service he additional 20 machines	727
Other fixed costs	50
Total monthly fixed costs	**Br. 1600**

Other data follows

	Per unit	Per Br. 100 of sales
Selling price	Br. 0.50	100%
Cost of snack	0.40	80%
Contribution margin	Br. 0.10	20%

Instructions; - these questions relate to the above data unless other wise noted. Consider each question independently

a. What is the monthly BEP (in units and in Birrs)?
b. If 20,000 units were sold, what would be the company's net income?
c. If the space rental cost were doubled, what would be the monthly BEP (in units and in birrs)?
d. If, in addition to the fixed rent, Ethio food services Company paid the vending machine manufactures 1 cent per units sold, what would be the monthly BEP (in units and in Birrs)?
e. If in addition to the fixed rent, Ethio paid the machine manufacturer 2 cents for each unit sold in excess of the BEP, what would the new net income be if 20,000 units were sold? Prefer the original data

2. Africa Transportation Company specializes in having heavy goods over long distances. Africa's revenues and expenses depend on revenue miles, a measure that combines both weights and

mileage. Summarized data for the year are based on the total revenue miles of Br, 800,000.

	Per revenue mile
Average selling price (revenue)	Br, 1.40
Average variable expresses	1.20
Fixed expenses	120,000

Instruction

a. Compute the budged net income. Ignore income taxes.
b. Management is trying to decide how various possible decisions might affect the net income. Compute the net income for each of the following changes. Consider each case independently.
   i. A 10% increase in revenue miles
   ii. An average increase in selling price of 3 cent per mile and a 5% increase in revenue miles. Refer the original data
   iii. An average increase in selling price of 5% and a 10% increase invariable expense.
   iv. A 10% increase in fixed expense in the form of more advertising and a 5% increase in revenue miles

3. Luxury products inc. manufactures recreational equipment one of the company's products, a skate board, sells for Br. 37.50 the skate boards are manufactured in an antiquated plant that relives heavily on direct labor workers. Thus, variable costs are high, totaling Br.22.50 per skate board.

Over the past year the company sold 40,000 skate boards, with the following operating results;-

Sales (40, skate boards)	Br.1, 500,000
Variable expenses	900,000
Contribution margin	600,000
Fixed expenses	480,000
Net income	Br.**120, 000**

Management is anxious to maintain and perhaps even improve its present level of income from the skateboards.

Instruction;-

a. Compute the CM ratio and the BEP (in skate boards and in birrs).What is the degree of operating leverage at last year's level of sales?
b. Due to increase in labor rates, the company estimates that variable costs will increase by Br. 3 per skate board next year. If the change takes place and the selling price per skate board remains constant at Br.37.50. What will be the new CM ratio and the new BEP (in skate boards and in birrs)
c. Refer to the data in (b) above. If the expected change in variable costs takes place, how many skate boards will have to be sold next year to earn the same net income as last years?
d. Refer to the data in (b) above. The president has decided that the company may have to raise the selling price on the skate boards. If luxury products wants to maintain the same CM ratio last year, what selling price. Per skate board must it charge in the next year to cover the increased labor costs?
e. Refer to the original data. The company is considering the consideration of a new automated plant to manufacture the skateboards. The new plant would slash variable costs by 40% but it should cause fixed costs to increase by 90%. If the new plant were built, what would be the company's new CM ratio and the new BEP (in skate boards and in birrs)?

4. Tafach Candy company is a whole sale distributor of candy. The company service grocery, convenience, and drugstores in a large metropolitan area. The company has achieved small but steady growth in the sales over the past few years while candy prices have

been increasing. Tafach candy is formulating its plans for the coming fiscal year. Presented below are the data used to project the current year after tax income of Br.110, 400.

Average selling price per box	Br, 4
Average variable costs per box	
Cost of candy	Br, 2
Selling expense	0.4
Total	Br. 2.4

Annual fixed costs		
Selling	Br.160, 000	
Administrative		280,000
Total expenses		440,000

Annual sales volume (390,000 boxes)	Br. 1,560,000
Tax rate	40%

Manufacturers of candy have announced that they will increase price of their products on average of 15% in the coming year, owning to increase in raw material (Sugar, Cocoa, Peanuts, etc.) and labor costs. Tafach Candy Company expects that all other costs will remain at the same rates or level as in the current year.

Instructions:-

a. What is Tafach Company's BEP in boxes of candy for the current year?
b. What selling price per box must Tafach Candy Company charge to cover the 15%. Increase in the cost candy and still maintains the current contribution. Margin ration?
c. What volume of sales in birr must the Tafach candy company achieves in the coming year to maintain the same net income after taxes as projected for the current year if the selling price of candy remains at Br 4 per box and the cost of candy increases by 15%?
d. What strategies might Tafach Candy Company use to maintain the same net income after taxes as projected for the current year?

6. Hospitals Measure their volume in terms of patient days, which are defined as the number of patients multiplied by the number of days that the patients are hospitalized. Suppose large hospital has fixed costs Br 18 million per year and variable costs of Br 300 per patient day. Daily revenues vary among classes of patients. For simplicity, assume, that there are two classes:-

1. Self-pay patients (s) who pay an average of Br. 500 per day
2. Non self-pay (G) who are the responsibility of insurance companies and government agencies and who pay an average of Br 4 per day. Twenty percent of the patients are self pay.

Instructions:

a. Compute the BEP in patient days, assuming that the planned mix of patients is maintained.
b. Suppose that 15,000 patient days were achieved but that 25% of the patient day were self pay (instead of 20%). Compute the net income and BEP.

6. The frozen delicacies company specializes in preparing tasty main courses that are frozen and shipped to the finer restaurant in the loss angles area. When a diner orders the item, the restaurant heats and services it.

The budget data for 20 x 2:

	Product	
	Chicken Cordon Bleu	Veal Marsala
Selling price to restaurants	$5	$7
Variable expense	3	4
Retribution margin	$2	$3
Number of units	250,000	125,000

The items are prepared in the same kitchens, delivered in the same trucks, and so fourth. Therefore, the fixed costs of Br 840,000 are unaffected by the specific products.

Instructions:-

a. Computer the planned net income for 20x2
b. Computer the BEP in units, assuming that the planned sales mix is maintained
c. Computers the BEP in units if only veal were sold and if only chicken were sold.
d. Suppose 90,000 units of veal and 270,000 units of chicken were sold. Computer the net income. Computer the new BEP if there is relationship persisted in 20x2. What is the major lesson of this problem?

7. The president of WCY, TNC notes that the net income after income taxes last year was Br. 162,000. Income taxes are at the rate of 40% of income before taxes. This profit was earned by selling 255,000 units of a product at a price of Br, 6 per unit. By reducing the selling price to Br, 5 per unit, he believes that sales volume can be increased to 350,000 units next year and those profits will be increased as a result. Fixed costs for the year are Br, 240,000.

Instruction:

a. Will profits be increased by the reduction in the selling price and the expected increase in sales volume? Show computations.
b. With a selling price of 5 per unit, how much sales volume is needed to earn no less than Br, 162,000 after income taxes?

8. The plant manager of Ethio Inc, has been searching for ways to improve profit maligns by cutting the variable costs; the fixed costs have already been reduced to a minimum and are budgeted at Br, 315,000 for the year. The product produced at this plant is sold for Br, 12.50 per unit. The materials used in the production of this product line have cost Br, 9.50 per unit but can be obtained from another source at a cost of Br, 9.20 per unit. In the past each unit of product required 20minutes.

Instructions:-

a. Compute the number of units that had to be sold under the old production method in order to break even.
b. Compute the number of units that must be sold under the revised production plan in order to break even.

c. How many units must be sold under the revised plan to earn a net income after taxes of Br, 252,000? Income taxes are at the rate 40% of income before taxes.

9. Adama Hotel in Nazareth has 350 rooms with a fixed cost of Br, 192,000 per month during the busy season. Room rates Br, 50 per day with variable costs of Br, 10 per rented room per day. Assume a 30 day month. The hotel is subject to a 30% income tax rate.

Instruction:-

a. How many rooms must be occupied per day to break even?
b. How many rooms must be occupied per month to make a monthly after tax profit of Br, 75,600
c. Refer the original data. Assume that the Adama Hotel has these contribution margins per month from use of space in its hotel:-

Lease shops in Hotel	Br, 20,400
Meals served, conventions	10,600
Dinning room and coffee shop	9,400
Bar and cocktail lounge	7,600

What average rate per day must the hotel charge to make an after tax income of Br. 75,600 per month. Assume occupancy averages 30% per day. Ignore the original average rate.

10. A social welfare agency has a government budget appropriation for 20x3 of Br, 900,000. The agency's major mission is to help disabled persons who are unable to hold jobs. On the average, the agency supplements each person's other income by Br, 5,000 annually. The agency's fixed are Br.290, 000. There are no other costs.

Instructions:- consider each situation independently unless other wise told.

a. How many disabled persons were helped during 20x3?
b. For 20x4, the agency's budget appropriations have been reduced by 15%. It the agency continues the same level of monetary support

per person, how many disabled persons will be helped in 20x4? Compute the percentage decline in the number of persons helped.

c. Assume a budget reduction of 15%, as in requirement (b) above. The manager of the agency has discretion as to how much to supplement each disabled person's income. She does not want to reduce the number of persons served. On the average, what is the amount of supplement that can be give to each person? Compute the percentage decline in the annual supplement.

4.12 GLOSSARY

Break Even point: the level of activity at which an organization neither earns nor incur a loss. The Break even can also be defined as the point at which total Revenue equals total costs and as the point where contribution margin total equals total fixed costs.

Contribution Margin Method: the approach that centers 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 costs, Break even points (BEP) will be reached.

Contribution Margin Ratio (CM Ratio): is the ratio of contribution margin to sales.

Break-even graph (chart): is a graph which shows the relation ship between revenues, costs and level of activity in an organization presented in a graph form.

Degree of operating leverage: a measure, at a given level of sales, of how a percentage changes in sales volume will affect profit. The degree of operating leverage is computed by dividing contribution margin by net income.

Equation method: a method of computing the break-even point that relies on the equation.

Profit= sales - variable expense - FC

Margin of safety: the excess of budgeted (or actual) sales over the break-even volume of sales.

Operating leverage: is a measure of the extent to which fixed costs are being used in an organization. The greater the fixed cost, the greater is the sensitivity of net income to changes in sales.

Sales mix: the relative combination is which a company's product is sold.

CHAPTER V: RELEVANT INFORMATION AND DECISION MAKING

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5.0 INTRODUCTION

Making decision is choosing from alternatives. In this unit, several analytical techniques that aid managers in making a variety of business decisions are discussed. Your understanding of the previous units here determine the extent to which you comprehend the unit-"Relevant Information and Decision Making". It includes three sections. The first section explains the nature of "relevant" information. The steps in the decision making process are discussed in section two. The last section illustrates the application of the concept of relevant costs and benefits to various marketing and production decisions. Emphasis is also given to the relevance of opportunity costs and to the irrelevance of sunk costs.

5.1 LEARNING OBJECTIVES

Making correct decisions is one of the most important tasks of a successful manager. Every decision involves a choice between at least two alternatives. For instance, 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.

After studying this unit you should be able to meet these learning objectives:

- explain the relevant costs for decision making purpose.
- describe and explain the decision making model
- apply the decision making concepts in a variety of business situations.

5.2. RELEVANT COSTS AND DECISION MAKING MODEL

5.2.0. Overview

Before the management of an enterprise can make an informed decision on any matter, they need to incorporate all of the relevant costs which apply to the specific decision at hand in their decision making process. To include any non-relevant costs or to exclude any relevant costs will result in management basing their decision on misleading information and ultimately to poor decisions being taken.

Therefore, management accountants have an important role in the decision-making process, not as an ultimate decision maker but as collectors and summarizers of relevant information.

5.2.1 Objectives

Upon completing this section, you should be able to:

- discriminate between relevant and irrelevant information for making decision.

- explain the relevance of opportunity costs and the irrelevance of sunk costs to decision making.
- explain the significance quantitative and qualitative factors in decision making.
- describe the short run decision making model

5.2.2. Relevant Costs Defined

What makes information relevant to a decision problem? Relevance is one of the key characteristics of good management accounting information. This means that management accounting information produced for each manager must relate to the decisions which he/she will have to make.

Relevant information includes the predicted future costs and revenues that differ among the alternatives. Any cost or benefit that does not differ between alternatives is irrelevant and can be ignored in a decision. All future revenues and/or costs that do not differ between the alternatives are irrelevant.

In brief, there are two criteria that qualify information to be relevant for decision making.

i. **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 affect future, but not past. Nothing can alter what has already happened.

ii) Different under Competing Alternatives: Relevant information must involve future costs or benefits that differ among the alternatives. These are called **differential revenues and costs**. In cost and management accounting, the term differential cost is synonymous with avoidable cost and relevant cost. 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.

Sunk Costs and Opportunity Costs

The emphasis on differential revenues and costs gives rise to two other, related concepts that you may have already encountered in your study of economics: *sunk costs and opportunity costs*. A **sunk cost** is one that has already been incurred and therefore will be the same no matter which alternative a manger selects. Sunk costs are never relevant for decision making because they are not differential.

Suppose a company has spent Br.500, 000 developing a new product. Problems have risen and the managers must now decide whether or not to market it. The Br.500, 000 is irrelevant to the decision because it is not differential; that is, the cost will be the same whether or not the firm markets the product. Similarly, depreciation on a machine is irrelevant in decision which products to make with that machine. All historical costs, whether original cost or book value (cost minus accumulated depreciation), are sunk costs.

Opportunity costs play a vital role in a decision making. An opportunity cost is the benefit lost by taking one action as opposed to another. The "other" action is the best alternative available other than the one being contemplated.

Suppose Beza Company owns a warehouse and can either use it to store products or rent it to another company for Br.8, 000 per year. Using the space for storage requires that Beza forego the opportunity to rent it, which means that there is a difference to Beza if it chooses to take one action rather than another. When Beza considers any action that requires using the space for storage, the relevant cost of the space is its opportunity cost, the Br.8, 000 rent Beza will not collect.

5.2.3. Model for Decision Making

How does a company go about making good tactical decisions? The six steps in decision-making process are as follows:

1. Define the problem.
2. Identify alternatives as possible solutions to the problem; eliminate alternatives that are not feasible.
3. Identify the relevant costs and benefits associated with each feasible alternative; eliminate irrelevant costs and benefits from consideration.
4. Total the relevant costs and benefits for each alternative.
5. Assess qualitative factors.
6. Select the alternative with the greatest overall benefit (make the decision)

These six steps define a simple decision model. A decision model is a set of procedures, if followed, will lead to a decision. The paragraph that follows discusses the sequence of steps to be followed.

Define the problem. The first step in decision-making process is to recognize and define a specific problem. This is the most important stage because all other activities in the process depend on it. If one does not have a clear understanding of the specific problem, he/she may spend valuable time and energy in identify 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.

Identify the Alternatives. Decision- making is selecting between two or more alternatives. This step is concerned with listing and considering of possible solutions. If a machine breakdown, what are the alternative courses of action? The machine can be repaid 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. As part of this step, the company eliminates alternatives that are not feasible.

Identify relevant information Here, the costs and benefits associated with each feasible alternative are identified. At this step, clearly irrelevant costs can be eliminated from the consideration. The management accountant is responsible for gathering necessary data.

Total relevant costs and benefits This step involves determining the relevant costs and benefits of the possible alternatives.

Assess qualitative factors. Decision making is based on an evaluation of quantitative and qualitative factors. Typically, the quantitative factors are those for which measurement is easy and precise. In addition to this financial criterion, there are other factors that bear upon the decision and that are usually referred to as qualitative. Qualitative factors are simply those factors that are hard to put a number on. Put differently, qualitative aspects are those for which measurement in birrs and cents is difficult and imprecise

Qualitative factors can significantly affect the manager's decision. For example in make-or –buy decision, the quality of the product purchased externally, the reliability of supply sources, the expected stability of price over the next years, labor relations, community image and so on. Therefore, qualitative factors must be taken into consideration in the final step of the decision making model.

Make the decision. Once all relevant costs and benefits for each alternative have been assessed, the qualitative factors weighed, a decision can be made.

Learning Activity I

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

5.3. COMMON RELEVANT COST APPLICATIONS

5.3.0. Overview

Many of the decisions described in this unit are involved with two or more courses of action from which the decision maker must select the best alternative. The analyses of these alternative choice decisions are aided by relevant cost and benefit data.

Therefore, the concept of relevant costs and benefits is applied here for various types of marketing and production decisions. Does this mean that each decision requires a different approach to identifying relevant costs? No. The fundamental principle in all decision situations is that relevant costs are future costs that differ among alternatives. The principle is simple, but its application is not always straightforward.

5.3.1. Objectives

Upon completing this section, you should be able to:

- 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 keep-or-drop a product line or other segments of a company.
- Measure product profitability when production is constrained by a scarce resource.
- identify qualitative and quantitative factors to be considered in a make-or-buy decisions
- prepare an analysis to support a decision to make or buy certain parts or products.

- prepare an analysis showing joint products should be sold at the split-off point or process further.
- identify sunk costs and explain why they are not relevant in decision whether to keep or replace equipment.

5.3.2. Marketing Decisions

Special-Order Decisions

A special order is a one-time order that is not considered part of the company's normal on going business. For example, a discount department store chain planning a big sale offers to make a large one-time purchase of a firm's product but wants a reduced price. 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. Kora's manufacturing plant has the capacity to produce 15,000 units each month. The factory is currently operating at 70% production level to meet the monthly demand. The company normally charges Br. 130 per unit using a 30% markup on manufacturing costs. Cost information for the current activity level is as follows:

Direct materials	Br. 756,000
Direct labor	189.000
Variable manufacturing overhead(MOH)	21,000
Fixed manufacturing overhead	105,000
Total manufacturing costs	**Br.1,050,000**

Additional expenses include a Br. 10 variable selling and administrative expenses and fixed selling and administrative expenses of Br. 2.50 per unit. Currently, the company had an opportunity to sell all its produce at Br. 130. Management, however, would like to use the excess capacity to accept the special order.

No additional fixed manufacturing costs or selling and administrative expenses will be incurred to permit production of the 4, 000 units special order.

Because these units are being sold directly to the chain store, variable selling and administrative expenses are expected to be only Br. 2.50 per unit on the special order.

Instructions:

a. Would it be profitable for Kora Company to accept this special order at Br.100? Why?

b. Refer all the facts presented above. However, assume that the special order was for 6, 000 units instead of 4, 000 units. The conditions of the special order specify that it has to be accepted in full as acceptance of partially quantity is not allowed. To accept this special order Kora Company must cut back normal sales because

production capacity can not be expanded in the short run. Should the special order be accepted or rejected? Why?

c. Refer requirement (b) above. At what selling price per unit would the company be indifferent between accepting and rejecting the offer?

There are two approaches to costs on income statement: absorption/financial approach and 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	xxx	Variable costs	Xxx
Gross profit	xxx	Contribution margin	Xxx
Selling and Admin. Expenses	xxx	Fixed costs	Xxx
Operating income	xxx	Operating income	Xxx

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.

Solution

a. At first glance, it appears unprofitable for Kora to accept the special order. Not only is the sales price of Br.100 per unit much less than the regular sales price, it is even less than Kora’s Br.102 average per-unit cost of manufacturing the product. Let us look, however, at

the incremental monthly revenue and manufacturing costs that should result from accepting this special order.

	Without special order 10, 500units	**Effect of special order 4,000 units**	**With special order 14, 500 units**
Sales	Br. 1,365,000	Br. 400,000	Br. 1,765, 000
Variable expenses			
Direct material	Br. 756, 000	Br. 288, 000	Br. 1, 044,000
Direct labor	189, 000	72, 000	261, 000
MOH	21, 000	8,0 00	29, 000
Selling & Administrative	105, 000	10, 000	115, 000
Total variable expenses	Br. 1,071,000	Br. 378, 000	Br. 1, 449, 000
Contribution Margin	Br. 294,000	Br. 22, 000	Br. 316, 000
Fixed expenses			
Manufacturing overhead	Br. 105,000	-	Br. 105, 000
Selling and admin.	26,250	-	26, 250
Total fixed expenses	131, 250	-	Br. 131, 250
Operating income	**Br. 162, 750**	**Br. 22, 000**	**Br. 184, 750**

This analysis shows that accepting the special order will generate incremental revenue of Br.400, 000, and incremental costs of only

Br.378, 000. Therefore, accepting the special order will increase Kora's monthly profit by Br.22, 000.

The relevant factors in this type of decision are the incremental revenue that will be earned and the additional (incremental costs) that will be incurred by accepting the special order. The only incremental costs of filling the special order are the related variable manufacturing costs; accepting the order will not increase fixed manufacturing costs. Thus, the Br.102"average manufacturing cost," which includes fixed costs per unit, is not entirely relevant to the decision.

Recommendation: 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.

Based on the relevant data, Kora Company should accept the special order because it brings an additional income of Br. 22,000 for company.

Income with special order	Br. 184, 750	
Income without special order	162, 750	
Additional income if the order had been accepted	**22,000**	**Br.**

b. In evaluating the merits of a special order, managers should consider the effect that filling the order might have upon the company's regular sales volume and sales prices.

   In this requirement, the company has **no sufficient capacity** to produce the special order without affecting normal sales. To accept the special order for 6, 000 units Kora Company must cut back normal sales by 1, 500 units because production capacity can not be expanded in the short run Therefore, the relevant costs to be used 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. 567,000 variable costs and a forgone contribution margin of Br. 42,000.

The total cost of accepting the special order, Br. 609,000, exceeds the offered selling price of Br. 600,000.

Incremental revenue		Br. 600,000
Incremental cost		
Variable costs	Br. 567,000	
Opportunity costs	42,000	609, 000
Disadvantage in favor of accepting the special order		**(Br.9, 000)**

Kora Company should not accept the special order because it has a net Br. 8,000 disadvantage. The above analysis may be presented as tabulated here below:

	A Without special order 10, 500units	**B Effect of special order on Regular Sale 1,500 units**	**C Effect of special order 6,000 units**	**(A-B)+C With special order 14, 500 units**
Sales	Br. 1,365,000	Br.195, 000	Br. 600,000	Br. 1,770, 000
Variable expenses				
Direct	Br. 756,	Br.108, 000	Br. 432,	Br. 1,

material	000		000	080,000
Direct labor	189, 000	27, 000	108, 000	270,0 00
MOH	21, 000	3, 000	12,0 00	30, 000
Selling & Admin.	105, 000	15, 000	15, 000	105, 000
Total variable exp.	Br. 1,071,000	Br.153, 000	Br. 567, 000	Br. 1, 485, 000
Contribution Margin	Br. 294,000	Br.42, 000	Br. 33, 000	Br. 285, 000
Fixed expenses				
MOH	Br. 105,000	-	-	Br. 105, 000
Selling and admin.	26,250	-	-	26, 250
Total fixed expenses	131, 250	-	-	Br. 131, 250
Operating income	**Br. 162, 750**	**Br.42, 000**	**Br. 33, 000**	**Br. 153, 750**

Income with special order = Br. 153,750

Income without special order = 162,750

Disadvantage of accepting the special order = **Br. (9,000)**

c. Under the condition given in (b), 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 Kora Company equally attractive between these two alternatives

P (6,000) – 6,000 (94.5) = 42,000

P (6,000) = 42,000 + 567, 000

P (6,000) = 609,000

P = $\frac{609{,}000}{6{,}000}$

P = **Br. 101.5**

Keep-or-Drop Decisions

Often a manager needs to determine whether or not a segment or other segments of a company should be kept or dropped. Segment report prepared on a variable-costing basis provides valuable information for these keep-or-drop decisions. However, while segmented reports provide useful information for such decisions, relevant costing describes how the information should be used.

In keep-or-drop 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. Brass Ltd. manufactures three products, X, Y and Z. The present net annual income from each item is as follows:

	X	**Y**	**Z**	**Total**
Sales	Br. 50,000	Br.40,000	Br.60,000	Br.150,000
Variable Costs	30,000	25,000	35,000	90,000
Contribution margin	20,000	15,000	25,000	60,000
Fixed Costs	7,000	18,000	20,000	55,000
Profit(Loss)	**Br. 3,000**	**Br(3,000)**	**Br.5,000**	**Br.5,000**

Brass Ltd. is concerned about its poor profit performance, and is considering whether or not to cease selling Product Y. It is felt that selling prices cannot be increased or lowered without adversely affecting net income. Br.5, 000 of the fixed costs of Product Y is direct fixed costs which would be saved if production ceased. All other fixed costs will remain the same.

Instructions:

a. Advise Brass Ltd. whether or not to cease production of Product Y. Assume that the total assets would be unaffected by the

decision and the resources made available by dropping Product Y would remain idle.

b. Suppose, however, it were possible to use the resources realized by stopping production of Product Y, and switch to produce a new item, Product W, which would sell for Br.50,000 and incur variable costs of Br.30,000 and extra fixed costs of Br.6,000. What will the new decision be?

Solutions:

a. Here, in this requirement, it appears that Brass Company will improve its overall profits if it drops Product Y. However, in order to make the **correct decision** regarding dropping a product line, we need to compare lost contribution margin with avoidable fixed costs. If the avoidable fixed costs are greater than lost contribution margin then Brass Company is better off dropping Product Y.

	A **Total before change**	**B** **Effect of dropping Product Y**	**A– B** **Total after change**
Sales	Br.150,000	Br.40,000	Br.110,000
Variable Costs	90,000	25,000	65,000
Contribution margin	60,000	15,000	45,000
Fixed expenses	55,00	5,000	50,000

	0		
Profit (loss)	**Br.5,000**	**Br(10,000)**	**Br. (5,000)**

Dropping Product Y reduces total sales by Br.40, 000. Similarly, total variable expenses are reduced by Br.25, 000. Thus, the total contribution margin is reduced by Br.15, 000. Moreover, in analyzing the fixed costs of Product Y, we find that Br.13, 000 of the total fixed costs of Br.18, 000 are not avoidable, that is, they will continue even if Product Y is dropped. Only Br.5, 000 of the fixed costs are avoidable. When we compare the avoidable fixed costs of Br.5, 000 with the loss contribution margin of Br.15, 000, we see that total net profits will decrease by Br.10, 000 if Product Y is dropped.

Income with Product Y	=	Br. 5,000
Net loss assuming Product Y is dropped	=	(5,000)
Disadvantage of Dropping Product Y	=	**Br. (10,000)**

To sum up, assuming only the two alternatives, keep Product Y or drop it, keeping it will be the best choice because dropping it would reduce income by Br.10, 000.

b. The conclusion in requirement (a) above will be correct if and only if the resources made available by dropping Product Y would be idle. Nevertheless, dropping Product Y and using the resources realized by stopping production of Product Y to produce a new item, Product W is recommendable. The Br. 14,000 addition to profits from Product W more than offset the Br. 10,000 decline from eliminating Product Y, providing an overall increase in profit of Br. 4,000.

	A Total before change	**B** Effect of dropping Product Y	**C** Effect of adding Product W	**(A– B) +C** Total after change
Sales	Br.150,000	Br.40,000	Br.50,000	Br.160,000
Variable Costs	90,000	25,000	30,000	95,000
Contribution margin	60,000	15,000	20,000	65,000
Fixed expenses	55,000	5,000	6,000	56,000
Profit (loss)	**Br.5,000**	**Br(10,000)**	**Br.14,000**	**Br.9,000**

Income assuming Product Y is dropped and W is added	=	Br.9,000
Income before change	=	5,000
Advantage of Dropping Product Y & Adding Product W	=	**Br. 4,000**

Example 2. Addis Supermarket has two departments; namely, D 01 and D 02. Management is concerned about the continued losses shown by D 01 and wants a recommendation as to whether or not this department should be discontinued. The predicted income statement for Addis Supermarket is given below:

	D 01	**D 02**	**Total**
Sales	Br.100,	Br.60,	Br.160, 000

	000	000	
Variable	80,	24,	104, 000
expenses	000	000	
Contribution	20,	36,	56, 000
Margin	000	000	
Fixed Expenses	32,	12,	44, 000
	000	000	
Income (Loss)	**Br. (12, 000)**	**Br. 24, 000**	**Br. 12, 000**

A study indicates that Br.15, 000 of the fixed expenses for D 01 will be avoided if the department is dropped. Furthermore, the manger will use the vacated space for expansion of D 02 if the other department is discontinued. The expansion of D 02 would result in a 25% increase in the sales of the department with 60% contribution margin. In addition the expansion requires additional avoidable fixed costs of Br.3000.

Instruction: Would you recommend that D 01 be dropped? Why or why not?

Solution

Of course, a company considering dropping a segment often has other alternatives. If Addis Supermarket drops D 01, the company probably could use the freed-up space in some other way, such as to expand the other department, add another one, or even to rent the idle facility to another company.

Addis Supermarket is considering finding the best way to use existing resources. These two alternatives under consideration are to keep D 01 or discontinue D01 and expand D 02. Dropping department D 01 would reduce profits by Br.5, 000 and the

expansion of D 02 would boost income by Br.6, 000. Therefore, dropping D01 and expanding D 02 increases the overall profit of the company by Br.1, 000.

	A Total before Change	**B Effect of dropping D 01**	**C Effect of expanding D 02**	**(A-B) +C Total after Change**
Sales	Br.160, 000	Br.100, 000	Br.15, 000	Br.75, 000
Variable expenses	104, 000	80, 000	6, 000	30, 000
Contribution Margin	56, 000	20, 000	9, 000	45, 000
Fixed Expenses	44, 000	15, 000	3, 000	32, 000
Income (Loss)	**Br. 12, 000**	**Br.5,0 00**	**Br.6 ,000**	**Br.13, 000**

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): Temaru Company has two products: a plain cellular phone and a fancier cellular phone with many special features. Unit data follow:

	Plain Phone	Fancy Phone
Selling price	Br.80	Br.120
Variable costs	64	84
Contribution margin	Br.16	Br.36
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.

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.

b. Here, 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 limiting factor (a÷b)	Br.16per MHR*	Br. 12 per MHR

MHR* =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.

5.3.3. Production Decisions

Make-or-Buy Decisions

Most manufactured products consist of several components that are assembled into finished unit. Many of these components can be bought from an outside supplier or made by the assembling firm. For each of these components, the firm's managers must decide: make or buy. The make-or-buy decision is the act of making a choice between producing an item internally (in-house) or buying it externally (from an outside supplier). The buy side of the decision also is referred to as outsourcing. Make-or-buy decisions usually arise when a firm that has developed a product or part-or significantly modified a product or part-is having trouble with current suppliers, or has diminishing capacity or changing demand.

In make or buy decisions, the appropriate means of analysis is to compare the relevant cost of buying the part with the relevant cots of making the part. Here relevant cost of buying the component is typically the amount paid to supplier. It may also include transportation costs incurred to get the component to the company's plant and costs incurred to process the part upon receipt.

The relevant cost of making the component is often the variable costs incurred to produce the component. In some cases, however, the company will need to acquire special equipment to produce the product or will hire additional supervisory personnel to assist with making the product. These incremental fixed costs will be part of the relevant cost of making the part. The alternative chosen make or buy, is typically the one with the lowest cost.

Factors that may influence firms to make a part in-house include:

- Cost considerations (less expensive to make the part)
- Desire to integrate plant operations
- Productive use of excess plant capacity to help absorb fixed overhead (using existing idle capacity)
- Need to exert direct control over production and/or quality
- Better quality control

- Design secrecy is required to protect proprietary technology
- Unreliable suppliers
- No competent suppliers
- Desire to maintain a stable workforce (in periods of declining sales)
- Quantity too small to interest a supplier
- Control of lead time, transportation, and warehousing costs
- Greater assurance of continual supply
- Provision of a second source
- Political, social or environmental reasons (union pressure)
- Emotion (e.g., pride)

Factors that may influence firms to buy a part externally include:

- Lack of expertise
- Suppliers' research and specialized know-how exceeds that of the buyer
- cost considerations (less expensive to buy the item)
- Small-volume requirements
- Limited production facilities or insufficient capacity
- Desire to maintain a multiple-source policy
- Indirect managerial control considerations
- Procurement and inventory considerations
- Brand preference
- Item not essential to the firm's strategy

The two most important factors to consider in a make-or-buy decision are cost and the availability of production capacity. Cost considerations should include all relevant costs. Obviously, the buying firm will compare production and purchase costs. Elements of the "make" analysis include:

- Incremental inventory-carrying costs
- Direct labor costs
- Incremental factory overhead costs
- Delivered purchased material costs

- Incremental managerial costs
- Any follow-on costs stemming from quality and related problems
- Incremental purchasing costs
- Incremental capital costs

Cost considerations for the "buy" analysis include:

- Purchase price of the part
- Transportation costs
- Receiving and inspection costs
- Incremental purchasing costs
- Any follow-on costs related to quality or service

Example 1. Assume that a division of Dream Company makes an electric component for its speakers. The management is trying to decide whether the division of the company should manufacture this component part or purchase it from another manufacturer.

The following are production costs for 100,000 units of the component for the forth-coming year.

Direct material		Br.500, 000
Direct labor		200,000
Factory overhead		
Indirect labor	Br. 32,000	
Supplies	90,000	
Allocated occupancy costs	50,000	172,000
Total cost		**Br.872, 000**

A small local company has offered to supply the components at a price of Br.8.20 each. If the division discontinued the production of its components it would save two thirds of the supplies cost and Br.22, 000 of indirect labor cost. All other overhead costs would continue regardless of the decision made.

Instruction:

a. Should the parts be made or bought? Assume that the capacity now used to make the parts will become idle if they are purchased from outside.

b. Suppose Ethio may decide to rent the facility it devotes to making the part to a nearby manufacturer for Br. 45, 000 annually, could this change your answer to part (a)? Why?

Solution:

a. In this case Br.10, 000 of indirect labor cost and the Br.50, 000 allocated occupancy costs are unavoidable costs. That is, a total of Br. 60,000 fixed overhead costs cannot be eliminated irrespective of the decision made. Therefore, these costs are irrelevant for the decision making at hand. The relevant costs can be computed as follows.

	Cost to Make		**Cost to Buy**	
	Unit	**Total**	**Unit**	**Total**
Direct material	Br. 5.00	Br. 500,000		
Direct labor	2.00	200,000		
Factory overhead				
Indirect labor	0.22	22,000		
Supplies	0.60	60,000		
Occupancy costs	-	-		
Total cost	**Br. 7.82**	**Br.782, 000**	**Br. 8.20**	**Br.820, 000**

Dream Company should make the component internally because the firm saves Br. 38,000 by purchasing the component.

b. If the space now being used to

Net relevant cost to buy	Br. 820,000
Net relevant cost to make	782,000
Advantage in favor of make	**Br. 38,000**

produce the part would otherwise be idle, then Dream Company should continue to produce its own component part and the supplier's offer should be rejected, as stated above. Idle space that has no alternative use has an opportunity cost of zero.

But what if the space now being used to produce the part would **not sit idle** rather could be used for some other purpose? In that case, the space would have an opportunity cost that would have to be considered in assessing the desirability of the supplier's offer. What would this opportunity cost be? It would be the segment margin that could be derived from the best alternative use of the space. Therefore, the use of the idle facilities may change our previous decision.

Assuming the space now being used to produce part would be rented to a nearby manufacture for Br. 45, 000 per annum. The analysis will take the following form.

	Make	**Buy and Leave Facility Idle**	**Buy and Rent out**
Cost to obtain parts	Br. 782,000	Br. 820, 000	Br.820, 000
Contribution from other products	-	-	
Rent revenue	-	-	(45, 000)
Net relevant costs	**Br. 782, 000**	**Br. 820, 000**	**Br.775, 000**

Dream Company would be better off through accepting the supplier's offer and to using the rent the available facility to a near by manufacturer. This move has the least net relevant cost of Br.775, 000.

Example 2. Ethio Company currently produces the 12, 500 units of part TM # 02 that is used each year to make its product. Management is considering the possibility of purchasing this component part from another manufacturer. Ethio's accountants have provided the following estimate of per unit cost based on 12, 500 units to manufacture TM # 02.

Direct Material	Br.7
Direct labor	2
Variable manufacturing overhead	6
Fixed manufacturing overhead	5
Total manufacturing cost	Br. 20

Lucy Company has offered to supply the part for Br. 18. If Ethio Company accepts the offer, it will be able to use the facilities it devotes to making the part to manufacture another product that would be sold for Br. 80,000 per annum with contribution margin of 25% of sales. And it will also be able to reduce its fixed overhead costs to Br. 37,500.

Instructions:

a. Based on relevant data, should Ethio management make or buy the 12, 500 units of TM # 02?
b. Assuming the Br. 18 price form Lucy Company, at what annual unit volumes will Ethio is economically indifferent between making and buying the part?
c. Instead of producing other product, Ethio may decide to rent the facility it devotes to making the part to a nearby manufacturer for Br. 40, 000 annually, could this change your answer to part (a)? Why?

Solution

a. To approach the decision from a financial point of view, the manager must focus on the relevant or differential costs. The differential cost can be obtained by eliminating from the cost data those costs that are not avoidable –that is, by eliminating the sunk costs and the future costs that will continue regardless of whether the parts TM # 02 are produced internally or purchased from outside.

Thus, the relevant cost computation follows:

	Cost to Make	
	Unit	**Total**
Direct material	Br.7	Br.87, 500
Direct labor	2	25, 000
Variable factory overhead	6	75, 000
Fixed factory overhead (OH)	2	25, 000*
	Br.17	**Br.212, 500**

*Avoidable fixed OH= (12, 500 X Br.5)-Br.37, 500=Br25, 000

Here above, the analysis shows that the variable costs of producing the part TM # 02 (materials, labor, and variable overhead) are differential

costs. All these variable costs, therefore, can be avoided or eliminated by buying the part from the outside supplier.

Again, are only the variable costs relevant? No. Perhaps Br. 25, 000 of the total fixed factory overhead cost is avoidable, and then it too will be a differential cost and relevant to the decision. Therefore, the decision should be made by comparing the total of all variable costs and the avoidable fixed factory overhead against the net relevant cost to buy.

Computation of net relevant costs to buy

Purchase price=12, 500 x Br.18	=	Br.225, 000
Less: Contribution from other products=Br.80, 000 x 0.25	=	20, 000
Net relevant costs		Br.**205, 000**

Cost to make	Br.212, 500
Cost to buy	205, 000
Advantage in favor of buy	**Br.7, 500**

b. Cost functions

Cost to make = (7+2+6) Q + 25, 000
=15Q + 25, 000
Cost to buy =18Q-20, 000

Let "Q units" be annual production with in the relevant range that Ethio is economically indifferent between making and buying the part assuming the Br.18 offer from Lucy Company. Thus, 15Q + 25, 000 =18Q-20, 000

3Q=45, 000
Q=**15, 000 units**

c. Our decision in part (a) above will not change unless the alternative use of the idle facility falls below Br.12, 500, i.e., Br.225, 000 less Br.212, 500.

Computation of net relevant costs to buy

Purchase price=12, 500 x Br.18	=	Br.225, 000
Less: Rental income	=	40, 000
Net relevant costs		Br.**185, 000**

Cost to make	Br.212, 500

Cost to buy	185, 000
Advantage in favor of buy	**Br.27, 500**

Sell or Process Further Decisions

In some manufacturing processes, several intermediate products are produced from a single input. Such products are known as joint products if they have relatively significant sales values and are not separately identifiable as individual products until their split off. The process that makes the joint products is called a **joint process**. The costs associated with making these products up to the point where they can be recognized as separate products (the split-off point) are called joint product costs.

Manufacturers of joint products must decide to sell them at the split-off point or process them further into another saleable product. It is profitable to continue processing a joint product after the split-off point so long as the incremental revenue from such processing exceeds the incremental processing costs (separable costs). In such decisions, the joint product costs incurred before the split-off point are irrelevant and should be ignored. The joint product costs have already been incurred and therefore are sunk costs. However, allocation of joint product costs is need for some purposes, such as balance sheet inventory valuation. In case joint products are on hand at the end of an accounting period, some value must be assigned to them. To do so, joint product costs must be allocated to specific units of inventory. In addition, joint costs are also important for income determination.

Learning Activity II

1. What information is needed for the sell or process further decision? Explain
2. Should joint costs be considered in a sell-or-process further decision? Explain
3. Suppose that a product can be sold at split-off for Br.5, 000 or processed further at a cost Br.1, 000 and then sold for Br.6, 400. Should the product be processed further?

Example 1. Hibret Company uses a common direct material, RM-01, to produce three joint products. The cost of processing the single material up to the split off point amounts to Br.8, 000. The following cost and revenue data pertain to the joint products at the split off point

Joint Product	Sales price per unit	Output produced
X	Br.1.20	2, 500 units
Y	2.00	2, 000
Z	1.50	3, 000

The joint products can be sold at the split off point or after further processing. Assume no loss of input in further processing. The following information provides the incremental revenue per unit and the separable cost (on a total basis) for each product if they were processed further.

Product	Sales price per unit	Separable cost
X	Br.2.00	Br.1, 800
Y	3.25	2, 000
Z	2.00	1, 750

Instructions:

a. Currently, Hibret Company processes all the joint products further. How much would be the profit with this processing decision?
b. Which product should be sold at the split off and which should be processed further? How much would be the profit with this processing decision?

Solution:

a. Total Profit=Total Revenue-Total Cost

Because all joint products are sold at the split-off point, the profit from these products will be the difference between the sell at the split-off point and the joint cost.

Sales revenue at split- off

Product X = (2, 500 x Br. 1.20) = Br.3, 000

Product Y = (2, 000 x Br. 2.00) = 4, 000

Product Z = (3, 000 x Br. 1.50) = Br.11, 500

4, 500

Less:	Joint costs	8,000
	Profits	**Br. 3, 500**

b. As a general rule, it will always be profitable to continue processing a joint product after the split –off point so long as the incremental revenue from such processing exceeds the incremental costs. Therefore, it may not be profitable to Hibret Company to sell all the joint products at the split-off. Consider the analytical approaches below for each product.

Product X

Sales revenue after Further Process (2,500 x Br 2.00)	Br. 5, 000

Less: Sales value at split- off (2,500 x Br. 1.20)	3, 000
Incremental revenue	Br. 2, 000
Less: Separable (incremental) costs	1,800
Advantage of processing further	**Br. 200**

A differential analysis for Product X would show the Br.2, 000 additional revenue from selling after further processing and the additional costs of further processing Br.1, 800, giving Br.200 difference in favor of a decision to process the product beyond the split-off point. Another way to look at the decision is to say that the opportunity cost of processing further is the Br.3, 000 given up by not selling at split-off. Incorporating the opportunity cost into the analysis of the decision to process further gives total costs of Br.4, 800(Br.3, 000+Br.1, 800). Subtracting Br.4, 800 from Br.5, 000 revenue also gives the Br.200 advantage.

Product Y

Sales revenue after Further Process (2,000 x Br 3.25)	Br. 6, 500
Less: Sales value at split- off (2,000 x Br. 2.00)	4, 000
Incremental revenue	Br. 2, 500
Less: Separable (incremental) costs	2, 000
Advantage of processing further	**Br. 500**

Product Z

Sales revenue after Further Process (3,000 x Br 2.00)	Br. 6, 000
Less: Sales value at split- off (3,000 x Br. 1.50)	4, 500
Incremental revenue	Br. 1, 500
Less: Separable (incremental) costs	1,750

Disadvantage of processing further **(Br. 250)**

To summarize, Hibret Company's manager would correctly conclude that product X and Y should be processed into another saleable product. And Product Z, on the other hand, should be sold at the split-off because the firm would be Br.250 worse off if it processes further. The joint product cost of Br. 8,000 should not be used to reach this decision. Rather, the analysis should be limited to the difference between the incremental revenue and the incremental (separable) cost.

Profit of this better decision, i.e. to sell Product Z at split-off and further process the other two products will be

Profit = Total Revenue- Total Cost

=5, 000 + 6, 500 + 4, 500-(8, 000 + 1, 800 + 2, 000)

= Br.4, 200

Alternatively computed,

Profit = Profit in (a) above + Advantage in further processing Product X & Y

= Br.3, 500 + Br.700

= Br.4, 200

Keep or Replace Equipment Decisions

Care must be taken to select only the data that are relevant for a decision whether to replace or keep the old equipment. In such kind of decision, the book value of the old equipment is not a relevant consideration, for instance.

In deciding whether to replace or keep existing equipment, four commonly encountered items differ in relevance:

i. **Book value of old equipment:** Irrelevant, because it is a past (historical) Cost. Therefore, depreciation on old equipments irrelevant.
ii. **Disposal value of old equipment:** Relevant, because it is an expected future inflow that usually differs among alternatives.
iii. **Gain or loss on disposal:** This is the algebraic difference between book value and disposal value. It is therefore, a meaningless combination of irrelevant and relevant items. Consequently, it is best to think of each separately.
iv. **Cost of new equipment:** Relevant, because it is an expected future outflow that will differ among alternatives. Therefore depreciation on new equipment is relevant.

Example 1. Consider these data regarding Success Company photocopying requirements:

	Old Equipment	**Proposed Replacement Equipment**
Useful life, in years	5	3
Current age, in years	2	0
Useful life remaining, in years	3	3
Original cost	Br. 25,000	Br. 15,000
Accumulated depreciation	10,000	0
Book value	15,000	Not acquired yet
Disposal value (in cash) now	3,000	Not acquired yet
Disposal value in 2 years	0	0
Annual cash operating costs for power, maintenance, toner and supplies	Br. 14,000	

The administrator is trying to decide whether to replace the old equipment. Because of rapid changes in technology, he expects the replacement equipment to have only a three-year useful life. Ignore the effects of taxes.

Instruction: Should Success keep or replace the old equipment? Compute the difference in total cost over the next 3-years under both alternatives that is, keeping the original or replacing it with the new machine.

Solution:

	THREE YEARS TAKEN TOGETHER	
	Old Equipment	**New Equipment**
Cost of new equipment	-	Br. 15,000
Disposal Value	-	(3,000)
Cash operating costs	Br. 42,000	22,500
Net relevant costs	**Br. 42,000**	**Br. 34,500**

Recommendation: Replacing the old equipment has a net Br. 7,500 advantage (Br.42, 000 less Br. 34,500)

Example (2) Awash Company has just today paid for and installed a special machine for polishing cars at one of its several outlets. It is the first day of the company's fiscal year.

The machine cost, Br. 20,000. Its annual cash operating costs total Br. 15,000, exclusive of depreciation. The machine will have a 4-year useful life and a zero terminal disposal price.

After the machine has been used for a day, a machine salesperson offers a different machine that promises to do the same job at a yearly cash operating cost of Br. 9,000, exclusive of depreciation. The new machine will cost Br. 24,000 cash, installed. The "old" machine is unique and can be sold outright for only Br. 10,000 minus Br. 2000 removal cost. The new machine, like the old one, will have a 4-year useful life and zero terminal disposal prices.

Sales, all in cash, will be Br. 150,000 annually, and other cash costs will be Br. 110,000 annually, regardless of this decision.

Instructions:

a. Prepare a summary income statement covering the next four years under both alternatives (when the new machine is not purchased and when the new machine is purchased). What is the cumulative difference in operating income for the 4 years taken together?
b. Determine the desirability of purchasing the new machine using only relevant costs in your analysis?

Solutions:

Two different approaches may be used to solve such kinds of problems for decision-making purposes.

i. **Comparative income approach.** This approach includes both relevant and irrelevant costs. When the comparative income approach is used, the net operating income for each alternative is computed and compared. All revenues and costs are considered-even those that are the same for each alternative.
ii. **Differential analysis.** In this approach, only revenues and costs that differ among the alternatives are considered.

N.B. The end-result- a correct decision - will be the same regardless of which method is used.

Method I. Comparative income approach.

Awash Company Comparative Income Statement For the Next 4 years together		
	Old Machine	**New Machine**
Sales	Br. 600,000	Br. 600,000
Cash operating costs	(60,000)	(36,000)
Other cash costs	(440,000)	(440,000)
Depreciation	(20,000)	(24,000)
Loss on disposal		(12,000)
Income	**Br. 80,000**	**Br. 88,000**

Comment: The above analysis (which includes both relevant and irrelevant items) shows Br. 8000 cumulative difference in operating income for the 4 years taken together. Ignoring income taxes and the time value of money, the purchase of the new machine appears to be a favorable.

Method II. Differential analysis

	FOUR YEARS TAKEN TOGETHER	
	Old machine	**New machine**
Cost of new equipment	-	Br. 24,000
Disposal value	-	(8,000)
Cash operating costs	Br. 60,000	36,000
Net relevant costs	**Br. 60,000**	**Br. 52,000**

When differential analysis is used, the focus is on cash flows. The investment decision is based on the difference between the net cash inflows and the net cash outflows. Regardless of which method is used; the **net cash advantage** will always be the same. Net cash advantage in favor of replacing old machine is Br. 8,000 as shown above using differential analysis.

Check Your Progress

1. ZiZu Woolen Products Company makes outdoor shirts. A chain store manager has approached the sales manager of ZiZu offering to buy 40, 000 shirts at Br.16.50 per shirt. The offer is to be filled any time during the coming year. Data pertaining to the coming year's planned operations without this order is as follows:

Sales(250,000 shirts)	Br.5, 000, 000
Cost of Sales	4, 150, 000
Gross profit	850, 000
Selling & Administrative Exp.	600,000
Income	**Br.200, 000**

ZiZu Company has a capacity to make 300, 000 shirts per year. Fixed costs included in cost of sales are Br.400, 000. The only variable selling and administrative expenses are a 1% sales commission and a Br.1.25 per shirt fee paid to the designer. The sales manager believes that accepting the offer would result in a loss because the average

total cost of a shirt is Br.19.00. He feels that even though sales commission would not be paid on the order, a loss would result.

Instruction:

a. Determine whether the company should accept the offer. Assume that the special order would not affect existing sales and would not require the sales commission.

b. Suppose the special order was for 60, 000 shirts instead of 40, 000 shirts and sales at regular prices would fall to meet the special order. What would the firm's income be if it accepted the order? Would you recommend the company to accept this special order? Why or why not.

2. Great Company manufactures 60, 000 units of part XL-40 each year for use on its production line. The following are the annual costs of making part XL-40:

	Total Costs	**Unit**
Direct material	Br. 480, 000	Br.8
Direct labor	360, 000	6
Variable factory overhead (FOH)	180, 000	3
Fixed FOH	360, 000	6
Total manufacturing costs	**Br. 1, 380, 000**	**Br.23**

Another manufacturer has offered to sell the same part to Great for Br.21 each. The fixed overhead consists of depreciation, property taxes, insurance, and supervisory salaries. The entire fixed overhead would continue if the Great Company bought the component except that the cost of Br. 120, 000 pertaining to some supervisory and custodial personnel could be avoided.

Instruction:

a. Should the parts be made or bought? Assume that the capacity now used to make parts internally will become idle if the pats are purchased?
b. Assume that the capacity now used to make parts will be either (i) be rented to near by manufacturer for Br. 60, 000 for the year or (ii) be used to make another product that will yield a profit contribution of Br. 250,000 per year. Should the company purchase them from the outside supplier?

3. In a chemical process two products, X and Y, are produced as a result of a joint production process at the split off point. The joint cost of processing these products totaled Br.12, 000. The quantities produced in a period being 5, 000 liters and 4, 000 liters, respectively. The following data relates to these products:

	Product	
	X	**Y**
Sales Price per liter at split off	**Br.8.50**	**Br.6.00**

Product X is sold at the split off but before agreeing to sale Y at split off, the management wants to know whether it is advisable to process it into another product YZ that can be sold at Br.8.20 per liter. The separable cost of processing Y to YZ is estimated to be Br10, 000 per period. Assume no loss of input in further processing.

Instruction: Would you recommend the company to process Y into YZ? Why or why not?

4. Top Company expects the following results for the coming year.

	X	**Y**	**Z**	**Total**
Sales	Br.100, 000	Br.150, 000	Br.470, 000	Br.720, 000
Variable costs	Br.52, 000	Br.50, 000	Br.190, 000	Br.292, 000

Fixed costs	80, 000	50, 000	240, 000	370, 000
Total costs	132, 000	100, 000	430, 000	662, 000
Profit(Loss)	**(Br.32, 000)**	**Br.50, 000**	**Br.40, 000**	**Br.58, 000**

Instruction. Answer each of the following questions independently.

a. Suppose that all fixed costs are allocated based on the floor space each segment occupies and all are unavoidable. What will total profit be if Top drops the X segment?
b. Suppose that Top could avoid Br.55, 000 in fixed costs by dropping the X segment. However, the managers believe that if they do drop X, sales of each of the other lines will fall by 5%. What will profit be if Top drops X and losses 5% of the sales of each of the other segments?

5.4 Summary

Cost and management accountants supply information for special types of decision-making. The essential quantitative factors influencing such decisions are differential revenues and costs, including opportunity costs. Costs and revenues that will be the same whatever action is taken can be ignored. Historical costs are sunk and irrelevant for current decisions because they cannot be changed by some current action. Avoidable fixed costs are relevant. Whether a cost is relevant to a particular decision does not always depend on whether the cost is variable or fixed.

Typical examples of special types decisions are whether to drop a product or product line, whether to produce a component internally or purchase it from an outside supplier, whether to further process joint products, whether to accept a special order, keep or replace an old

equipment, and how to use limited supply of some critical input factors.

5.5 Answers to Learning Activity and Check your progress questions

Learning Activity I

1. The only costs that are relevant in making decisions are the expected future costs that will differ among the choices that are available
2. Quantitative factors are those that are measured in numerical terms. Qualitative factors are those outcomes in which measurement in birrs and cents is difficult.

Learning Activity II

1. In joint product the decision to sell at split-off or process further is based on comparing the separable costs and the incremental revenue obtainable by processing further. And the decision will be in favor of further process if the incremental revenue exceeds the separable cost.
2. Joint costs are sunk costs, costs that have been already incurred, in sell or process further decision. Therefore, they are irrelevant for decision making.
3. Incremental revenue (Br.6400-Br.5000) = Br.1, 400
   Incremental costs 1, 000
   Advantage in further processing **Br.400**

Check Your Progress

1. a. Effect of the special order

Incremental revenue		Br.660, 000
Incremental costs		
Cost of Sales (15x40, 000)	Br.600, 000	
Designers Fee (1.25x40, 000)	50, 000	650, 000

Incremental profit		**Br.10, 000**

b.

Incremental revenue(16.50 x 60, 000)		Br.990, 000
Incremental costs		
Cost of Sales (16.25 x40, 000)	Br.975, 000	
Opportunity Cost (16.45x10, 000)	164, 500	1,139,500
Disadvantage in favor of the special order		**(Br.149, 500)**

2. a. Make costs Br120, 000 less

Net relevant costs

Cost to make	Br.1, 140, 000
Cost to buy	Br.1, 260, 000

c. Buying and manufacturing other product is less costly.

Net relevant costs

Cost to make	Br.1, 140, 000
Buy & Rent out	Br.1, 200, 000
Buy & Manufacture other Product	Br.1, 010, 000

3. It will be better to sell Product Y at split-off .

Product Y

Sales revenue after Further Process (4,000 x Br 8.20)	Br. 32, 800
Less: Sales value at split- off (4,000 x Br. 6.00)	24, 000
Incremental revenue	Br. 8, 800
Less: Separable (incremental) costs	10,

	000
Disadvantage of processing further	**Br. 1,200**

4. a. Top Company's income will decrease by Br.48, 000.

	Total Before Change	**Effect of Dropping X**	**Total After Change**
Sales	Br.720, 000	Br.100, 000	Br.620, 000
Variable costs	Br.292, 000	Br.52, 000	Br.240, 000
Fixed costs	370, 000	-	370, 000
Total costs	662, 000	52, 000	610, 000
Profit(Loss)	**Br.58, 000**	**Br.48, 000**	**Br.10, 000**

b. Top Company's income will decrease by Br.12, 000.

	Total Before Change	**Effect of Dropping X**	**Effect of Dropping X on Y**	**Effect of Dropping X on Z**	**Total After Change**
Sales	Br.720, 000	Br.100, 000	Br.7, 500	Br.23, 500	Br.589, 000
Variable costs	Br.292, 000	Br.52, 000	Br.2, 500	Br.9, 500	Br.228, 000
Fixed costs	370, 000	55, 000	-	-	315, 000
Total costs	662, 000	107, 000	2, 500	9, 500	543, 000

Profit(Loss)	**Br.58, 000**	**(Br.7, 000)**	**Br.5, 000**	**Br.14, 000**	**Br.46, 000**

5.6 Glossary

Differential Cost .Any cost that differs between alternatives in a decision-making situation. In managerial accounting, this term is synonymous with avoidable cost and relevant cost.

Sunk cost. Any cost that has already been incurred and that cannot be changed by any decision made now or in the future.

Special order. A one-time order that is not considered part of the company's normal ongoing business.

Constraint. A limitation under which a company must operate, such as limited machine time available or limited raw materials available that restricts the company's ability to satisfy demand.

Make or buy decision. A decision as to whether an item should be produced internally or purchased from an outside supplier.

Joint product costs. Costs that are incurred up to the split-off point in producing joint products.

Joint products. Two or more items that are produced from a common input.

Sell or process further decision. A decision as to whether a joint product should be sold at the split-off point or processed further and sold at a later time in a different form.

Split-off point. That point in the manufacturing process where some or all of the joint products can be recognized as individual products.