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MANAGEMENT ACCOUNTING

MAIN TEXT

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UNIT 1: MANAGEMENT ACCOUNTING AND THE BUSINESS ENVIRONMENT

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1.0 INTRODUCTION

Management accounting is an essential tool that enhances a manager's ability to make effective economic decisions with the use of both financial and non-financial information. Recently, the business world has been fraught with a number of corporate failures and this has brought dramatic changes in the business environment and as a result of globalisation there is a high increase in technological innovations and the need to meet increasing market demands without increasing cost.

Management accounting is built on financial accounting and the concepts in management accounting build on one another. You are expected to begin your understanding of managerial decisions by asking, "How will my decision affect the cost and revenues of the organisation?" Then you go further to more complex questions: what is the most appropriate cost-management system for the company: "what products or services should we emphasize?" "What do our budget variances means?"

This course material will produce answers to these questions and many others. But first of all, it is important that you have a good knowledge and understanding of the role of accounting information in decision making and the various users of accounting information.

There is also the need to distinguish financial accounting from management accounting. We would also be discussing the regulations in business.

2.0 OBJECTIVES

After studying this unit on management accounting and the business environment, you should be able to:

- Explain the role of accounting in decision making
- Identify the various users of accounting information in terms of external and internal users
- Differentiate management accounting and financial accounting functions
- Describe the role of management accounting in organisations
- State the four major trends influencing management accounting today.
- Identify and give practical examples of ethical dilemma that management accountants face in today's business world.

3.0 MAIN CONTENT

3.1 Role of Accounting in Decision Making

Management accounting is concerned with providing information to managers. It provides the essential data with which organizations are actually run. Because it is manager oriented, any study of management accounting must be preceded by some understanding of what managers do and the information managers need.

Every organization-large and small has managers. Someone must be responsible for making plans, organizing resources, directing personnel and controlling operations. In carrying out these actions, decisions must be made. Decision making arises because of the need to choose between alternatives. Careful consideration must be given to all information available at the time because of the long-term consequences a decision made now will have. There are four main steps in the decision making process:

1. Identify each situation in which a decision is needed and determine the goals we wish to achieve.

2. Identify the relevant information needed to determine possible available alternatives

3. Identify and obtain information needed to assess the consequences or outcomes of the alternatives.

4. Choose a course of action which will achieve the goals established.

Usually, decision making involves the use of scarce economic resources which are traded in the market place at a price.

However, many factors apart from the monetary impact, such as personal tasks, social factors, environmental factors, religions and/or moral factors and government policy must be considered. Economic decisions usually involve an inwards or outwards flow of money or monetary equivalents. Economic decisions are made in many different markets, be they retail, wholesale, the stock market, local or international. Hence, if decision makers are to make informed decisions then some knowledge of accounting measurement systems, concept and standards is desirable.

As a profession, accounting has evolved in response to society's need for economic information to help people make economic decisions; accounting is often called the 'language of businesses. To be effective, the recipient must understand the message that the sender intends to convey. Accounting has been defined as the process of identifying, measuring, recording and communicating economic information to permit informed judgements and economic decisions. The primary purpose of accounting is to help persons make economic decisions. In our society resources must be allocated among and within all kinds of entities. Accounting information provides the basis for making decisions about most resources allocation. To be useful, data must be identified, measured, recorded, classified, summarised and communicated to potential users. These are the critical elements of accounting.

Economic decisions are made every day, business opportunities are identified which will satisfy the ambitions of the entrepreneur. Factors considered in the planning stage of a new business are investment needs, financing estimates of operating costs and how much to charge for services. In summary, there is the establishment of implicit goals, the collection of information about the proposed business and consideration of future consequences. As the business progresses, accounting information is needed to monitor how well the business actually performs in comparison with the estimates, how and when to replace assets, and how taxes will impact on the business. For the purpose of decision making, the past is used as a guide for future estimate of the consequences of different alternatives. The accountant can help significantly in the areas of budgeting, investigating, interpreting and communicating result for use by both internal and external decision makers.

Self Assessment Exercise 1.1

(a) What are the four main steps in decision making?
(b) Explain how accountants are useful in decision making.

3.2 Users Of Accounting Information

The basic purpose of accounting information is to help you make decisions, whether you are a company chief executive office, production manager, hospital or school administrator, an investor, etc. Regardless of who is making the decision, understanding accounting information allows for a more informed and better decision. The preparation of this information for users (decision makers) outside the entity is called **financial accounting**. Such **external users** might be investors or creditors of the entity, customers, suppliers and regulatory bodies. External users need to know: does a firm have the capacity to meet its

monetary obligations when they fall due? What are its earning prospects? How sound is the firm's financial structure? Is continuity of operations and supply assured? Has the firm met its statutory obligations?

The preparation of information for use by decision makers inside the entity to plan and control operations is called **management accounting**. **Internal users** who are mostly made up of management uses the same financial statements as outside decision makers, plus internal reports to meet the needs of a specific user group or general-purpose reports for the general use of external users.

Internal decision makers are managers at all levels who use financial information for planning and controlling the operations of a business entity. Managers need to know: what resources are available? How much debit exists? How profitable are operations? What business should they be in? What are the most efficient processes? What effect may changes in selling prices have? Does the firm have sufficient cash reserves to meet obligations? Should the firm buy or lease resources? They need data that will ensure that day-to-day and long-term operations continue success fully.

Self Assessment Exercise 1.2

Provide a listing of the main users of accounting information and explain how they use the information in their decision making.

3.3 Distinction between Management Accounting and Financial Accounting

Financial accounting reports are prepared for the use of external parties such as shareholders and creditors, whereas management accounting reports are prepared for managers inside the organisation. This contrast in basic orientation results in a number of major differences between financial and management accounting rely on the same underlying financial data. These differences are summarised below

Table 1: Difference between Management and Financial Accounting

	Management accounting	**Financial accounting**
Primary users	Organization managers at various levels	Outside parties such as investors and government agencies but also organization managers.
Freedom of choice of accounting measures	No constraints other than requiring the benefits of improved management decisions to exceed information costs. Relevance and flexibility of data emphasized.	Constrained by generally accepted accounting principles. Objectivity and verifiability of data are emphasized.
Behavioural implications in selecting accounting measures	Choice should consider how measurements and reports will influence managers daily behaviours	Choice based on how to measure and communicate economic phenomena. Behavioural considerations are

		secondary, although executive compensation based on reported results may have behavioural impacts.
Time focus of reports	Future orientation: formal use of budgets as well as historical records. Example: 20x2 budget versus 20x2 actual performances.	Past orientation: historical evaluation. Example: 20x1 actual performance versus 20x2 actual performance.
Time span or reports	Flexible, varying from hourly to 10 to 15 years	Less flexible: usually one year or one quarter.
Types of reports	Detailed reports: includes details about products, departments, territories, customers and employees.	Summary reports: primarily report on the entity as a whole
Influence of other functional areas	Field is less sharply defined. Heavier use of economics, decision sciences, and behavioural sciences.	Field is more sharply defined. Lighter use of related disciplines.

Source:

In summary, the type of information required by the different user groups differs. External users primarily rely on financial information about the company. They analyze this information in conjunction with general economic information, such as information about the industry in which the company operates. External users focus on broad information that reveals the overall performance of the company as a whole. In addition, financial accounting only reports information on financial transactions that have occurred in the past. Internal users need to review financial information about the company, such as financial statement information. They also use non-financial information about the company, such as customer satisfaction levels and competitor data. Internal users focus on detailed information that reveals the performance of particular sub-units of the company, such as divisions or departments. In addition, management accounting concentrates on past and present information, as well as the forecasting of future financial transactions.

Self Assessment Exercise 1.3

State five differences between management accounting and financial accounting

3.4 The Role of Management Accountants in Organizations

The role of management accountants in organisations has changed rapidly over the last decade. Consider the following four work activities of management accountants:

- Collecting and compiling information.
- Preparing standardized reports.
- Interpreting and analyzing information
- Being involved in decision making.

Recent surveys show that management accountants are spending less time on the first two activities and more time on the last two. In essence, the management accountant is becoming an internal consultant on information-related issues – that is, an advisor for managers about what information would be useful, what information is available, and how to analyze the information and use it in decision making.

Four major trends are influencing management accounting today:

1. Shift from a manufacturing-based to a service-based economy especially in the United States. Service industries are extremely competitive, and their managers increasingly rely on accounting information.

2. Increased global competition. Global competition has increased in recent years as many countries have lowered international barriers to trade such as tariffs and duties.

3. Advances in technology especially the electronic commerce or e-commerce-conducting business online.

4. Changes in business processes. Accountants must adapt to changes in management practices. Some of these practices include the just-in-time philosophy, lean manufacturing and total quality management.

Self Assessment Exercise 1.4

Briefly explain recent roles of accountants in organisation

3.5 Ethical Conduct for Professional Accountants

Business operations change from time to time. However, the need for accountants to maintain high ethical standards for professional conduct will never change. Integrity has always been important, but after the collapse of big organisations like ENRON, WORLDCOM, TYCO, etc integrity has become more important and topical. Accountants have been called upon to re-establish a high reputation for ethics and integrity so that the events that led to the collapse of these companies could be prevented.

The Institute of Management Accountants explains that **ethics** "deals with human conduct in relation to what is morally good and bad, right and wrong. It is the application of values to decision making. These values include honesty, fairness, responsibility, respect and compassion. Ethics is simply doing what is right".

What makes an action by an accountant unethical? An unethical act is one that violates the ethical standards of the profession. The standards, however, leave much room for individual interpretation and judgment. A first step is to ask two questions: is this action unethical? Would it be unethical not to take this action? If the answers to these questions are clear, then the ethical action is clear. For example, if Worldcom's Accountants had asked whether their recording of expenses as assets was unethical, they would have no choice but to have

answered “yes”. However, a manager’s ethical choice becomes more complex when there are no legal guidelines or even clear-cut ethical standards. Ethical dilemmas exist when managers must choose an alternative and there are (1) significant value conflicts among differing interests, (2) real alternatives that are both justifiable, and (3) significant consequences on stakeholders.

Suppose you are an accountant whose superior has asked you to supply the company’s banker with a profit forecast for the coming year. A badly needed bank loan rides on the prediction. Your superior is absolutely convinced that profits will be least ₦5,000,000 – anything less than that and the loan is not likely to be approved. Your analysis shows that if the planned introduction of a new product goes extraordinary well, profits will exceed ₦5,000,000. The most likely outcome, however, is for a modestly successful introduction and a ₦1,000,000 profit. If product fails, then the company stands to lose ₦6,000,000. Without the loan, the new product cannot be taken to the market, and there is no way the company can avoid a loss for the year. Bankruptcy is a real possibility.

What forecast would you make? The fundamental issue here is disagreement about the prospects for the new product. If your superior is correct, it would be unethical to make a forecast of less than ₦5,000,000, which seems to guarantee financial problems, perhaps even bankruptcy. This would hurt stockholders, management, employees, suppliers, and customers. But if you are correct, a forecast of ₦5,000,000 may not be fair and objective. It may mislead the bank. Maybe you are wrong and your superior is right. There is no easy answer to this dilemma. It is one of those gray areas where neither actions is without its risks. But remember that a series of gray areas can create a black area. That is, a series of actions that push the boundary of ethical behaviour can add up to a clearly unethical situation. Accountants must draw the line someplace, and it is usually better to be conservative than to push the boundary too far. Enron was the champion of pushing the boundaries. If its managers had done this once or twice, providing that they did not do anything clearly unethical, it might have been overlooked. But the accumulation of questionable actions created an environment where ethical considerations were secondary.

Ethical dilemmas sometimes arise when you only observe, rather than possibly commit the unethical behaviour. If you discover unethical behaviour in an organisation, you are obligated to try to halt that behaviour. However, you still have confidentiality issues to confront. Most often you can bring the issue to the attention of your supervisor or any special ethics officer in the organisation. However, if there is not an ethics officer and you suspect your supervisor is involved in unethical activity, your decision becomes more complex. You may then need to go directly to the top levels in the company. Ultimately, the board of directors may become involved. If the case involves legal issues and the board is not responsive, approaching the securities and exchange commission (the body that regulates corporate reporting) or other legal authorities may be necessary. However, rarely is it appropriate to go directly to the media.

Self Assessment Exercise 1.5

As an employee of an organisation, when an ethical dilemma arises what are you expected to do?

4.0 CONCLUSION

The role of accountants has increased beyond mechanical bookkeeping to include participating in strategic decision making. In trying to make these decisions, they must be aware of the business environment in which they operate and their own duties must be well spelt out. This will in the long run assist accountants in settling ethical dilemmas when they arise.

5.0 SUMMARY

In this unit, we have considered the role of accounting in decision making. We have also identified the various users of accounting information. This unit has distinguished between financial accounting and management accounting and the role of management accounting in organisations have been identified. We have also treated ethical conducts for professional accountants and some issues relating to ethical dilemma were identified.

6.0 TUTOR-MARKED ASSIGNMENT

(A) _____ decisions usually involve an inwards or outwards flow of money or monetary equivalents. (economic)

(B) _____ information is needed to monitor how well the business actually performs in comparison with the estimates, how and when to replace assets, and how taxes will impact on the business. (accounting)

(C) The preparation of information for users (decision makers) outside the entity is called _____. (financial accounting)

(D) The _____ explain that **ethics** "deals with human conduct in relation to what is morally good and bad, right and wrong. (institute of management accountants)

(E) Explain the four major trends influencing management accounting today

7.0 REFERENCES/FURTHER READINGS

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UNIT 2: COST TERMS, CONCEPTS AND CLASSIFICATION

CONTENTS

1.0 INTRODUCTION

In Management Accounting, the term 'cost' is used in many different ways. This is because there are many types of costs and these cost are classified differently according to the immediate needs of management. For example, managers may want cost data to prepare external financial reports, to prepare planning budgets, or to make decisions. Each different type of cost data demand a different classification and definition of costs. For example, the preparation of external financial reports requires the use of historical cost data, whereas decision making may require current cost data.

In this unit, we will discuss many of the possible uses of cost data and how costs are defined and classified for each use.

2.0 OBJECTIVES

After studying this unit on cost terms, concepts and classification, you should be able to:

(i) Mention the three broad categories of manufacturing cost;
(ii) Define a Prime cost;
(iii) Explain the concept of cost behaviour;
(iv) Explain cost as it relates to decision making;
(v) Identify cost objects.

3.0 MAIN CONTENT

Our focus in this unit is on manufacturing companies, since their basic activities include most of the activities found in other types of business organisations. Manufacturing companies such as Unilever, Dangote Flour and Coca-Cola are involved in acquiring raw material,

producing finished goods, marketing, distributing, billing and almost every other business activity. Therefore, an understanding of costs in a manufacturing company can be very helpful in understanding cost in other types of organisations.

In this unit, we develop cost concepts that apply to different organisations. For example, these cost concepts apply to fast-food outlets such as Mr. Biggs, Sweet Sensation and Mama Cass; Television companies such as Channels TV; consulting firms such as PriceWaterhouseCoopers and KPMG; and your local hospital. The exact terms used in these industries may not be the same as those used in manufacturing, but the same basic concepts apply. With some slight modifications, these basic concepts also apply to merchandising companies such as Shoprite, Cash 'n' Carry and Park 'n' Shop, which resell finished goods acquired from manufacturers and other sources. With this in mind, let us begin our discussion on manufacturing costs.

3.1 Manufacturing Cost

Most manufacturing companies divide manufacturing costs into three broad categories: direct materials, direct labour and manufacturing overhead. A discussion of each of these categories follows.

3.1.1 Direct Materials

The material that is transformed into the final product are called **raw materials**. This term is somewhat misleading, since it seems to imply unprocessed natural resources like wood, pulp or iron ore. Actually, raw materials that are used in the final product; and the finished product of one company can become the raw material of another company. For example, flour produced by Dangote Flour are a raw material used by bakeries. Direct materials are those materials that become an integral part of the finished product and can be physically and conveniently traced to it. Sometimes it is not worth the effort to trace the costs of relatively insignificant materials to the end products. Such minor items would include the solder used to make electrical connections in a Sony TV. Materials such as solder and glue are called **indirect materials** and included as part of manufacturing overhead, which is discussed later in this section.

3.1.2 Direct Labour

The term direct labour is reserved for those labour costs that can easily (i.e., physically and conveniently) be traced to individual units of product. The labour costs of assembly-line workers, for example, would be direct labour costs, as would the labour costs of carpenters, bricklayers and machine operators.

Labour costs that cannot be physically traced to the creation of products, or that can be traced only at great cost and inconvenience, are termed **indirect labour** and treated as part of manufacturing overhead, along with indirect materials. Indirect labour includes the labour costs of caretakers, supervisors, materials handlers and night security guards. Although the efforts of these workers are essential to production, it would either be impractical or

impossible to accurately trace their costs to specific units of product. Hence, such labour costs are treated as indirect labour.

In some industries, major shifts are taking place in the structure costs. Sophisticated automated equipment, run and maintained by skilled indirect workers, is increasingly replacing direct labour. In a few companies, direct labour has become such a minor element of cost that it has disappeared altogether as a separate cost category. However, the vast majority of manufacturing and service companies still continue to recognize direct labour as a separate cost category.

3.1.3 Manufacturing Overhead

Manufacturing overhead, the third element of manufacturing cost, includes all costs of manufacturing except direct materials and direct labour. Manufacturing overhead includes items such as indirect materials; indirect labour; maintenance and repairs on production equipment; and heat and light, property taxes, depreciation and insurance on manufacturing facilities. A company also incurs costs for heat and light, property taxes, insurance, depreciation and so forth, associated with its selling and administrative functions, but these are not included as part of manufacturing overhead category.

Various names are used for manufacturing overhead, such as indirect manufacturing cost, factory overhead and factory burden. All of these terms are synonymous with manufacturing overhead. Manufacturing overhead combined with direct labour is called **conversion cost**. This term stems for the fact that direct labour cost and overhead cost are incurred in the conversion of materials into finished products. Direct labour combined with direct materials is called **prime cost**.

Self Assessment Exercise 2.1

Briefly explain the three categories of Manufacturing Costs

3.2 Non-Manufacturing Cost

Generally, non-manufacturing cost are sub classified into two categories:

- Marketing or selling cost
- Administrative cost

3.2.1 Marketing or Selling Costs:

This includes all cost necessary to secure customer orders and get the finished product or service into the hands of these customers. These costs are often called order-getting and order-filling costs.

Examples of marketing costs include advertising, shipping, sales travel, sales commissions, sales salaries and costs of finished goods warehouses.

3.2.2 Administrative Cost:

This includes all executive, organisational and clerical costs associated with the general management of an organisation rather than with manufacturing, marketing or selling. Examples of administrative costs include executive compensation, general accounting, secretarial, public relations and similar costs involved in the overall, general administration of the organisation as a whole.

Self Assessment Exercise 2.2

Explain the non-manufacturing costs with reference to Marketing and Administrative costs.

3.3 Product costs versus Period costs

In additions to the distinction between manufacturing and non- manufacturing costs, there are other ways to look at cost. For instance, cost can also be classified as either **product cost** or **period costs**.

Generally, costs are recognised as expenses on the Profit and Loss account (sometimes alternatively known as the income statement) in the period that benefits from the cost. For example, if a company pays for liability insurance in advance for two years, the entire amount is not considered an expense of the year in which the payment is made. Instead, half of the cost would be recognised as an expense each year. This is because both years not just the first – benefit from the insurance payment. The unexpensed portion of the insurance payment is carried on the balance sheet as an asset called prepaid insurance. You should be familiar with this type of accrual from your financial accounting coursework.

The matching principle is based on the accrual concept and states that costs incurred to generate a particular revenue should be recognised as expenses in the same period that the revenue is recognised. This means that if a cost is incurred to acquire or make something that will eventually be sold, then cost should be recognised as an expense only when the sale takes place – that is, when the benefit occurs. Such costs are called product costs.

3.3.1 Product cost

For financial accounting purposes, product costs include all the costs that are involved in acquiring or making a product. In the case of manufactured goods, these costs consist of direct materials, direct labour and manufacturing overhead. Product costs are viewed as attaching to units of product as the goods are purchased or manufactured, and they remain attached as the goods go into stock awaiting sale. So, initially, product costs are assigned to a stock account of the balance sheet. When the goods are sold, the costs are released from stock as expenses (typically called cost of goods sold) and matched against sales revenue. Since product costs are initially assigned to stocks, they are also known as stock-related costs.

We want to emphasize that production cost are not necessarily treated as expenses in the period in which they are incurred. Rather, as explained above, they are treated as expenses in the period which the related products are sold. This means that a product cost such as direct materials or direct labour might be incurred during one period but not treated as an expense until a following period when the completed product is used.

3.3.2 Period cost

Period costs are all the costs that are not included in product costs. These costs are expensed on the profit and loss account in the period in which they are incurred, using the usual rules of accrual accounting you have already learned in financial accounting. Period costs are not included as part of the cost of either purchased or manufactured goods. Sales commissions and office rent are good examples of the kind of costs we are talking about. Neither commissions nor office rent are included as part of the cost of purchases or manufactured goods. Rather, both items are treated as expenses on the profit and loss account in the period in which they are incurred. Thus, they are said to be period cost.

Self-Assessment Exercise 2.3

Differentiate between Product cost and Period cost.

3.4 Cost Classifications for Predicting Cost Behaviour

Quite frequently, it is necessary to predict how a certain cost will behave in response to a change in activity. For example, a manager may want to estimate the impact that a 5 per cent increase in long-distance calls would have on the company's total electricity bill or on the total wages the company pays its long-distance operators. **Cost behaviour** means how a cost will react or respond to changes in the level of business activity. As the activity level rises and falls, a particular cost may rise and fall as well or it may remain constant. For planning purposes, a manager must be able to anticipate which of these will happen; and if a cost can be expected to change, the manager must know by how much it will change. To help make such distinctions, costs are often categorized as variable or fixed.

3.4.1 Variable cost

A **variable cost** is a cost that varies, in total, in direct proportion to changes in the level of activity. The activity can be expressed in many ways, such as units produced, units sold, miles driven and occupied, lines of print, hours worked and so forth. A good example of a variable cost is direct materials. The cost of direct materials used during a period will vary, in total, in direct, proportion to the number of units that are produced. To illustrate this idea, consider the example of a car factory. Each car requires one battery. As the output of cars increases and decreases, the number of batteries used will increase and decrease proportionately. If car production goes up 10 percent, then the number of batteries used will also go up 10 percent.

One interesting aspect of variable cost behaviour is that a variable cost is constant if expressed on a per unit basis. There are many examples of costs that are variable with respect to the products and services provided by a company. In a manufacturing company, variable costs include items such as direct materials and some elements of manufacturing overheads such as lubricants, shipping costs and sales commission. For the present we will also assume that direct labour is a variable cost. Although as we shall see later, direct labour may act more like a fixed cost in many situations. In a merchandising company, variable costs include items such as cost of goods sold, commissions to salespersons and billing costs. In a hospital, the variable cost of providing health care services to patients would include the costs of the supplies, drugs, meals, and perhaps, nursing services.

The activity causing changes in a variable cost need not be how much output is produced or sold. For example, the wages paid to employees at an outlet will depend on the number of hours the shop is open and not strictly on the number of videos rented. In this case, we would say that wages costs are variable with respect to the hours of operation. Nevertheless, when we say that a cost is variable, we ordinarily mean it is variable with respect to the volume of revenue-generating output – in other words, how many units are produced and sold, how many videos are rented, how many patients are treated and so on.

3.4.2 Fixed cost

A **fixed cost** is a cost that remains constant, in total, regardless of changes in the level of activity. Unlike variable costs, fixed costs are not affected by changes in activity. Consequently, as the activity level rises and falls, the fixed costs remain constant in total amount unless influenced by some outside force, such as price changes. Rent is a good example of a fixed cost. Suppose a hotel rents a machine for ₦8,000 per month that washes rugs and sheets. The ₦8,000 monthly rental cost will be sustained regardless of the number of washes that may be performed during the month.

Very few costs are completely fixed; most will change if there is a large enough change in activity. For example, suppose that the capacity of the rug and sheet washing machine at the hospital is 200 times per month. If the clinic wishes to wash more than 200 times in a month, it would be necessary to rent an additional machine, which would cause an increase in the fixed costs.

When we say cost is fixed, we mean it is fixed within some relevant range. The **relevant range** is the range of activity within which the assumptions about variable and fixed costs are valid. For example, the assumption that the rent for a rug and sheet washing machine is ₦8,000 per month is valid within the relevant range of 0 to 200 washes per month. Examples of fixed costs include straight-line depreciation, insurance, property taxes, rent, supervisory salaries, administrative salaries and advertising.

Self-Assessment Exercise 2.4

Give examples of Fixed and Variable cost of a beverage company.

3.5 Cost Classifications for Assigning Costs to Cost Objects

Costs are assigned to objects for a variety of purposes including pricing, profitability studies and control of spending. A **cost object** is anything for which cost data are desired – including products, product lines, customer, jobs and organizational sub-units.

For purposes of assigning costs objects, costs are classified as either direct or indirect.

3.5.1 Direct Cost

A **direct cost** is a cost that can easily and conveniently be traced to the particular cost object under consideration. The concept of direct cost extends beyond just direct materials and direct labour.

For example, if Samsung is assigning costs to its various regional and national sales offices, then the salary of the sales manager in its Tokyo office would be a direct cost of that office.

3.5.2 Indirect Cost

An **indirect cost** is a cost that cannot easily and conveniently be traced to the particular costs object under consideration. For example, a soap factory may produce dozens of varieties of packet soaps. The factory manager's salary would be an indirect cost of a particular variety such as bathing soap.

The reason is that the factory manager's salary is not caused by any one variety of soap but rather is incurred as a consequence of running the entire factory. To be traced to a cost object such as a particular product, the cost must be caused by the cost object. The factory manager's salary is called a common cost of producing the various products of the factory. A **common cost** is a cost that is common to a number of costing objects but cannot be traced to them individually. A common cost is a particular type of indirect cost.

A particular cost may be direct or indirect, depending on the cost object. While the soap factory manager's salary is an indirect cost of manufacturing bathing soap, it is a direct cost of the manufacturing division. In the first case, the cost object is the bathing soap product. In the second case, the cost object is the entire manufacturing division.

Self-Assessment Exercise 2.5

What is a cost object?

3.6 Classifications for Decision Making

Costs are important feature of many business decisions. In making decisions, it is essential to have a firm grasp of the concepts differential cost, opportunity cost and sunk cost. These are extremely important principles in management accounting that must be treated. But, for the purpose of this course, we will treat it briefly.

3.6.1 Differential Cost and Revenue

Decision involves choosing between alternatives. In business decisions, each alternative will have certain costs and benefits that must be compared to the cost and benefits of the other available alternatives. A difference in cost between any two alternatives is known as a **differential cost**. A differential in revenues between any two alternatives is known as **differential revenue.**

A differential cost is also known as an **incremental cost** although technically an incremental cost should refer only to an increase in cost from one alternative to another, decreases in cost should be referred to as decremental costs. Differential cost is a broader term, encompassing both cost increases (incremental costs) and cost decreases (decremental costs) between alternative.

The accountant's differential cost concept can be compared to the economist's marginal cost concept. In speaking of changes in cost and revenue, the economist employs the terms marginal cost and marginal revenue. The revenue that can be obtained from selling one more unit of product is called marginal revenue, and the cost involved in producing one more unit of product is called marginal cost. The economist's marginal concept is basically the same as the accountant's differential concept applied to a single unit of output.

3.6.2 Opportunity Cost

Opportunity cost is the potential benefit that is given up when one alternative is selected over another. To illustrate this important concept, consider the following examples.

Example 1

Victoria has a part-time job that pays her ₦1000 per week while attending college. She would like to spend a week at the beach during session holiday, and her employer has agreed to give her the time off, but without pay. The ₦1000 in lost wages would be an opportunity cost of taking the week off to be at the beach.

Example 2

Suppose that Company A is considering investing a large sum of money in land that may be a site for a future shop. Rather than invest the funds in land, the company could invest the funds in high-grade securities. If the land is acquired, the opportunity costs will be the investment income that could have been realized if the securities had been purchased instead.

Example 3

Dokpesi is employed with a company that pays him a salary of ₦20,000 per year. He is thinking about leaving the company and returning to school. Since returning to school would require that he give up his ₦20,000 salary, the forgone salary would be an opportunity cost of seeking further education.

Opportunity cost is not usually entered in the accounting records of an organization, but it is a cost that must be explicitly considered in every decision a manager makes. Virtually every alternative has some opportunity cost attached to it. In example 3 above, for instance, if Dokpesi decides to stay at the job, there still is an opportunity cost involving: it is the greater income that could be realized in future years as a result of returning to school.

3.6.3 Sunk Cost

A **sunk cost** is a cost that has already been incurred and that cannot be changed by any decision made now or in the future. Since sunk costs cannot be changed by any decision, they are not differential costs. Therefore, they can and should be ignored when making a decision.

To illustrate a sunk cost, assume that a company paid ₦50,000 several years ago for a special-purpose machine. The machine was used to make a product that is now obsolete and is no longer being sold. Even though in hindsight the purchase of the machine may have been unwise, no amount of regret can undo that decision. And it would be folly to continue making the obsolete product in a misguided attempt to 'recover' the original cost of the machine. In short, the ₦50,000 originally paid for the machine has already been incurred and cannot be a differential in any future decisions. For this reason, such costs are said to be sunk and should be ignored in decisions.

Self-Assessment Exercise 2.6

Explain the similarities between the Incremental cost concept and the Marginal cost concept.

4.0 CONCLUSION

Accounting for the cost of a product or service is very crucial. It is an important aspect of management accounting. In managing an organization, understanding the concept of costs could avert a lot of financial problems. Costs are associated with all types of organisations – business, non-business, manufacturing, retail and service.

Generally, the kinds of cost incurred and the way in which these cost are classified depends on the type of organisation involved. Management accounting is as applicable to one type of organisation as to another (manufacturing, merchandising and service).

5.0 SUMMARY

In this unit, we considered cost characteristics of a variety of organizations but with emphasis on manufacturing organizations. We classified cost in various forms: Prediction of cost behaviour; assigning costs to costs objects; decision making. We also classified cost into manufacturing and non-manufacturing costs, then Product and Period costs.

It can be seen that cost as a concept could take up various forms and an accountants should be familiar with all the various forms so that cost could be well managed.

6.0 TUTOR MARKED ASSIGNMENT

1 The material that is transformed into the final product are called _____ (a) products (b) items **(c)** raw materials (d) stock

2 The term _____ is reserved for those labour costs that can easily be traced to individual units of product. **(a)** direct labour (b) cost labour (c) traced expenses (d) product cost.

3 Labour costs that cannot be physically traced to the creation of products, or that can be traced only at great cost and inconvenience, are termed _____ and treated as part of manufacturing overhead. (a) untraceable cost (b) great labour (c) overhead labour **(d)** indirect labour

4 _____ includes all costs of manufacturing except direct materials and direct labour. (a) Manufacturing expenses (b) Overhead cost **(c)** Manufacturing overhead (d) Total overhead.

5 Direct labour combined with direct materials is called **prime cost**. (a) combination cost **(b)** Prime cost (c) Direct cost (d) compulsory cost

6 _____ means how a cost will react or respond to changes in the level of business activity. (a) Reaction agent **(b)** Cost behaviour (c) Responsive action (d) Change behaviour

7 A _____ is a cost that remains constant, in total, regardless of changes in the level of activity. (**Fixed cost)**

8 A _____ is anything for which cost data are desired – including products, product lines, customer, jobs and organizational sub-units. (**Cost object**)

9 A _____ is a cost that is common to a number of costing objects but cannot be traced to them individually (**Common cost**)

10 A _____ is a cost that has already been incurred and that cannot be changed by any decision made now or in the future. (**Sunk cost)**

7.0 REFERENCES/FURTHER READINGS

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UNIT 3 COST-VOLUME-PROFITS ANALYSIS

CONTENTS

1.0 INTRODUCTION

Cost-Volume-Profits analysis, sometimes termed 'Breakeven analysis' seeks to study the relationship between costs, volume and profit at differing activity levels and can be a useful guide for short-term planning and decision-making. As a manager of a corporation, when making decisions that affect the volume of output, you would classify costs as fixed or variable. You would want to know how such decisions would affect costs and revenues. You would also realize that many factors in addition to the volume of output will affect costs. Yet, a useful starting point in your decision process would be to specify the relationship between the volume of output and costs and revenues. And you would want to study the effects of output volume on revenue (sales), expenses (costs), and net income (net profit). This study is what is called cost-volume-profit (CVP) analysis.

In this unit, we shall define contribution, explain breakeven point, discuss cost-volume-profit analysis by use of graphical representation and use cost-volume-profit equations to determine breakeven points in units of production and in naira sales, level of sales to result in large profit in units and naira sales, level of sales to result in target profit after tax in units and contribution/sales ratio.

2.0 OBJECTIVES

After studying this unit, you should be able to:

(i) define contribution analysis;
(ii) explain breakeven point;
(iii) discuss cost-volume-profit analysis by use of graphical representation;
(iv) use cost-volume-profit equation to determine:
- breakeven point in units of production and naira sales;
- level of sales to result in target profit in units of production and naira sales;

- level of sales to result in target profit after tax in units and contribution/sales ratio.

3.0 MAIN CONTENT

3.1 Contribution Margin

Consider the following commonsense arithmetic approach: every unit sold of an item generates a contribution margin or marginal income. Contribution margin is the unit sales price minus the variable cost per unit. If the unit sales price of selling a packet of biscuit is ₦100.00 and the extra cost of producing the packet of biscuit is ₦60.00, it therefore means that the contribution margin is ₦40.00.

Sometimes, the unit price and unit variable costs of a product are not known. This situation is common in companies that sell more than one product because no single price or variable cost applies to all products. For example, a grocery store sells hundreds of products at many different prices. In such cases, you can use total sales and total variable costs to calculate variable costs as a percentage of each sales naira. That is, for instance, ₦50,000.00 is the sales and total variable costs is ₦35,000.00.

Sales price	100%
Less: Variable expenses as a percentage of naira sales	70%
Contribution margin percentage is therefore	30%

$$\left\{ \text{i.e. } \frac{35{,}000 \times 100}{50{,}000} \right\}$$

Self Assessment Exercise 3.1

Define Contribution margin.

3.2 Breakeven Analysis

The most basic cost-volume-profit (CVP) analysis computes breakeven point in number of units and in naira sales. The breakeven point is the level of sales at which revenue equals expenses and net income is zero.

Cost-volume-profit analysis otherwise known as breakeven analysis refers to a technique that assists in decision-making by employing the marginal costing concept and is used to measure the effect on profit as a result of changes in volume of activities, cost and prices. It also facilitates planning in the sense that CVP analysis could assist to predict future cost levels and sales as related to a range of level of activity. It demonstrates how the profit will be affected as a result of changes in any of the variables that make up the profit function. Its use requires the separation of the total cost function into their variable and fixed portions as required in the application of marginal costing principles.

Marginal costing is an accounting technique which determines the marginal cost by distinguishing between fixed and variable costs.

3.2.1 Basic Assumptions of Cost-Volume-Profit Analysis

The basic assumptions associated with C-V-P technique are:

(1) all costs could be categorized as either variable cost or fixed cost;
(2) semi-variable cost can be segregated into both the variable and its fixed component;
(3) selling price per unit is constant;
(4) variable cost per unit is constant;
(5) total fixed cost remains unchanged regardless of output;
(6) parity of production and sales. That is there is no closing stock of goods since production equals sales;
(7) only one product is involved and in case of a multi-product organisation, there is a constant sales mix;
(8) level of technology and efficiency remains the same;
(9) volume is the only independent variable that affects cost;
(10) risk and uncertainty are non-existent;
(11) there is a relevant range.

3.2.2 Limitations of the Basic Assumptions

Be informed that in a true life situation, the basic assumptions of C-V-P analysis discussed above tend only to be valid over a limited range of activity. The basic assumptions of C-V-P analysis have the following deficiencies:

(1) it might be difficult to separate some costs into their fixed and variable cost portions;

(2) the selling price per unit is assumed to be constant. This is not realistic because of possibility of discounts;

(3) the variable cost per unit is assumed to be constant. This is not realistic because quantity discount could result in decrease in material cost and labour cost per unit;

(4) fixed cost is assumed to remain unchanged. This is not true because in reality because fixed cost moves in a step-like manner. Also, in the long-run, all costs became variable;

(5) it is assumed that production is equal to sale, hence, no closing stock. This assumption looks unrealistic because a business is a going concern and invariably stocks are carried from one period to the other;

(6) the assumption of one product or constant mix of product is not realistic because most organisations produce variety of products and invariably, actual mix turn out to be radically different from the expected level of activity;

(7) the assumption that there is no change in level of technology and efficiency is untenable since innovations are taking place everyday in all spheres of business endeavours.

Self Assessment Exercise 3.2

1. Define the term 'breakeven point'.
2. What is cost-volume-profit analysis?
3. State five assumptions associated with C-V-P analysis.
4. Are there any limitations to the basic assumptions associated with C-V-P analysis? If yes, state five of them.

3.3 Cost-Volume-Profit in Graphic Form

Graphical approach may be preferred where:

(a) a simple overview is sufficient;
(b) there is a need to avoid a detailed numerical approach when, for instance, the recipients of the information have no accounting background.

The basic chart is known as a Breakeven Chart which can be drawn in two ways. The first is known as the traditional approach and the second as the contribution approach. Whatever approach is adopted, all costs must be capable of separation into fixed and variable elements, that is, semi-fixed or semi-variable costs must be analysed into their components of fixed and variable cost.

3.3.1 The Traditional Breakeven Chart

Assuming that fixed and variable costs have been resolved, the chart is drawn in the following way:

(a) Draw the axes:

(1) horizontal: showing levels of activity expressed as units of output or as percentage of total capacity;
(2) vertical: showing values in ₦'s as appropriate for costs and revenues;

(b) Draw the cost lines:

(1) Fixed cost – this will be a straight line parallel to the horizontal axis at the level of the fixed costs;
(2) Total cost – this will start where the fixed cost line intersects the vertical axis and will be a straight line sloping upward at an angle depending on the proportion of variable cost in total costs;

(c) Draw the revenue line:

This will be a straight line from the point of origin sloping upwards at an angle determined by the selling price.

Illustration 3.3.1

A company makes a single product with a total capacity of 400,000 litres per annum. Cost and sales data are as follows:

Selling price	₦1 per litre
Marginal cost	50k per litre
Fixed costs	₦100,000.00

Draw a traditional breakeven chart showing the likely profit at the expected production level of 300,000 litres.

Solution:

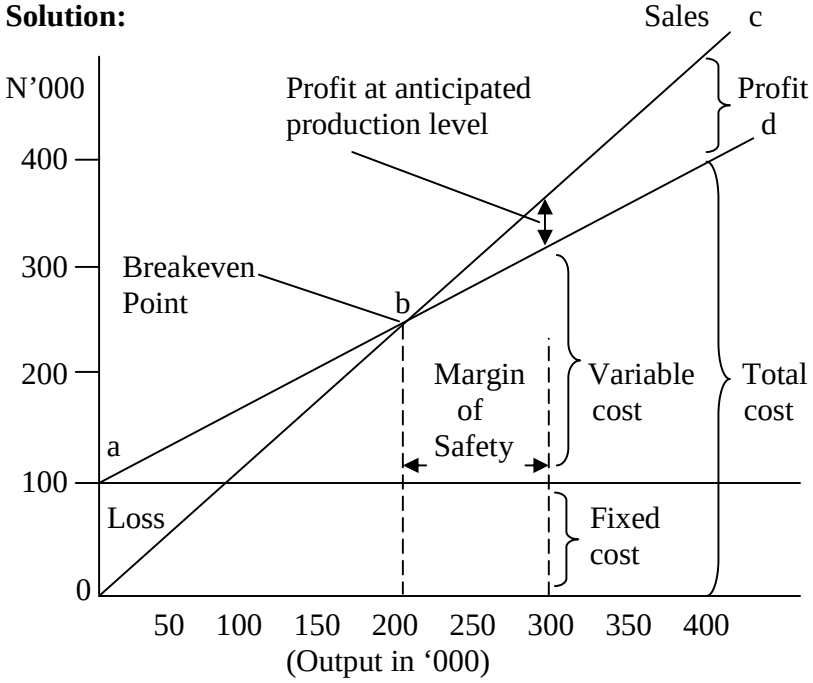

Figure 3.3.1 Traditional Breakeven Chart

From figure 3.3.1 above, you can see that breakeven point is at an output level of 200,000 litres and that the width of the profit wedge indicates the profit at a production level of 300,000.

The profit is N50,000.00.

3.3.2 The Contribution Breakeven Chart

The contribution breakeven chart uses the same axes and data as the traditional chart.

The only difference is that variable costs are drawn on the chart before fixed costs resulting in the contributing being shown as a wedge.

Illustration 3.3.2

All you need do is to repeat illustration 3.3.1 except that a contribution breakeven chart should be drawn as in overleaf:

Solution:

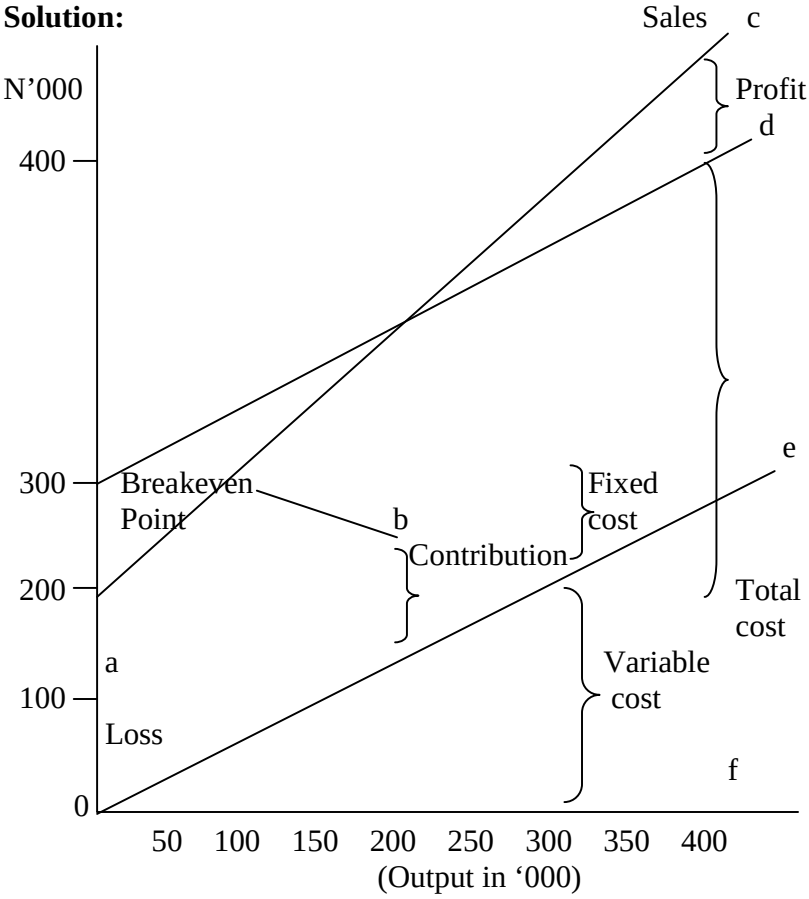

Figure 3.3.2 Contribution Breakeven Chart

If you look at the graph figure 3.3.2 above, you will observe that the area C-O-E represents the contribution earned. There is no direct equivalent on the traditional chart. The area of D-A-C-F represents total cost and is the same as the traditional chart.

You will also observe that the reversal of fixed costs and variable costs enables the contribution wedge to be drawn, thus, providing additional information.

An alternative form of the contribution breakeven chart is where the net difference between sales and variable cost, that is, total contribution, is plotted against fixed costs.

You will observe this from figure 3.3.3 below using again the same data from illustration 3.3.1. You should note from figure 3.3.3 that:

(a) sales and variable costs are not shown directly;

(b) both forms of contribution chart (figures 3.3.2 and 3.3.3) show clearly the contribution is first used to meet fixed costs and when these costs are met, the contribution becomes profit.

Solution:

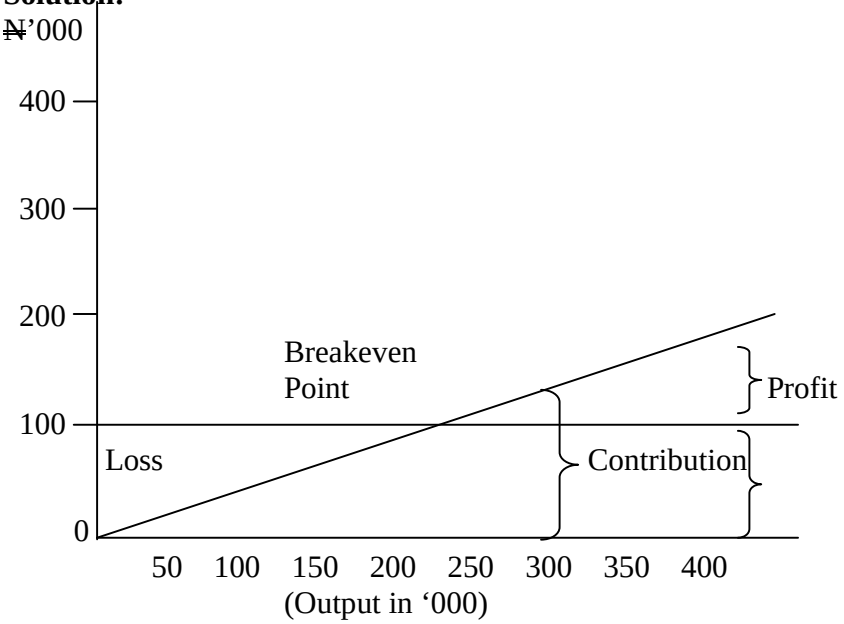

Figure 3.3.3 Alternative Form of Contribution Breakeven Chart

Self Assessment Exercise 3.3

A company makes a single product with a total capacity of 800,000 litres per annum. Cost and sales data are as follows:

Selling price	₦2.00 per litre
Marginal cost	₦1.00 per litre
Fixed cost	₦200,000.00

Draw a traditional breakeven chart showing the likely profit at the expected production level of 600,000 litres.

3.4 Cost-Volume-Profit Equation

Cost-volume-profit analysis can be undertaken by graphical means, which has been dealt with in the immediate preceding sub-topic or by simple formulae which are listed below and illustrated by examples.

(a) Breakeven point (in units) = $\frac{\text{Fixed Costs}}{\text{Contribution/unit}}$

(b) Contribution/Sales Ratio = $\frac{\text{Contribution/Unit}}{\text{Sales price/Unit}} \times 100$

(c) Break-even point (₦ Sales) = $\frac{\text{Fixed Costs}}{\text{Contribution/Unit}} \times \text{Sales price/Unit}$

= Fixed costs $\times \frac{1}{\text{C/S Ratio}}$

(d) Level of Sales to result in target profit (in units)

$$\frac{\text{Fixed costs + Target Profit}}{\text{Contribution/Unit}}$$

(e) Level of sales to result in target profit after tax (in units)

$$\text{Fixed cost} + \frac{\text{Target profit}}{\frac{\text{1-Tax Rate}}{\text{Contribution/Unit}}}$$

(f) Level of sales to result in target profit (₦ sales)

$$\frac{\text{(Fixed cost + Target Profit) x Sales Price/unit}}{\text{Contribution/Unit}}$$

You should note that the above formulae relates to a single product firm or one with an unvarying mix of sales. With a multi-product firm, it is possible to calculate the break even point as follows:

Break-even point (₦ Sales) = $\frac{\text{Fixed Costs x Sales Value}}{\text{Contribution}}$

Illustration 3.3.3

A company makes a single product with a sales price of N10.00 and a marginal cost of N6.00. Fixed costs are N60,000.00 per annum. Calculate:

(a) Number of units to breakeven;

(b) Sales at breakeven point;

(c) Contribution/Sales ratio;

(d) What number of units will need to be sold to achieve a profit of N20,000.00 per annum?

(e) What level of sales will achieve a profit of N20,000.00 per annum?

(f) As in (d) above, with a 40% tax rate;

(g) Because of increasing costs, the marginal cost is expected to rise to N6.50 per unit and fixed costs to N70,000.00 per annum. If the selling price cannot be increased, what will be the number of units required to maintain a profit of N20,000.00 per annum? (ignore tax)

Solution:

Contribution = Selling price – Marginal cost
= N10 – N6
= **N4.00**

(a) Breakeven point (units) = $\frac{\text{N60,000}}{\text{N4}}$

= **15,000.00 units**

(b) Breakeven point (N sales) = N15,000.00 x N10.00

= **N150,000.00**

(c) Cost / Sales ratio = $\frac{\text{N4.00}}{\text{N10.00}}$

= **40%**

(d) Number of units for target profit = $\frac{\text{N60,000.00 + N20,000.00}}{\text{N4.00}}$

= **20,000 units**

(e) Sales for target profit = 20,000 x N10.00

= **N200,000.00**

(Alternatively, this figure can be arrived at by the following reasoning: After breakeven point, the contribution per unit becomes net profit per unit, so that as 15,000 units were required at breakeven point, 5,000 extra units would be required to make N20,000.00 profit. The total units would now be 15,000 + 5,000 = 20,000 x N10.00 = N200,000.00).

(f) Number of units for target profit with 40% tax:

$$= \frac{60{,}000.00 + \left(\frac{N20{,}000.00}{1 - 0.4}\right)}{N4.00}$$

= **23,333 units**

(g) Note that the fixed costs, marginal cost and contribution have changed.

Number of units for target profit = $\frac{N70{,}000.00 + N20{,}000.00}{N3.50}$

= **25,714 units**

You should note that cost / sales ratio is sometimes known as the profit / volume ratio, where P/V means profit / volume ratio.

Self Assessment Exercise 3.4

Lookman Limited makes a single profit with a sales price of ₦15.00 and a variable cost of ₦8.00. Fixed costs are ₦80,000.00 per annum.

You are required to calculate:

(a) Number of units to breakeven;

(b) Sales at breakeven point;

(c) Contribution / sales ratio;

(d) What number of units will need to be sold to achieve a profit of ₦30,000.00 per annum?;

(e) What level of sales will achieve a profit of ₦30,000.00 per annum?;

(f) As in (d) above, with a 30% tax rate;

(g) Due to increasing costs, the variable cost is expected to rise to N8.50 per unit and fixed costs to N90,000.00 per annum. If the selling price cannot be increased, what will be the number of units required to maintain a profit of N30,000.00 per annum (ignore tax)?

3.5 The Margin of Safety

The margin of safety is the planned unit sales less the breakeven unit sales. It shows how far sales can fall below the planned level before losses occur. For instance, if the company planned to produce 40,000 units and the company will breakeven at 25,000 units, it therefore

means that the company has a margin of safety of 15,000 units. If you observe the traditional breakeven chart of figure 3.3.1 above, you will notice that the margin of safety is 100,000 litres which is the difference between the expected production and the breakeven point.

Self Assessment Exercise 3.5

Define a margin of safety.

4.0 CONCLUSION

From the discussion so far, you will note that the contribution margin is the unit sales price minus the variable cost per unit. You will also note that the breakeven point is the level of sales at which revenue equals expenses and net income is zero. The margin of safety is the planned unit sales less the breakeven unit sales. Cost-volume-profit in graphic form can be represented by the traditional approach or by the contribution approach.

Cost-volume-profit analysis can be undertaken by simple formulae that would enable you to solve for the breakeven point in units and naira sales, cost / sales ratio, level of sales to result in target profit in units and naira sales as well as level of sales that would result in target profit after tax in units.

5.0 SUMMARY

In this unit, we discussed cost-volume-profit analysis. We explained the various components of cost-volume-profit analysis such as contribution, margin, breakeven point, and graphical representation of cost-volume-profit analysis, cost-profit-volume equation and the margin of safety.

In the next unit, discussion will focus on variable and absorption costing.

6.0 TUTOR-MARKED ASSIGNMENT

1. Tota Company Limited makes a single profit with a sales price of N50.00 and a marginal cost of N30.00. Fixed costs are N80,000.00 per annum. You are required to calculate:

   (a) Number of units to breakeven

   (b) Sales at breakeven point

   (c) Cost / sales ratio

   (d) What number of units will need to be sold to achieve N50,000.00 profit per annum?

   (e) What level of sales will achieve a profit of N50,000.00 per annum?

(f) As in (d) with a 35% tax rate.

(g) Due to increasing costs, the marginal cost is expected to rise to N35.00 per unit and fixed costs to N120,000.00 per annum. If the selling price cannot be increased, what will be the number of units required to maintain a profit of N50,000.00 per annum (ignore tax)?

2. The following data were collected from Faith Limited:

Total fixed costs	N6,000.00
Variable cost	N3.00 per unit
Selling price	N5.00 per unit
Present sales level	5,000 units

You are required to:

(a) Construct a breakeven chart

(b) Read off from the chart:
(i) Breakeven point;
(ii) Estimated profit or less at sales volume of 5,000 units;
(iii) Margin of Safety.

7.0 REFERENCES/FURTHER READINGS

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UNIT 4 VARIABLE AND ABSORPTION COSTING

CONTENTS

1.0 INTRODUCTION

Many companies base the evaluation of managers at least partly on the income of the organisational segment they manage. Consequently, managers strive to make their performance look good by making decisions that would increase income. The question is: how should we measure income?

Accountants make many judgements when measuring income. One of the most important of them is choosing the appropriate method for calculating product costs. Some managers think product costing is a subject of interest only to accountants. However, when they realise that product costs affect their evaluation, they quickly begin to pay attention to the determination of product costs. It is only by knowing what influences product costs, will they be able to predict how their decisions will affect income and hence their evaluations.

This unit focuses on two major variations of product costing, namely: variable costing (the contribution approach) and absorption costing (the functional, full costing, or financial-reporting approach). You should take note that these methods differ in only one respect: fixed manufacturing overhead is excluded from the cost of products under variable costing, but is included in the cost of products under absorption costing.

2.0 OBJECTIVES

After studying this unit, you should be able to:

(i) define variable costing technique;
(ii) define absorption costing technique;
(iii) calculate and compare variable costing and absorption costing techniques;
(iv) distinguish gross margin from contribution margin;

(v) state the effect of changes in production on the profit under absorption costing technique;
(vi) state factors to be considered in making a choice between variable and absorption costing.

3.0 MAIN CONTENT

3.1 Variable Costing

Variable costing is a decision-making technique used to determine the effect of cost on changes in the volume of time and output in a multi-product firm especially in the short-run. Variable costing emphasizes the direct material, direct labour, direct expenses and other variable overheads of a product. It demands that fixed costs of the relevant period are written off in full against the contribution. Recall that the contribution is the difference between the sales value and the variable cost of a product in a given period of time.

3.1.1 Variable Costing Statement Format

The format showing the components of a variable costing statement is as shown below:

	₦	₦
Sales (a)		X
Direct material	X	
Direct labour	X	
Direct expenses	X	
Prime cost	X	
Production variable costs	X	
Production variable cost (b)		X
Contribution (a – b)		X

Fixed costs are excluded from the cost structure and therefore written off in the period.

3.1.2 Advantages of Variable Costing

The advantages of variable costing are as follows:

(a) Profit volume ratio helps management to decide which products are most profitable;

(b) Contribution margin helps to decide whether:

(i) to accept or reject a special order;
(ii) to close down a line of product or business;
(iii) to determine product profitability;
(iv) to determine product mix using linear programming technique;
(v) to make or buy or lease decisions on an item of plant and equipment;
(vi) to decide further processing decision particularly in relation to joint product cost;

(c) It assists in the pricing decision-making process;

(d) Contribution approach can be used to forecast the units to be produced and sold;

(e) It facilitates the stock valuation for final account purposes.

3.1.3 Disadvantages of Variable Costing

The disadvantages of variable costing are also listed below:

(a) The analysis of costs into fixed and variable costs may be subjective for the purpose of costs classification;

(b) It places emphasis on the short-run effects of costs, whereas, fixed costs will vary in the medium and long-term;

(c) It is impossible to determine strategic or long-term decision in that, giving a product total cost data, it needs to be noted that in the final analysis (long-run), fixed costs must be recovered;

(d) It focuses attention on the contribution level and the tendency to exclude fixed costs by the management, may be disastrous.

Self Assessment Exercise 4.1

(a) Define variable costing.
(b) State three advantages and disadvantages of variable costing.

3.2 Absorption Costing

Absorption costing is a method of costing stocks in which all production costs such as variable and fixed are included as part of the cost of items. It is, therefore, a technique in which all costs are absorbed into production cost, hence operating statements prepared using this approach, does not distinguish between fixed and variable cost. It is an approach which allocates all production costs into individual products.

Fixed production overheads are absorbed into products by establishing overhead absorption rate. This may result to over or under absorbed overhead, which is less or more than recovery of fixed overheads at planned or predetermined activity level.

3.2.1 Format for Absorption Costing

There are two techniques of absorption costing, namely: absorption costing standard cost (where there is no opening and closing stock) card and absorption costing operating statement (with opening and closing stocks).

(a) **Absorption costing standard cost** (where there is no opening and closing stocks) format is shown below:

		Per Unit ₦	₦
Sales			X
Direct materials		X	
Direct labour		X	
Direct expenses		X	
Prime cost		X	
Production variable overhead		X	
(i)	Marginal cost	X	
	Fixed production overhead cost	X	
(ii)	Total production cost of sales (Absorption cost)		(X)
Gross profit			XX

(b) **Absorption costing operating statement** (with opening and closing stocks) is shown below:

	Per Unit ₦	₦
Sales		X
Opening stock (valued at absorption cost)	X	
Cost of production (valued at absorption cost)	X	
	X	
Less: Closing stock (valued at absorption cost)	X	
Total cost of sales		X
Gross profit		X

3.2.2 Advantages of Absorption Costing

The advantages of absorption costing are:

(a) It does not undermine the importance of fixed cost;
(b) It avoids fictitious losses being reported by representing product cost at full factory cost to bring the product to a point that it is ready for use;

(c) It assists in arriving at total cost of production which is a basis for selling price decision process;

(d) It matches costs with revenues since fixed production cost are considered in the product cost;

(e) It represents current market trends and, therefore, it is widely accepted especially for tax purposes.

3.2.3 Disadvantages of Absorption Costing

The disadvantages of absorption costing are:

(a) It does not help in decision-making;

(b) Production may be very difficult since there is element of fixed cost in the product cost;

(c) Calculation of under or over absorbed overhead may be problematic;

(d) It overbears the product cost with management administrative inefficiency which may partly be represented in the fixed cost;

(e) It does not conform with the matching principle which stipulates that all costs (fixed and variable) must be matched against revenue in the period concerned for determination of profit.

Self Assessment Exercise 4.2

(a) Define absorption costing.
(b) State four advantages and disadvantages of absorption costing.

3.3 Profit Comparison of Variable and Absorption Costing

Variable costing is a useful technique for studying the effects of changes in volume and type of output in a multi-product business. It is an accounting technique that distinguishes between fixed and variable costs. The primary purpose of marginal costing is to provide information to management on the effects on costs and revenues of changes in the volume and type of output in the short-run.

It can also be used in the system for recording and collecting costs. In this case, fixed costs are treated as period costs in profit statement while stocks are valued at variable cost.
Absorption costing is the approach used in all published accounts and all financial accounting statements. It emphasizes a functional classification of costs, for example: manufacturing, selling and distribution and financial costs.

Further distinctions between variable and absorption costing techniques are presented in tabular form below:

S/N	VARIABLE COSTING	ABSORPTION COSTING
a.	Fixed overheads are written off in a period. It is treated as period costs.	Fixed overheads are absorbed into production, such that part of fixed cost is carried to subsequent year by way of

		its inclusion in closing stock.
b.	Only variable costs are regarded as product cost.	Fixed production overhead form part of the product cost.
c.	Contribution is the main feature of the operating statement (sales less variable costs = contribution).	Contribution is treated as funds in which fixed costs are absorbed to arrive at profit.
d.	Distinction is made between fixed and variable costs.	No distinction is made between fixed and variable costs.
e.	Stocks are valued at variable costs which exclude fixed costs.	Stocks are valued at total production cost including fixed production overhead costs.
f.	It is used for decision-making purposes.	It is used for routine purposes.

It is imperative to state that the variable costing approach (also known as the contribution approach) highlights the total contribution which forms a fund out of which fixed costs must be paid. The contribution per unit will be the same irrespective of the level of output. You should note also that this approach does not attempt to imply a fixed overhead rate per unit rather fixed overheads do not change with the level of output. Therefore, it should only be stated in total.

Illustration 3.3.1

Using hypothetical figures to explain the presentation of the distinction between variable and absorption costing, we have the following:

1. Variable costing statement:

		₦'000	₦'000
Sales			760
Less: Variable costs			300
Contribution			460
Less: Fixed Cost:	Manufacturing cost of goods sold	150	
	Selling costs	170	320
Net profit			140

2. Absorption costing statement:

	₦'000	₦'000
Sales		760
Less: Manufacturing cost of goods sold		450
Gross profit		310
Less: Selling costs		170
Net profit		140

You will observe that both statements had the same net profit, but this was attained by different procedure. The variable costing statement determines the value of contribution

before applying fixed costs. However, the absorption costing statement applies the manufacturing cost (variable and fixed costs) to determine the gross profit or margin.

You should not confuse gross margin and contribution margin. Try and list the ways in which these two margins differ using the variable and absorption costing statement above. You would be able to extract that as shown below:

(1) Gross margin appears in an absorption costing income statement while contribution margin is in a variable costing income statement;

(2) Gross margin is revenue less manufacturing cost while contribution margin is revenue less all variable costs;

(3) Gross margin is based on a categorization of costs by function while contribution margin divides costs by cost behaviour;

(4) Gross margin is required for financial reporting while contribution margin is most useful for short-term management decisions.

Let us consider another illustration.

Illustration 3.3.2

Bimbo Nigeria Limited produces shirt in 2006 and made the following data available. As a management accountant, you are required to present to the management of Bimbo Nigeria Limited the profit based on variable costing and absorption costing.

Selling price	₦20.00 per unit
Variable manufacturing cost	₦8.00 per unit
Fixed manufacturing cost	₦20,000.00
Selling and administrative costs:	
Fixed	₦10,000.00
Variable	₦4.00 per unit
Shirts produced	20,000 units
Shirts sold	19,500 units

Solution 3.3.2

(a) Variable Costing Statement

	₦	₦
Sales (19,500 units x ₦20.00)		390,000
Variable manufacturing cost of production		

(20,000 units x ₦8.00)		160,000	
Less: Closing stock (500 units x ₦8.00)		4,000	
Variable manufacturing cost of goods sold (19,500 x ₦8.00)		156,000	
Add: Variable selling and administrative costs		78,000	
Variable costs of goods sold			234,000
Contribution			156,000
Less: Fixed Costs:	Manufacturing costs	20,000	
	Selling and administrative costs	10,000	30,000
Profit			126,000

(b) Absorption Costing Statement

		₦	₦
Sales (19,500 units x ₦20.00)			390,000
Less: Costs of goods sold:			
Variable manufacturing costs (20,000 units x ₦8.00)		160,000	
Fixed manufacturing costs		20,000	
		180,000	
Less: Closing stock (500 units x ₦8.00)		4,000	175,500
Gross profit			214,500
Less: Selling and administrative costs (19,500 x ₦4.00) +		10,000	88,000
Profit			126,500

You should note that the ₦9.00 applied to the closing stock in the absorption costing statement is the sum of ₦8.00 variable manufacturing cost per unit and ₦1.00 fixed manufacturing cost. Again, you would note that the difference in the operating statement of both techniques of ₦500.00 relates to the valuation of the closing stock (₦4,500.00 – ₦4,000.00).

To see more vividly how variable and absorption costing systems work, we shall use a more detailed example below.

Illustration 3.3.3

TOSA Nigeria Limited makes a replacement parts (a plastic ring) for large plastic injection molding machines. Each machine requires four new rings a year. In 2006 and 2007, the company had the following standard costs for production of rings:

Basic Production Data at Standard Cost:

	₦
Direct material	1.30
Direct labour	1.50

Variable manufacturing overhead	0.20
Standard variable cost per ring	3.00

The annual budget for fixed manufacturing overhead is ₦150,000.00. Expected (or budgeted) production is 150,000 rings per year, and the sales price is ₦5.00 per ring.

For simplicity, we will assume that the single cost driver is 20k per ring variable manufacturing overhead for rings produced. Also, we will assume that both budgeted and actual selling and administrative expenses are ₦65,000.00 per annum as fixed cost plus sales commission at 5% of naira sales. Actual produce quantities are:

In units (rings)	2006	2007
Opening stock	-	30,000
Production	170,000	140,000
Sales	140,000	160,000
Closing stock	30,000	10,000

There are no variances from the standard variable manufacturing costs, and the actual fixed manufacturing overhead incurred is exactly ₦150,000.00 each year. Based on this information, we can:

(1) Prepare income statements for 2006 and 2007 under variable costing;

(2) Prepare income statement for 2006 and 2007 under absorption costing;

(3) Show a reconciliation of the difference in operating income for 2006, 2007 and the two years as a whole.

Solution 3.3.3

TOSA Nigeria Limited: Comparative Income Statements using Variable Costing for the year 2006 and 2007.

Particulars	**2006**		**2007**	
	₦'000	₦'000	₦'000	₦'000
Sales (140,000 x ₦5.00) and (160,000 x ₦5.00) (A)		700		800
Variable Expenses:				
Variable manufacturing cost of goods sold:				
Opening stock (0 x ₦3.00) and (30,000 x ₦3.00)	-		90	
Add: Variable cost of goods manufactured (170,000 x ₦3.00) and (140,000 x ₦3.00) respectively	510		420	
	510		510	
Less: Closing stock (30,000 x ₦3.00) and (10,000 x ₦3.00)	90		30	
	420		480	
Variable selling expenses at 5% of naira sales (140,000 x ₦5.00 x 5%) and 160,000 x ₦5.00 x 5%)	35		40	

Total variable expenses (B)		455		520
Contribution margin (C) = (A) – (B)		245		280
Fixed Expenses:				
Fixed factory overhead	150		150	
Fixed selling and administrative expenses	65		65	
Total fixed expenses (D)		215		215
Operating income (C) – (D)		30		65

You would observe that the variable costing statement shown above in solution 3.3.3 has a familiar contribution approach format with solution 3.3.1 except for detailed calculation expressed in solution 3.3.2. We account for the costs of the product by applying all variable manufacturing costs to the goods produced at a rate of ₦3.00 per ring; thus we have inventories at standard variable costs.

In contrast, we do not apply any fixed manufacturing costs to products, but we regard them as expenses in computing the contribution margin. However, variable selling and administrative expenses are not inventoriable. They are affected only by the level of sales, not by changes in inventory.

TOSA Nigeria Limited: Comparative Income Statements using Absorption Costing for the year 2006 and 2007.

Particulars	**2006**		**2007**	
	₦'000	₦'000	₦'000	₦'000
Sales (140,000 x ₦5.00) and (160,000 x ₦5.00) (A)		700		800
Cost of Goods Sold:				
Variable manufacturing cost of goods sold:				
Opening stock (0 x ₦4.00) and (30,000 x ₦4.00)	-		120	
Cost of goods manufactured (170,000 x ₦4.00) and (140,000 x ₦4.00) respectively	680		560	
	680		680	
Less: Closing stock (30,000 x ₦3.00) and (10,000 x ₦3.00)	120		40	
Cost of goods sold		560		640
Gross profit at standard rate		140		160
Production – volume variance		20 (F)		10 (U)
Gross profit at actual rate		160		150
Selling and administrative expenses (65,000 + 25,000) and (65,000 + 40,000) respectively		100		105
Operating income		60		45

You should note that:

Variable cost per unit	₦3.00
Fixed cost (₦150,000.00 ÷ 150,000 units)	₦1.00
Standard absorption cost	₦4.00

Computation of production – volume variance on expected volume of production of 150,000 rings is:

2006	₦20,000.00 F	(170,000 – 150,000) x ₦1.00
2007	₦10,000.00 U	(140,000 – 150,000) x ₦1.00
Two years together	₦10,000.00	(310,000 – 300,000) x ₦1.00

Where F means favourable and U means unfavourable.

You should note that production – volume variance is a variance that appears whenever actual production (like 170,000 units and 140,000 units in illustration 3.3.3) deviates from the expected volume of product (like expected production of 150,000 rings in illustration 3.3.3) used in computing the fixed overhead rate. It is calculated as (actual volume – expected volume) multiplied by fixed overhead rate as shown in the computation of production – volume variance above.

As you can see, absorption costing differs from variable costing format in three ways. First, the unit product cost used for computing cost of goods sold is ₦4.00 and not ₦3.00. This is because fixed manufacturing overhead of ₦1.00 is added to the ₦3.00 variable manufacturing cost. The ₦1.00 of fixed manufacturing overhead applied to each unit is the fixed-overhead rate.

$$\text{Fixed overhead rate} = \frac{\text{budget fixed manufacturing overhead}}{\text{expected volume of products}} = \frac{₦150,000}{150,000 \text{ units}}$$

$$= ₦1.00$$

Second, fixed factory overhead does not appear as a separate line in an absorption costing variance statement. Instead, the fixed factory overhead appears in two places: as part of the cost of goods sold and as production – volume variance.

Thirdly, the format for an absorption costing income statement separates costs into the major categories of manufacturing and non-manufacturing. In contrast, a variable costing income statement separates costs into the major categories of fixed and variable. In an absorption costing statement, revenue less manufacturing cost (both fixed and variable) is gross profit or gross margin. In a variable costs (both manufacturing and non-manufacturing) is the contribution margin. This difference is illustrated by a condensed comparison of 2007 income statements (in thousands of naira).

Variable costing		**Absorption costing**	
	₦		₦
Revenue	800	Revenue	800
All variable cost	520	All manufacturing cost	650
Contribution margin	280	Gross margin	150
All fixed costs	215	All non-manufacturing costs	105
Operating income	65	Operating income	45

You should note that all manufacturing costs of ₦650,000.00 is standard absorption cost of goods sold (₦640,000.00) plus production – volume variance (₦10,000.00).

Self Assessment Exercise 4.3

(a) State the difference between contribution margin and gross margin.

(b) Distinguish between an absorption costing income statement and a variable costing income statement.

(c) TOSHIBA Nigeria Limited produces bags in 2006 and made the following data available. As a management accountant, you are required to present to the Management of TOSHIBA Nigeria Limited the profit based on variable costing and absorption costing respectively.

Selling price	₦50.00 per unit
Variable manufacturing cost	₦18.00 per unit
Fixed manufacturing cost	₦30,000.00
Selling and administrative costs:	
Fixed	₦20,000.00
Variable	₦8.00 per unit
Units produced	30,000 units
Units sold	25,000 units

3.4 Effects of Changes in Production on Profit

When changes occur in the level of activity, the absorption costing approach may cause some confusion. Assuming in a period, 20,000 units of two products were produced and sold. Costs and revenues were:

			₦
Sales			100,000.00
Production costs:	Variable		35,000.00
	Fixed		15,000.00
Administrative and selling overheads:		Fixed	25,000.00

Using the absorption costing approach, the profit per unit and cost per unit can be calculated as follows:

Selling price per unit		₦5.00
Less: Total cost per unit:	75,000	
	20,000	₦3.75
Profit per unit		₦1.25

If these figures are used as guides to work out results at any activity level other than 20,000, they would be incorrect and may be misleading. For example, if the level of activity changes

to 25,000 units, it might be assumed that the total profits would be 25,000 x ₦1.25 = ₦31,150.00. However, the results are likely to be as follows:

Absorption Costing Income Statement

	₦
Sales (25,000 x ₦5.00)	125,000.00
Less: Production cost (₦35,000 x 1.25 + ₦15,000)	58,750.00
Gross profit	66,250.00
Less: Administrative and selling overheads	25,000.00
Net profit	₦41,250.00

The difference is, of course, caused by the incorrect treatment of the fixed cost. In such circumstances, the use of the variable costing approach presents a clearer picture. Based on the data above, the variable cost per unit and the contribution per unit are calculated as follows:

Variable cost per unit = $\frac{₦35,000.00}{20,000 \text{ units}}$ = ₦1.75

Contribution per unit = Sales price – Variable cost per unit

= ₦5.00 – ₦1.75

= ₦3.25

If the activity is increased form 20,000 to 25,000 units, the expected profit would be:

= (25,000 units x contribution per unit) – Fixed costs

= (250,000 x ₦3.25) – ₦40,000.00

= ₦41,250.00

The variable costing income statement would be:

	₦
Sales	125,000.00
Less: Variable cost (25,000 x ₦1.75)	43,750.00
Contribution	81,250.00
Less: Fixed costs	40,000.00
Net profit	41,250.00

Self Assessment Exercise 4.4

Using the data provided in the example above, if the level of activity increases from 20,000 units to 35,000 units, solve and examine the effect on profit comparing the variable costing and absorption costing income statements.

3.5 Factors to be considered in making a choice between Variable and Absorption Costing

Companies that use operating income to measure results usually prefer variable costing. This is because changes in production volume affect absorption costing income but not variable costing income.

A company that wants to focus managers' effort on sales would prefer to use variable costing, since the level of sales is the primary driver of variable costing income. However, the argument below relate to the use of these techniques in the routine cost accounting system of the organisation and not to their use for decision making or costing.

Arguements for the use of variable costing in routine costing:

(a) Simple to operate;

(b) No apportionments, which are frequently on an arbitrary basis, of fixed costs to product or departments. Many fixed costs are indivisible by their nature, e.g. Managing Director's salary;

(c) Where sales are constant, but production fluctuates (possibly an unlikely circumstance), variable costing shows a constant net profit whereas absorption costing shows variable amounts of profit;

(d) Under or over absorption of overheads is almost entirely avoided. The usual reason for under/over absorption is the inclusion of fixed costs into overhead absorption rates and the level of activity being different to that planned;

(e) Fixed costs are incurred on a time basis e.g. salaries, rent, rates, etc. and do not relate to activity. Therefore, it is logical to write them off in the period they are incurred and this is done using variable costing;

(f) Accounts prepared using variable costing more nearly approaches the actual cash flow position.

Arguments for the use of absorption in routine costing are:

(a) Fixed costs are a substantial and increasing proportion of costs in modern industry. Production cannot be achieved without incurring fixed costs which thus form an inescapable part of the cost of production, so should be included in stock valuation. Variable costing may give the impression that fixed costs are somehow absorbed from production;

(b) Where production is constant but sales fluctuate, net profit fluctuations are less with absorption costing than with variable costing;

(c) Where stock building is a necessary part of operation, the inclusion of fixed costs in stock valuation is necessary and desirable;

(d) The calculation of variable cost and the concentration upon contribution may lead to the firm setting prices which are below total cost although producing some contribution. Absorption cost makes this less likely because of the automatic inclusion of fixed charges.

No generalised, all embracing answer can be given as to which technique should be used. Having regard to all the factors, the accountant should make a judgement as to which technique is more appropriate for the requirements of a particular organisation.

Self Assessment Exercise 4.5

(a) State the factors to be considered that support the use of variable costing approach.
(b) State the factors to be considered that support the use of absorption costing approach.

4.0 CONCLUSION

You would recall that absorption costing is a method of costing stocks in which all production costs such as variable and fixed are included as part of the cost of items. Variable costing emphasises the direct material, direct labour, direct expenses and other variable overheads of a product. It demands that fixed costs of the relevant period are written off in full against the contribution. Basically, the treatment of fixed cost is the fundamental difference between variable and absorption costing.

You should also recall that when changes occur in the level of activity, the absorption costing approach may cause some difference. The difference is caused by the incorrect treatment of the fixed costs in such situation; the use of the variable costing approach presents a clearer picture. No generalised, all embracing answer can be given as to which technique should be used. Having regard to all the factors, you should make a judgement as to which technique is more appropriate for the requirements of a particular organisation.

5.0 SUMMARY

In this unit, we discussed the definitions of variable and absorption costing. We compared variable and absorption costing and also considered the effect of changes in production on profit. Finally, we discussed the factors in making a choice between variable and absorption costing.

In the next unit, you will be introduced to discussion on measurement of cost behaviour in business organisations.

6.0 TUTOR-MARKED ASSIGNMENT

1. Felicity Nigeria Plc. produces plastic crates in 2009 and made the following information available. As a management accountant, you are required to present to the Management of Felicity Nigeria Plc. the profit based on variable costing and absorption costing.

Selling price	₦65.00 per unit
Variable manufacturing cost	₦22.00 per unit
Fixed manufacturing cost	₦40,000.00
Selling and administrative cost: Fixed	₦30,000.00
Variable	₦12.00 per unit
Units produced	50,000 units
Units sold	45,000 units

2. Greenland Nigeria Limited makes a replacement part (a plastic ring) for large plastic injection molding machines. Each machine requires four new rings a year. In 2008 and 2009, the company had the following standard costs for production of rings.

Basic production data at standard cost:

Direct material	₦2.30
Direct labour	₦2.30
Variable manufacturing overhead	₦0.20
Standard manufacturing overhead	₦5.00

The annual budget for fixed manufacturing overhead is ₦250,000.00. Budgeted production is 250,000 rings per year and the sales price is ₦7.00 per ring. Budgeted and actual selling and administrative expenses are ₦80,000.00 per annum as fixed cost plus sales commission at 8% of naira sales.

Actual product quantities are:

In Units (rings)	2008	2009
Opening stock	-	50,000
Production	280,000	240,000
Sales	240,000	260,000
Closing stock	60,000	40,000

There are no variances from the standard variable manufacturing costs and the actual fixed manufacturing overhead incurred is exactly ₦250,000 each year.

Based on the above information, you are required to:

(1) Prepare income statement for 2008 and 2009 under variable costing technique; and

(2) Prepare income statement for 2008 and 2009 under absorption costing technique.

7.0 REFERENCES/FURTHER READINGS

Horngren, C.T., Sunden, G.I., and Strratton, W.O. (2004). Introduction to Management Accounting, 12th edition. U.S.A: Prentice-Hall of India Private Limited.

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UNIT 5 MEASUREMENT OF COST BEHAVIOUR

CONTENTS

1.0 INTRODUCTION

As you know, every organisation engages in some form of activities or the other. Activities use resources and these resources have costs. We measure the relationship between activity and cost using cost drivers. Recall that a cost driver is any output measure that causes costs (that is, causes the use of costly resources), for instance, number of parts received. Measurement of cost behaviour simply means understanding and quantifying how activities of an organisation affect levels of costs.

As you will see, understanding cost behaviour is fundamental to management accounting. There are numerous real world cases in which managers have made very poor decisions to reduce production, close manufacturing plants, or bid too high or too low on jobs because they had erroneous cost behaviour information. Therefore, understanding relationships between costs and their cost drivers allows managers to evaluate new manufacturing methods or service practices, make proper short-run marketing decisions, make short-run production decisions, plan or budget the effects of future activities, design effective management control systems, make proper long-run decisions and design accurate and useful product costing systems.

Now that you are aware that knowledge of the patterns of cost behaviour and ways that future costs can be predicted is a fundamental requirement for the management account, it would enable you to have a more meaningful insight into the measurement of cost behaviour.

2.0 OBJECTIVES

After studying this unit on measurement of cost behaviour, you should be able to:

(i) explain that, as level of activity changes, there is a corresponding increase or decrease on the total variable cost;

(ii) explain that the level of activity changes do not affect the fixed cost but could result in stepped up fixed cost;

(iii) define mixed cost, and the various techniques used in separating mixed cost into fixed and variable cost.

3.0 MAIN CONTENT

3.1 Effect of Changes in Activity on Both Total Variable Costs and Per Unit Variable Costs

A variable cost is a cost that varies with the measure of activity. Examples include: direct materials, royalties per unit, power usage, without a standing charge). Variable cost can be analyzed into two main groups, namely: linear and non-linear or curvilinear.

(a) **Linear Variable Cost**

This is the easiest way of showing the relationship between total variable cost and changes in activity as a straight line graph:

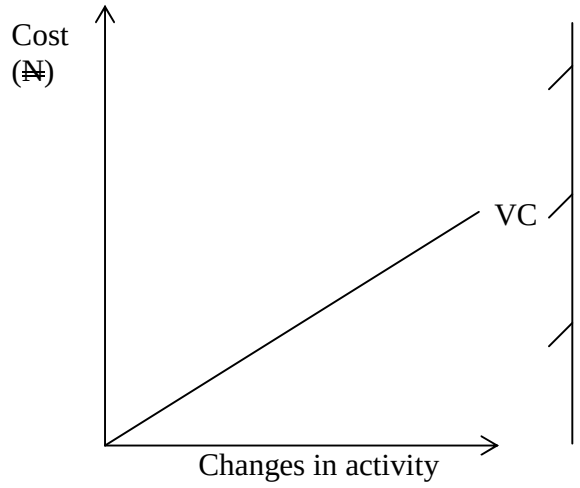

Figure 3.1.1 Linear Variable Cost

As you can see from the graph above, there is a linear relationship between total variable cost and changes in activity. That means the more there are changes in the level of activity, the more the cost will proportionately increase. In order to ensure easy computation and analysis, the linear relationship is expressed algebraically as:

Total Variable Cost = b (x)

where: x = volume of output in units / hours
b = a constant representing the variable cost per unit

Illustration 3.1.1

The materials contained in each assembly GT – 400 are:

6 kgs of material A at ₦2.50 each
30 kgs of material B at ₦4.00 each
16 kgs of material C at ₦3.00 each

What is the expected variable cost of materials for producing 80 assemblies?

Solution 3.1.1

				₦
6 kgs of material A at ₦2.50	=	(6 x ₦2.50)	=	15.00
30 kgs of material B at ₦4.00	=	(30 x ₦4.00)	=	120.00
16 kgs of material C at ₦3.00	=	(16 x ₦4.00)	=	48.00
Variable cost per assembly			=	183.00

Total variable cost = ₦183.00 x 80 = **₦14,640.00**

(b) **Non-Linear (or Curvi-Linear) Variable Cost**

Recall that in the case of linear variable cost, there is a proportionate increase in cost, in relationship with the level of activity. However, in the case of non-linear variable cost, you would observe that an extra unit of output would cause a less than proportionate increase in cost or a more than proportionate increase, which is called a convex. When it is a more than proportionate increase, it is called a concave. The non-linear variable costs are explained graphically below. The non-linear cost curve establishes the relationship between output and variable cost as that of a curved line on a graph, unlike the linear cost curve which is straight line as shown in figure 3.1.

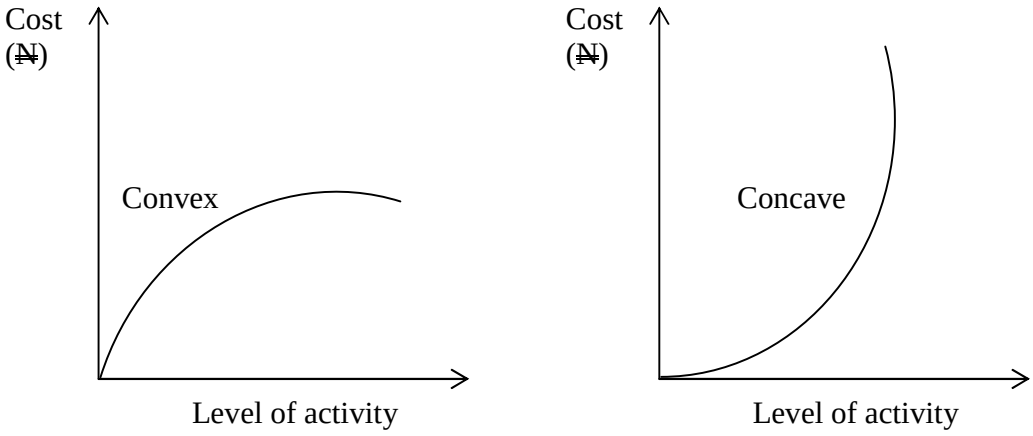

Figure 3.1.2 Non-Linear (or Curvilinear) Variable Cost

The non-linear variable cost can be shown algebraically as:

Cost = $bx + cx^2 + dx^3 + \ldots\ldots px^n$

where: x = volume of output in units
b, c, d … p = constants representing the variable cost per unit

Illustration 3.1.2

Analysis of cost and activity records for a project show that the variable cost can be accurately represented by the function:

Cost = ₦$(bx + cx^2 + dx^3)$

where b = 10; c = 0.7 and d = 0.8.

Calculate:

(i) Variable cost when production is 20 units;
(ii) Variable cost when production is 25 units. Is the function convex or concave?

Solution 3.1.2

1. Cost = ₦ $(10 \times 20) +$ ₦ $(0.7 \times 20^2) +$ ₦ (0.8×20^3) = ₦1,120.00

2. Cost = ₦ $(10 \times 25) +$ ₦ $(0.7 \times 25^2) +$ ₦ (0.8×25^3) = ₦1,937.35

You will observe that a slight increase in activity from 20 to 25 units resulted in almost doubling of variable cost. This shows that there is a more than proportionate increase in the unit cost of extra production. Hence, you can conclude that the function is concave.

Self Assessment Exercise 5.1

(a) Define variable cost.

(b) Explain a linear and a non-linear variable cost.

(c) Explain the difference between a convex and a concave non-linear variable cost.

(d) The materials contained in each assembly Zone ID are:

20 kgs of material A @ ₦5.00 each
60 kgs of material B @ ₦2.00 each

30 kgs of material C @ ₦10.00 each.

What is the expected variable cost of materials for producing 65 assembles?

(e) Analysis of cost and activity records for a project show that the variable cost can be accurately represented by the function:

Cost = ₦$(bx + cx^2 + dx^3)$

where b = 30; c = 0.5 and d = 0.6.

Calculate:
(i) Variable cost when production is 10 units;
(ii) Variable cost when production is 15 units to the function convex or concave?

3.2 Effect of Changes in Activity on both Total Fixed Cost and Fixed Cost expressed on a per unit basis

A cost which is incurred for an accounting period and which, within certain output or turnover limits tend to be unaffected by fluctuations in the level of activity is known as a fixed cost. A fixed cost can also be referred to as a period cost. Since fixed costs are a function of time, they do not respond to changes in the levels of activity. Therefore, changes in cost are not related to changes in the volume of activity within a given range of activity.

Examples of fixed costs include: rates, salaries, rent, time-based depreciation. From the above, you can understand that a fixed cost is a cost incurred, whether the company is producing or not. That is why it is described as a period cost. A fixed cost can be shown graphically as:

(a) **Fixed Cost**

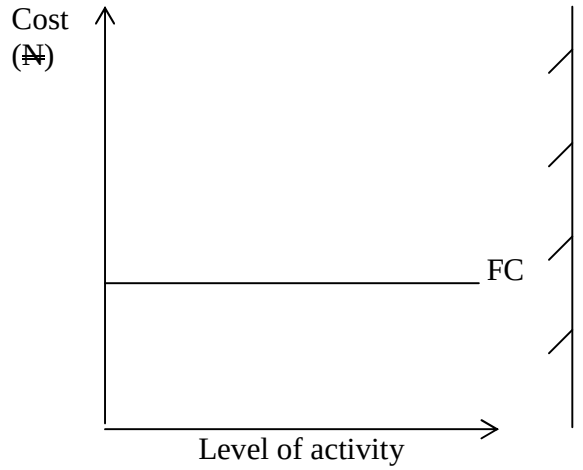

Figure 3.2.1 Linear Variable Cost

You will observe from the graph that the fixed cost (FC) is an horizontal line indicating that, at any level of activity, the fixed cost remains the same.

Although we have described fixed costs as unchanging regardless of changes in the given cost driver, this rule of thumb holds true only within reasonable limits. Fixed cost can increase or step up only after a range of activity and not at every level of activity. For example, rent costs which are generally fixed will rise if increased production requires a larger or additional building or if the landlord decides to raise the rent. On the contrary, rent costs may go down if decreased production causes the company to move to a smaller plant. You can see that there is only a step up of fixed cost when a range of activity is exceeded.

This can be represented graphically below:

(b) **Stepped Fixed Cost**

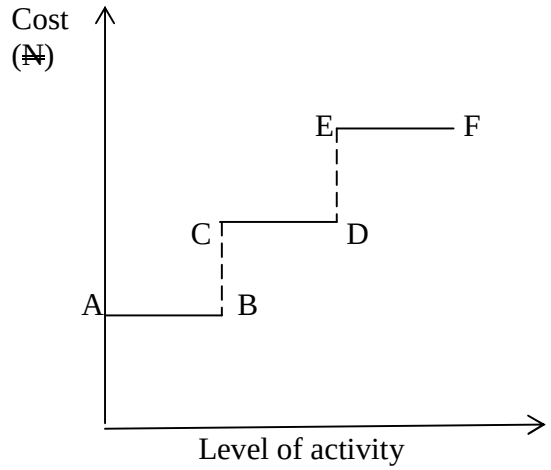

Figure 3.2.2 Non-Linear Variable Cost

You will observe from the above graph that after a range of activity, the fixed cost stepped up. You will also see that between points A to B level of activity, there was a fixed cost of ₦A incurred. You will further see that the company's fixed cost would increase to ₦C if it operates at level of activity CD. Similarly, the fixed cost would step up to ₦E if the company operates at level of activity EF.

The limit of cost-driver activity level within which a specific relationship between costs and the cost driver is valid, is called **Relevant Range**. Hence, you will observe from the above graph figure 3.2.2 that points AB, CD and EF represent various relevant range of activity. Even though fixed costs can be depicted on a graph, it can also be shown algebraically as – $y = a$, where y is the cost, and a, is a constant.

Self Assessment Exercise 5.2

(a) Define fixed cost.

(b) Why is fixed cost described as a period cost?
(c) What do you understand by the term “relevant range”?

3.3 Semi-Variable Cost

As you may suspect, it is often difficult to classify a cost as exactly variable or exactly fixed. Semi-variable cost contains both fixed and variable components and which is thus partly affected by a change in the level of activity. Examples of semi-variable cost are PHCN (NEPA) bill, water rate and some GSM operations bills. Semi-variable cost can be represented graphically below:

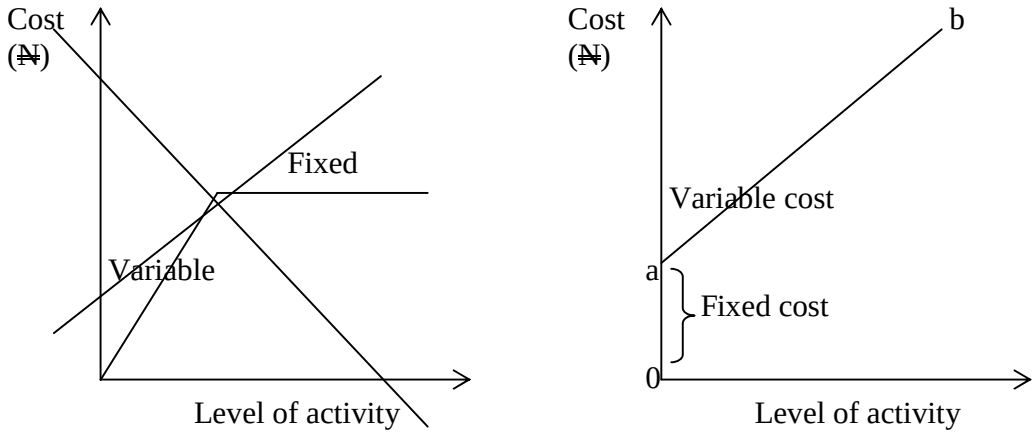

Figure 3.3.1 Semi-variable Cost

The above graph shows that at point a, the company would spend ₦a as fixed cost to discharge such obligation and spend variable cost as level of activity increased beyond point a. Example is PHCN (NEPA) bill with access fees which represent the fixed cost and the variable cost which is determined by the level of consumption.

Semi-variable costs can also be expressed algebraically by bringing together the expressions for variable cost and fixed cost thus:

Linear semi-variable cost = $a + bx$

Where ‘a’ represents fixed cost;
b represents the unit variable cost; and
x represents the level of activity.

Non-linear semi-variable cost = $a + bx + cx^2 + dx^3 \ldots. + px^n$

Illustration 3.3.1

Consider the maintenance packaging unit of TOSA Limited which shows that there is a fixed cost element of ₦5,000.00 per month and variable cost element relating to hours amounting to ₦ 6.00 per machine hour. What is the expected cost for a month when the planned activity level is:

1. 2,500 machine hours?
2. 3,000 machine hours?

Solution 3.3.1

1. Total cost = a + bx

   = ₦5,000.00 + (₦6.00 x 2,500)

   = **₦20,000.00**

2. Total cost = ₦5,000.00 + (₦6.00 x 3,000)

   = **₦23,000.00**

You should note that semi-variable cost can be referred to as **mixed cost**. The value in solution 3.3.1 is a mixed cost (₦20,000.00 and ₦23,000.00). There might be times where a mixed cost is incurred and there would be the need to separate the mixed cost into fixed and variable cost in order to facilitate management decision-making. Therefore, mixed costs can be separated into a variety of techniques. Some of the techniques that would be discussed as you proceed in this are:

1. The high – low method or the range method;
2. Scatter graph; and
3. Regression analysis.

Self Assessment Exercise 5.3

1. Explain what you understand as semi-variable cost.

2. Mention three techniques that can be used to separate mixed cost.

3. A breakdown of maintenance packaging department of PHCN Plc. costs shows that there is a fixed element of ₦10,000.00 per month and a variable element related to hours amount to ₦4.00 per machine hour. What is the expected cost for a month when the planned activity level is:

   (i) 4,000 machine hours?
   (ii) 5,000 machine hours?

3.4 Use of High-Low Method

By this method, a check is made of historic costs in previous accounting periods and the costs in the two particular periods are selected for cost estimation namely:

(1) the period with the highest volume of output; and
(2) the period with the lowest volume of output.

You should note that the periods with the highest / lowest output may not be the periods of highest or lowest cost. The difference between the total cost of the high output and the total cost of the low output will be the variable cost of the difference in output level.

Illustration 3.4.1

The costs of operating the maintenance department of a computer manufacturer, for the last five months have been as follows:

Month	**Amount (₦)**	**Production Volume (Standard hour)**
January	120,000.00	6,000
February	125,000.00	7,000
March	104,000.00	5,000
April	121,000.00	8,000
May	125,000.00	8,500

What cost should be expected in month 6 when output is expected to be 10,000 standard hours?

Solution 3.4.1

Steps:

1. Determine the variable cost per standard hour;
2. Determine the fixed cost; and
3. Determine the expected cost in month 6.

A. 1. High output 8,500 hours
Low output 5,000 hours
3,500

B. Total cost as per high output ₦125,000.00
Total cost as per Low output ₦104,000.00
Total variable cost of 3,500 standard hour = ₦21,000.00

C. Variable cost per standard hour = $\frac{₦21,000.00}{3,500}$

= **₦6.00**

2. Substituting in either the high or low volume cost:

	High (8,500 hours)		Low (5,000 hours)
	₦		₦
Total cost	125,000.00		104,000.00
Variable cost (8,500 x ₦6.00)	51,000.00	(5,000 x ₦6.00)	30,000.00
Fixed cost	74,000.00		74,000.00

You should note that whichever volume cost is used, the fixed cost would be the same.

3. Estimated total cost of 10,000 standard hours of output:

	₦
Fixed costs	74,000.00
Variable costs (10,000 x ₦6.00)	60,000.00
	134,000.00

Advantages of High and Low Method

1. It is relatively simply to operate;

2. It is a quick and inexpensive method of determining the underlying relationship of cost and level of activity; and

3. It is not subjective.

Disadvantages of High and Low Method

1. It ignores any information between the two extreme observations;

2. It is not fully represented because it does not make use of the whole of the available data; and

3. When the extreme points are not typical, the function calculated will reflect an abnormal rather than normal cost function. That is, a situation where there is no relationship between the level of activity and the costs.

Self Assessment Exercise 5.4

1. What are the advantages and disadvantages of using high – low method?

2. You have been asked to prepare an analysis between fixed and variable costs in your department. The power costs do not seem to fit into either category easily. The details are as follows:

Week	Power Cost (₦)	Machine Hours
1	3,600.00	8,000
2	3,950.00	9,000
3	3,050.00	6,500
4	3,380.00	7,400
5	3,870.00	8,600
6	4,020.00	9,200
7	2,095.00	3,700

You are required to:

1. Separate the cost, finding the closest estimate of the element and the variable cost per machine hours, using high and low method;

2. Estimate the total cost likely in week 8 if the expected level of machine hours is 8,000.

3.5 Use of Scatter Graph

This is a visual technique which coordinates the cost and the level of activity of historical records for a period of time and is plotted on a graph. Because it uses all the available data instead of just two points, the scatter graph is more reliable than the high-low method.

In the scatter graph method which can also be called the visual-fit method, we draw a straight line through a plot of all the available data, using judgement to fit the line as close as possible to all the plotted points.

If the cost function for the data is linear, it is possible to draw a straight line through the scattered points that comes reasonably close to most of them and thus captures the general tendency of the data.

We can extend that line back until it intersects the vertical axis of the graph. At the point of interception with the cost axis, the fixed cost emerges.

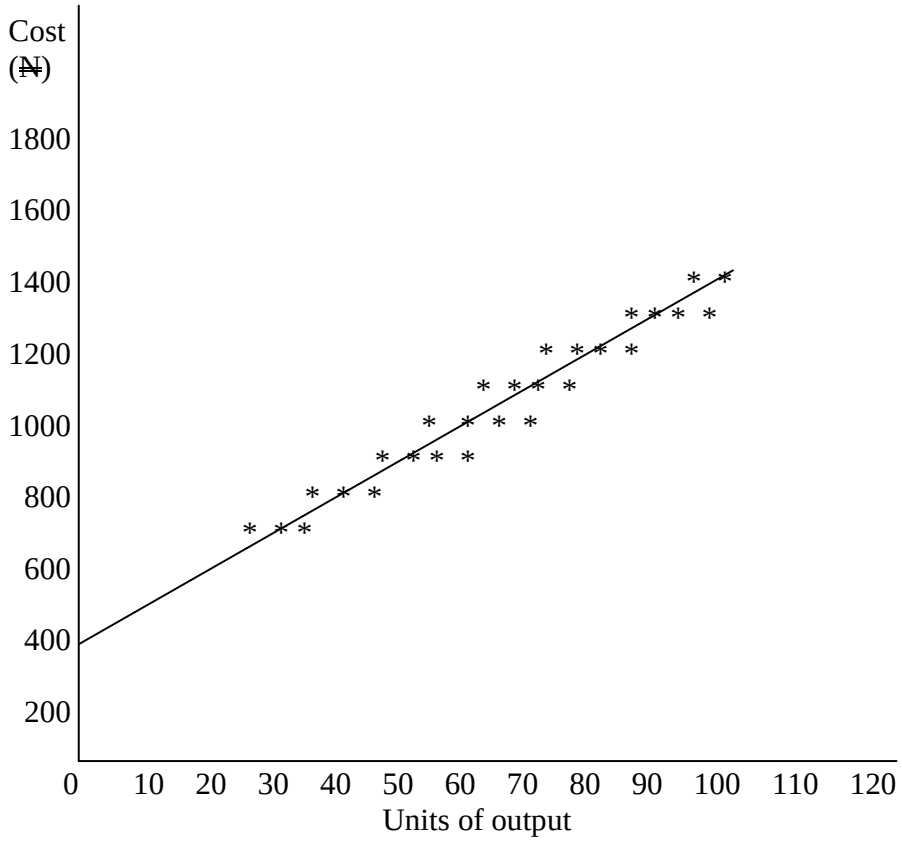

Figure 3.4.1 Scatter graph showing visual line of best fit

You would observe from the graph above that the dotted line is drawn to show the intersection with the vertical axis and thus gives an estimate of the fixed content of the cost being considered; in this case, ₦400.00. The slope of the line i.e. the variable element is found as follows:

Cost @ zero activity = ₦400.00
Cost @ 100 units activity = ₦1,200.00

$$\text{Variable cost per unit} = ₦\frac{(1{,}250.00 - 400.00)}{100 - 0}$$

$$= ₦8.50$$

Therefore, the estimate cost function = ₦400.00 + 8.5x

where x = units of output

The graphical method is simple to use and provides visual indication of approximate cost behaviour. In view of the fact that each individual is likely to draw a different line with a different slope, the method is subjective and approximate. This subjectivity is the main

reason that the visual-fit method or scatter graph is now replaced by least squares regression analysis.

Self Assessment Exercise 5.5

What is the major deficiency of scatter graph or visual-fit method?

3.6 Use of Least Square Regression Method

The least square regression measures a cost function more objectively (with statistics rather than human eye sight) than does the visual-fit method. Regression analysis that uses one cost driver to measure a cost function is called simple regression. The use of multiple cost drivers for a single cost is called multiple regression. We will discuss only simple regression analysis here. The least square is frequently used to establish values for the coefficients – *a* and *b* (representing fixed and variable costs respectively (in the linear cost function).

$$y = a + bx$$

where y is total cost – the dependent variable
x is the agreed measure of activity – the independent variable.

Simple regression analysis can easily be calculated using one of the following approaches, either:

Solve the following two equations:

$$\sum y = an + b\sum x \quad \ldots\ldots\ldots\ldots \quad (1)$$
$$\sum xy = a\sum x + b\sum x^2 \quad \ldots\ldots\ldots\ldots \quad (2)$$

Or, transpose the normal equations stated above and calculate the coefficients directly:

$$a = \frac{\sum y\sum x^2 - \sum x\sum xy}{n\sum x^2 - (\sum x)^2}$$

$$b = \frac{\sum xy - \sum y\sum x}{n\sum x^2 - (\sum x)^2}$$

Both approaches are illustrated in the following example.

Illustration 3.5.1

The following data have been collected on costs and output:

Output ('000)	1	2	3	4	5	6	7
Costs (₦'000)	14	17	15	23	18	22	31

Calculate the coefficients in the linear cost function y = a + bx, using:

(1) the normal equation;
(2) the coefficient function.

Solution 3.5.1

Output (x)	**Cost (y)**	**xy**	**x^2**
1	14	14	1
2	17	34	4
3	15	45	9
4	23	92	16
5	18	90	25
6	22	132	36
7	31	217	49
$\sum x = 28$	$\sum y = 140$	$\sum xy = 624$	$\sum x^2 = 140$

where n = 7 (i.e. number of pairs of readings)

1. Using the normal equations:

140	=	7a + 28b	…….	(1)
624	=	28a + 140b	…….	(2)

and eliminating one coefficient thus:

624	=	28a + 140b	…….	(2)
560	=	28a + 112b	…….	(1) x 4
64	=	28b		

b = 2.286 and substituting this value in one of the equations, the value of a is found to be 10.86.

Therefore, Regression line is y = 10.86 + 2.286x

2. Using the coefficient formulae:

$$a = \frac{(140 \times 140) - (28 \times 624)}{7(140) - 28^2} = 10.86$$

$$b = \frac{7(624) - (28 \times 140)}{7(140) - 28^2} = 2.286$$

When you have calculated the coefficients, the cost function can be used for forecasting simply by inserting the appropriate level of activity. For example, what are the predicted costs at output levels of:

(a) 4,500 units (i.e. 4.5 in 000's), and
(b) 8,000 units (i.e. 8 in 000's)?

(a) $y = 10.86 + 2.286 (4.5)$ = ₦21.147

You should note that a prediction within the range of the original observations (1 to 7 in Example 1) is known as interpolation.

(b) $y = 10.86 + 2.286 (8)$ = ₦29.148

You should also note that a prediction outside the range of original observations is known as an extrapolation.

Advantages of Regression Analysis

1. Line of best fit can be easily recognised and could be extended through the use of multiple regression analysis;

2. It uses the whole data, unlike the high and low methods.

Disadvantages of Regression Analysis

1. A reasonable number of observations are required;

2. The elimination of non-random variables can reduce the available data and frustrate any attempt to fix the curve statistically to the observation;

3. A true relationship may not be linear; it may be curvilinear.

Self Assessment Exercise 5.6

Costs in the repairs and maintenance department of TOSA Limited in previous periods have been recorded as follows:

	Output (Standard hours of Production)	Repair and Maintenance Costs
1	2,400	6,400
2	2,300	6,400
3	2,500	6,460
4	2,700	6,600
5	2,000	5,900
6	2,860	7,000

1. Use the least squares technique to estimate the fixed and variable costs;

2. What should be the budget estimate for repairs and maintenance of output of 3,000 standard hours is predicted?

4.0 CONCLUSION

You would recall from our discussions that the level of activity has increased effect on the total variable cost as the level of activity increases. This relationship could be linear or non-linear. You would also recall that the effect of changes in activity on fixed cost is static because it is a period cost. However, we discussed that, after a range of activity, fixed cost could step up, but not at every level of activity.

You would further recall that semi-variable cost contains both fixed and variable components and which is thus partly affected by a change in the level of activity. Semi-variable cost can also be called mixed cost. In order to provide information to facilitate management decision-making, mixed cost can be separated into fixed and variable cost by the use of high and low method, scatter graph and least square regression analysis.

5.0 SUMMARY

In this unit, we have discussed generally the measurement of cost behaviour. We discussed the effects of changes in activity on fixed cost and variable cost. We also considered semi-variable cost which led us to the use of techniques such as high and low method, scatter graph and least square regression analysis, as techniques used in the separation of fixed and variable cost to facilitate planning and decision-making.

In the next unit, we shall discuss transfer costing system and target costing.

6.0 TUTOR-MARKED ASSIGNMENT

(1) Martina Evert, President of Evert Tool Company, has asked you, as the Management Accountant, for information about the cost behaviour of manufacturing support costs. Specifically, she wants to know how much support cost is fixed and how much is variable. The following data are the only records available:

Month	Machine Hours	Support Costs (₦)
May	850	9,000
June	1,300	12,500
July	1,000	7,900
August	1,250	11,400
September	1,750	13,500

Find the monthly fixed support cost and the variable support machine hour by the high-low method, and show the variable cost for the period May to September.

2. On November 15, 2009, Sheila David, a newly-hired cost analyst at David Company, was asked to predict overhead cost for the company's operation in 2010, when 510 units are expected to be produced. She collected the following quarterly data:

Quarter	Production in Units	Overhead Costs (₦)
1/06	76	721
2/06	79	715
3/06	72	655
4/06	136	1,131
1/07	125	1,001
2/07	128	1,111
3/07	125	1,119
4/07	133	1,042
1/08	124	997
2/08	129	1,066
3/08	115	996
4/08	84	957
1/09	84	835
2/09	122	1,050
3/09	90	991

(1) Using the high-low method to estimate costs, prepare a prediction of overhead costs for the last quarter of 2009;

(2) Sheila ran a regression analysis using the data she collected. The result was – y = ₦337.00 + ₦575.00x. Using this cost function, predict costs for the last quarter of 2009.

(3) Which prediction do you prefer? Why?

7.0 REFERENCES/FURTHER READINGS

Horngren, C.T., Sunden, G.I., and Strratton, W.O. (2004). Introduction to Management Accounting, 12th edition. U.S.A: Prentice-Hall of India Private Limited.

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MODULE 2 BUDGETING AND CAPITAL INVESTMENT

UNIT 6 TRANSFER PRICING SYSTEM AND TARGET COSTING

CONTENTS

1.0 INTRODUCTION

In this unit, we shall be discussing transfer pricing system and target costing. Transfer pricing is the process of determining the price at which goods are transferred from one profit centre to another profit centre within the same company. Transfer pricing is an internal issue to a company which can be used for performance appraisal.

Target costing is cost management tool for making cost a key focus throughout the life of a product.

This unit will enlighten you on the relevance of transfer pricing and target costing to a company.

2.0 OBJECTIVES

After studying this unit, you should be able to:

(i) define transfer pricing;
(ii) explain the requirements that transfer pricing must meet;
(iii) examine the economic approach to transfer pricing;
(iv) explain the various methods of transfer pricing;

(v) explain target costing.

3.0 MAIN CONTENT

3.1 The Necessity of Transfer Pricing

You will recall from the introduction that transfer pricing was defined as the process of determining the price at which goods are transferred from one profit centre to another profit centre within the same company. Such internal trading is more prevalent within horizontally and vertically integrated companies than conglomerate operations with their heterogeneous groupings.

If profit centres are to be used, transfer prices become necessary in order to determine the separate performances of both the 'buying' and 'selling' profit centres. (A profit centre is any sub-unit of a company i.e. a division of a company) which is responsible for revenue, costs and profit. In other words, it is a unit to which both revenue and costs are assigned, such that the profitability of the sub-unit can be measured. If transfer prices are set too high, the selling centre will be favoured whereas if set too low the buying centre will receive an unwarranted proportion of the profits.

In general terms, transfer pricing is purely an internal bookkeeping exercise which does not affect the overall profitability of the firm.

Self Assessment Exercise 6.1

What is transfer pricing?

3.2 Basic Requirement of Transfer Pricing

In an ideal situation, transfer prices should be set in a manner and at a level which fulfill three basic requirements, namely:

(a) **Goal Congruence** – The prices should be set so that the divisional management's desire to maximise divisional earnings is consistent with the objectives of the company as a whole. The transfer prices should not encourage sub-optimal decision-making.

(b) **Performance Appraisal** – The prices should enable reliable assessments to be made of divisional performance. The prices for part of information which should guide decision-making, appraise managerial performance, evaluate the contribution made by the division to overall company profits and assess the worth of the division as an economic unit.

(c) **Divisional Autonomy** – The prices should seek to maintain the maximum divisional autonomy so that the benefits of decentralisation (motivation, better decision-making,

initiative etc.) are maintained. The profits of one division should not be dependent on the actions of the other divisions.

You should note that, in practice, there are extreme difficulties in establishing prices which meet all these requirements. If prices are set centrally at levels where overall company objectives are met, then the autonomy of divisions is jeopardized, motivation may diminish and some of the benefits of decentralisation will be lost.

Alternatively, where divisions act autonomously and freely set transfer prices, sub-optimal decision-making is hard to avoid. There is no completely satisfactory solution to this problem, but research studies suggest that companies are prepared to accept a certain level of sub-optimal decision-making on the part of divisions in order to gain the more than compensating advantages which they perceive arise from decentralisation.

Self Assessment Exercise 6.2

1. Enumerate and explain the requirements for transfer pricing.
2. Is the requirements of transfer pricing absolutely attainable? Discuss.

3.3 Economic Approach to Transfer Pricing

Before discussing the various methods used in practice for setting transfer prices, it is useful to consider the relevant aspects of economic analysis which indicate the theoretical optimum price.

Given a profit maximising objective, economic theory stipulates that the marginal net revenue product of each resource throughout the company should be the same. This means that the equilibrium transfer price would be the marginal cost of the selling division for that output level at which this marginal cost equals the buying division's marginal revenue product from the use of the resources or item transferred.

This can be shown graphically in the illustration below:

Illustration 3.3.1

Assuming, a company has two divisions, S and B. S makes an intermediate product which can be sold to division B or on the open market which is perfectly competitive. Division B has complete freedom to buy from S or on the open market. It can be assumed:

(a) that there is perfect knowledge of all cost and revenue functions;

(b) that the buying and selling costs on the open market are the same as for internal buying and selling;

(c) that the firm has a profit maximising objective.

Let S be supplying division
B be buying division
P_1 open market price of intermediate product
MC_S marginal cost function of S
MC_B net marginal revenue function of B

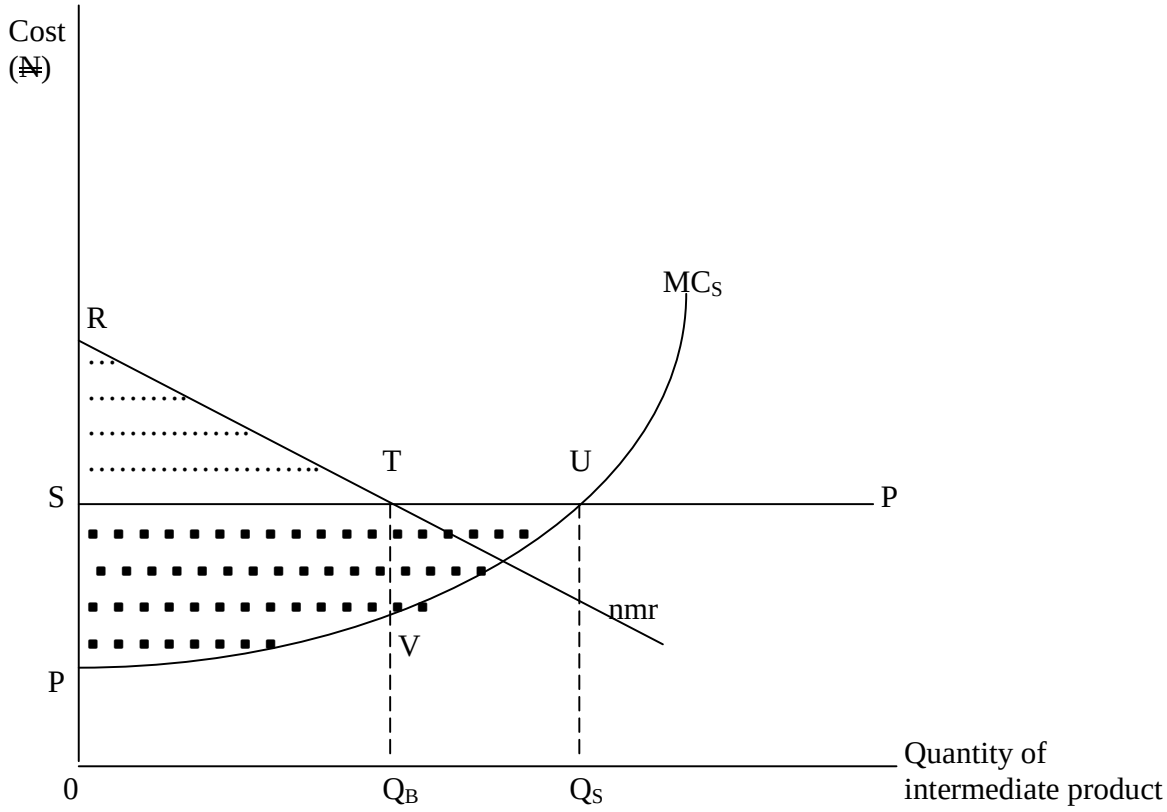

Figure 3.3.1

You should note the following:

(a) The net marginal revenue function (nmr_B) is the difference between the selling price of the final product and division B's own marginal cost, i.e. excluding the cost of the intermediate product transferred from Division S.

(b) OQ_S represents the total output of intermediate products from Division S. OQ_B represents the amount of output transferred to Division B while the difference between Q_S and Q_B represents the amount sold on the open market.

(c) The shaded area, PSRTU, represents total profits for the company as a whole which could be distributed as follows:

Area RST to division B,
Area SUP to division S.

The reasoning for this is that RTU is the net marginal revenue function for the firm as a whole resulting from sales of the final product; so that the area above pi (transfer price of intermediate product) represents the marginal revenue resulting from the inclusion of the intermediate product into the final product. The area SUP shows the difference between the marginal cost of the intermediate products either as part of the final product (area STVP) or as direct sales of the intermediate product (area TUV).

(d) The optimal quantities, Q_B and Q_S, are found by the usual method of equating marginal revenue to marginal cost. Q_B corresponds to the intersection of the net marginal revenue division B with pi. Q_S corresponds to the intersection of pi and the marginal cost division S.

You should recall that in conditions of perfect competition as assumed in this case, the selling price per unit is equal to average revenue and average revenue is equal to marginal revenue.

In this particular case, division S will be indifferent as to whether to transfer internally or sell on the open market. Similarly, division B can buy internally or externally as desired and in each case, the price would be pi.

(e) Transfer pricing policies are based on the marginal costs of the supplying division plus any opportunity costs to the whole organisation. However, in this case, no opportunity costs were identified so that the optimal transfer price is the stated intermediate product market price, pi, which also enables the two quantities, Q_B and Q_S, to be determined.

Self Assessment Exercise 6.3

What is the theoretically optimum transfer price?

3.4 Method of Setting Transfer Pricing

Generally, there is insufficient information to set prices using the economic analysis previously described. Companies need to use methods for selling transfer prices which are feasible, which use information that is available without undue costs, and which meet as many of the requirements of transfer pricing.

The methods utilised can be divided into three categories, namely:

(a) Market-based pricing;
(b) Cost-based pricing; and
(c) Negotiated pricing.

(a) Market-Based Pricing

Where a market exists outside the firm for the intermediate product and where the market is competitive (i.e. the firm is a price taker) then the use of market price as the transfer price between divisions would generally lead to optimal decision-making. Where significantly external buying and selling costs exists, then a transfer price may be set somewhat lower than market price to reflect the cost savings from internal transfers. These circumstances may lead to negotiated market prices where the total cost savings are apportioned between the buying and selling divisions.

Where appropriate market prices exist, their use represents a feasible ideal. However, there are difficulties in applying the concept universally. These include:

(1) frequently, there is no market for the intermediate product or service. This is typically the case for specialised components, materials, parts or services;

(2) it may be difficult to obtain an appropriate price;

(3) there may not be the availability of perfectly competitive market; and

(4) available market prices may be considered unrepresentative.

(b) Cost-Based Pricing

Cost-based transfer pricing systems are usually used because the conditions for selling ideal market prices frequently do not exist. Given all the difficulties in establishing ideal prices, firms have to find some answer to the transfer pricing problem so that methods based on costs which are readily available from the normal accounting systems are frequently used. A general problem which arises in such circumstances is that the costs may include inefficiencies of the selling division which would thus be transferred to the buying division. In order not to burden the buying division with the inefficiencies of the selling division, standard costs should be used as the basis of transfer price instead of actual cost. The two main cost derived methods are those based on full cost and variable cost.

(1) Full Cost Transfer Pricing Method – This method is full costs plus a profit mark up. It has the disadvantage that sub-optimal decision-making may occur particularly when there is idle capacity within the firm.

Example 1

Division S sells to division B at full cost plus $33\frac{1}{3}\%$ and division B sells externally at a similar mark up. The following data are available:

Division S	Division B
₦	₦

Variable cost per unit	26	Transfer price	48
Fixed cost per unit	10	Own variable cost per unit	15
Total cost per unit	36	Fixed cost per unit	9
Mark up	12		72
Transfer price	₦48	Mark up	24
		Selling price	₦96

Thus, based on the stated pricing rules, division B would be attempting to sell at ₦96.00. If spare capacity exists then B may try to obtain any price above marginal cost but is likely to treat marginal cost as the variable cost of the division that is ₦63.00 (₦48.00 + ₦15.00). As far as the firm as a whole is concerned, the marginal cost is the variable cost in each division, ₦41.00 (₦26.00 + ₦15.00) so that the firm may lose a contribution margin if ₦63.00 is deemed to be the minimum acceptable figure for marginal pricing.

Full cost transfer pricing suffers from a number of other limitations. They are:

(1) the calculated cost is only accurate at one level of output;

(2) the validity of any pricing decision based on past costs is questionable;

(3) when transfers are made at full cost plus a profit mark up, the selling division is automatically given a certain level of profit rendering genuine performance appraisal difficult;

(4) when the selling division is inefficient or working at low volume, the cost may be unacceptably high as far as the buying division is concerned.

(2) Variable Cost Transfer Pricing – Variable cost transfer pricing demands that transfers be made at the (standard) variable costs up to the point of transfer. Assuming that the variable cost is a good approximation of economic marginal cost, then this system would enable decisions to be made which would be in the interest of the firm as a whole. However, variable cost-based prices will result in a loss for the selling division. So, performance appraisal becomes meaningless and motivation will be reduced.

A possible way of resolving this dilemma is to use a variable cost-based transfer price so that sub-optimal decision-making is minimised. And as a separate exercise, credit the selling division with a share of the overall profit which eventually results from the transferred item.

(c) Negotiated Pricing

Transfer prices could be set by negotiation between the buying and selling divisions. This would be appropriate if it could be assumed that such negotiations would result

in decisions which are in the interests of the firm as a whole and which are acceptable to the parties involved.

However, there are difficulties in this approach because it is unlikely that the parties concerned have equal bargaining power and protracted negotiations may be time-consuming and divert management energies away from their primary tasks. Disagreements, which are all too likely, will require some form of arbitration by central management which itself undermines the autonomy of divisions and may cause resentment.

Self Assessment Exercise 6.4

1. What is market-based transfer pricing and why might there by difficulties in using this approach?

2. Describe full cost transfer pricing and its characteristics.

3. What is variable cost transfer pricing and how might any possible demerits be overcome?

4. What is negotiated transfer pricing?

3.5 Target Costing

Consider a situation when a company is deciding whether to develop and market a new product. In evaluating the feasibility of the new product, management must determine both the price it can charge and the expected cost. The market conditions are such that management cannot influence prices. If a company is to achieve management's desired profit, it must focus on the product's cost. What management needs is an effective tool to reduce costs without reducing value to the customer. Target costing is a cost management tool for making cost reduction a key focus throughout the life of a product. A desired or target cost is set before creating or even designing the product. The target cost is based on the product's predicted price and the company's desired profit. Managers must then try to reduce and control costs so that the product's cost does not exceed its target cost. The emphasis of target costing is on proactive, up-front planning throughout every activity of the new product development process.

Self Assessment Exercise 6.5

What is target costing?

4.0 CONCLUSION

You would recall from the discussion so far that transfer pricing is described as the process of determining the price at which goods are transferred from one profit centre to another

profit centre within the same company. The basic requirements which transfer pricing must meet are goal congruence, performance appraisal and divisional autonomy.

The methods of setting transfer prices are market-based pricing, cost-based pricing and negotiated pricing. Target cost is a cost management tool for making cost reduction a key focus throughout the life of a product.

5.0 SUMMARY

In this unit, we discussed transfer pricing and target costing. We discussed the necessity of transfer pricing, basic requirements of transfer pricing, the economic approach to transfer pricing and method of setting transfer pricing.

In the next module, we shall discuss strategic and performance management.

6.0 TUTOR-MARKED ASSIGNMENT

1. What is transfer pricing?

2. Is the requirements of transfer pricing absolutely attainable? Discuss.

3. What is market-based transfer pricing and why might there be difficulties in using this approach?

4. What is target costing?

7.0 REFERENCES/FURTHER READINGS

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UNIT 7 CAPITAL INVESTMENT DECISION

CONTENTS

1.0 INTRODUCTION

In the last module, we discussed pricing decisions in the firm. In this module, discussions would centre on strategic performance and management. The first unit in this module would be devoted to capital investment decision.

Capital investment decision can be seen as a firm's decision to invest its current funds in long term activities in anticipation of an expected flow of future benefits over a number of years. the investment decision could be in the form of acquisition of additional fixed assets, replacements and modifications of activities or expansion of a plant. Consequently, the financial manager should give due consideration to the following factors when capital budgeting decisions are involved:

(1) availability of investment capital and its alternative;
(2) the huge expenditures or large cash outlay;
(3) the gestation period between initial expenditures and returns, and
(4) the expectation of higher returns because of factors (1) and (2) above.

Based on the factors stated above, the manager must not fail to make appropriate investment or selection of good projects because the volume of fixed assets far exceed current assets and the owners of the company (shareholders) are long term investors, whose high expected returns can only be met with the higher returns from long term assets.

2.0 OBJECTIVES

After studying this unit, you should be able to:

(i) define capital investment decision;

(ii) define and calculate:

(a) accounting rate of return;
(b) payback period;
(c) net present value;
(d) internal rate of return;

(iii) explain the impact of taxation and inflation on capital budgeting.

3.0 MAIN CONTENT

3.1 Capital Budgeting for Projects

Every company needs to decide where and how to spend its money on major projects that will affect its financial results for years to come. Such decisions require investments of large amounts of resources (capital) that are often called capital outlays. The term 'capital budgeting' describes the long-term planning for making and financing such outlays.

Capital budgeting has three phases, which are:

(1) identification of potential investments;

(2) choosing which investments to make (which includes gathering data to aid the decision); and

(3) follow-up monitoring of these investments.

Usually, accountants are only involved in the second and third phases. The question is: "Why are accountants involved in capital budgeting decisions?"

This is because they function primarily as information specialists. As you know, one of the purposes of a cost management system is to provide cost measurement for strategic decisions such as major capital budgeting decisions.

Accountants will gather and interprete as much information as possible to help management to make such decisions. To help organize what could be pages and pages worth of information, accountants rely on capital budgeting models. Let us take a look at how some of these models work.

Self Assessment Exercise 7.1

Why is investment decision important?

3.1.1 Accounting Rate of Return Method

This method is derived from the concept of Return On Capital Employed (ROCE) or Return On Investment (ROI); in that it measures the ratio of Accounting profits to the Accounting Investments and evaluates projects on the basis of this ratio. This is a basic definition only and variations exist in the definitions as would be seen in the following examples:

- Profit may be before or after tax;
- Capital may or may not include working capital;
- Capital invested may mean the initial capital investment or the average of the capital invested over the life of the project.

The following two ways of determining the ratios are acceptable for examination purposes:

(a) ARR

$$= \frac{\text{Average annual accounting profit after depreciation, interest before taxation x 100\%}}{\text{Initial capital invested}}$$

Where the initial capital invested is equal to original cost of a new project or the written down value or net book value of an existing project. The reason for this assertion is that, since companies are going concern, there must be replacement of assets, that is, the need for depreciation.

(b) ARR

$$= \frac{\text{Average annual accounting profits after depreciation, interest before taxation x 100\%}}{\text{Average capital invested}}$$

Where the average capital invested is equal to initial capital invested plus scrap value (if any) divided by two. You should note that if a particular question specifically defines the accounting rate of return, such definition, as stipulated in the question must be adopted in solving the question.

Illustration 3.1.1

Mr. Felix was able to convince his Uncle to grant him a loan of ₦200,000.00, which he intends to invest in a farming project. He estimates that the project will yield the following returns annually for the next five consecutive years:

Year	**Cash flow (₦)**
1	60,000.00
2	60,000.00

3	80,000.00
4	60,000.00
5	40,000.00

There was no scrap value at the end of the fifth year and he desires to evaluate the project on the basis of Accounting Rate of Return.

You are required to provide the ARR of this project on the assumption that the annual returns are profits after depreciation but before taxation.

Solution 3.1.1:

If option (A) under the ARR method is used, then the ARR will be:

$$= \frac{\text{Average Profits}}{\text{Initial investments}}$$

$$\text{Average profit} = \frac{60{,}000 + 60{,}000 + 80{,}000 + 60{,}000 + 40{,}000}{5}$$

$$= ₦60{,}000.00$$

$$\text{Therefore, ARR} = \frac{60{,}000 \times 100}{20{,}000 \quad 1}$$

$$= 30\%$$

If option (B) is used under the ARR method, then the ARR will be:

$$= \frac{\text{Average Profits} \times 100\%}{\text{Average Initial investment of capital}}$$

$$\text{Average capital} = \frac{₦200{,}000.00}{2}$$

$$= ₦100{,}000.00$$

$$\text{Therefore, ARR} = \frac{₦60{,}000.00 \times 100}{₦100{,}000.00 \quad 1}$$

$$= 60\%$$

Decision Rules:

(a) The rule is to invest in all projects whose accounting rate of return are higher than the company's predetermined minimum acceptable ARR;

(b) Where mutually exclusive projects are concerned, the rule is to accept the project with the highest ARR.

Advantages of ARR

1. It is easy to calculate;

2. It makes use of all the profits for all the years of project;

3. For divisionalised companies, managers would find the technique easier to understand because it is similar to their normal annual performance evaluation technique.

Disadvantages of ARR

1. It does not recognise the time value of money;

2. It is an average concept and as such will hide the sizes and timing of the individual cash flow;

3. It is based on accounting profits which may differ as a result of differences in accounting methods and does not necessarily represent relevant cash flows;

4. It recognises depreciation instead of the more relevant capital allowances;

5. It does not take into consideration the risk associated with each project as well as the attitude of the management of the company to risk;

6. There is no unique definition of ARR. For instance, "average profits" may be profits after depreciation, interest and tax. Initial investment could be initial investment plus scrap value or just initial investment.

Self Assessment Exercise 7.2

1. What is Accounting Rate of Return (ARR)?

2. State three advantages and disadvantages each of ARR.

3. NOSA won an award from the Department of Entrepreneurial Studies, National Open University of Nigeria the sum of ₦500,000.00 which he intends to invest in a shoe making business. He estimates that the project will yield the following returns annually for the next five consecutive years:

Year	**Cash flow (₦)**
1	150,000.00

2	160,000.00
3	140,000.00
4	180,000.00
5	120,000.00

The business desires to evaluate the project on the basis of accounting rate of return.

You are required to provide the accounting rate of return of this project on the assumption that the annual returns are profit after depreciation but before taxation.

3.1.2 Payback Method

This technique measures projects on the basis of the period over which the investment pays back itself or the period of recovery of the initial investment.

Payback is defined as the period usually expressed in years, in which the cash outflows will equate the cash inflows from a project.

It is evident that this method pays attention to the shortness of the project, which is, the shorter the period of recovery of initial outlay, the more acceptable the project becomes and this constitutes the decision rule.

Illustration 3.1.2

Ogba Limited having a project which involves immediate cash outlay of ₦200,000.00. The company estimates that the net cash inflows from the project will be as follows:

Year	**Cash flow (₦)**
1	20,000.00
2	40,000.00
3	220,000.00
4	80,000.00

Calculate the payback period for the above project.

Solution:

Ogba Limited – Investment Appraisal

Year	**Cashflow (₦)**	**Consecutive Cashflows**
0	(200,000.00)	(200,000.00)
1	20,000.00	(180,000.00)
2	40,000.00	(140,000.00)
3	220,000.00	80,000.00

4	80,000.00

Payback period = 2 years + $\frac{140,000}{220,000}$ x 12 months

= 2 years + 7.6 months ≈ 2 years 8 months

Decision Rules:

(a) Using the payback method, accept all projects whose payback period are shorter than the company's predetermined minimum acceptable payback period;

(b) If mutually exclusive projects are involved, whereby only one of the projects can be undertaken and others rejected, the rule is to accept the project with the shortest payback period.

Advantages of Payback Period

(1) It is simple to calculate and understand;

(2) It is the least of all the methods of capital budgeting in exposing the firm to problems of uncertainty, since it focuses on shortness of project to pay back the initial outlay;

(3) It is a fast screening technique, especially for the firms that have liquidity problems.

Disadvantages of Payback Period

(1) It does not incorporate time value of money, that is, it does not recognise the fact that the value of ₦1.00 today will be far more than the value of ₦1.00 in two or three years' time. This constitutes the alternative forgone of money due to passage of time and not inflation;

(2) It ignores cashflows after the payback period;

(3) It does not take into account the risks associated with each project and the attitude of the company to risk.

Self Assessment Exercise 7.3

1. Define payback period.

2. TOSAN collected ₦300,000.00 loan from his father to invest in a farming project. He estimates that the net cash inflows from the project will be as follows:

Year	Cashflows
1	50,000

2	80,000
3	150,000
4	60,000

Calculate the payback period for the above project.

3.1.3 Net Present Value Method (NPV)

The net present value is a summation of all discounted cash flows (present value) associated with a project. The NPV method computes the present value of all expected future cash flows using a minimum desired rate of return. The minimum rate of return depends on the risk of a proposed project – the higher the risk, the higher the rate. Based on the cost of capital (what the firm pays to acquire more capital), managers determine the sum of the present values of all expected cash flows from the project.

You should note that cost of capital is also called required rate of return, hurdle rate or discount rate. If the sum of the present values of all expected cash flows from the project is positive, the project is desirable. If the sum is negative, the project is undesirable.

A positive NPV means that accepting the project will increase the value of the firm because the present value of the project's cash inflows exceeds the present value of its cash outflows. When choosing among several investments, managers should pick the one with the greatest net present value.

Decision Rules:

(a) Accept all projects that produce positive net present value;

(b) If mutually exclusive projects are involved, the rule is to accept the project that produces the highest positive net present value.

Illustration 3.1.3:

At a cost of capital of 10% per annum, calculate the NPV of Ogba's project. Given a cash inflow of ₦200,000.00 and inflow of ₦60,000.00, ₦60,000.00, ₦80,000.00, ₦60,000.00 and ₦40,000.00 for years 1, 2, 3, 4, and 5 respectively.

Solution 3.1.3:

Year	**Cashflows**	**Discounting Flow @ 10%**	**Present Value (₦)**
0	(200,000)	1.0000	(200,000)
1	60,000	0.9091	54,546
2	60,000	0.8264	49,584
3	80,000	0.7513	60,104
4	60,000	0.6830	40,980
5	40,000	0.6209	24,836
		+ NPV	**30,050**

Advantages of NPV

(1) The time value of money is recognised;

(2) It measures, in absolute terms (₦ value), the increase in the wealth of the shareholders;

(3) It is additive, in that decisions can be reached on a combination of projects, through the addition of their respective NPVs;

(4) Unlike the payback period, it measures projects by the utilisation of all cash flows of the project;

(5) It is more preferable to internal rate of return (IRR(in decisions under capital rationing, that is, shortage of investment funds.

Disadvantages of NPV

(1) It is more difficult to calculate than payback and accounting rate of return;

(2) It relies heavily on the correct estimation of the cost of capital. Where errors occur in the cost of capital used for discounting decision, using the NPV would be misleading;

(3) Unlike the IRR, non-accounting managers may not be conversant with the decision rule of NPV, especially in large decentralized organisations;

(4) Like all the other methods, it does not take risk into account;

(5) It ignores inflation.

Self Assessment Exercise 7.4

1. Explain net present value method.

2. What do you consider as the advantages and disadvantages of NPV? State four each.

3. At 10% cost of capital, calculate the NPV of TOSAN project with a cash outflow of ₦500,000.00 and inflow of ₦70,000, ₦80,000, ₦100,000 and ₦80,000 for years 1, 2, 3 and 4 respectively.

3.1.4 Internal Rate of Return (IRR) Method

The IRR is that cost of capital that will produce an NPV of zero if applied to a project. It is a breakeven point cost of capital. It is also the cost of capital that will equate the cash inflows of a project with the cash outflows of that project. In order to generate the cost of capital that will produce exactly zero NPV, the following procedures may be followed:

(1) Generate two opposite values of NPV (+ and – values) using two different discount rates earlier;

(2) Interpolate between the two discount rates generated in (1) above, in order to estimate the cost of capital that will produce an NPV of zero;

(3) The interpolation formulae can be defined as:

$$IRR = R_1 + \frac{NPV_1}{(NPV_1 + NPV_2)} \times R_2 - R_1$$

where R_1 is the lower cost of capital that generates positive NPV_1, and

R_2 is the highest cost of capital that generates negative NPV_2.

You should note that the absolute value of the negative NPV is what is used in the computation.

Illustration 3.1.4:

Using a cash outflow of ₦200,000 and cash inflow of ₦60,000, ₦60,000, ₦80,000, ₦60,000 and ₦40,000 for years 1, 2, 3, 4, and 5 respectively, calculate the IRR for Ogba's project with a cost of capital at 10% and 20%.

Solution 3.1.4:

Year	**Cashflow (₦)**	**DF @ 10%**	**PV**	**DF @ 20%**	**PV**
0	(200,000)	1.0000	(200,000)	1.0000	(200,000)
1	60,000	0.9091	54,546	0.8333	49,998
2	60,000	0.8264	49,584	0.6944	41,664
3	80,000	0.7513	60,104	0.5787	46,296
4	60,000	0.6830	40,980	0.4822	28,932
5	40,000	0.6209	24,836	0.4109	16,436
		+NPV	30,050	- NPV	(16,674)

R_1 = 10%, NPV_1 = ₦30,050

R_2 = 20%, NPV_2 = (₦16,674)

$$IRR = R_1 + \frac{NPV_1}{(NPV_1 + NPV_2)} \times R_2 - R_1$$

$$= 10\% + \frac{30,050}{(16,674 + 30,050)} \times (20 - 10)\%$$

$$= 10\% + 6.43\%$$

= **16.43%**

Decision Rules:

(a) Using the IRR technique, the rule is to accept all projects whose IRR are greater than the company's cost of capital;

(b) If mutually exclusive projects are being considered, the rule is to accept the project that produces the highest IRR.

Advantages of IRR

(1) It recognises the time value of money;

(2) It is more attractive to divisional managers in large organisations since they are used to the return approach in evaluations;

(3) It provides to us a margin of safety in the calculation of a company's cost of capital, that is, it measures all allowable margin of errors.

Disadvantages of IRR

(1) It is difficult to calculate than the other methods;

(2) Where the cash flows of a project are unconventional, in which case, cash inflows occur in between cash outflows and vice versa, the IRR technique will produce more than one IRR for a project. It can lead to a situation of sub-optimal decision;

(3) Where mutually exclusive projects are being considered, the IRR may produce a decision that will conflict with the NPV decision in that the IRR, being a rate of return, does not recognise the size or scale of project;

(4) A project may produce more than one IRR. This also occurs when a project has unconventional cash flows.

Self Assessment Exercise 7.5

1. Explain the IRR technique.

2. State three advantages and disadvantages each of IRR.

3. Using a cash outflow of ₦200,000 and cash inflows of ₦60,000, ₦60,000, ₦80,000, ₦60,000 and ₦40,000 for years 1, 2, 3, 4 and 5 respectively. You are required to calculate the IRR for TOSAN's project given a cost of capital at 9% and 18%.

3.2 Income Taxes and Capital Budgeting

Income taxes paid by companies are cash outflows. Their basic role in capital budgeting does not differ from that of any other cash outflow. However, taxes tend to narrow the cash differences between projects. For example, if the cash savings from operations of one project over another were ₦500,000, a 40% tax rate would shrink the savings to ₦300,000. This is because ₦200,000 (40% x ₦500,000) of the savings would have to be paid in taxes. Because taxation causes a change in cashflows, it is a factor to be considered in project appraisal.

Taxation effects on a project are in numerous ways, but probably, the most significant three effects are as follows:

(a) corporate taxes on project profit;
(b) investment incentives; and
(c) the reduction of the Weighted Average Cost of Capital (WACC).

Illustration 3.2.1:

An electronic company is considering the purchase of a casting machine at a cost of ₦20,000. The project cash flows are estimated as follows:

Year 0	Year 1	Year 2	Year 3	Year 4
(₦20,000)	7,000	5,000	11,000	5,000

The following may be assumed:

(a) the existence of other taxable profits;
(b) 25% writing down allowances (WDA) which is done by reducing balance method;
(c) 30% rate of corporation tax;
(d) The machine was sold for ₦4,500 at the end of 4 years;
(e) 1 year lag on all tax effects.

The company requires a 10% return after tax. Calculate the NPV of the project.

Solution 3.2.1:

Year	Project Cash flow	Tax effect on WDA	Tax on production	Net after tax cash flow	Discount factors	Present values
0	(20,000)			(20,000)	1.000	(20,000)
1	7,000	1,500		8,500	0.909	7,726
2	5,000	1,125	(2,100)	4,025	0.826	3,325
3	11,000	844	(1,500)	10,344	0.751	7,769
4	5,000	633	(3,300)	6,853	0.683	4,667
5	4,500	549	(1,500)	(951)	0.621	(591) 2,895

You should note that the tax effect of the Written Down Allowance (WDA) was calculated as follows:

	₦			₦
Capital cost	20,000			
25% WDA	5,000	@ 30%	=	1,500
Written down value	15,000			
25% WDA	3,750	@ 30%	=	1,125
Written down value	11,250			
25% WDA	2,812	@ 30%	=	844
Written down value	8,438			
25% WDA	2,109	@ 30%	=	633
Written down value	6,329			
Sold for	4,500			
Therefore, Balancing allowance	1,829	@ 30%	=	549

You should note that tax percent is applied to profit of the previous year to get tax on profit of current year. You will observe that the project has a positive NPV of ₦2,895.00 and subject to the decision rule, the project is acceptable.

Self Assessment Exercise 7.6

A block making company is considering the purchase of a blocking machine at the cost of ₦50,000.00. The project cash flows are estimated as follows:

Year 0	Year 1	Year 2	Year 3	Year 4
(₦50,000)	15,000	10,000	20,000	10,000

The following assumptions were made:

(a) the existence of other taxable profits;
(b) 40% written down allowances which is done by the reducing balance method;
(c) 35% rate of corporate tax;
(d) the machine was sold for ₦10,000 at the end of 4 years;
(e) 1 year lag on all tax effects.

The company requires a 10% returns after tax. You are required to calculate the NPV of the project.

3.3 Inflation and Capital Budgeting

Inflation can simply be defined as an increase in the average price of goods and services. Inflation in capital budgeting refers to increase in estimates as a result of changes in price levels. This means that if we ignore inflation, we may end up overstating or understating our net cash flows in which case, the NPVs used for decision making would be wrong.

A school of thought believes that inflation can be ignored, because it affects both variables (cash flows and cost of capital) that make up NPV on which we have our decision. They

argue that since inflation will generate increases in cash flows and cost of capital, the providers will increase their required returns to meet changes in price level. Consequently, the effect of inflation would be cancelled out in arriving at the NPV.

The above assertions may be contested because of the following reasons:

(a) Inflation does not affect the cash flows and cost of capital in the same way. Cash flow may increase, whereas providers of funds especially shareholders may not ask for the proportionate increase in their required return (i.e. cost of capital);

(b) Even among the cash flows, inflation will not affect them in the same way. A company may translate expected inflation rate into estimates of materials and overhead costs.

It will be wrong if estimates for sales-related cash flows also incorporate the same expected inflation rate. This inability of the company to adjust for inflation in its selling price is dependent on the nature of the demand for its product and service.

(c) Labour cost and labour-related cash flows may not move in line with the general inflation rate because of the actions of labour and industrial unions;

(d) For the manager, making estimates for inflation rate will be compounded by the fact that there must be full provision for variable cost of production with full effects of inflation if the company intends to remain in operation.

From the above, we will conclude that if inflation is ignored, sub-optimal decisions would be the case.

However, the presence of inflation will complicate planning and forecasting problems of the manager, predicting the estimates of future cash flows is troublesome in its own case and would be worsened if inflation is recognised.

The following illustration explains the way that inflation is dealt with in capital budgetting.

Illustration 3.3.1:

A labour saving machine cost ₦60,000 and will save ₦24,000 per annum at current wage rates. The machine is expected to have a 3-year life and nil scrap value. The firm's cost of capital is 10%. Calculate the project's NPV.

(a) With no inflation;

(b) With general inflation of 15% which wage rates are expected to follow (i.e. synchronized inflation);

(c) With general inflation of 15% and wages rising at 20% per annum (i.e. differential inflation).

Differential inflation is where costs and revenue change at differing rates of inflation or where the various items of cost and revenue move at different rates. And synchronized inflation is where costs and revenues rise at the same rate.

Solution 3.3.1:

(a) No inflation:

Year	**Cash flow**	**DF @ 10%**		**Present Value**
0	(60,000)	1.000		(60,000)
1	24,000	0.909		21,816
2	24,000	0.826		19,824
3	24,000	0.751		18,024
		– NPV	=	(336)

Therefore, project is unacceptable as it has a negative NPV at company's cost of capital.

(b) General inflation 15%, wages increasing at 15% (synchronized inflation):

Wage savings per annum with no inflation ₦	Wage savings per annum with 15% inflation ₦
24,000	27,600
24,000	31,740
24,000	36,501

With no inflation, the appropriate discounting rate was 10%. With inflation at 15%, the 10% discounting rate is insufficient to bring cash sums arising at different periods into equivalent purchasing power terms. Without inflation, ₦1.00 now was deemed equivalent to ₦1.10 a year. With a 15% inflation rate, the sum required would be ₦1.10 x 1.15 = ₦1.125, thus, the discount rate to be used is 26½%.

Project NPV with 15% synchronized inflation:

Year	**Cash flow (₦)**	**26½% Discount Factors**		**Present Value**
0	(₦60,000)	1.000		(60,000)
1	27,600	0.792		21,859
2	31,740	0.624		19,806
3	36,501	0.494		18,031
		NPV	**=**	**(304)**

Therefore, project is unacceptable.

(c) Project with 15% general inflation and wages rising at 20% per annum (differential inflation):

Wages per annum:

Year 1	24,000 x (1.20)	=	₦28,800
Year 2	24,000 x $(1.20)^2$	=	₦34,560
Year 3	24,000 x $(1.20)^3$	=	₦41,472

Project NPV with differential inflation:

Year	**Cash flow (₦)**	**26½% Discount Factors**	**Present Value**
0	(₦60,000)	1.000	(60,000)
1	28,808	0.792	22,810
2	34,560	0.624	21,565
3	41,472	0.494	20,487
		NPV =	**(304)**

Therefore, project is acceptable.

4.0 CONCLUSION

You would recall from our discussion that capital investment decision was described as a firm's decision to invest its current funds in long term activities in anticipation of an expected flow of future benefits over a number of years. You would also recall that the capital budgeting models such as: accounting rate of return (ARR), payback period, net present value (NPV) and internal rate of return (IRR) were discussed. We stated that:

- accounting rate of return measures the ratio of accounting profits to the accounting investments in evaluating projects;
- payback period method measures projects on the basis of the period over which the investment pays back itself or the period of recovery of the initial investment;
- net present value method is a summation of all discounted cash flows (present value) associated with a project;
- internal rate of return method is the cost of capital that will equate the cash inflows of a project with the cash outflows of that project.

You would also recall that taxes tend to narrow the cash differences between projects while inflation in budgeting refers to decrease in estimates as a result of changes in price levels.

5.0 SUMMARY

In this unit, we discussed capital investment decision. We looked at the various methods that have helped the accountants to give advice to management on investment appraisal. Such methods are accounting rate of return, payback period, net present value and internal rate of return. We also looked at the impact of taxation and inflation on capital budgeting.

In the next unit, we shall discuss introduction to budget with special emphasis on master budget.

6.0 TUTOR-MARKED ASSIGNMENT

1. A school of thought believes that inflation can be ignored because it affects both variables (cash flows and cost of capital) that make up NPV on which we base our decision. Discuss.

2. Mr. Sudeen was given a loan of ₦500,000.00 which he intends to invest in a shoe making business. He estimates that the project will yield the following returns annually for the next four consecutive years.

Year	Cash flow
1	150,000
2	160,000
3	140,000
4	180,000
5	120,000

The business desires to evaluate the project on the basis of accounting rate of return. You are required to provide the accounting rate of return of this project on the assumption that the annual returns are profit after depreciation but before taxation.

7.0 REFERENCES/FURTHER READINGS

Horngren, C.T., Sunden, G.I., and Strratton, W.O. (2004). Introduction to Management Accounting, 12th edition. U.S.A: Prentice-Hall of India Private Limited.

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UNIT 8 INTRODUCTION TO BUDGET: THE MASTER BUDGET

CONTENTS

1.0 INTRODUCTION

Has it ever crossed your mind that most people associate the word 'budget' with limitations on spending? For example, governments often approve spending budgets for their various agencies. Then they expect the agencies to keep their expenditures within the limits prescribed by the budget. In contrast, most business organisations use budgets to focus attention on the company operations and finances, not just a limit to spending. Budgets highlight potential problems and advantages early, allowing managers to take steps to avoid these problems or use the advantages wisely.

Recent surveys show just how valuable budgets can be. Study after study has shown the budget to be the most widely used and highest rated tool for cost reduction and control. Advocates of budgeting go so far as to claim that the process of budgeting forces a manager to become a better administrator and puts planning in the forefront of the manager's word. Actually, many seemingly healthy businesses have died because managers failed to draw up, monitor and adjust budgets to changing conditions.

This unit will expose to you budgeting and the master budget.

2.0 OBJECTIVES

After studying this unit, you should be able to:

(i) define a budget;
(ii) define and describe a master budget;
(iii) describe the relationship between planning and control;
(iv) state the advantages and disadvantages of budgeting; and
(v) explain the relevance of the human factor in budgeting.

3.0 MAIN CONTENT

3.1 Definition of Budget

A budget is a tool that helps managers in both their planning and control functions. Interestingly, budgets help managers with their control function, not only by looking forward, but also by looking backward. Budgets deal with what managers plan for the future. However, they can also be used to evaluate what happened in the past. Budgets can be used as a benchmark that allows managers to compare actual performance with estimated or desired performance. From the foregoing, we can say that a budget is a formal business plan. Planning and budgeting are especially important to keep an organization going.

In general, plans are developed using physical values, for example, the number of units to be produced, the number of hours to be worked, the amount of materials to be consumed and so on. When monetary values are attached, the plan becomes a budget. Budgets are prepared for departments, for functions such as production, inspection, marketing or for financial and resource items e.g. capital expenditure, cash, materials etc.

The formal definition of a budget is that "a budget is a quantitative statement for a defined period of time, which may include planned revenues, expenses, assets, liabilities and cash flows. A budget provides a focus for the organization aids the coordination of activities and facilitates control.

Self Assessment Exercise 8.1

What is a budget?

3.2 Differences between Planning and Control

Planning is an unavoidable segment of all human activity. Because of its importance to organizations, their planning processes have become refined and structured in order to improve their efficiency. Planning can be defined as the establishment of objectives, and the formulation, evaluation and selection of the policies, strategies, tactics and action required to achieve these objectives. Planning comprises long-term/strategic planning and short-term operational plans. Short-term operational plan usually refers to a period of one year. Thus, you can see that the overall process of planning covers both the long and short terms.

Planning without consideration of the type, frequency and method of control will largely be a waste of time. It follows from this that part of the planning process involves the design of an appropriate control system. You can see that planning precedes control.

Control, on the other hand, is conceived with the efficient use of resources to achieve a previously determined objective or set of objectives, contained within a plan. In an organisational sense, control is exercised by the feedback of information on performance compared with plan. Planning is achieved by means of a master budget whereas control is generally exercised through the comparison of actual costs with a flexible budget. Thus, you

can see that planning and control are inextricably linked and indeed in practice, the distinction between the two functions is often blurred.

Self Assessment Exercise 8.2

What is planning and what is control?

3.3 Advantages and Disadvantages of Budgeting

3.3.1 Advantages of Budgeting

The advantages of budgeting are as listed below:

1. It is the major formal way in which the organizational objectives are translated into specific plans, tasks and objectives related to the individual managers and supervisors;

2. It is an important medium of communication for organizational plans and objectives, and of monitoring the progress towards meeting those objectives;

3. The development of budgets helps to achieve coordination between the various departments and functions of the organization;

4. The involvement of all levels of management with setting budgets, the acceptance of defined targets, the two-way flow of information and the facets of a properly organised budgeting system will help to promote a coalition of interest and to increase motivation;

5. Management's time can be saved and attention directed to areas of most concern by the "exception principle" which is at the heart of the budgetary control;

6. Performance of all levels is systematically reported and monitored thus aiding the control of current activities;

7. The investigation of operations and procedures which is part of budgetting, planning and the subsequent monitoring of expenditure, may lead to reduced costs and greater efficiency.

3.3.2 Disadvantages of Budgetting

Below are the difficulties which may occur in connection with budgeting, but it does not necessarily follow that they will occur in any given organisation.

1. There may be too much reliance on the technique as a substitute for good management;

2. The budgeting system, perhaps because of undue pressure or poor human relations, may cause antagonism and decrease motivation;

3. Variances are just as frequently due to changing circumstances, poor forecasting or general uncertainties and due to managerial performance;

4. Budgets are developed round existing organizational structures and departments which may be inappropriate for current conditions and may not reflect the underlying economic realities;

5. The very existence of well-documented plans and budgets may cause inertia and lack of flexibility in adapting to change;

6. There is inherent lags and delays in the system.

Self Assessment Exercise 8.3

1. State five advantages of budgeting.
2. State four disadvantages of budgeting.

3.4 Human aspect of Budgeting

No matter how accurate sales forecasts are, if budgets are to benefit an organization, they need the support of all the firm's employees. The attitude of top management will heavily influence the lower level workers' and manager's attitude toward budgets. The human, social and organizational factors which are involved at all stages in budgeting are of critical importance and cannot be overemphasized. Budgeting is not a mechanistic technical procedure. Its success is totally dependent upon the goodwill and cooperation of the participants. Without this, budgeting will become merely a paper exercise with no real impact on the operations of the organization; except perhaps negatively.

Many of the behavioural problems with budgeting arise from management's attempts to make the budget perform different functions, some of which are, to an extent, incompatible. These functions include:

(1) acting as a target;
(2) acting as a plan;
(3) being a control measure;
(4) a means of motivating managers;
(5) acting as a device for measuring performance;
(6) promoting a goal congruence;
(7) acting as a medium of communication and coordination;
(8) acting as a framework for the delegation of authority and so on.

The overriding importance of the human aspects of budgeting cannot be overemphasized. Too often, top management and accountants are overly concerned with the mechanics of budgets, ignoring the fact that the effectiveness of any budgeting system depends directly on whether the affected managers and employees understand and accept the budget. Budgets created with the active participation of all affected employees are generally more effective

than budgets imposed on subordinates. This involvement is usually called participative budgeting.

Self Assessment Exercise 8.4

Employees' acceptance of budgets is critically important. Discuss.

3.5 The Master Budget

The master budget represents a consolidation of all the supporting budgets and represents the financial effects of the total plan for the business as a whole. The terms used to describe specific budget schedules vary from one organization to another. However, most master budgets have common elements. The usual master budget for a non-manufacturing company has the following components:

(a) Operating budget

(1) Sales budget
(2) Purchases budget
(3) Cost-of-goods sold budget
(4) Operating expenses budget
(5) Budgeted income statement

(b) Financial budget

(1) Capital budget
(2) Cash budget
(3) Budgeted balance sheet

In addition to these categories, manufacturing companies that maintain inventories prepare ending inventory budgets and additional budgets for each type of resource existing such as labour, materials and factory overheads.

Each of the parts of the master budget is prepared in the conventional manner except that budgeted costs, revenues, investments and so on, are used instead of historical figures.

The two major parts of a master budget are the operating budget and the financial budget. The operating budget focuses on the income statement and its supporting schedules. The financial budget focuses on the effects that the operating budget and other plans such as capital budgets and repayments of debt will have on cash. In addition to the master budget, there are countless forms of special budgets and related reports. For example, a report might detail goals and objectives for improvements in quality or customer satisfaction during the budget periods.

The master budget, supported by the subsidiary budgets is presented to top management for approval. If approval is given, the master budget becomes the financial summary of the

agreed plan for the budget period being considered, usually for the year ahead. If not approved, amendments are made in underlying budgets (e.g. the sales budget, the production budget, etc.) in order to bring about the desired effects on the master budget.

Self Assessment Exercise 8.5

Describe the master budget.

4.0 CONCLUSION

You would recall in our discussion so far that a budget is defined as a quantitative statement for a defined period of time, which may include planned revenues, expenses, assets, liabilities and cash flows.

You would also recall that planning was defined as the establishment of objectives, and the formulation, evaluation and selection of the policies, strategies, tactics and actions required to achieve these objectives while control is concerned with the efficient use of resources to achieve previously determined objectives. Furthermore, we discussed that the human, social and organizational factors, which are involved at all stages in the budgeting, are of critical importance and cannot be ignored.

Finally, we stated that the master budget represents a consolidation of all the supporting budgets and represents the financial effects of the total plan for the business as a whole.

5.0 SUMMARY

In this unit, we discussed the introduction to budget. We started by defining budget and proceeded to defining planning vis-à-vis control. We highlighted the advantages and disadvantages of budgeting as well as human aspect of budgeting. Finally, we described master budget.

In the succeeding unit, discussion would continue budgeting with special focus on flexible budgets and overhead analysis.

6.0 TUTOR-MARKED ASSIGNMENT

1. Planning and control are inextricably linked together. Discuss.
2. The human aspect of budgeting is of critical importance. Explain.
3. What is a master budget?

7.0 REFERENCES/FURTHER READINGS

Horngren, C.T., Sunden, G.I., and Strratton, W.O. (2004). Introduction to Management Accounting, 12th edition. U.S.A: Prentice-Hall of India Private Limited.

Lucey, T. (2003). Management Accounting, Book Power ELST with Continuum, 5th Edition.

UNIT 9 FLEXIBLE BUDGETS AND OVERHEAD ANALYSIS

CONTENTS

1.0 INTRODUCTION

Managers and employees of any organization want to know how they are performing in meeting their goals. Upper level managers also want to know how the organization is meeting its financial objectives. A good knowledge about what went wrong and what went right would help managers to plan and manage the organization more effectively in future periods.

This unit introduces flexible budgets, which are budgets designed to direct management to areas of actual financial performance that deserve attention. Flexible budget, sometimes called variable budget, is a budget that adjusts for changes in sales volume and other cost-driver activities.

The flexible budget is identical to the master budget in format, but it is different from the master budget because the flexible budget may be prepared for any level of activity. This unit will expose you to what flexible budget is all about in detail and would consider issues that affect flexible budget.

2.0 OBJECTIVES

After studying this unit, you should be able to:

(i) define a master budget;
(ii) define a flexible budget;
(iii) compare a flexible budget with a master budget;
(iv) determine flexible budget variances; and
(v) prepare a flexible budget.

3.0 MAIN CONTENT

3.1 Deficiencies of a Static Budget vis-à-vis Actual Result

Static budget is really just another name for master budget. The master budget assumes fixed level of activity. In other words, a master budget is prepared for only one level of a given type of activity.

For example, given the performance report of a manufacturing company called Adele Nigeria Limited, using master budget for the month of May, 2010 stated below.

Adele Nigeria Limited
Performance Report using Master Budget for the month-ended May, 2010

Particulars	Actual (1)	Master Budget (2)	Master Budget Variance (3)	
Units	7,000	9,000	2,000	
Sales	₦217,000	₦279,000	₦62,000	U
Variable Expenses:				
Variable manufacturing expenses	151,270	189,000	37,730	F
Shipping expenses (selling)	5,000	5,400	400	F
Administrative expenses	2,000	1,800	200	U
Total variable expenses	₦158,270	₦196,200	₦37,930	F
Contribution margin	58,730	82,800	24,000	U
Fixed Expenses:				
Fixed manufacturing expenses	₦37,300	₦37,000	₦300	U
Fixed selling and administrative expenses	₦33,000	₦33,000	-	
	₦70,300	₦70,000	₦300	U
Variances	(₦11,500)	₦12,800	₦24,370	U

Where U means Unfavourable expense variances which occur when actual expenses are more than budgeted expenses and F means Favourable expense variances which occur when actual expenses are less than budgeted expenses.

As you can see from the performance report (a generic term that usually means a comparison of actual results with some targets) above, consider Adele Nigeria Limited using a traditional costing system with only one cost driver. Assume that the cost driver is sales volume (i.e., units sold) is 9,000 units. All the budget figures are then based on projected sales of 9,000 units.

You can also observe that the performance report of Adele Nigeria Limited has three columns. The first represents the actual result for May, 2010, the second column represents

the master budget and the third represents, the differences or variances between actual results and the master budget. A variance is a deviation of an actual amount from the expected budgeted amount.

The master budget called for production and sales of 9,000 units but only 7,000 units were actually produced and sold, resulting in 2,000 units difference. These are called master (static) budget variances. Actual revenue that exceed expected revenue results in favourable revenue variances. However, when actual revenues are below expected revenues, the variances are unfavourable. Similarly, actual expenses that exceed budgeted expenses result in unfavourable expense variances, and actual expenses that are less than budgeted expenses, result in favourable expense variances. A helpful performance report will include variances that direct management's attention to significant deviations from expected result. Each significant variance should cause a manager to ask questions. By explaining why a variance occurs, managers are forced to recognize changes that have affected revenues or costs and that might affect future decisions.

The comparison of actual results with a master budget is not very useful for management. Assuming you are asked to explain why there was an operating loss of ₦11,570 when a profit of ₦12,800 was budgeted. Obviously, you might want to say the sales were ₦62,000 below expectations, but have you consider the fact that the favourable variances for the variable costs are misleading? Would you really say the cost control is satisfactory?

Considering the lower-than-projected level of sales activity, would you really expect to pay ₦196,200 for variable expenses when only 7,000 units were produced? Certainly not! You would rather have budgeted for a lesser amount of variable expenses if you were expecting 7,000 units to be sold. Obviously, the mater budget is deficient in expressing this fact in the performance report.

Self Assessment Exercise 9.1

Does the master budget provide all necessary explanation for the changes that affect revenues and costs that might be observed in a performance report? Explain your position.

3.2 Characteristics of a Flexible Budget

Since the comparison of actual results with a master budget is obviously not very useful for management, a more helpful benchmark for analysis is the flexible budget. Recall that flexible budget is a budget that adjusts for changes in sales volume and other cost-driver activities. So when sales turn out to be 7,000 units instead of 9,000 units, managers can use the flexible budget to prepare a new budget based on this new cost-driver level. We can then see what the total variable expenses should be based on a sales level of 7,000 units and compare this amount to the actual result. For performance evaluation, the flexible budget would be prepared at the actual levels of activity achieved. Contrarily, the master budget is kept fixed or static to serve as the original benchmark for evaluating performance. It shows revenues and costs at only the original planned levels of activity.

The principles underlying the flexible budgets are:

(1) ***To prepare contingency plans in advance*** – flexible budgets are prepared for a range of activity rather than for a single level of activity;

(2) ***Budgetary Control*** – flexible budgeting is fundamental to budgetary control. Control is not achievable with a fixed budget. In fixed budgets control, the budgets prepared are based on one level of output, a level which has been carefully planned to equate sales and production at the most profitable rate. If the level of output actually achieved differs considerably from that budgeted, large variances will arise. Basically, the idea of a flexible budget is that there shall be some standard of expenditure from varying levels of output.

Example of a flexible budget is given below:

Adele Nigeria Limited
Flexible Budgets

Particulars	Flexible budget	Flexible budgets for various levels of sales/production activity		
Units		7,000	8,000	9,000
	₦	₦	₦	₦
Sales	31.00	217,000	248,000	279,000
Variable cost/expense:				
Variable manufacturing costs	21.00	147,000	168,000	189,000
Shipping expenses (selling)	0.60	4,200	4,800	5,400
Administrative expenses	0.20	1,400	1,600	1,800
Total variable costs/expenses	21.80	152,600	174,400	196,200
Contribution margin	9.20	64,400	73,600	82,800
Budget formula per month				
Fixed costs:				
Fixed manufacturing costs		37,000	37,000	37,000
Fixed selling and admin. costs		33,000	33,000	33,000
Total fixed costs		70,000	70,000	70,000
Operating income (loss)		5,600	3,600	12,800

Self Assessment Exercise 9.2

Flexible budget provides a helpful benchmark for comparing actual result with budgeted costs and revenues. Discuss.

3.3 Evaluation of Financial Performance using Flexible Budgets

Comparing the flexible budget with actual results accomplishes an important performance evaluation purpose. There are two reasons why actual results might differ from the master budget. First, sales and other cost-driver activities were not the same as originally

forecasted. The second is that revenues or variable costs per unit of activity and fixed costs per period were not as expected.

The intent of using the flexible budget for performance evaluation is to isolate unexpected effects on actual results that can be corrected if adverse or enhanced if beneficial. This is because the flexible budget is prepared at the actual level of activity, and any variance between the flexible budget and actual results cannot be due to activity levels. They must be due to deviation of actual costs or revenues from flexible budget amounts because of pricing or cost control. These variances between the flexible budget and actual results are called flexible budget variance.

On the contrary, variances between the master budget and the flexible budget are due to activity levels, not cost control. These latter differences between the master budget amounts and the amounts in the flexible budget are called activity-level variances.

Illustration:

Consider a simple example of a company that plans to sell 10,000 units of a product for ₦2.00 per unit. Budgeted variable costs are ₦1.00 per unit and budgeted operating income is ₦4,000.00. Suppose the company actually sells 8,000 units and makes an operating income of ₦2,000.00. Compute and interpret the master budget variance, the sales activity variance and the flexible budget variance.

Answer:

The master budget variance is ₦4,000 – ₦2,000 = ₦2,000 (U). The sales activity variance is the lost contribution margin on the 200 units of lost sales: ₦1.00 x 200 = ₦2,000.00. Therefore, the flexible budget variance is ₦0. The entire shortfall in operating income was caused by failing to meet the unit sales budget of 10,000 units. The operation was efficient but not effective.

When evaluating performance; it is useful to distinguish between effectiveness and efficiency. Effectiveness is the degree to which a goal, objective or target is met. For example, the statement that the operation was not effective stated above shows the sales budget of 10,000 units was not met. Efficiency, on the other hand, is the degree to which inputs are used in relation to a given level of outputs. For example, if a budgeted variable cost of 8,000 units was actually ₦9,000 and the actual variable cost as an example above is ₦8,000, then one can assert that the operation was efficient. You can see that the flexible budget provides a base to evaluate financial performance by isolating the causes of variance.

Self Assessment Exercise 9.3

1. Explain when the following variances occur:

    (a) master budget variance;
    (b) flexible budget variance;

(c) activity-level variance.

2. Define effective and efficiency.

3.4 Flexible Budget Variances

The flexible budget variances indicate whether operations are efficient or not, and may form the basis for periodic performance evaluation. The flexible budget variances are the differences between flexible budget and actual result. In order to understand more vividly the flexible budget variances, we shall be looking at a performance report of Adele Nigeria Limited in 3.2.

You would observe that three levels of activity were provided for, which are 7,000, 8,000 and 9,000 units respectively. Assuming there was actual 8,000 units sold, we shall be relating the actual result to the flexible budget of I,000 units to measure the efficiency of the firm.

Adele Nigeria Limited
Performance Report for the month ended May 31, 2010

Particulars	Actual costs incurred	Flexible budget	Flexible budget variance
Units	8,000	8,000	-
	₦	₦	₦
Sales	247,200	248,000	800 U
Variable cost/expense:			
Variable manufacturing costs	167,000	168,000	1,000 F
Shipping expenses (selling)	4,900	4,800	100 U
Administrative expenses	1,000	1,600	600 F
Total variable costs/expenses	172,900	174,400	1,500 F
Contribution margin	74,300	73,600	700 F
Budget formula per month			
Fixed costs:			
Fixed manufacturing costs	37,000	37,000	-
Fixed selling and admin. costs	33,000	33,000	-
Total fixed costs	70,000	70,000	-
Operating income (loss)	4,300	3,600	700 F

Assuming Adele Nigeria Limited had the above performance report based on the 8,000 units sold, looking at the individual variances, you would observe that some were favourable while others were unfavourable. Precisely, the variable manufacturing cost and administrative cost were favourable and the total variable costs was also favourable showing that there is an efficient cost control measure in place. However, the shipping expense was unfavourable meaning that the company spent more than it had budgeted for on that cost, and so, that was not efficient. On the overall, considering the total cost management of the company, it would be concluded that it was efficient.

Sales of 8,000 units were made but due to perhaps factory errors, some of the units were deficient resulting in selling them at a discount. Consequently, target sales amount could not be achieved. This affected the operating income of the company. In a holistic measure, you can see that it can be said of the company (Adele Nigeria Limited) that it was efficient in its performance as it was able to have a favourable operating income of ₦700.00.

Based on the above analysis, you can observe that each unit performance of Adele Nigeria Limited can be evaluated.

Self Assessment Exercise 9.4

1. Define a flexible budget variance.

2. TOSAN Limited prepared a flexible budget for the month of May, 2010 which is as follows:

Particulars	Flexible budgets for various levels of sales/production activity		
Units	7,000	8,000	9,000
	₦	₦	₦
Sales	217,000	248,000	279,000
Variable cost/expense:			
Variable manufacturing costs	147,000	168,000	189,000
Shipping expenses (selling)	4,200	4,800	5,400
Administrative expenses	1,400	1,600	1,800
Total variable costs/expenses	152,600	174,400	196,200
Contribution margin	64,400	73,600	82,800
Budget formula per month			
Fixed costs:			
Fixed manufacturing costs	37,000	37,000	37,000
Fixed selling and admin. costs	33,000	33,000	33,000
Total fixed costs	70,000	70,000	70,000
Operating income (loss)	5,600	3,600	12,800

If at the end of the month of May, 2010, 9,000 units were sold at a selling price of ₦31.00, variable manufacturing costs, shipping expenses and administrative fixed cost remained the same. Prepare TOSAN Limited performance report showing the flexible budget variances and comment whether it is efficient or not on the individual centers and the company as a whole.

4.0 CONCLUSION

You would recall that a master or static budget assumes fixed level of activity while the flexible budget is a budget that adjusts for changes in sales volume and other cost-driver activities. You should also not forget that comparison of the flexible budget to actual results accomplishes an important performance evaluation purpose. Comparing the flexible budget

to actual results brings about the flexible budget variances. The flexible budget variances indicate whether operations are efficient or not.

5.0 SUMMARY

In this unit, we were able to discuss the deficiencies of a static budget in relation to actual result, the qualities of a flexible budget that make it a better option to a static or master budget, the use of flexible budget for evaluation of the financial performance and finally, using flexible budget variances as a means of measuring the efficiency of performance.

In the next unit, you will discuss another interesting topic titled standard cost and variance analysis.

6.0 TUTOR-MARKED ASSIGNMENT

1. Prepare a cost budget for the following cost items.

Items	Cost function
Materials	$5x$
Wages	$2{,}600 + 2.8x$
Salaries	4,000
Maintenance	$1{,}000 + 0.0009x^2$
Consumables	$0.000625x^2$

Assuming an activity level of 1,000 units, 1,500 units, 2,000 units and 2,500 units.

2. As a management accountant of Goodwill Company Limited, you are required to determine the flexible budget variance for the cost control performance report for the month of January 31, 2010. The flexible budgetted sales of 7,000 units had variable cost as follows:

	₦
Direct materials	70,000
Direct labour	56,000
Indirect labour	11,900
Idle time	2,800
Clearing up time	2,100
Supplies	4,200
Fixed costs:	
Factory supervision	14,400
Factory rent	5,000
Equipment depreciation	15,000
Fixed selling and administrative costs	33,000

The actual sales of 7,000 units for the month had a variable costs as follows:

Direct materials	69,920

Direct labour	61,500
Indirect labour	9,100
Idle time	3,550
Clearing up time	2,500
Supplies	4,700

7.0 REFERENCES/FURTHER READINGS

Horngren, C.T., Sunden, G.I., and Strratton, W.O. (2004). Introduction to Management Accounting, 12th edition. U.S.A: Prentice-Hall of India Private Limited.

Lucey, T. (2003). Management Accounting, Book Power ELST with Continuum, 5th Edition.

UNIT 10 STANDARD COST AND VARIANCE ANALYSIS

CONTENTS

1.0 INTRODUCTION

Standard costing is a useful control technique based on the feedback control cycle. Standard costing establishes predetermined estimates of the cost of products or services, collects actual costs and output data and compares the actual results with the predetermined estimates. The predetermined costs are known as standard costs.

The difference between standard and actual is known as a variance. The process by which the total variance or difference between standard and actual costs is subdivided is known as variance analysis.

The purpose of this unit is to expose to you the concept of standard costing which would enable you to appreciate the relevance of variance analysis as a basis for assessing performance and efficiency.

In this unit also, discuss would centre on definition of standard cost, evaluation of how standards are set, definition and calculation of direct material variances, direct labour variances, variable overhead variances and fixed overhead variances. Finally, the advantages of standard costing would be discussed.

2.0 OBJECTIVES

After studying this unit, you should be able to:

(i) define standard cost;
(ii) evaluate how standards are set;
(iii) define and calculate direct material variances;
(iv) define and calculate direct labour variances;

(v) define and calculate variable overhead variances;
(vi) define and calculate fixed overhead variances;
(vii) list the advantages of standard costing.

3.0 MAIN CONTENT

3.1 Definition of Standard Costs

Standard cost can be defined as the planned unit cost of the product, components or services produced in a period. The standard cost may be determined on a number of bases. The main uses of standard costs are in performance measurement, control, stock valuation and in the establishment of selling prices.

In an ideal state where a standard cost produced should be accepted as truly representative and realistic, it should be based on sound technical and engineering studies, specified production methods, work study and work measurement, clearly defined material specifications and price and wage rate projections. However, standards produced less rigorously can also be of some value, particularly in service areas and in industries, where a detailed engineering basis is in appropriate.

You should note that a standard cost is not an average of past costs but past costs are likely to contain the results of past mistakes and deficiencies.

Self Assessment Exercise 10.1

Define standard cost.

3.2 Setting Standard Costs

Standards which can be used for control purposes rest on a foundation of properly organized, standardized methods and procedures and a comprehensive information system. A standard cost implies that a target exists for every single element which contributes to the product; the types, usage and prices of materials and parts, the grades, rates of pay and times for the labour involved and so on. Considerable effort is involved in establishing standard costs and keeping them updated.

The factors to be considered when setting standards should be examined with respect to material, labour, overheads and sales price/margin. The material content of a product is derived from technical and engineering specifications frequently in the form of a bill of materials. The standard quantities required include an allowance for normal and inevitable loss in production that is machinery loss, evaporation and expected levels of breakages and rejections. The responsibility for providing material prices is that of the buying department. The prices used are not past costs, but the forecast expected costs for the relevant budget period. The expected costs should take cognisance of trends in material prices, anticipated changes in purchasing policies, quantity and cash discounts and any factor which will influence material costs.

The agreed methods of manufacture are the basis of setting the standard labour times. The techniques of work measurement are involved, often combined with the work study projections. The labour standards must specify the exact grades of labour to be used as well as the times involved. When the times and grades of labour have been established, a forecast of the relevant wage rates for the control period can be made, usually by the personnel department.

The predetermined overhead and absorption rates become the standards for overheads to reach cost centre using the budgeted standard labour hours as the activity base.

The setting of the selling price is based on a variety of factors including the anticipated market demand, competing products, manufacturing costs, inflation estimates and so on. When the selling price is established, it becomes the standard selling price.

Self Assessment Exercise 10.2

What factors need to be considered when setting standards?

3.3 Standard Costs – Direct Material Variance

The direct material variance is the difference between the standard direct material cost of the actual production volume and the actual cost of direct material. The direct material variance can be subdivided into the direct material price variance and the direct material usage variance. By definition, the direct material price variance is the difference between the standard price and actual purchase price for the actual quantity of material while the direct material usage variance is the difference between the standard quantity specified for the actual production and the actual quantity used, at standard purchase price.

The direct material variance formulae can be seen as follows:

Actual purchase quality x actual price/ (i.e. total purchase cost)		
minus	Price variance	
Actual purchase quantity x standard price		
Actual quantity used for actual production x standard price		Direct material variance
minus	Usage variance	
Standard quantity for actual production x standard price		

Let us look at this extract from a standard cost card and work out an example for a direct material variance.

Example:

Extracts from a Standard Cost Card

	Standard cost/unit
Raw materials 60 kg @ ₦3.50 per kg	210
	Actual results
Production	140 parts
Direct material purchases 8,000 kg @ a cost of	₦30,000.00
Opening stock: direct material	1,800 kg
Closing stock: direct material	1,450 kg

Solution:

Let us apply the formulae for direct material variance as stated above.

	₦		
Total purchase price	30,000.00		
		Price variance	
Minus		₦2,000.00 (A)	
8,000 kg x ₦3.50 per kg	28,000.00		Direct material variance
8,000 kg x ₦3.50 per kg	29,225.00		₦1,825.00 (A)
		Usage variance	
Minus		₦175.00 (F)	
8,400 kg x ₦3.50 per kg	29,400.00		

where (A) means adverse and (F) means favourable.

If the price/usage is less than standard, the variance is favourable, but if the price/usage is more than the standard, it is adverse.

You should note that the price variance is based on the actual quantity purchased and is extracted first. Thereafter, the actual price is never used for variance calculations.

In the above example, the actual usage of 8,350 kg was calculated as follows:

Opening stock + Purchases – Closing stock = Usage

i.e. 1,800 + 8,000 – 1,450 = 8,350 kg

To calculate the usage variance, the actual usage of 8,350 kg multiplied by standard price of ₦3.50 is compared with the standard quantity for actual production (i.e. 140 units x 60 kg per unit = 8,400 kg) multiplied by standard price of ₦3.50.

Self Assessment Exercise 10.3

1. Define the following variances:

   (a) direct material variance
   (b) direct material price variance
   (c) direct material usage variance

2. Extract from a standard cost card shows the following information:

	Standard cost/unit ₦
Raw materials 60 kg @ ₦5.60 per kg	448
	Actual results
Production	190 parts
Direct material purchases 10,500 kg @ a cost of	₦63,000.00
Opening stock: direct material	2,900 kg
Closing stock: direct material	1,800 kg

You are expected to solve for direct material variance.

3.4 Standard Costs – Direct Labour Variance

The direct labour variance is the difference between the standard direct labour cost and the actual direct labour cost incurred for the production achieved. It is subdivided into direct labour rate variance and direct labour efficiency variance.

The direct labour rate variance is the difference between the standard and actual direct labour rate per hour for the total hours worked.

The direct labour efficiency variance is the difference between the standard hours for the actual production achieved and the hours actually worked, valued at the standard labour rate.

The formulae are as follows:

Actual labour hours x actual rate/ (i.e. total labour cost)		
minus	Rate variance	
Actual labour hours x standard rate		
Actual labour hours x standard rate		Direct labour variance
minus	Efficiency variance	
Standard hours produced x standard rate		

Example:

Let us consider an extract from a standard cost card and work out an example for a direct labour variance.

Extract from a Standard Cost Card

	Standard cost/unit
	₦
Direct labour 15 hours @ ₦6.75 per hour	101.25
	Actual results
Production	140 parts
Direct wages	₦14,405.00 for 2,150 hours

Solution:

Applying the formulae, we have:

	₦		
Actual wages paid	14,405.00		
		Rate variance	
Minus		₦107.50 (F)	
2,150 hours @ ₦6.75 per hour	14,512.50		Direct labour variance
2,150 hours @ ₦6.75 per hour	14,512.50		₦230.00 (A)
		Efficiency variance	
Minus		₦337.50 (A)	
2,100 hours @ ₦6.75 per hour	14,175.00		

You can verify the direct labour variance by calculating the difference between actual wages paid which is ₦14,405.00 and the standard labour cost of the actual production which is ₦14,175.00 – ₦14,405.00 = ₦230.00 (A).

You should note that the standard hours produced is 140 units x 15 hours which is 2,100 hours.

Self Assessment Exercise 10.4

1. Define the following:

   (b) direct labour variance
   (c) direct labour rate variance
   (d) direct labour efficiency variance

2. Extract from a standard cost card shows the following data:

	Standard cost/unit ₦
Direct labour 18 hours @ ₦8.20 per hour	147.60
	Actual results
Production	180 parts
Direct wages	₦29,000.00 for 3,450 hrs

   You are required to solve for direct labour variance.

3.5 Standard Costs – Manufacturing Overhead Variance

All material, labour and other expenditure which cannot be identified with the product are known as overheads. Overheads are normally analysed into categories appropriate to the organisation and the intended purpose. For example, in a manufacturing organisation, overheads might be separated into production overheads, administrative overheads, marketing overheads and so on.

In variance analysis, overheads are absorbed into costs by predetermined overhead absorption rates (OAR) which are calculated by dividing the budgetted overheads for the period by the activity level anticipated. The actual level can be expressed in various ways such as units, weight, sales etc. However, the most useful concept is the standard hour. The standard hour is a unit measurement of production. Thus:

Total overhead absorbed = OAR x SHP

where SHP is Standard Hours of Production

Where the standard costing system uses total absorption costing principles, i.e., where both fixed and variable overheads are absorbed into production costs, the total overheads absorbed can be subdivided into Fixed Overhead Absorption Rates (FOAR) and Variable Overhead Absorption Rates (VOAR). Thus:

Fixed overheads absorbed	=	FOAR x SHP
Variable overheads absorbed	=	VOAR x SHP
Total overheads absorbed	=	(FOAR + VOAR) x SHP

Variable overheads are only absorbed into production costs when standard marginal costing is used, hence, only variances relating to variable overheads can arise.

Example:

Let us consider an example relating to variable overhead variances and fixed overhead variances based on the following data:

Budget for Department X for period No. 6

Fixed overheads	₦15,360.00
Variable overheads	₦20,480.00
Labour hours	5,120

Actual for the period

Fixed overheads	₦15,850.00
Variable overheads	₦21,220.00
Labour hours	5,100
Standard hours produced	5,050

From the budget, the overhead absorption rates have been calculated using standard hours as the absorption base.

$$\text{FOAR} = \frac{\text{Budgeted fixed overheads}}{\text{Budgeted activity (standard hours)}} = \frac{15,360}{5,120}$$

= ₦3.00 per hour

$$\text{VOAR} = \frac{\text{Budgeted variable overheads}}{\text{Budgeted activity (standard hours)}} = \frac{20,480}{5,120}$$

= ₦4.00 per hour

and the Total Absorption Rate = ₦3.00 + ₦4.00 = ₦7.00 per hour

You should note that because the absorption rates for fixed overheads have been calculated, the examples will be based on total absorption costing principles and not standard marginal costing principle.

3.5.1 Variable Overhead Variance

The variable overhead variance is the difference between the actual variable overheads incurred and the variable overheads absorbed. This variance is simply the over or under absorption of overheads. The variable overhead variance is subdivided into variable overhead expenditure variance and the variable overhead efficiency variance. The variable overhead expenditure variance is the difference between the actual variable overheads incurred and the allowed variable overhead based on the actual hours worked. The variable overhead efficiency variance is the difference between the allowed variable overheads and the absorbed variable overhead.

Formulae:

Actual variable overheads
Minus
Actual labour x VOAR
→ Variable overhead expenditure variance

Actual labour x VOAR
Minus
SUP x VOAR
→ Variable overhead efficiency variance

Both → Total variable overhead variance

Solution:

Using the above data, we have:

₦21,220.00
Minus
2,100 x ₦4.00
→ Expenditure variance ₦820.00 (A)

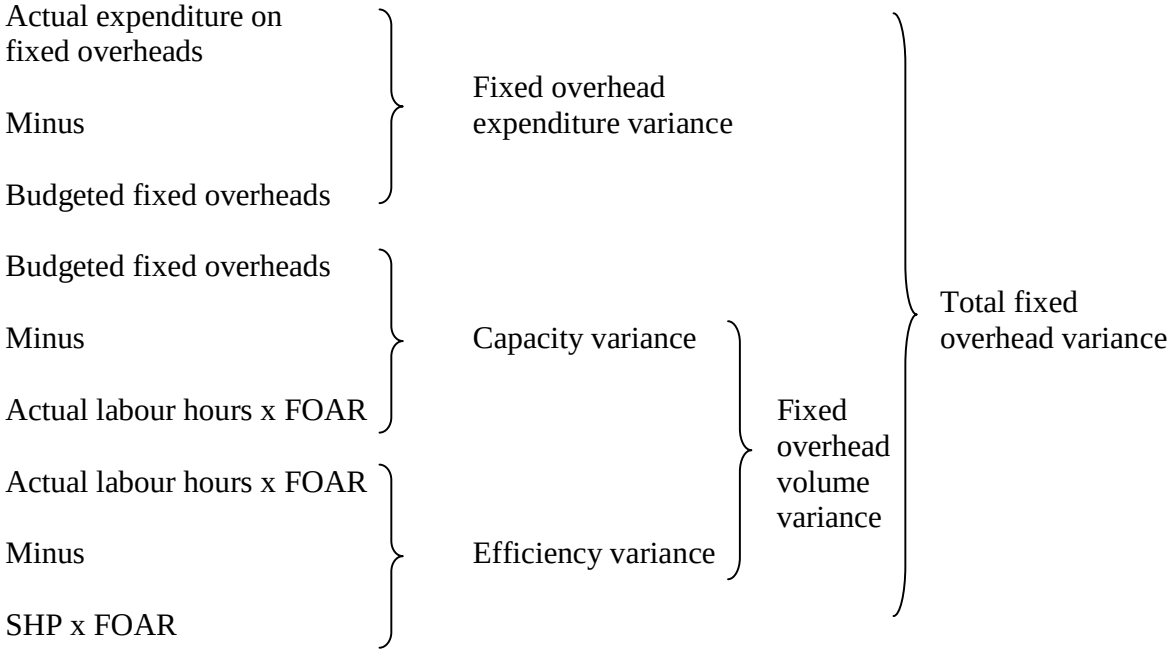
5,100 x ₦4.00
Minus
5,050 x ₦4.00
→ Efficiency variance ₦200.00 (A)

Both → Total variable overhead variance ₦1,020.00 (A)

3.5.2 Fixed Overhead Variance

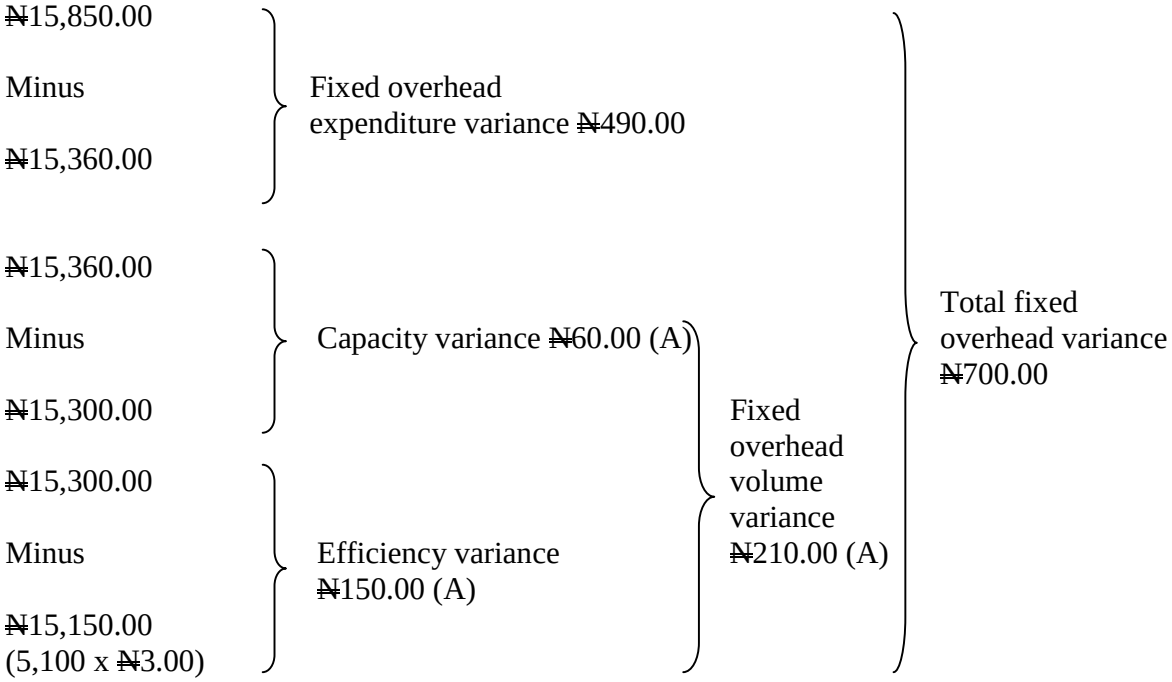
The fixed overhead total variance is the total difference between the fixed overhead absorption by the actual production and the actual fixed overhead for the period. It is subdivided into fixed overhead expenditure variance and fixed overhead volume variance. The fixed overhead expenditure variance is the difference between actual fixed overheads and allowed or budgeted fixed overheads for the period while the fixed overhead volume variance is the difference between the fixed overhead absorbed by the actual production and budgeted fixed overheads for the period. The fixed overhead volume variance is further subdivided into an efficiency variance and a capacity variance. The fixed overhead volume efficiency is the difference between the standard hours of production achieved and the actual labour hours, valued at the FOAR while the fixed overhead volume capacity variance is the difference between the budgeted hours and actual hours, valued at the FOAR.

The formulae of these variances are as follows:



Solution:

Based on the data in the example above, we have:



Self Assessment Exercise 10.5

1. Define the following variances:

   (a) variable overhead variance
   (b) variable overhead expenditure variance
   (c) variable overhead efficiency variance
   (d) fixed overhead total variance
   (e) fixed overhead volume variance
   (f) fixed overhead volume efficiency variance
   (g) fixed overhead volume capacity variance

2. Determine the variable overhead variances and the fixed overhead variances from the following data:

Budget for Department X for period No. 6

Fixed overheads	₦16,360.00
Variable overheads	₦21,480.00
Labour hours	6,120
Standard hours of production	6,050

Actual for the period

Fixed overheads	₦16,850.00
Variable overheads	₦22,220.00
Labour hours	6,100
Standard hours produced	6,050

If the FOAR = $\frac{16,360}{6,120}$ = ₦2.67

and VOAR = $\frac{21,480}{6,120}$ = ₦3.51

3.6 Advantages of Standard Costs

The advantages of standard costs are as follows:

1. Standard costing is an example of management by exception. Management attention is directed towards those items which are not proceeding according to plan through the studying of variances. Management are able to delegate cost control through the standard costing system knowing fully well that variances will be reported;

2. The process of setting, revising and monitoring standards encourages re-appraisal of methods, materials and techniques thus leading to cost reduction;

3. Standard costs represent what the parks and products should cost. They are not merely averages of past performances and as a result they are better guide to pricing than historical cost;

4. A properly developed standard costing system with full participation creates a positive cost effective attitude through all levels of management and increases motivation and goal congruence.

Self Assessment Exercise 10.6

State three advantages of standard costing that you know.

4.0 CONCLUSION

You would recall that in the discussion above, we defined standard cost as the planned unit cost of the product, components or services produced in a period.

You would also recall that we stated that standards which are used for control purposes rest on a foundation of properly organised, standardised methods and procedures and a comprehensive information system.

We also stated that direct material variance is the difference between the standard direct material cost of the actual production volume and the actual cost of direct material while direct labour variance is the difference between the standard direct labour cost and the actual direct labour cost incurred for the production achieved.

Variable overhead variance was defined as the difference between the actual variable overheads incurred and the variable overheads absorbed while fixed overhead total variance is the total difference between the fixed overhead absorption by the actual production and the actual fixed overhead for the period.

5.0 SUMMARY

In this unit, we discussed standard cost and variance analysis. We started by defining standard costs and how standards are set and then proceeded to direct material variance, direct labour variance, manufacturing overhead variance and concluded with advantages of standard costing.

In the next unit, you will be introduced to another topic titled Management Control System.

6.0 TUTOR-MARKED ASSIGNMENT

1. You are required to determine the direct material variances and the direct labour variances from the following data extracted from a standard cost card:

	Standard cost/unit
	₦
Raw materials 85 kg @ ₦6.00 per kg	510
Direct labour 20 hours @ ₦10.00 per hour	210
	720

	Actual results
Production	180 parts
Direct material purchases 11,500 kg @ a cost of	₦60,000.00
Opening stock: direct material	2,500 kg
Closing stock: direct material	1,800 kg
Direct wages	₦29,000 for 3,500 hrs

2. Compute the total variable overhead variances from the following data:

	Actual results for the period
Variable overheads	₦25,450.00
Labour hours	7,200
Standard hours produced	7,050

where the variable overhead absorption rate is given as ₦6.00 per hour.

7.0 REFERENCES/FURTHER READINGS

Horngren, C.T., Sunden, G.I., and Strratton, W.O. (2004). Introduction to Management Accounting, 12th edition. U.S.A: Prentice-Hall of India Private Limited.

Lucey, T. (2003). Management Accounting, Book Power ELST with Continuum, 5th Edition.

MODULE 3 STOCK AND MANAGEMENT CONTROL

UNIT 11 MANAGEMENT CONTROL SYSTEMS

CONTENTS

1.0 INTRODUCTION

In previous units, we have discussed many important tools used by management accountants such as: activity-based costing, relevant costing, budgeting and variance analysis. They are each useful by themselves.

However, they are most useful when they are parts of an integrated system, that is, an orderly, logical plan to coordinate and evaluate all the activities of the organisation's value chain. Managers of most organisations today realize that long-run success depends on focusing on cost quality and service.

It is in the light of this that this unit discusses how the management control system helps managers fixes resources and talents of the individuals in an organisation on such goals as cost, quality and service. As you will see, no single management control system is inherently superior to another. The "best" system is the one that consistently leads to actions that meet the organisation's goals and objectives.

2.0 OBJECTIVES

After studying this unit, you should be able to:

(i) define management control system;
(ii) explain the three responsibility centres;
(iii) discuss agency theory;
(iv) differentiate between controllable and uncontrollable costs in relation to financial performance;
(v) list and discuss the keys to successful management control systems.

3.0 MAIN CONTENT

3.1 Management Control Systems and Organisation

A management control system is a logical integration of techniques to gather and use information to make planning and control decisions, to motivate employee behaviour and to evaluate performance.

The first and most basic component in a management control system is the organisation's goals. This is because the focus of the management control system is on internal management decision-making and motivating performance consistent with the organisation's goals.

Top managers set organisation's overall goals, performance measures and targets. Managers review these goals on a periodic basis usually once in a year. These goals provide a long-term framework around which an organisation will form its comprehensive plan for positioning itself in the market. However, goals without performance measures do not motivate managers.

The purpose of performance measures is to set direction and to motivate managers. Measurements provide incentives; hence, it is important that performance measures be tied to valuable goals; otherwise, managers who achieve high performance measures may not create value for the company and its owners.

Targets for goals are specific quantified levels of the measures. As you can see, goals and their related performance measures are very broad. In fact, they are often too vague to guide managers and employees. Consequently, top managers also identify key success factors. Key success factors are characteristics or attributes that managers must achieve in order to drive the organisation towards its goals. An example of a key success factor can be timeliness in service delivery. Performance measures for timeliness would include check-in-time, check-out-time and response time to customers.

Although key success factors and related performance measures give managers more focus than the overall organisation's goals, they still do not give lower-level managers and employees the direction they need to guide their daily actions. To set this direction, top managers work with lower-level managers within the appropriate business unit to select specific tangible actions that can be carried out and observed on a short-term basis. Examples of specific actions related to timeliness are implementing an express check-in system and training staff to use the new check-in system.

Balancing the various goals is an important part of management control. To design a management control system that meets the organisation's needs, managers need to identify responsibility centres, develop performance measures, establish a monitoring and reporting structure, weigh costs and benefits, and provide motivation to achieve goal congruence and managerial effort.

Self Assessment Exercise 11.1

Meeting organisation's goals is the first and most basic component of management control systems. Discuss.

3.2 Identifying Responsibilities Centres

Responsibility centres is a set of activities and resources assigned to a manager, a group of managers or other employees. A set of machine and machining activities may be a responsibility centre for a production supervisor. The full production department may be a responsibility centre for the department head. The entire organisation may be a responsibility centre for the president or managing director.

An effective management control system gives each manager responsibility for a group of activities and actions, and then monitors and reports on the results of the activities and the manager's influence on those results. System designers apply responsibility accounting to identify what parts of the organisation have primary responsibility for each action, develop performance measures and targets and design reports of these measures by responsibility centre.

Responsibility centres usually have multiple goals and actions that the management control system monitors. In this regard, responsibility centres usually are classified according to their financial responsibility as cost centres, profit centres and investment centres.

A cost centre is a responsibility centre which a manager is accountable for costs only. It is the financial responsibility of a cost centre to control and report costs. An entire department may be considered a single cost centre or may contain several cost centres.

Profit centres have the responsibility for controlling revenues as well as costs. Despite the name, a profit centre can exist in non-profit organisations (though it might not be referred to as such) when a responsibility centre receives revenues for its services. All profit centre managers re responsible for both revenues and costs, but they may not be expected to maximise profits.

An investment centre is a step further than a profit centre. Its success is measured not only by its income, but also by relating that income to its invested capital, as in a ratio of income to the value of the capital employed. Hence, an investment centre has the financial responsibility to control and report its cost and revenue, and relating its income to the capital invested.

Self Assessment Exercise 11.2

Define the following terms:

(a) responsibility centre;
(b) responsibility accounting;
(c) cost centre;
(d) profit centre;
(e) investment centre.

3.3 Keys to Successful Management Control Systems

Successful management control systems have several key factors in addition to appropriate measures of profitability. They are focused on controllability, management by objectives and tailoring budgets for managers.

(a) Focus on Controllability

Top management should distinguish between the performance of the division manager and the performance of the division as an investment centre by the organisation. They should evaluate managers on the basis of their controllable performance (in many cases, some controllable contribution in relation to controllable investment). However, they should base their decisions such as increasing or decreasing investment in a division on the economic viability of the division, and not on the performance of its managers.

This distinction helps to clarify some difficulties. For example, top management may want to use an investment base to gauge the economic performance of a retail store, but the manager may be judged by focusing on income and forgetting about any investment allocations. If investment is assigned to the manager, the aim should be to assign only that investment that the manager can control. Controllability depends on what decisions managers can make regarding the size of the investment base. In a highly decentralized company, for instance, managers can influence the size of these assets and can exercise judgement regarding the appropriate amount of short-term credit and perhaps some long-term credit.

(b) Management by Objectives

Management by objectives (MBO) describes the joint formulation by a manager and his or her supervisors of a set of goals and plans for achieving the goals for a forthcoming period. For the purpose here, the terms ‘goals and objectives’ are synonymous. The plans often take the form of a responsibility accounting budget. The manager’s performance is then evaluated in relation to these agreed budgetted objectives.

Regardless of whether it is so labelled, an MBO approach lessens the complaints about lack of controllability because of its stress on budgetted results. That is, a budget is negotiated between a particular manager and his or her superior for a particular period and a particular set of expected outside and inside influences. In this way, a manager may more readily accept an assignment to a less successful segment. This is preferable to a system that emphasises absolute profitability for its own sake. Unless focus is placed on currently attainable results, able managers will be reluctant to accept responsibility for segments that are in economic trouble.

(c) Tailoring Budgets for Managers

Many of the troublesome motivational effects of performance evaluation systems can be minimised by the astute use of budgets. The desirability of tailoring a budget to particular managers cannot be overemphasised. For example, return on investment can provide goal congruence and managerial effort if top management gets everybody to focus on what is currently attainable in the forthcoming budget period. Typically, divisional managers do not have complete freedom to make major investment decisions without checking with senior management.

Self Assessment Exercise 11.3

Explain the keys to successful management control system.

3.4 Agency Theory, Performance and Rewards

Connecting rewards to performance is desirable, but often, a manager's performance cannot be measured directly. Ideally, rewards should be based on managerial performance. In practice, the rewards usually depend on the financial results in the manager's responsibility centre.

The economists defined agency theory as the formal choices of performance measures and rewards. When top management hires a manager, both should agree to an employment contract that details performance measures and how they will affect rewards. For example, a manager might receive a bonus of 15% of her salary, if her responsibility centre achieves its budgetted profit. According to agency theory, employment contracts will trade off three factors, such as:

(1) **Incentives** – The more a manager's reward depends on a performance measure, the more incentive the manager has to take actions that maximise that measure. Top management should define the performance measure to promote goal congruence and base enough reward on it to achieve managerial effort.

(2) **Risk** – The greater the influence of uncontrollable factors on a manager's reward, the more risk the manager bears. Managers must be paid more if they are expected to bear more risks. Creating incentive by linking rewards to responsibility centre results has the undesirable side effect of imposing risk on managers.

(3) **Cost of Measuring Performance** – The incentive versus risk trade-offs is not necessary if a manager's performance is perfectly measured. This is because a manager could then be paid a fixed amount if he or she performs as expected, and nothing if not. Whether to perform or not is completely controllable by the manager, and observation of the level of performance is all that is necessary to determine the compensation earned. But directly measuring a manager's performance is usually expensive and sometimes infeasible. The cost-benefit criterion usually indicates that perfect measurement of a manager's performance is not worth its cost.

Self Assessment Exercise 11.4

Connecting rewards to performance is desirable but often a manager's performance cannot be measured directly. In the light of the above assertion, what is agency theory?

3.5 Controllability and Measurement of Financial Performance

Management control systems often distinguish between controllable and uncontrollable events and between controllable and uncontrollable costs. An uncontrollable cost is any cost that cannot be affected by the management of a responsibility centre within a given time span. Controllable costs include all costs that are influenced by a manager's decision and actions.

The term 'controllable' is, in a sense, a misnomer because no cost is completely under the control of a manager. The term is widely used, however, to refer to any cost that is affected by a manager's decisions, even if not totally "controlled".

The distinctions between controllable and uncontrollable costs serve an information purpose. Costs that are completely uncontrollable tell nothing about a manager's decisions and actions because nothing the manager does will affect the cost. Such costs should be ignored in evaluating the responsibility centre manager's performance. On the contrary, reporting controllable costs provides evidence about a manager's performance.

Many organisations combine the contribution approach to measuring income with responsibility accounting. That is, they report by cost behaviour as well as by degrees of controllability. Managers are asked to explain the total segment contribution of their departments, but are held responsible only for the controllable contribution. You should note that fixed costs controllable by the segment managers are deducted from the contribution margin to obtain the contribution controllable by segment managers. These controllable costs are usually discretionary fixed costs such as local advertising and some salaries, but not the manager's own salary. Other non-controllable fixed costs are not considered controllable in the organisation by the segment manager.

Self Assessment Exercise 11.5

Financial performance of managers can be measured by their influences on cost. Discuss.

4.0 CONCLUSION

You would recall in the discussion that management control system was defined as logical integration of techniques to gather and use information to make planning and control decisions, to motivate employee behaviour and to evaluate performance.

You would also recall that responsibility centres were said to be cost centres, profit centres and investment centres.

We referred to definition of agency theory by the economists as the formal choices of performance measures and rewards.

Finally, we referred to uncontrollable cost as any cost that cannot be affected by the management of a responsibility centre within a given time span and controllable costs include all costs that are influenced by a manager's decisions and actions.

5.0 SUMMARY

In this unit, we discussed how management control systems help managers in focusing resources for attainment of organizational goals. We also discussed the responsibility centres that are required to meet organization's needs. We further discussed keys to successful management control systems, agency theory and performance and rewards as well as controllability and measurement of financial performance.

In the next unit, you will be introduced to another topic titled divisional performance appraisal.

6.0 TUTOR-MARKED ASSIGNMENT

1. The actualisation of organisation's goals is the first and most basic component of management control systems. Discuss.

2. Connecting rewards to performance is desirable but most often a manager's performance cannot be measured directly. Based on this assertion, what is agency theory?

3. Define the following terms:

   (a) responsibility centre;
   (b) responsibility accounting;
   (c) cost centre;
   (d) profit centre; and
   (e) investment centre.

7.0 REFERENCES/FURTHER READINGS

Horngren, C.T., Sunden, G.I., and Strratton, W.O. (2004). Introduction to Management Accounting, 12th edition. U.S.A: Prentice-Hall of India Private Limited.

Lucey, T. (2003). Management Accounting, Book Power ELST with Continuum, 5th Edition.

UNIT 12 DIVISIONAL PERFORMANCE APPRAISALS

CONTENTS

1.0 INTRODUCTION

It may be possible for a single proprietor to monitor and oversee the detailed operations of a small business outfit, bit it would be impossible for an individual to oversee all the operations of a large scale organisation and take all the relevant decisions required. This is obviously because many large business organisations have complex structures which have their various challenges and problems. It demands therefore that some management functions should be transferred to subordinate managers.

In large companies, there is substantial decentralisation of managerial decision making from central management to the operating divisions of the company. This has occurred in existing single companies and also as a consequence of merger activity. Typically, mergers result in a large, diversified group consisting of a number of operating divisions, with various degree of autonomy, answerable to the holding company or the main board of directors.

As a result of such structural changes, the financial control of divisions by central management has become a complex and vital task. It is one in which practicing management accountant, particularly at senior levels, has a key role in the design and operation of performance appraisal systems which assists central management to ensure that the company, as a whole, fulfills overall company objectives.

2.0 OBJECTIVES

After studying this unit, you should be able to:

(i) explain the concept ‘decentralisation’;
(ii) state the objectives of decentralisation;
(iii) discuss the potential problems associated with decentralisation;

(iv) explain the reasons why companies choose to or not to decentralise;
(v) list the objectives of performance appraisal;
(vi) describe and calculate the various profits used as measure of performance appraisal.

3.0 MAIN CONTENT

3.1 The Concept of Decentralisation

As organisations grow in size and complexity, top management find themselves unable to make all the decisions. In such circumstances, authority for certain types of decision making is delegated to subordinate managers and thus some decision making moves away from the centre and decentralisation takes place.

The amount of decentralisation can vary widely. In theory, total decentralisation could occur whereby a division operated completely autonomously with authority to make all types of decisions and would thus in effect be a separate entity. This situation is unlikely to be encountered and while the amount of delegated authority varies considerably, certain types of decisions invariably seem to be retained by the central management. Typically, these include: major investment decisions, self staff appointments and salaries and pricing decisions.

The main areas of divisional responsibility are connected with the day-to-day actions of manufacturing, selling and promotion, labour appointments and utilisation, maintenance and customer and supplier relationships.

There are no absolute standards to judge the extent to which an organisation is decentralised. An organisation may have numerous operating divisions, but with all decisions of any significance taken at the centre, while another may have few or no identifiable divisions yet has genuine, decentralised decision making. The natural result of a policy of decentralisation is the creation of semi-autonomous operating divisions where the local management has considerable, but not absolute, discretion and has responsibility for divisional profitability. It is in such circumstances that formal performance appraisal and monitoring systems become necessary. Therefore, decentralisation is defined as a system in which the authority for decision making is delegated to the other levels of management.

Self Assessment Exercise 12.1

What is decentralisation?

3.2 Objectives of Decentralisation

The general purpose of decentralisation and the creation of divisional structures is to enhance the efficiency of the enterprise as a whole and to make it more capable of meeting overall objectives. Decentralisation should be able to meet the following objectives when properly organized and controlled:

(1) **Improve Local Decision-making** – Divisional management are in close touch with the day-to-day operations and are in a position to make more informal and speedier decisions.

(2) **Improve Strategic Decision-making** – Central management are relieved of much lower level and routine decision-making and thus able to concentrate on strategic considerations.

(3) **Increase in Flexibility and Reduced Communication Problems** – The ability to take decisions near the point of action reduces response time and means that adjustments can be made more swiftly. The shorter communication lines means quicker decisions and fewer changes of errors caused by communication channels.

(4) **Increased Motivation of Divisional Management** – This is the key feature of decentralisation and arguably is the most important factor contributing to increased efficiency. Research shows that people value greater independence and respond in a positive manner to increased responsibility, particularly when this is linked to the reward system of the organisation. An important factor in the design of performance appraisal systems is to ensure that motivation is not stifled and that goal congruence is encouraged. Over-emphasis on one performance target can distort operations as management concentrate unduly on the designated single factor and ignore other equally important aspects of the organisation.

(5) **The Spread of Genuine Decision-making and increasing responsibility** – This entails provision of better training for junior management. In many organisations, there are movements within the divisional management and between divisional and central management thus enhancing career opportunities for able and ambitious managers. The existence of these opportunities helps to attract people of the right caliber and increases morale and motivation.

3.3 Problems Associated with Decentralisation

The major potential problem with decentralisation, particularly where the divisions are highly interdependent, is that of sub-optimal decision-making. This is caused by decisions where benefits to one division are more than affected by costs or losses of benefits to other divisions. Where there is a lack of congruence between the overall objectives of the organisation and the goals and aims of the local decision maker, then sub-optimal decision-making is likely unless there is a relevant and well-designed appraisal system.

Other problems and extra costs which may occur with decentralisation are the duplication of certain services, like personnel functions. In addition, it is likely that decentralisation will require more sophisticated information system. Friction may also occur between divisional managements, particularly where the performance of one division is dependent on that of another division. This problem is aggravated when financial considerations which affect divisional performance are concerned. A particular example of this is the problem of setting transfer prices for goods and services supplied by one division to another. The price at which

goods or services are transferred affects the financial performance of both divisions involved and is a possible area in which sub-optimal decisions may be taken.

Self Assessment Exercise 12.2

What are the possible problems that may arise with decentralisation?

3.4 Centralisation versus Decentralisation

The difference between centralisation and decentralisation is a matter of degree along a continuum of decision-making authority. The delegation of the freedom to make decisions is called decentralisation.

Let us take a look at some of the reasons why companies choose to or not to decentralise:

Costs and Benefits:

For organisations which practice decentralisation, there are some benefits attached. First, lower-level managers have the best information concerning local conditions and therefore, may be able to make better decisions than their superiors.

Second, decentralisation gives managers decision-making ability and other management skills that help them move upward in the organisation, ensuring continuity of leadership. In addition, managers enjoy higher status by being independent and thus are better motivated.

However, some of the costs of decentralisation are that managers may make decisions that are not in the organisation's best interest, either because they act to improve their own segment's performance at the expense of the organisation or because they are not aware of relevant facts from other departments. Another cost is that management in decentralised organisations tends to duplicate services that might be less expensive if a centralised is in place e.g. accounting, advertising and personnel. In addition, costs of accumulating and processing information frequently rise because responsibility accounting reports are needed for top management, to learn about and evaluate decentralised units and their managers. Finally, managers in decentralised units may waste time, negotiating with other units about goods or services that one unit provides to the other.

Middle Ground:

Cost-benefit considerations usually require that some management decisions be highly decentralised and others centralised. For example, much of the controller's problem-solving and attention-directing functions may be decentralised and handled at lower levels, whereas income tax planning and mass store keeping such as payroll may be highly centralised.

Decentralisation is not successful when organisation's departments are relatively independent of one another. That is, the decisions of a manager in one department will not affect the fortunes of another department.

Profit Centres and Decentralisation:

Decentralisation expresses freedom to make decisions and profit centres express accountability for revenue and expenses. They are entirely separate concepts. Indeed, cost centres may be more heavily decentralised than profit centres if cost centre managers have more freedom to make decisions. The fundamental question is, will a profit centre better solve the problems of goal congruence and management effort than a cost centre? If that is case, a profit centre can be decentralised.

Transfer Pricing:

Very few problems arise in decentralised organisations when all the departments are independent of one another. Departmental heads can then focus only on their own departments without hurting the organisation as a whole. On the contrary, when departments interact greatly, there is an increased possibility that what is best for one department hurts the other department, so much so that it has a negative effect on the entire organisation. Such situation may occur when one department provides products or services to the other department and charges that department a transfer price. Transfer prices are the amounts charged by one department of an organisation for a product or service that it supplies to another department of the same organisation.

Self Assessment Exercise 12.3

Discuss some of the reasons why managers choose or may not choose to decentralise.

3.5 Objectives of Performance Appraisal

When central management has decided that decentralisation should take place and operating divisions are established, some system of control or performance appraisal becomes necessary. As with any form of information system, the performance appraisal system should assist management to plan and control activities, and to make decisions which enable the objectives of the organisation as a whole to be met. In particular, performance appraisal systems for monitoring divisions with substantial delegated powers should:

1. **Promote goal congruence** – The performance appraisal system and criteria employed should help local management to direct operations and to make decisions in ways that fulfill overall company objectives. Ideally, the goals of local management should coincide with overall company goals.

2. **Provide Relevant and Regular Feedback to Central Management** – Central management need regular feedback of appropriate information in order to judge the capability of local management and also to assess the economic worth of the division as an operating unit.

3. **Encourage Initiative and Motivation** – The performance appraisal system should not be narrowly conceived or so rigidly applied that it stifles initiative, for example, if local

management see an opportunity which would increase overall company profits, but which would reduce the profits of their own division, then the system should be flexible enough for this to take place without local management feeling that they will be penalized.

4. **Encourage Long-run View Rather than Short-run Expedients –** The long-term success of the organisation is the primary objective and the performance appraisal systems and measures should encourage decision-making which contributes to this objective. Another emphasis on short-run considerations may cause adverse long-term effects, short-term improvements on results are relatively easily made by, for example, foregoing proper maintenance, having poorer quality but cheaper staff, reducing product quality and other similar expedients.

Self Assessment Exercise 12.4

What are the objectives that performance appraisal seek to achieve where decentralisation exists?

3.6 Profitability Measures of Performance

Profit is a widely used absolute measure of performance and is one familiar to management and acceptable to them; which is an important behavioural consideration. When profit is used as a performance measure, it provides a means by which a division can be compared with another division and one division's performance can be compared period by period.

When profit is used as a measure of performance appraisal, it may be defined in a variety of ways and a number of the more important variants are described below, including controllable profit, divisional profit, net profit, controllable residual profit, and net residual profit.

Controllable Profit – This is defined as revenues less costs controllable at the divisional level. The rationale for this concept is sound in that the measure includes only those costs and revenues for which local management has primary responsibility. Items that are included or excluded are dealt with below:

1. ***Variable Items (Costs and Revenues:*** In general, those items of costs and revenues which are dependent on local decisions are included. For example, sales income, costs of labour, materials, operating expenses including short run interest charges relating and rewards to controllable working capital items such as debtors and inventories.

2. ***Divisional Overheads:*** This include items which are fixed in relation to activity, but can be varied by management action, such as administrative and supervisory costs and, where delegated to the division, advertising costs.

3. ***Depreciation and Fixed Asset Costs:*** These items should be excluded because it is outside the control of local management. However, if fixed asset investment is

controllable by local management, then depreciation on controllable items would be included.

4. ***Apportionment Items:*** Frequently, a portion of central administration costs or part of the costs of facilities used jointly by divisions are charged to the division. These are non-controllable and all such apportioned costs should be excluded.

Divisional Profit – This is the profit that arises from divisional operations which can be calculated without arbitrarily apportioning central costs. It is equivalent to controllable profit less depreciation on division's assets and other non-controllable divisional overheads.

Net Profit – This can be defined as revenue less controllable divisional costs and apportioned central administration costs.

The use of this method does allow local management to be aware of all the costs of the division and of its net effect on the group results. However, all methods of apportioning costs are arbitrary and local management has no control over the amount of costs apportioned which may be at a significant level. In such circumstances, appraisal by divisional net profit may have adverse behavioural effects, reduce motivation and may lead to sub-optimal decision-making.

Controllable Residual Profit or Income – This is sales revenue less controllable divisional costs and interest inputted on the divisional investment. Using residual profit as a performance measure assumes that the level of divisional investment is a responsibility of divisional management. This should be contrasted with the view taken when controllable profit is used as a performance measure that the investment level is a central, strategic responsibility. It follows that depreciation should be charged on fixed assets controlled by the division when residual income is calculated. The imputed interest charged on the amount invested represented the opportunity cost of funds and is normally based on the firm's cost of capital.

Net Residual Profit – This is controllable residual profit less interest on non-controllable divisional assets and apportioned head office charges. This performance measure attempts to appraise the economic worth of the division as a whole from the viewpoint of the group. It combines both the performance of local management (appraised by controllable residual profit) and an evaluation of the investment in the division and its total costs, including an appropriate share of central charges.

The various definitions of profits have been discussed in the preceding paragraphs. What measures to use is a matter of judgement which depends on a variety of factors including company objectives, degree of decentralisation, quality of local management, the efficiency of available information system and other such considerations.

Let us see a summary of the relationship of the appraisal measures based on profit.

Relationship of Divisional Profit Measures

Divisional Revenue (from external sales and internal transfers) less divisional variable costs

= **Divisional Contribution**

Less Controllable divisional fixed overheads
Less Depreciation on fixed assets controlled by the division

= **Controllable Profit**

Division classified as Profit Centre	Division classified as an Investment Centre
Controllable Profit	Controllable Profit
Less: non-controllable divisional fixed overheads	Less: imputed interest on controllable investment
Less: depreciation on fixed assets not controlled by division	**Controllable Residual Profit**
Divisional Profit	Less: non-controllable divisional fixed overhead Less: depreciation on non-controllable divisional fixed assets Less: imputed interest on non-controlled investment
Less: apportioned Central Costs	Less: apportioned Central Costs
= **Net Profit**	= **Net Residual Profit**
Less: Taxation	Less: Taxation
= **Net Profit after Tax**	= **Net Residual Profit after Tax**

The above table summaries the various measures and shows their relationships. It will be seen that after controllable profit, there is a divergence whereby divisions are considered either as profit centres or where imputed interest is involved, as investment centres.

Let us consider an example to explain the relationship of the appraisal measures based on profit.

Example:

The following data have been collected relating to ice-cream division of the UTC Group.

Data for Ice-cream Division

			₦
Sales Revenue	-	external customers	600,000
	-	internal transfers	350,000
Variable operating costs	-	Labour	95,000
	-	Materials	160,000
	-	Overheads	42,500
Fixed operating cost	-	Controllable by division	78,000
	-	Controllable centrally	41,000
Divisional management cost			26,500
Fixed Assets (at cost)	-	Divisional purchases	450,000
	-	Central purchases	250,000
Total central administration and management costs (This was apportioned on the basis of sales revenue which was ₦5.2 million for the group as a whole)			684,210

The group's weighted average cost of capital is estimated at 15% and it is the group's policy to calculate depreciation on a straight line basis at 25% and to impute interest on a gross investment basis.

Solution:

	₦	₦
Divisional Revenue		950,000
Less: Variable Costs		
Labour	95,000	
Materials	160,000	
Overheads	42,500	297,500
Divisional Contribution		652,500
Less: Controllable overheads	78,000	
Controllable depreciation (450,000 x 25%)	112,500	190,500
Controllable Profit		**462,000**

Calculation of Net Profit

Profit Centre Approach		Investment Centre Approach	
	₦		₦
Controllable Profit b/f	462,000	Controllable Profit b/f	462,000
Less: Non-controllable fixed overheads	41,000	Less: imputed interest on controllable investment (15% x ₦450,000)	67,500
Non-controllable depreciation (250,000 x 15%)	62,500		
Divisional Profit	**358,500**	**Controllable Residual Profit**	**394,500**
		Less:	
		Non-controllable Overheads	41,000
Less Apportioned Central Charges		Non-controllable Depreciation	62,500
684,210 x 950,000		Non-controllable imputed interest	37,500
5,200,000 1	125,000	Apportioned Central Charges	125,000
Net Profit before Tax	**223,500**	**Net Residual Profit before Tax**	**128,500**

Self Assessment Exercise 12.5

You are required to describe the following profit performance revenues:

(a) controllable profit;
(b) divisional profit;
(c) net profit;
(d) controllable residual profit.

4.0 CONCLUSION

You would recall in our discussion that decentralisation was defined as a system in which the authority for decision-making is delegated to the other levels of management.

The general purpose of decentralisation and the creation of divisional structures is to enhance the efficiency of the enterprise as a whole and to make it more capable of meeting overall objectives. The potential particular problem associated with decentralisation is sub-optimal decision-making.

Basically, the performance appraisal system should assist management to plan and control activities, and to make decisions which enable the objectives of the organisation as a whole to be attained.

The number of ways profit is used as measure of performance appraisal are: controllable profit, divisional profit, net profit, controllable residual profit and net controllable residual profit.

5.0 SUMMARY

In this unit, we discussed decentralisation starting from its concept to objective, problems associated therewith, and the differences between centralisation and decentralisation. We also discussed the objectives of performance appraisal and finally profitability measures of performance.

In the next unit, we shall discuss non-financial performance measures.

6.0 TUTOR-MARKED ASSIGNMENT

1. Performance appraisal seeks to achieve certain objectives. What are these objectives?

2. Explain the following terms:

   (a) controllable profit;
   (b) divisional profit;
   (c) net profit;
   (d) controllable residual profit.

3. The following data have been collected relating to ice-cream division of the shoe-making division of PZ Plc.

Data for Ice-cream Division			₦
Sales Revenue	-	external customers	750,000
	-	internal transfers	500,000
Variable operating costs	-	Labour	110,000
	-	Materials	180,000
	-	Overheads	62,500
Fixed operating cost	-	Controllable by division	98,000
	-	Controllable centrally	47,000
Divisional management cost			46,500
Fixed Assets (at cost)	-	Divisional purchases	490,000
	-	Central purchases	350,000
Total central administration and management costs (This was apportioned on the basis of sales revenue which was ₦6 million for the group as a whole)			580,000

The group's weighted average cost of capital is estimated at 18% and it is the group's policy to calculate depreciation on a straight line basis at 20% and to impute interest

on a gross investment basis. You are required to present the profit and investment approaches.

7.0 REFERENCES/FURTHER READINGS

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UNIT 13 NON-FINANCIAL PERFORMANCE MEASURES

CONTENTS

1.0 INTRODUCTION

For many years, organisations have monitored their non-financial performance. for example, sales organisations have followed up on customers to ensure their satisfaction and manufacturers have tracked manufacturing defects and product performance.

In this unit, we shall describe the balanced scorecard approach to implementing a company's strategy and consider perspectives, characteristics and pitfalls in implementing a balanced scorecard.

2.0 OBJECTIVES

After studying this unit, you should be able to:

(i) explain the control of quality, control of cycle time and the control of productivity;
(ii) discuss strategy and the balanced scorecard;
(iii) explain the four perspectives of the balanced scorecard;
(iv) discuss the characteristics of a good balanced scorecard;
(v) discuss the pitfalls in implementing a balanced scorecard.

3.0 MAIN CONTENT

3.1 Importance of Controlling Non-Financial Areas

In recent years, most organisations have developed a new awareness of the importance of controlling non-financial performance areas such as: quality, cycle time and productivity.

Let us discuss the controlling of these non-financial areas below:

3.1.1 Control of Quality

Quality control is the effort to ensure that products and services perform to customer requirements. In essence, customers define quality by comparing their needs to the attributes of the product or service. Defining quality in terms of customer requirement is 50% done. There remains the problem of reaching and sustaining the desired level of quality.

In recent years, total quality management (TQM) evolves as an approach to quality control after much rethinking on approaches to quality control. TQM focuses on prevention of defects and on customer satisfaction. The TQM approach is based on the assumption that the cost of quality is minimized when a firm achieves high quality levels. Total quality management is the application of quality principles to all of the organisation's endeavors to satisfy customers.

To implement TQM, employees are trained to prepare, interpret and act on quality control charts. The quality control chart is a statistical plot of measures of various product dimensions or attributes. This plot helps detect process deviations before the process generates defects. These plots also identify excessive variation in product attributes that should be addressed by process or design engineers.

3.1.2 Control of Cycle Time

Cycle time, or throughput time, is the time taken to complete a product or service, or any of the components of a product or service. It is a summary measure of manufacturing or service efficiency and effectiveness, and an important cost driver. The longer a product or service is in process, the more costs are consumed. Low cycle time means quick completion of a product or service (without defects). Lowering cycle time requires smooth-running processes and high quality, and also creates increased flexibility and quicker reactions to customer needs. As cycle time is decreased, quality problems become apparent throughout the process and must be solved if quality is to be improved. Decreasing cycle time also results in bringing products or services more quickly to customers.

An effective means of measuring cycle time is to use bar coding, where a bar code (similar to symbols on most grocery products) is attached to each component or product and read at the end of each stage of completion. Cycle time is measured for each stage as the time between readings of bar codes. Bar coding also permits effective tracking of materials and products for inventories, scheduling and delivery.

Cycle time can also be displayed on a control chart, known as cycle-time report. This report is similar to the flexible budget reports where unfavourable variances indicate that poor-quality materials and poor design led to extensive rework and retesting.

3.1.3 Control of Productivity

Productivity is a measure of outputs divided by inputs. The fewer inputs needed to produce a given output, the more productive the organisation. This simple definition, however, raises

difficult measurement questions. How should outputs and inputs be measured? Specific management control issues usually determine the most appropriate measures of inputs and outputs. Labour-intensive (especially service) organisations are concerned with increasing the productivity of labour, so labour-based measures is appropriate. Highly automated companies are concerned with machine use and productivity of capital investments, so capital-based measures, such as the percentage of time machines are available, may be most important to them. Manufacturing companies, in general, are concerned with the efficient use of materials and so for them, measures of material yield (a ratio of material outputs over material inputs) may be useful indicators of productivity. In all cases of productivity ratios, a measure of the resource that management wishes to control is in the denominator (the input) and some measure of the objective of using the resource is in the numerator (the output).

Self Assessment Exercise 13.1

Explain the following control of non-financial areas:

(i) Control of quality;
(ii) Control of Cycle time; and
(iii) Control of productivity.

3.2 Company's Strategy and the Balanced Scorecard

Strategy specifies how an organisation matches its own capabilities with the opportunities in the marketplace to accomplish its objectives. In formulating a company's strategy, the company must thoroughly understand its industry. Industry analysis focuses on five forces which are:

(i) competitors
(ii) potential entrants into the market;
(iii) equivalent products;
(iv) bargaining power of customers; and
(v) bargaining power of input suppliers.

The collective effect of these forces shapes a company's profit potential. In general, profit potential decreases with greater competition, stronger potential entrants, products that are similar and more-demanding customers and suppliers.

The balanced scorecard translates an organisation's mission and strategy into a set of performance measures that provides the framework for implementing its strategy. The balanced scorecard does not focus solely on achieving financial objectives that an organisation must achieve to meet its financial objectives. The scorecard measures an organisation's performance from four perspectives which shall be discussed later in this unit. They include:

(1) Financial
(2) Customer

(3) Internal business processes, and
(4) Learning and growth.

The balanced scorecard balances the use of financial and non-financial performance measures to evaluate short-run financial performance, such as: quarterly earnings. That is because the key strategic non-financial and operational indicators, such as: product quality and customer satisfaction, measure changes that a company is making for the long-run. The financial benefits of these long-run changes may not appear immediately in short-run earnings. However, given the company's strategy, strong improvement in non-financial measures usually indicates the creation of future economic value. For example, an increase in customer satisfaction, as measured by customer surveys and repeat purchases, indicates a strong likelihood of higher sales and income in the future.

By balancing the mix of financial and non-financial measures, the balanced scorecard broadens management's attention to short-run and long-run performance. For profit making companies, the goal of the balanced scorecard is to improve a company's overall financial performance. Non-financial measures simply serve as leading indicators for the hard-to-measure long-run financial goals.

Self Assessment Exercise 13.2

1. What is Strategy?
2. What is Balanced Scorecard?

3.3 Perspectives of the Balance Scorecard

You would recall as stated in the above sub-unit that the balanced scorecard has four perspectives which are financial, customer, internal business processes and learning and growth perspectives. These are discussed below:

1. **Financial Perspective** – This perspective evaluates the profitability of the strategy of a company. For instance, if cost reduction relative to competitors' costs and sales growth are a company's strategic initiative, the financial perspective would focus on how much of the operating income that would be earned from reducing costs and selling more units.

2. **Customer Perspective** – This perspective identifies targeted customer and market segments and measures the company's success in these segments. Example can be the use of number of new customers and customer satisfaction ratings to measure a company's growth objectives.

3. **Internal-Business-Process Perspective** – This perspective focuses on internal operations that create value for customers that in turn further the financial perspective of increasing shareholder value.

4. **Learning and Growth Perspective** – This perspective identifies the capabilities the organisation must excel lat, to achieve superior internal processes that create value for customers and shareholders.

Self Assessment Exercise 13.3

List and explain the perspectives of the Balanced Scorecard.

3.4 Characteristics of a Good Balanced Scorecard

A well-designed balanced scorecard has several features, such as:

(1) The balanced scorecard tells the story of a company's strategy, articulating a sequence of cause-and-effect relationships, that is, the links among the various perspectives that describe how strategy will be implemented. Each measure in the scorecard is part of a cause-and-effect chain, from strategy formulation to financial outcomes.

(2) The balanced scorecard helps to communicate the strategy to all members of the organisation by translating the strategy into a coherent and linked set of understandable and measurable operational targets.

(3) For profit-making companies, the balanced scorecard must motivate managers to take actions that eventually result in improvements in financial performance. A balanced scorecard emphasises non-financial measures as part of a program to achieve future financial performance. When financial and non-financial performance measures are properly linked, most, if not all, of the non-financial measures serve as leading indicators of lagging future financial performance.

(4) The balanced scorecard limits the number of measures, identifying only the most critical ones. The purpose is to focus managers' attention on measures that most affect the implementation of strategy.

(5) The balanced scorecard highlighted less-than-optimal trade-offs that managers may make when they fail to consider operational and financial measures together.

Self Assessment Exercise 13.4

What are the characteristics of a good balanced scorecard?

3.5 Pitfalls in Implementing a Balance Scorecard

Pitfalls to avoid in implementing a balanced scorecard include the following:

1. Managers should not assume the cause-and-effect linkages are precise. They are merely hypotheses. Over time, a company must gather evidences of the strength and

timing of the linkages among the non-financial and financial resources. With experience, organisations should alter their scorecards to include those non-financial objectives and measures that are the best leading indicators of financial performance.

2. Managers should not seek improvements across all of the measures all of the time. Trade-offs may need to be made across various strategic goals. For example, strive for quality and on-time performance, but not beyond a point at which further improvement in these objectives may be inconsistent with long-run profit maximisation.

3. Managers should not use only objective measures (such as operating income from cost leadership, market shares and manufacturing yield) in the balanced scorecard. When using subjective measures (such as customer and employee-satisfaction ratings), managers must be careful that the benefits of this potentially rich information are not by using measures that are inaccurate as that can be easily manipulated.

4. Managers should not fail to consider both costs and benefits of initiatives such as spending on information technology and research and development before including these objectives in the balanced scorecard. Otherwise, managers may focus on measures that will not result in overall long-run financial benefits.

5. Managers should not ignore non-financial measures when evaluating managers and other employees. Managers tend to focus on what their performance is to measure by excluding non-financial measures when evaluating performance. This will reduce the significance that managers give to non-financial measures.

Self Assessment Exercise 13.5

What are the pitfalls to be avoided in implementing the balanced scorecard?

4.0 CONCLUSION

You would recall that areas of non-financial control include quality, cycle time and productivity. Strategy specifies how an organisation matches its own capabilities with the opportunities in the marketplace to accomplish its objectives.

A balanced scorecard translates an organisation's mission and strategy into a set of performance measures that provides the framework for implementing its strategy. The balanced scorecard has four perspectives which are: financial, customer, internal business processes and learning and growth perspectives.

5.0 SUMMARY

In this unit, we discussed the importance of controlling non-financial areas and proceeded in discussing strategy and balanced scorecard, perspectives of the balanced scorecard,

characteristics of a good balanced scorecard and finally, the pitfalls in implementing a balanced scorecard.

6.0 TUTOR-MARKED ASSIGNMENT

1. Explain the following control of non-financial areas:

   (a) Control of quality;
   (b) Control of Cycle time;
   (c) Control of productivity.

2. What are the characteristics of a good balanced scorecard?

3. Discuss the various perspectives of the balanced scorecard.

7.0 REFERENCES/FURTHER READINGS

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UNIT 14 ACTIVITIY BASED COSTING

CONTENTS

1.0 INTRODUCTION

In the past, almost all companies used traditional costing systems. Traditional Costing System do not accumulate or report costs of activities or processes. Traditional costing systems work well with fairly simple production and operating systems. In the 1990s, in the United States, however, many businesses changed their operating systems in response to a more complex business environment. This led to a need for new and improved cost accounting system. The most significant improved in cost accounting system design has been activity based costing (ABC). ABC is aimed at using only cause and effect approach of cost allocations. ABC is an attempt to reflect more accurately in product costs, those activities which influence the level of support overheads. This includes such items as inspection, production planning, set-up tooling and other costs. Traditionally, all overheads were absorbed in production volume as measured by labour or machine hour.

It is in the light of this unit to expose to you the concept of activity base costing so as to enrich your knowledge about the application of this approach in cost accounting system.

2.0 OBJECTIVES

After studying this unit, you should be able to

1. Define activity-based costing
2. Distinguish between traditional an ABC system
3. Explain how activities are identified that are included in an ABC system
4. Explain how indirect costs are traced to activities and cost objects.
5. State the factors that affect cost drivers
6. Calculate the cost of a batch using ABC
7. State the benefits of ABC

3.0 MAIN CONTENT

3.1 Comparison of Traditional and ABC Costing

One of the most important differences between traditional and activity-based costing system is the extent of allocation. Traditional system generally allocates only production costs to the products. Activity-based costing systems often expand allocation of costs beyond production to processes such as order processing, design, marketing and customer service.

Another difference between traditional and ABC Costing is that traditional Costing only often use one cost driver. Activity-based Costing can use more than one cost drivers. Cost drivers is any factor which causes a change in the cost of an activity; for example, number of transactions per channel, number of product service per channel etc.

Another difference is that traditional systems for not attempt to identify accumulate or report costs by activities performed. But the activity-based costing identify, accumulate cost by activities performed.

Another difference is that traditional costing systems work well with fairly simple production and operating systems but activity –based costing work well in complex production and operating systems.

Self Assessment Exercise 14.1

What are the differences between traditional and activity based costing

3.2 Identifying Activities to include in the ABC System

Activity-based Costing refines a costing system by identifying individual activities as the fundamental cost objects. An activity is an event, task or unit of work with a specified purpose. For example, designing products, setting up machines, operating machines and distributing products. ABC Systems calculate the costs of individual activities and assign costs to cost objects such as products and services on the basis of the activities needed to produce each product or service. Activities consume resources. For example, workers are paid to pack and ship finished goods to customers. Then products that consume the activities (packing and shipping) are allocated the costs of those activities.

Defining activities is not a simple matter. It might demand evaluating hundreds of task performed in an organisation before choosing the activities that form the basis of its ABC system. An activity-based Costing System with many activities becomes complex and unwieldy to operate. An activity-based costing system with too few activities may not be rich enough to measure cause-and-effect relationships between cost drivers and various indirect costs. In choosing activities, one identifies activities that account for a sizable fraction of indirect costs and combines other activities that have the same cost allocation based into a single activity. For example, in a block making firm, you can combine the maintenance of the block-making machine, operations of the machine, process control an

product inspection into a single activity which can be known as machine operations. This is because these activities have the same cost driver which is machine-hours.

Self Assessment Exercise 14.2

Identifying activities to be included in an ABC System is not a small matter. Discuss

3.3 Tracing Overhead Costs to Activities and Cost Objects.

Recall that an activity is an event, task or unit of work with a specified purpose and cost objects are products or services which cost can e assigned. Tracing overhead costs to activities and cost objects can be explained by the following approach;

1. Direct-Cost tracing – ABC Systems aim to reclassify some indirect costs as direct costs by evaluating if some of the costs currently classified as indirect can be traced to cost objects or products. For example, the costs of cleaning and maintenance activity which consist of salaries and wages paid to workers responsible for cleaning the block making machine. These costs can be traced directly to the specific blocks produced by the machine. Direct tracing of costs improves cost accuracy and is simplier.

2. Indirect-Cost pools. Cost pool is the point of focus for the cost relating to a particular activity in an activity-based costing. Cost pools are similar in principle to cost centres in traditional system. It may be decided that an activity-based system is required, then the appropriate cost drivers are chosen and the costs associated with each activity are gathered together in cost pools. ABC systems create smaller indirect cost pools linked to the different activities. The original single indirect cost pool would not be homogeneous. This is because the costs of some of the activities that are lumped into the single cost pool have a weak cause-and-effect relationship. Each of the new activity-related cost pools would be homogeneous. This is because each activity cost pool would include only cost related to that activity, for example, the distribution cost pool include only cost incurred for distribution purpose.

3. Cost-allocation bases. For each activity cost pool, measure of the activity preformed serves as the cost-allocation bases. For example, the measure of distribution activity serves as the cost-allocation base for distribution costs.

Self Assessment Exercise 14.3

What are the three approaches in tracing overhead costs to activities and cost objects?

3.4 Assigning Cost to Activity Cost Pools

A cost hierarchy categories indirect costs into different cost pools on the basis of the different types of costs drivers, or cost-allocation bases or different degrees of difficulty in determining cause-and-effect relationships. ABC systems commonly use a cost hierarchy

with four levels to identify cost-allocation basis that are, whenever, possible cost drivers of costs in activity cost pools. The four levels of a cost hierarchy used by ABC systems are:

1. Output unit-level costs- These are costs of activities performed on each individual unit of a product or service. The cost of these activities increase with additional units of output produced.

2. Batch-level Costs- These are cost of activities related to a group of units of products or services rather than to each individual unit of product or service. In companies that purchase many different types of direct materials. Procurement costs can be significant. Procurement costs include the costs of placing purchase orders, receiving materials, and paying suppliers. These costs are batch-level costs because they are related to the number of purchase orders placed rather than to the quality or value of materials purchased.

3. Product –sustaining costs (or Service sustaining costs)- These are cost of activities undertaken to support individual products or services regardless of the number of units or batches in which the units we produced. Examples of product-sustaining costs are product research and development costs, cost of making engineering changes, and marketing cost to launch new products.

4. Facility-sustaining costs- These are costs of activities that can not be traced to individual products or services but that support the organisation as a whole. For example, the general administration costs (including top management Compensation, rent and building security) are facility-sustaining costs.

It is usually difficult to find a good cause-and-effect relationship between these costs and the cost-allocation base. These lack of a cause-and-effect relationship causes some companies not allocate these costs to products and instead to deduct them separately from operating income. Allocating all costs to products or services becomes important when management wants to set selling prices on the basis of an amount of cost that includes all costs.

Self Assessment Exercise 14.4

ABC systems commonly use a cost-hierarchy with four levels to identify cost-allocation bases, explain these four levels.

3.5 Factors that affect Cost Driver

The factors that most likely affect cost drivers are:

a. Accuracy – the greater the level of accuracy required of product costing, the more the cost drivers.

b. Correlation- the more closely a cost driver correlates with activity use, the fewer distortions in products cost and the fewer cost drivers.

c. Homogenity- The cost pool should be homogenous. It can fairly be represented by one cost driver. Where this is not possible, the pool may need to be sub-divided and numerous cost drivers used and the resultant effect make the system more complex and costly to administer

d. Inspection- this is the extent that one cost can be fairly applied to diverse products. If the cost driver, 'number of inspections' was used to trace inspection costs to products, distortions will be introduced. If inspections take varying amounts of time for different products, inspection hours may be a better cost driver or there may be a need for several cost drivers to trace cost fairly.

Let us consider a practical use of cost drivers. Conventionally, the cost pools and cost drivers chosen must suit the organisation, the products or services and the objectives of the ABC system. As a result, they will vary from organisation to organisation and there are no universally applicable examples.

Illustration.

An organisation introduced ABC and has separated its main activities into reasonably homogenous cost pools. Cost drivers have been selected for each pool, the usage of which correlates approximately to the amount of overhead in the cost pool. Budgeted overheads and cost driver volumes are as below:

Cost Pool	Budgeted Overhead	Cost Drivers	Budgeted Volume	Cost	Driver Rates
	N1,000				N1,000
Material Procurement	2,100	Number of Order	6,500	2,100,000 / 6,500	= 323
Material Handling	2,850	Number of Movement	3,750	2,850,00 / 3,750	=760 per move
Set up	1,900	Number of setup	750	1,900,00 / 750	=2,533 per set up
Maintenance	3,650	Maintenance hours	32,000	3.650,000 / 32,000	=114 per hour
Quality Control	3,300	No of inspection	10,500	3,300,000 / 10,500	=314 per inspection
Machinery	4,600	No of machine hours	145,000	4,600,00 / 145,000	32 per hour

The calculated Cost Driver rates are used to trace the appropriate amount of overheads to the product. For example, a batch 224 part No. 0001A had a direct cost (material and labour) of N490,500 and usage of activities as follows:

Material orders	184	
Material Movement	79	
Set ups	42	
Maintenance hours	720	
Inspections	140	
Machine hours	2,160	

What was the cost of the batch using ABC?

Solution

Cost of batch 224 Part No 001A

	N	N
Direct Costs		490,500
Overheads:		
184 material order @N323	59,432	
79 Material Movement@N760	60,040	
42 Set-ups @N2,533	106,386	
720 Maintenance hours @N114	82,080	
140 Inspections @N314	43,960	
2,160 Machine hours@32	69,120	421,018
Batch Cost		**911,518**

Self Assessment Exercise 14.5

1. State the factors that affect cost drivers.

2. Determine the batch cost of a company, whose direct cost is given as N658,000 where the usage of activities are:

Material orders	92	
Material movements	132	
Set ups	58	
Maintenance hours	750	
Inspections	120	
Machine hours	2,100	

While the cost driver rate has been calculated and is given as;

Material order	400	
Material movement	320	
Set-ups	2,230	
Maintenance hours	730	
Inspections	210	
Machine hours	28	

3.6 Benefits of ABC Systems

The followings are benefits of ABC:

a. ABC provides realistic product costs most especially in advanced manufacturing technology (AMT) factories where support overheads are a significant proportion of total costs.
b. ABC enhances the tracing of overheads to the product. In modern factories, there are a growing number of non-factory floor activities. ABC is concerned with all activities.
c. It recognised activities which cause cost, and not products
d. It focuses attention on the real nature of cost behaviour and helps in reducing costs and identifying activities which do not add value to the product.
e. It also recognises the complexity and diversity of modern production by the use of multiple cost drivers, many of which are transaction based rather than based solely on production volume.
f. It provides a reliable indication of long-run variable product cost which is relevant to strategic decision making.
g. If is flexible to trace costs to processes, customers, areas of managerial responsibility, as well as products costs.
h. It also provides useful financial measures and non-financial measures, for example cost driver rates as financial measures and transaction volumes as non-financial measures.

Self Assessment Exercise 14.6

What are the benefits of activity-based costing?

4.0 CONCLUSION

In this unit, we discussed activity-based costing. We started by comparing traditional and ABC system and proceeded to identifying activities to include in the ABC system, tracing overhead costs to activities and cost objects, assigning cost to activity cost pools, factors that affect cost drivers and finally, state the benefits of ABC system.

5.0 SUMMARY

You should recall activity-based costing is an attempt to reflect more accurately in product costs, those activities which influence the level of support overheads one of the most important differences between traditional and ABC system is the extent of allocation.

ABC refines a costing system by identifying individual activities as the fundamental cost objects. ABC system calculate the cost of individual activities and assign cost to cost object such as products and services on the basis of the activities needed to produce each product or services.

ABC uses cost hierarchy and cost hierarchy categorises indirect costs into different cost pools on the basis of the different types of cost drivers. The factors that affect cost drivers are accuracy, correlation, homogeneity and inspection.

6.0 TUTOR MARKED ASSIGNMENT

1. Identifying activities to be included in an ABC system is not a small matter. Discuss.

2. What are the three approaches in tracing overhead costs to activities and cost objects.

3. An organisation introduced ABC and has separated its main activities into reasonably selected for each pool, the usage of which correlates approximately to the amount of overhead in the cost pool. Budgeted overhead and costs driver volumes are as follows:

Cost Pool	**Budgeted Overhead**	**Cost Drivers**	**Budgeted Volume**	**Cost Driver Rate**
	₦			₦
Material Procuremet	3,198,00	No. of order	7,800	3,198,000 =410 7,800 per order
Material handling	2,744,000	No of Movement	2,800	2,744,000 =980 2,800 per move
Set up	2,000,250	No. of setup	750	2,000,250 = 2,667 750 per set up
Mainatanance	3,650,000	maintenance hours	32,000	3,650,000 = 114 32,000 per hour
Quality Control	3,300,000	No of inspection	10,000	3,300,00 = 30 10,000
Machinery	5,600,00	No of machine hours	140,000	5,600,00 = 40 140,000 per hour

The calculated cost driver rates are used to trace the appropriate amount of overheads to the product. The batch 468 part No 00CA had a direct cost (material and labour) of N650,000 and usage of activities as follows:

Material orders	220
Material movements	87
Set ups	52
Maintenance hours	620
Inspections	180
Machine hours	2,800

What is the cost of the batch using ABC?

Solution

Cost of batch 468 Part No. 00CA

		₦	₦
Direct Costs:			650,000
Overheads			
220 material order	@N410	90,200	
87 material movement	@ N980	85,260	
52 set ups	@N2,667	138,684	

620 maintenance	@N114	70,680	
180 inspection	@N330	59,400	
2,800 machine hours	@N40	112,000	556,224
Batch Cost			1,206,224

7.0 REFERENCES/FURTHER READINGS

Horngren, C.T., Sunden, G.I., and Strratton, W.O. (2004). Introduction to Management Accounting, 12th edition. U.S.A: Prentice-Hall of India Private Limited.

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UNIT 15 STOCK MANAGEMENT

CONTENTS

1.0 INTRODUCTION

Stock can be classified into raw materials, work-in progress and finished goods. Raw materials are the components used in the manufacturing of products. Work-in-progress is partly finished goods and materials held between manufacturing stages. Finished goods are completed products ready for sale or distribution. The particular items include in each classification depend on the particular firm. What would be classified as a finished product for one company might be classified as raw material for another.

Stock is an investment to any company. It demands therefore, that it should be properly managed to eradicate loss and wastage to the company. Stock management includes recording and monitoring of stock levels, forecasting future demands and deciding when and how many to order. This can as well be known as stock control.

In this unit, we shall define stock management, explain stock cost, enumerate the benefits of stock management, calculate economic order quantity and re-order level, minimum level and the maximum level as they affect stock management. We shall also list the advantages and disadvantages of stock reorder level system.

2.0 OBJECTIVES

After studying this unit, you should be able to

1. Define stock management
2. Explain stock cost
3. State the benefit of stock management
4. Calculate the economic order quantity (EOQ)
5. Calculate the re-order level, the minimum level and the maximum level
6. State the advantages and disadvantages of reorder level system.

3.0 MAIN CONTENT

3.1 Stock Cost

The objective of stock management is to minimise, in total, the costs associated with stock. Stock represents am investment by the organisation. As with any other investment, the costs of holding stock must be related to the benefits to be gained to do this affectively. These costs can be categorised into three groups. They are as follows:

1. **Costs of holding stock.**
   The costs of holding stock which is also known as carrying costs include the following;
   a. Interest on capital invested in the stock
   b. Storage charges (rent, lighting, heating, refrigeration, air conditioning etc)
   c. Stores staffing, equipment maintenance and running costs.
   d. Handling costs.
   e. Audit, stock taking or perpetual inventory cost
   f. Insurance and security
   g. Deterioration and obsolescence
   h. Pilferage, vermin damage e.t.c.

2. **Costs of obtaining stock**
   The cost of obtaining stock which is sometimes known as ordering costs, include the following:
   a. The clerical and administrative costs associated with the purchasing, accounting, and goods received departments.
   b. Transport costs
   c. Where goods are manufactured internally, the set up and tooling costs associated with each production run.

3. **Stock out costs.**
   These are the costs associated with running out of stock. The avoidance of these costs is the basis reason why stocks are held in the first place. The stock and costs include the following:
   a. Lost of future sales be cause customer go elsewhere
   b. Labour frustration over stoppages
   c. Extra cost associated with urgent, often small quantity replenishment purchases.

Self Assessment Exercise 15.1

Mention the different types of stock costs and give three examples of each.

3.2 Benefits of Stocks Management

Over-stocking are stocks which are excess to current needs and it results in capital being tied up and increased costs of storage and obsolescence. Under-stocking may result in costly

production hold-ups, which may mean increased costs of goods. It also interrupts production, making machines and men idle and causing sales loss. However, there are benefits to be derived when a proper stock management is in place, such as:

1. Stock management can ensure proper execution of policies covering procurement and use of materials and make possible rapid shifts in business to meet changes in market conditions.

2. Stock management can obtain economics through a reduction in needless variety of items carried in stock

3. Stock management can help to eliminate delays in production caused by non-availability of required materials and tools.

4. Stocks management can avoid over accumulation of inventories and tools and thereby maintain the minimum investment consistent with production needs and procurement policies.

5. Stock management can reduce inventory losses caused by inadequate inspection of incoming materials, dmaged, deterioration, obsolescence, waste or theft.

6. Stock management can provide balance stores records to serve as a reliable basis for effective production planning, economical procurement, cost accounting and preparation of financial reports.

Self Assessment Exercise 15.2

What are the benefits of stock management?

3.3 The Economic Order Quantity(EOQ)

The economic order quantity is defined as the ordering quantity which minimises the balance of cost between inventory holding costs and re-order costs. To be able to calculate a basic EOQ certain assumptions are necessary. They are:

a. That there is a known, constant stockholding cost.
b. That there is a known, constant ordering cost.
c. That rates of demand are known and constant.
d. That there is a known, constant price pre unit, that is, there are no price discounts.
e. That replenishment is made instantaneously, that is, the whole batch is delivered at once.

It is possible to calculate the EOQ using a formula. The formula method gives an exact answer. The calculations are based on estimates of costs, demand etc. which are of course, subject to error. Therefore, it might be misleading to place undue reliance upon the figure. However, the formula is given below as

$$EOQ = \sqrt{\frac{2DCo}{Cc}}$$

Where D= Demand per annum
Co = Ordering cost per order
Cc= Carrying cost per unit per annum

Example

A company has a forecast demand of 50,000 unit per annum which are N12 each to purchase. The ordering and handling costs are N150 per order and carrying costs are 15% of purchase price per annum.

You are required to calculate the EOQ for this company.

Solution

We have Co = N150, D=50,000, Cc = N12x 15% = 1.8

$$EOQ = \sqrt{\frac{2x50,000x150}{1.8}}$$

$$= \sqrt{8,333,333}$$
= 2887 units

Example

The forecast demand for Tosan Ltd is 5,000 units per month, the ordering cost is N250 per order, the unit cost is N10 each and it is estimated that carrying costs ae 15% per annum. You are required to calculate EOQ for Tosan Ltd.

Solution

We have Co.= N250, D= 5,000x12= 60,000, Cc = N10 x 15% = 1.5

$$EOQ = \sqrt{\frac{2x60,000 \times 250}{1.5}}$$
=4472 units

Self Assessment Exercise 15.3

You are required to calculate the EOQ for a company whose demand is 70,000 units per annum with an ordering cost of N350 per order. The unit cost is N15 each and it was estimated that its carrying costs are 12% per annum.

3.4 Reorder Level System

The reorder level system is also known as the two-bin system. Its characteristics are as follows:

a. A predetermined re-order level is set for each item
b. When the stock level falls to the re-order level, a replenishment order is issued.
c. The replenishment order quantity is invariably the economic order quantity.
d. The name 'two-bin' system comes form the simplest method of operating the system such that the stock is separated into two bins. Stocks is initially drawn from the first bin and a replenishment order issued when it becomes empty.
e. Most organisations operating the re-order level system maintain stock records with calculated re-order levels which trigger off the required replenishment order.

Example 1

The following information has been gathered with regards to material Z of Kingsway Ltd.

Normal month usage	28,600
Maximum anticipated monthly usage	33,000
Minimum anticipated monthly usage	8,000
Delivery period from suppliers	
Maximum	3 months
Normal	2 months
Minimum	11/2 month
Re-order quantity (EOQ)	12,000 units

You are required to calculate

a. Re-order level
b. Minimum Stock level
c. Maximum Stock level

Solution

a. Re-order level = Maximum usage x maximum re-order period
=33,000 x 3 = 99,000 units

b. Minimum stock level
= Re-order level – (normal usage x normal re-order period)
= 99,000 – (28,600 x 2)
= 41,800 units

c. Maximum Stock level
= Re-order level + EOQ – (Minimum usage x minimum re-order period)
= 99,000 + 12,000 – (8,000 x 1.5)
= 99,000 units

Example 2

The following data relate to a particular stock item:

Normal usage	150 per day
Minimum usage	30 per day
Maximum usage	190 per day
Lead time	22-30 days
EOQ	5000 units

Using this data, you required to calculate

a. The re-order level
b. Minimum level
c. Maximum level

a. Re-order level = Maximum usage x Maximum lead time
= 190 x 30
= 5,700 units

b. Minimum level = Re-order level – (normal usage x Average lead time)
= 5,700 – (150 x 26)
= 5,700 – 3,900
=1,800

c. Maximum level = Re-order level + EOQ – (Minimum usage x minimum reorder period)
= 5,700+ 5000 – (30 x 22)
=10,040 units

You should note the following terminology used above.

a. Lead time is the period of time, expressed in days, weeks, month etc between ordering (either externally or internally) and replenishment, that is, when the goods are available for use.

b. Maximum level is the stock level selected as the maximum desirable which is used as an indicator to show when stock has risen too high.

c. Minimum level is a stock allowance to cover errors in forecasting between ordering and replenishment (Lead time).

This is also known as buffer stock or safety stock or safety stock.

d. The reorder level is the level of stock at which a further replenishment order should be placed.

Self Assessment Exercise 15.4

The following data relate to a particular stock item:

Normal usage	130 per day
Minimum usage	50 per day
Maximum usage	170 per day
Lead time	25-30 days
EOQ	6000 units

Using the above data, you are required to calculate:

a. The re-order level
b. The minimum level
c. The maximum level

3.5 Advantages and Disadvantages of Re-order level system

The advantages are:

a. Lower stocks on average
b. Items ordered in economic quantities through the EOQ calculation
c. Some what more responsive to fuctuations in demand
d. Automatic generation of a replenishment order at the appropriate time by comparison of stocks level against re-order level.
e. Appropriate for widely differently types of inventory within the same firm.

The disadvantages are:

a. Many items may reach re-order level at the same time, thus overloading the re-ordering system.
b. Items come up for re-ordering in a random fashion so that there is no set sequence
c. In certain circumstances, e.g variable demand, ordering cost e.t.c.) , the EOQ calculation may not be accurate.

Self Assessment Exercise 15.5

List three advantages and disadvantages each of the re-order level system.

4.0 CONCLUSION

In this unit, we discussed stock management. We started with stock cost and preceded to benefits of stock management, the economic order quantity (EOQ), the re-order level system and finally advantages and disadvantages of re-order level system.

5.0 SUMMARY

You should recall that stock management include recording and monitoring of stock levels, forecasting future demands and deciding when and how many to order.

Stock cost includes costs of holding stock, costs of obtaining stock and stockout costs. The economic order quantity is defined as the ordering quantity which minimises the balances of cost between inventory holdings costs and re-order costs. The re-order level is the level of stock at which a further replenishment order should be placed.

6.0 TUTOR MARKED ASSIGNMENT

(1) A company has a forecast demand of 60,000 units per annum which are N15 each to purchase. The ordering and handling costs are N150 per orderand carrying costs are 15% of purchase price per annum. You are required to calculate the EOQ for this company.

Solution
We have Co = N150, D = 60,000, Cc = N15 x 15% = 2.25

$$EOQ = \sqrt{\frac{2DCo}{Cc}}$$

$$= \sqrt{\frac{2x\ 60{,}000\ x\ 150}{2.25}}$$

= 2828 unit

(2) The following information has been gathered with regard to material X of MElador Ld

	Units
Normal month usage	32,600
Maximum anticipated monthly usage	37,000
Minimum anticipated monthly usage	12,000
Delivery period from suppliers	
Maximum	35months
Normal	31/2 months
Minimum	2 month
Re-order quantity (EOQ)	28,280 units

You are required to calculate

a. Re-order level
b. Minimum Stock level
c. Maximum Stock level

Solution

a. Re-order level = Maximim usage x maximum re-order period
   =37,500 x53
   = 187,500 units

b. Minimum stock level
   = Re-order level – (normal usage x normal re-order period)
   = 187,500 – (32,700 x 3.5)
   = 73,050 units

c. Maximum Stock level
   = Re-order level + EOQ – (Minimum usage x minimum re-order period)
   = 187,500 + 28,280 – (12,000 x 2)
   = 190,328 – 24,000
   = 191,780 unit

7.0 REFERENCES/FURTHER READING

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UNIT 16 RATIO ANALYSES

CONTENTS

1.0 INTRODUCTION

A ratio is expressed as the measure of the relationship between two mathematically inclined items or objects. Ratio analysis is the systematic production of ratios from both internal and external financial reports so as to summarise key relationship and results in order to appraise financial performance.

Ratio analysis can be directed towards various aspects of company performance including; the financial performance of the company in terms of income generation, the analysis of company solvency, the assessment of the company's performance in terms of its value to investors.

The various users of financial statements have different reasons for analysing the results as a basis to form their opinions on how well the operations of a firm had been run as well as its financial position as at a given date. It would assist in determining the strengths and weaknesses of a firm and also be able to predict the future.

A good knowledge of the interpretation of the ratios is therefore, desirable for management in making decisions.

2.0 OBJECTIVES

After studying this unit, you should be able to:

1. Explain the nature of ratio analysis
2. Calculate profitability ratios
3. Calculate solvency ratios
4. Calculate investment ratios
5. Calculate activity ratios

3.0 MAIN CONTENT

3.1 The Nature of Ratio Analysis

A single financial ratio is not itself enough to do determine a good or bad situation, hence, there is the need to compare with some other ratios using some standard to compare with some other ratios using some standard which may include:

1. Historical ratios – These are those computed from the records of the same company

2. Industry ratios – These are those that were computed on the average of all the firms in the same sector of economy. It is the industrial average ratio

3. Projected ratios – These are those that were derived based on the budgeted financial of the same company.

4. Competitor' ratios – These are those of chosen competitor companies, most importantly the ones adjudged adequately in the same period. The ratios are computed based on the financial statements of the competitor company for the same period.

Ratio analysis could be seen in various classifications such as trend analysis, industry analysis, consectional analysis and budgeted analysis. Each of them is discussed briefly.

1. Trend analysis – This is the comparison of financial ratio over a given period of time. This helps to ascertain the mode of change and the determination of the company's financial results in terms of being constant, diminished or increased over a give period of time.

2. Industry analysis – this is the comparison of a company's financial ratios with that of the industry average ratios which it belongs to. This basis of comparison has some deficiencies, which are
    a. Difficulties in obtaining information for driving the industry average rations.
    b. The average so derived are those of both the viable and less viable companies within the industry
    c. Accounting policies and mode of operation may not be the same for all the companies within the industry.
    d. Differences in parameter of the variables, that is, of the numerator and denominator.

3. Cross-Section Analysis – This is where the ratios relating to the same period and of a particular company is compared with that of some companies within the same industry relating to the same time.

4. Budgeted Analysis – This is the comparison of the current/past ratios with the future ratios in order to determine the company's relative strength and inadequately before, now

and in the future. The effect of this is to show the deficiency of the financial situation so that remedial actions can be put in place.

Based on the needs of the different users (that is, management, shareholders, employees, trade unions, government and government agencies, lenders, auditors, suppliers, public/customers, competitors, financial analyst and researchers) of financial statements, ratios have been classified as follows, among which are:

Profitability ratios
Solvency ratios
Investment ratios
Activity ratios

These shall be discussed in detail in the subsequent sub-section with the use of financial statements.

Self Assessment Exercise 16.1

Explain the following terms; Trend analysis, industry analysis, cross-section analysis and budgeted analysis.

3.2 Profitability Ratios

Profitability ratios are determined in order to ascertain or evaluate the operating adequacy of a company over time. In order to give room for effective analysis, the ratios under this category are:

a. Return on Capital Employed (ROCE)
b. Asset Turnover Ratios
c. Profitability Margin Ratios

Return on Capital Employed – This ratio measures the relationships between the return and the capital employed or the total net assets. The ROCE can be defined in different ways depending on the objective to be achieved and the comparison to be made.

The following can be adopted for the purpose of defining capital 'employed'.

a. Total assets, that is, fixed assets plus current assets
b. Net assets, that is, share capital plus reserves
c. Total assets less current liabilities, that is , shareholders' funds plus long-term liability plus debt capital .

Returns could be defined as any of the following:

a. Net profit before taxation
b. Net profit before interest and taxation

c. Net profit after taxation

If capital employed is defined as total assets less current liabilities, the return would be net profit before interest and tax i.e. definition

(1) for ROCE = $\frac{\text{Net profit before interest and tax}}{\text{Shareholders fund plus long-term liability and debt capital}} \times \frac{100}{1}$

If capital employed is defined as shareholders fund, then the return would be net profit before taxation.

i.e. definition (2) for ROCE $= \frac{\text{Net profit before tax}}{\text{share capital plus reserve}} \times \frac{100}{1}$

If capital employed is defined as total asset, return would be net profit before interest and tax

i.e. definition (3) for ROCE = $\frac{\text{Net profit before interest \& tax}}{\text{Total Asset}} \times \frac{100}{1}$

Profitability Margin Ratios – These ratios are used to measure the total relationship of the margin on sales and asset turnover as well as these of operating costs. These ratios are used to determine managerial capability.

The major types of profitability ratio are:

a. Cross profit margin = $\frac{\text{Gross profit}}{\text{Sales}} \times \frac{100}{1}$

b. Net profit margin = $\frac{\text{Net profit}}{\text{Sales}} \times \frac{100}{1}$

You should note that the net profit can be any of these:

1. Net profit before tax (NPBT)
2. Net profit after tax (NPAT)
3. Net profit before interest and taxation (NPBIT)

The net profit before taxation is generally considered a better figure to use than net profit after taxation. This is because the tax rate may change from year to year or companies may not be in the same taxable position, thus making yearly comparison difficult.

However, a much better measure of net profit is net profit before interest and tax (NPIT). This measure of profit show is earnings arising form commercial operation of business without the effect of financing.

Let us use, a financial statements to have practical calculations of these ratios.

The following is the final accounts of Musaga PLC

Musaga PLC
Profit and Loss Account for the year ended 31 December, 2009.

	N'000	N'000
Sales		11,800
Manufacturing Cost of Sales		
Materials	4,915	
Labour	1,520	
Factory overheads	1,300	7,735
Gross profit		4,065
Less Administrative expenses	1,200	
Selling & distribution expenses	640	
Bank interest	80	
Loan interest	400	2,320
Net profit before tax		1,745
Less Tax		220
Net profit after tax		1,525
Less Dividends		
15% Preference	113	
Ordinary- Interim (paid)	270	
Ordinary- final (proposal)	270	653
Transferred to reserves		872

Musaga Plc
Balance sheet as at 31 December, 2009

	N'000	N'000	N'000
Fixed Assets			
Premises	3,750		
Plants and Equipments	5,625		
Motor Vechicle	893		
Goodwill	263		
Patent Rights	75		10,606
Current Assets			
Stock: Finished Goods	300		
Raw Materials	292		
Consumable	480		
Trade Debtors	1,537		
Cash and Bank	240	2,849	
Less Current Liabilities			
Bank overdraft	1,275		
Trade creditors	1,236		

Taxation payable	220		
Proposed dividend	270	3,001	(152)
Net total asset			10,454
Represented by			
Share capital			
Ordinary shares N1 each			4,125
15% preference shares N1 each			750
Retained profit			2,579
			7,454
Debentures			
15% loan stock			3,000
Capital employed			10,454

Let us calculate the profitability ratios of Musaga PLC.

Solution

Profitability ratios: We shall use just one type

1a. Return on Capital employed $= \frac{\text{Net profit before interest and tax}}{\text{Shareholders fund plus long-term liability and debt capital}} \times \frac{100}{1}$

ROCE $= \frac{2,225,000}{10,454,000} \times \frac{100}{1}$

$= 21\%$

Net profit before interest and tax = 1,745,000 + 80,000,400,000 = 2,225,000

Shareholders fund plus long-term liability and debt capital = 7,454 + 3,000 = 10,454,000

b. Return on Capital Employed $= \frac{\text{Net profit before tax}}{\text{Share capital plus reserve}} \times \frac{100}{1}$

ROCE $= \frac{1,745,000}{7,454,000} \times 100$

$= 23\%$

c. Return on capital employed $= \frac{\text{Net profit before interest and tax}}{\text{Total Asset}} \times \frac{100}{1}$

$= \frac{2,225,000}{13,455,000} \times \frac{100}{1}$

$= 17\%$

Net profit = 1,745,000 + 80,000 +400,000 = 2,225,000

Total Assets = 10,606,000 + 2,849,000 = 13,455,000
You should note that any one selected is correct for use.

Profitability margin ratio

1. Cross profit margin = $\frac{\text{Gross profit}}{\text{Sales}} \times \frac{100}{1}$
   $= \frac{4,065,000}{11,800,000} \times \frac{100}{1}$
   = 34%

2. Net profit margin = $\frac{1,745,000}{11,800,00} \times \frac{100}{1}$
   = 15%

Self Assessment Exercise 16.2

Let us take the following financial statements as a base for calculating ratios for the various self assessment exercise that would be required in this unit.

The following is the final accounts of Tunde Plc

Tunde Plc

Profit and Loss Account for the year ended 31 December, 2008

	N'000	N'000
Sales		15,000
Less Manufacturing Cost of Sales		
Materials	5,600	
Labour	1,200	
Factory overheads	1,100	7,900
Gross profit		7,100
Less Administrative expenses	1,500	
Selling & distribution expenses	820	
Bank interest	210	
Loan interest	450	2,980
Net profit before tax		4,120
Less Tax		480
Net profit after tax		3,640
Less Dividends		
18% Preference	171	
Ordinary- Interim (paid)	380	
Ordinary- final (proposal)	400	951
Retained profit for the year		2, 689

Tuned PLC
Balanced sheet as at 31 December, 2009

	N'000	N'000	N'000
Fixed Assets			
Premises	4,200		
Plants and Equipments	5,600		
Motor Vechicle	890		
Goodwill	400		
Patent Rights	100		11,190
Current Assets			
Stock: Finished Goods	450		
Raw Materials	350		
Consumable	380		
Trade Debtors	3,320		
Cash and Bank	400	2,900	
Less Current Liabilities			
Bank overdraft	1,300		
Trade creditors	2,100		
Taxation payable	480		
Proposed dividend	400	4,280	(1,380)
			9,810
Financed by			
Share capital			
Ordinary shares N1 each			5,000
18% preference shares N1 each			950
Retained profit			2,689
			8,639
Debentures			
16% loan stock			1,171
			9,810

Self Assessment Exercise 16.3

Using the final accounts of Tunde PLc, you are required to calculate the following financial ratios:

1. Return on capital employed
2. Gross profit margin
3. Net profit margin

3.3 Solvency Ratios

These ratios can be classified into:

1. Short-term solvency or liquidity ratios
2. Long-term solvency or leverage ratios

1. **Liquidity or Short-term Solvency Ratios** – the liquidity or short-term solvency ratios are used to determine the ability of the company to meet its current obligations or liabilities. When a company is not liquid, it could lead to less of goodwill, poor credit ratings and undue legal tussles which may eventually led to the winding up of the company. On the other hand, excess liquidity could lead to under utilisation of assets.

   The liquid ratio can be categorised as follows among others:

   a. Current ratio
   b. Quick or acid test ratio
   c. Cash ratio.

   a. ***Current ratio*** – this is a measure of the relationship between the current assets and current liabilities. The current assets are made up of cash, debtors, bank and those assets that can be easily turned into cash within a period of one year, these include stock, marketable securities and prepayments. The liabilities payable within one year are referred to as current liabilities such s traded creditors, bills payable, bank overdraft, tax liability, proposed dividend and portion of long-term due within one year. A ratio greater than one shows that the company has more of current assets than current liabilities. The ratio ideally is expected to be 2:1.

      $$\text{Current ratio} = \frac{\text{Current Assets}}{\text{Current liabilities}}$$

      Referring to Musaga Plc, financial statements we can calculate the current ratio as

      $$\text{Current ratio} = \frac{2,849,000}{3,001,000} = 0.9 : 1$$

      Obviously, it is not adequate considering what is ideal.

   b. ***Quick or acid test ratio*** – This shows the relationship between liquid assets and current liabilities. The stock and prepayment items are not always included in the current assets because stock items are not usually the same in the different companies while prepayments may not e easily recoverable, for example advance payment for electricity or telephone.

      $$\text{The quick ratio} = \frac{\text{current assets – stock prepayments}}{\text{Current liabilities}}$$

      Refer to Musaga Plc final accounts, you would

      $$\text{Quick ratio} = \frac{1,777,000}{3,001,000} = 0.6 : 1$$

   c. ***Cash ratio*** – This ratio is used to determine the degree of responsiveness of cash and cash equivalents to take care of current liabilities and ascertain the ability of the company to hold enough cash and cash equivalent par time. It can be expressed as:

Cash + Marketable securities/trade investments
Current liabilities

From Musaga Plc Balance Sheet, we have

Cash ratio = $\frac{240,000}{3,001,000}$ = 0.08 :1

2. **Long-term Solvency or leverage ratios** – These are ratios that are used to ascertain the long-term financial performance of company, hence the usage of the terms financial leverage. Therefore, they are used to determine the manner in which funds provided by shareholders (owners) and debenture holders (lenders) are mixed up in order to finance the assets of the company. In general, the leverage ratios are determined in order to compute the financial risks and the company's competence to engage debts to the shareholders benefits.

   The ratios that can be compute under leverage ratio among others include;

a. ***Gearing ratio*** = $\frac{\text{Fixed interest Capital}}{\text{Capital employed (net total assets)}} \times \frac{100}{1}$

where the fixed interest capital is made up of the long-term loans from the financial institutions as well as the debentures or bonds raised from the capital markets and any other interest - bearing loan, whereas capital employed is the totality of net fixes and current assets i.e. total assets less current liabilities.

Therefore, referring to Musaga Plc

Gearing ratio = $\frac{3,750,000}{10,454,000} \times \frac{100}{1}$
= 36%

Where debentures (3,000,000) plus 15% preference shares (N750,000) = N3,750,000

b. ***Debt ratio*** = $\frac{\text{Total debts}}{\text{Capital employed}} \times \frac{100}{1}$

Where the total debts is a function of the fixed interest capital and short-term funds, deferred charges and various depositors. This ratio is to measure the extent to which the external providence of funds have contributed to the financing of the company.

Debt ratio = $\frac{6,751,000}{10,454,000} \times \frac{100}{1}$
= 65%
Where fixed interest capital is 3,000,000 + 750,000 and current liabilities 3,001,000

c. ***Equity to Assets ratio*** – This measures the degree of contribution of owners of business in financing the total assets put to use at a point in time.

Equity to Assets ratio = shareholders fund (capital and reserves) X 100
Total Assets (fixed and Current assets)

$$= \frac{4{,}125{,}000 + 2{,}579{,}000}{10{,}606{,}000 + 2{,}849{,}000} \times \frac{100}{1}$$

$$= \frac{6{,}704{,}000}{13{,}455{,}000} \times \frac{100}{1}$$

= 50%

3.4 Investment Ratios

Investment Ratios are ratios calculated in order to determine the ability of the company as it relates to consistency in sustaining investment potentials and stability.

The various ratios that can be calculated include:

a. Earning per share (EPs)
b. Dividend par share (DPS)
c. Dividend pay-out ratio
d. Earning yield
e. Dividend yield
f. Price-earning ratio (PER)

a. ***Earning Per Share***- This is a ratio that indicates the relationship of the distribution of profits to every shareholder in a company. It is calculated this:

EPS = Net Profit After Tax – Preference Dividend (Gross)
Number of ordinary share on issue

Using Musaga Plc financial statement, we have

$$EPS = \frac{1{,}525{,}000 - 113{,}000}{4{,}125{,}000} = \frac{1{,}412{,}000}{4{,}125{,}000}$$

= 34 kobo per share

b. ***Dividend per Share*** – This is expressed as a function of shareholders in a company. It is calculated as:

DPS = Ordinary dividend (Interim and final)
Number of ordinary share on issue

$$= \frac{540,\ 000}{4{,}125{,}000}$$

= 13 kobo per share

c. ***Dividend cover/pay-out ratio*** – This ratio shows the relationship between the DPS and EPs. That is, it shows the proportion of earnings that is required to pay the current dividends due to each ordinary shareholder.

It is calculated as:

$$\text{Dividend-payout ratio} = \frac{\text{Dividend per share}}{\text{Earning per share}} \times \frac{100}{1}$$

$$= \frac{0.13}{0.34} \times \frac{100}{1} = 38\%$$

d. ***Earnings yield*** – This is a ratio used to measure the degree of responsiveness of net profit after tax per share to market value per share (MVS). The market value per share can be sourced from the stock exchange official daily listing made available through the financial periodicals. It can be calculated as:

$$\text{Earning yield} = \frac{\text{EPS}}{\text{MVS}} \times \frac{100}{1}$$

Assuming the market value per share for Musaga Plc is N4 per share, therefore

$$\text{Earning yield} = \frac{.34}{4.00} \times \frac{100}{1}$$

$$= 8.5\%$$

e. ***Dividend yields*** – This is a ratio used to determine the percentage of return on investment made and it is calculated as:

$$\text{Dividend yield} = \frac{\text{DPS}}{\text{MVS}} \times \frac{100}{1}$$

$$= \frac{0.13}{4.00} \times \frac{100}{1}$$

$$= 3.25\%$$

f. ***Price earning ratio*** – the inverse of the earnings yield is referred to as the price-earning (P/E) ratio. This is a ratio that shows the shareholder's future outlook about the increase in the company's profit after tax. The security market operators also use it to evaluate the company's financial position as required by the shareholders.

It can be calculated as:

$$\text{Price-earning ratio} = \frac{\text{MVS}}{\text{EPs}}$$

$$= \frac{4.00}{0.34} = 12 \text{ times}$$

Self Assessment Exercise 16.4

Assuming a market value price of N3 per share using Tunde Plc financial statements, you are required to calculate the following investment ratios:

a. Earning per share (EPs)
b. Dividend par share (DPS)
c. Dividend pay-out ratio
d. Earning yield
e. Dividend yield
f. Price-earning ratio (PER)

3.5 Activity Ratios

Activity ratios are used by companies to assess the degree of effectiveness achieved with the utilisation of their assets. They also show the rate at which assets are turned over into sales. Therefore, they are used to measure the relationship between sales and assets.

The ratios that can be calculated include:

a. Debtors turnover
b. Average collection period
c. Assets turnover

a. ***Stock turnover***- This ratio shows the ability of a company in manufacturing and marketing of its product and is computed by dividing the cost of sales by the average stock, that is,

   $$\text{Stock turnover} = \frac{\text{cost of sales}}{\text{Average stock}}$$

   Where the average stock (is the opening and closing balances of stock divided by 2) However, the stock turnover, can be calculated where cost of sales is not available as

   $$\text{Stock turnover} = \frac{\text{Sales}}{\text{Stock}}$$

   Using Musaga Plc, we have

   $$\text{Stock turnover} = \frac{11,8000,000}{1.072,000} = 11 \text{ times}$$

b. ***Debtors turnover ratios*** – These are the ratios that are calculated to determine the degree of responsiveness of debtors to credit sales activities. Hence the ratio is calculated as:

   $$\text{Debtors turnover} = \frac{\text{Credit Sales}}{}$$

Average debtors

However, where the credit sales and the opening and closing debtors balances are not available, then, you should calculate debtors turnover as

Debtors turnover = Sales
Debtors

= 11,8000,000
1,537,000 = 8 times

c. ***Average Collection Period*** – This ratio is used to determine the average number of days for which amounts due from debtors remain uncollected is also used to determine a company's ability to sustain its credit policy compared with those of its competitors. It can be calculated as follows:

Average collection periods = 365 days / Debtors turnover or Debtor X 365 days / sales

= 1,537,000 x 365
11,800,000
= 48 days

d. ***Assets Turnover ratios*** – These ratios are used to measure the relationship between sales and assets. Some of the ratios that can e calculated are:

1. Net Asset Turnover = Sales / Net assets
2. Total assets turnover = Sales / Total assets
3. Current assets turnover = Sales / Current assets

Therefore, using Musaga Plc final accounts we have

1. Net Asset Turnover = 11,800,00 / 10,44,000 = 1.13 times
2. Total assets turnover = 11,800,00 / 13,455,000 = 0.88 times
3. Current assets turnover = 11,800,00 / 2,849,000 = 4.14 times

Self Assessment Excercise 16.5

Using Tunde Plc financial statements, your are required to calculate the following ratios:

1. Stock turnover
2. Debtors turnover ratio
3. Average collection period
4. Total asset turnover
5. Current asset turnover

4.0 CONCLUSION

In this unit, we discussed simple ratio analysis. We discussed and calculated the profitability ratio solvency ratios, investment ratios and activity ratios.

5.0 SUMMARY

You should recall that ratio analysis is the systematic production of ratios from the both internal and external financial reports so as to summarise key relationship and results, in order to appraise financial performance.

Profitability ratio are determined in order to ascertain or evaluate the operating adequacy of a company over time.

Liquidity or shot-term solvency ratios are used to determine the ability of the company to meet its current obligations or liabilities.

Long-term solvency ratios are used to determine the long-term financial performance of a company. Investment ratios are ratios used to determine the ability of the company as it relates to consistency in sustaining investment potential and stability.

Activity ratios are used to assess the degree of effectiveness achieved with the utilisation of their assets.

6.0 TUTOR MARKED ASSIGNMENT

The following is the financial accounts of Toyin Plc

Toyin PLc
Profit and Loss Account for the year ended 31st December, 2008

	N'000	N'000
Sales		14,000
Less Manufacturing Cost of Sales		
Materials	6,110	
Labour	1,700	
Factory overheads	1,200	9,010

Gross profit		4,990
Less Administrative expenses	890	
Selling & distribution expenses	700	
Bank interest	100	
Loan interest	350	2,040
Net profit before tax		2,950
Less Tax		150
Net profit after tax		2,800
Less Dividends		
12% Preference shares	150	
Ordinary- Interim (paid)	300	
Ordinary- final (proposal)	370	820
Retained profit for the year		1,980

Toyin PLC
Balanced sheet as at 31 December, 2008

	N'000	N'000	N'000	
Fixed Assets				
Premises	5,000			
Plants and Equipments	5,200			
Motor Vechicle	1,000			
Goodwill	400			
Patent Rights	200		11,800	
Current Assets				
Stock: Finished Goods	1,400			
Raw Materials	310			
Consumable	320			
Trade Debtors	2,100			
Cash and Bank	330		4,460	
Less Current Liabilities				
Bank overdraft	2,232			
Trade creditors	1,236			
Taxation payable	150			
Proposed dividend	370	3,988		(472)
				12,272
Represented by				
Share capital				
Ordinary shares N1 each				6,542
Retained profit				1, 980
Shareholders fund				8,522
12% preference shares N1 each				1,250
14% Debentures stock				2,500
Capital Employed				12,272

You are required to calculate the following financial ratio:

1a. Return on capital employed
b.Gross profit margin
c. Net profit margin

2a. Current ratio
d. Acid test ratio
e. Gearing ratio
f. Debt ratio.

3a. Earning per share
d. Dividend par share
e. Stock turnover
f. Debtors turnover

Solution

1a. return on Capital Employed

$$ROCE = \frac{\text{Net profit before interest and tax}}{\text{Shareholders fund plus long-term liability and debt capital}} \times \frac{100}{1}$$

$$= \frac{3,400,000}{12,272,000} \times \frac{100}{1}$$

$$= 27.71\%$$

OR

$$ROCE = \frac{\text{Net profit before tax}}{\text{Share capital plus reserve}} \times \frac{100}{1}$$

$$= \frac{2,950,000}{8,522,000} \times \frac{100}{1}$$

$$= 34.62\%$$

OR

$$ROCE = \frac{\text{net profit before interest and tax}}{\text{Total Asset}} \times 100$$

$$= \frac{3,400,000}{16,260,000} \times \frac{100}{1}$$

$$= 20.91\%$$

b. Gross profit margin $= \frac{\text{Gross profit}}{\text{Sales}} \times \frac{100}{1}$

$$= \frac{4,990,000}{14,000,000} \times \frac{100}{1} = 35.64\%$$

d. Net profit margin $= \frac{\text{Net profit}}{\text{Sales}} \times \frac{100}{1}$

$$= \frac{2,950,000}{14,000,000} \times \frac{100}{1}$$

$$= 21.07\%$$

OR

2,8000,000 x 100
14,000,000 1
= 20%
OR
3,400,000 x 100
14,000,000 1
= 24.29%

2a. Current Ratio = Current asset
Current Liabilities
=4,460,000
3,988,000
= 1.21:1

b. Acid test ratio =Current asset – stock
current liabilities
= 2,430,000
3,988,000
= 0.61 : 1

d. Gearing ratio = Fixed interest capital
Capital employed (net total assets)
3,750,000
12,272,000
=30.56%

e. Debt ratio = Total Debtors x 100
Capital employed 1
7,738,000 x 100
12,272,000 1
= 63.05%

3a. Earning per share = net profit after tax-Preference dividend
Number of ordinary shares
= 2,8000,000 – 150,000
6,542,000
= 41 kobo per share

b. dividend per share = Ordinary dividend (Interim and final)
Number of ordinary shares
=670,000
6,542,000
= 10 kobo per share

d. Stock turnover = sales
Stock
=14,000,000
2,030,000
=6.9 times

e. Debtor turnover = sales
Debtors

$$=\frac{14,000,000}{2,100,000}$$

=6.7 times

7.0 REFERENCES/FURTHER READINGS

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