

BHM 780 MANAGEMENT ACCOUNTING

BHM 780
ACCOUNTING

MANAGEMENT

Course Code

BHM 780

Course Title

Management Accounting

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Course Guide

**COURSE
GUIDE**

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Introduction

Management Accounting is an aspect of accounting designed to assist Management in the creation of policy and in the day-to-day operation of the business. It embraces all areas where assistance is needed by the management. It may cover accounting data relating to a variety such as striking a balance between retention policy and dividend policy, replacement of fixed assets, methods of financing, working capital requirements, capital requirements, capital structure planning, price fixing, etc.

BHM 780 – Management Accounting – is a semester coursework of two credit hours available for students taking PGD in Corporate Governance in the school of Business and Human Resources management.

The course Guide tells you what the course is all about and the relevant materials that you require to make your study very successful.

Course Contents

The course contents include nature of Management accounting and the relationship with other areas of accounting and financial management, cost analysis, marginal costing, activity – based costing, Break-even analysis, Budgeting, pricing and capital rationing decisions, etc.

Course Aims

This course is geared equipping you with the knowledge and tools necessary to take day-to-day management accounting decisions necessary for sound business operations. These aims will be achieved by exposing you to the relevant areas of Management accounting.

Objectives

On the successful completion of the course, you will be able to:

- Explain the nature of management accounting;
- Describe the function of management account system;
- Use the knowledge and tools acquired to formulate policies and day-to-day business decisions.

Course Materials

- Course Guide
- Study Units
- Textbooks
- Assignment Guide

Study Texts

There are 19 units in this course which should be studied carefully:

- Unit 1 Nature of Management Accounting
- Unit 2 Cost Analysis
- Unit 3 Marginal Costing
- Unit 4 Cost Volume Profit Analysis
- Unit 5 Activity Based Costing (ABC)
- Unit 6 Operating Statement
- Unit 7 Pricing Decision
- Unit 8 Capital Budgeting Decision
- Unit 9 Capital Rationing Decision
- Unit 10 Budget and Budgetary Control
- Unit 11 The Budget Process
- Unit 12 Standard Costing
- Unit 13 divisional financial performance Measures
- Unit 14 Transfer Pricing in Divisionalized Organization
- Unit 15 Cash Flow Statement
- Unit 16 Working Capital Management
- Unit 17 Quantitative Models for the Planning and Control of Stocks
- Unit 18 The Application of Linear Programming to Management
- Unit 19 Learning Curve Theory

Assignment/Exercise

Self-Assessment Exercise are incorporated in the main text. You are to do them carefully to enable you test your understanding of the course materials as you go on.

Assessments

Tutor-Marked Assignments

The NOUN will direct further on the TMAQ you will write and forward to your facilitator for grading. They will count for 40% of the total course marks.

Final Written Examination

At the end of the semester, you will write an examination. That will count for the remaining 60% of the course marks. Do expect that all the areas of the course will be assessed during the examination.

Summary

On successful completion, this course will not make you a management accountant but equip you to take important business decision.

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UNIT 1 NATURE OF MANAGEMENT ACCOUNTING

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- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Nature of Management Accounting
 - 3.2 Differences between Management Accounting and other Aspect of Accounting
 - 3.2.1 Financial Accounting Vs Management Accounting
 - 3.2.2 Cost Accounting Vs Management Accounting
 - 3.2.3 Financial Management Vs Management Accounting
 - 3.3 The Decision Making, Planning and Control Process
 - 3.4 Function Management Accounting
- 4.0 Conclusion
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1.0 INTRODUCTION

Accounting is concerned with providing both financial and non-financial information that will help decision makers to make good decisions. An understanding of accounting therefore requires an understanding of the decision-making process and an awareness of the users of accounting information.

During the past decade many organizations in both the manufacturing and service sectors have faced dramatic changes in their business environment. Deregulation combines with extensive competition from overseas companies in domestic markets has resulted a situation where most companies are now competing in a highly competitive global market. At the same time there has been a significant reduction in product life cycles arising from technological innovations and the need to meet increasingly discriminating customer demands. To compete successfully in today's competitive global environment companies are making customer satisfaction an overriding priority, adopting new management approach, changing their manufacturing systems and investing in new technologies. These changes are having a significant influence on management accounting system.

Progression through this material will reveal how these changes are influencing management accounting systems, but first of all it is important that you have a good background knowledge of some of the

important changes that are occurring in the business environment. That will enable you to achieve a more meaningful insight into the issues and problems of management accounting.

2.0 OBJECTIVES

After studying this unit you should be able to:

- Explain the nature of management accounting;
- Differentiate between management accounting, cost accounting, financial accounting and financial management;
- List and describe each of the seven factors involved in the decision-making, planning and control process;
- Describe the functions of management accounting system.

3.0 MAIN CONTENT

3.1 Nature of Management Accounting

Management accounting is an aspect of accounting designed to assist management in the creation of policy and in the day-to-day operation of the business. It embraces all areas where assistance is needed by the management. It may cover accounting data relating to a variety of subjects such as striking a balance between retention policy and dividend policy, replacement of fixed assets, methods of financing, working capital requirements, capital structure planning, price fixing, cost standards, " volume of sales and profit margins and so on. The management at different levels of a firm has to plan, take decisions and control the operations in the day-to-day conduct of business. Management Accounting seeks to provide relevant accounting information for use in planning, decision-making and control for the different levels of management at the right time.

3.2 Differences between Management Accounting and Other Aspects of Accounting

Management accounting is defined as the process of identification, measurement, accumulation, analysis, preparation, interpretation, and communication of financial information, which is used by management to plan, evaluate and control within an organization. It ensures the appropriate use of accountability for an organization's resources. Simply stated, management accounting is the accounting for the planning, controlling, and decision-making activities of an organization.

Management accounting therefore, is concerned with:

- Formulating strategy;
- Planning and controlling activities;
- Decision taking;
- Optimizing the use of resources;
- Disclosure to shareholders and others external to the entity;
- Disclosure to employees;
- Safeguarding assets.

3.2.1 Financial Accounting Vs Management Accounting

Financial accounting is concerned mainly with the historical aspects of external reporting that is, providing financial information to outside parties such as investors, creditors and governments. Management accounting, on the other hand, is concerned primarily with providing information to internal managers who are charged with planning and controlling the operations of the firm and making a variety of management decisions. More specifically, the differences between financial and management accountings are:

- 1) In financial Accounting, financial statements are mainly meant for outsiders such as shareholders, debenture holders, creditors etc. In management accounting, on the other hand, necessary statements are prepared mainly for the management.
- 2) In financial accounting, statements are presented in standard, well-defined and accepted forms; in management accounting, the management follows its own rules and norms for achieving its own objectives.
- 3) Financial accounting usually covers the entire organization whereas management accounting covers part of the organization at a time.
- 4) Financial accounting is statutory, while management accounting is optional.
- 5) Financial accounting is historical in approach. Management accounting essentially projects the future. In other words, data generated by the financial accounting system indicate what happened in the past. These data will be helpful only to the extent that they represent future events. If not, they would be of no avail because for taking decisions, information relating to the future is necessary. Management accounting can provide that.

3.2.2 Cost Accounting Vs Management Accounting

Although it is true that an efficient cost accountant must also function as a management accountant, because of the overlapping of areas between cost accounting and management accounting. The following distinctions can be made between the ideas associated with cost accounting, on one hand, and those with management accounting, on the other.

- 1) A cost accountant has to work through set routines, budgets and standards. He will measure actual performance and report to the management for rectifying mistakes and improving efficiency. But the management accountant should extend his activities still wider. He should concentrate his attention to matters relating to finance, profitability and productivity.
- 2) The cost accountant generally works out the year's operating statements while a management accountant will have to proceed further to plan and work out future operating statements of the organization.
- 3) The cost accountant will compare actual performance with standard set and report to the management for necessary action. The management accountant will not only make variance analysis but also suggest ways and means for improving the operations. For instance, if actual sales are less than budgeted sales, the management accountant will not simply ascertain the causes of such unfavourable variance but also look ahead to examine whether this can be increased in future and explore the prospects of improved sales.

3.2.3 Financial Management Vs Management Accounting

Management accounting and financial management have remained separate disciplines in most countries. Financial management deals with important issues concerning financial matters. Management accounting refers to the application of accounting skills to the problems of management. A comparison between the financial and management accounting may not be out of context. The basic points are as follows:

- 1) Financial management is concerned with taking financing decisions and planning capital structure of the firm. Management accounting is concerned with budgets and standards.
- 2) Financial management determines working capital requirement, financing and controlling it. Management accounting is concerned with providing management: with accounting, costing

and other statistical data for use in the process of planning and decision-making.

- 3) Financial management deals with planning and controlling long-term investments of the firm, e.g., capital expenditure decisions. Management accounting on the other hand, translates the plans of management covering all the activities of business in financial terms.
- 4) Financial management determines credit policy, retention policy and dividend policy. Management accounting expresses financial plans in terms of individual responsibilities for all levels of management.

SELF ASSESSMENT EXERCISE 1

- i) It is commonly suggested that a management accounting system should be capable of supplying different measures of cost for different purposes.
- ii) You are required to set out the main types of purpose for which cost information may be required in a business organization, and to discuss the alternative measures of cost which might be appropriate for each purpose.

3.3 The Decision-Making, Planning and Control Process!

Because information produced by management accountants must be judged in the light of its ultimate effect on the outcome of decisions, a necessary precedent to an understanding of management accounting is an understanding of the decision-making process.

FIGURE 1.1: THE DECISION MAKING, PLANNING AND CONTROL PROCESS

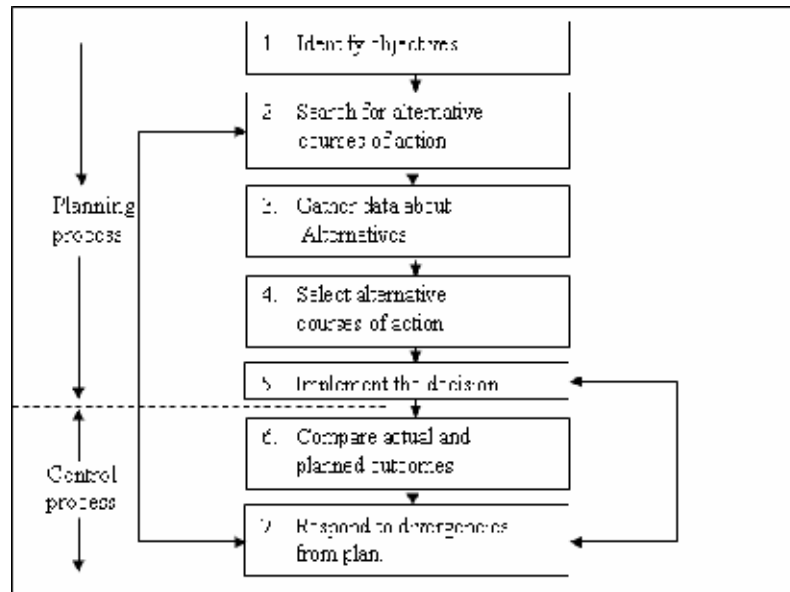


Figure 1.1. Represents a diagram of decision-making model. The first five stages represent the decision-making or the planning process. Planning involves making choices between alternatives and is primarily a decision making activity. The final two stages represent the control process, which is the process of measuring and correcting actual performance to ensure that the alternative that are chosen and the plans for implementing them are carried out. Let us not consider each of the elements of the decision-making and control process.

1) Before good decisions can be made there must be some guiding aim or direction that will enable the decision-makers to assess the desirability of favouring one course of action over another. Hence, the first stage in the stage in the decision-making process should be to specify the goals or objectives of the organization.

2) The Search For Alternative Courses Of Action

The second stage in the decision-making model is a search for a range of possible courses of action (or strategies) that might enable the objectives to be achieved.

3) Gather Data About Alternatives

When potential areas of activity are identified, management should assess the potential growth rate of the activities, the ability of the company to establish adequate market shares, and the cash flows for each alternative activity for various states of nature.

4) Select Appropriate Alternative Courses Of Action

In practice, decision-making involves choosing between competing alternative courses of action and selecting the alternative that best satisfies the objective of an organization.

5) Implementation Of The Decisions

Once alternative courses of action have been selected, they should be implemented as part of the budgeting process. The budget is a financial plan for implementing the various decisions that management have made.

6) Comparing Actual and Planned Outcomes and Responding to Divergencies From Plan

The managerial function of control consists of the measurement, reporting and subsequent correction of performance in an attempt to ensure that the firm's objectives and plans are achieved.

3.4 Functions of Management Accounting

A cost and management accounting system should generate information to meet the following requirements. It should:

- 1) Allocate cost between cost of goods sold and inventories for internal and external profit reporting; This information is required for meeting external financial accounting requirements, but most organizations also produce internal profit reports at monthly intervals. This product costs are also required for periodic internal profit reporting.
- 2) It provides relevant information to help managers make better decisions; this involves both routine and non-routine reporting. Routine information is required relating to the profitability of various segments of the business such as products, services, customers and distribution channels in order to ensure that only profitable activities are undertaken. Information is also required for making resource allocation and product mix and discontinuation decisions.

Non-routine decision is required for strategic decisions. These decisions are made at infrequent intervals and include decisions relating to the development and introduction, of new products and services, investment in new plant and equipment and the negotiation of long-term contracts with customers and suppliers.

- 3) It provides information for planning, control and performance measurement; Management accounting systems should provide

information for planning, control and performance measurement, planning involves translating goals and objectives into ~ specific activities and resources that are required to achieve the goals and objectives. Companies develop both long-term and short-term plans and the management accounting function plays a critical role in this process. Short-term plans, in the form of the budgeting process, are prepared in ore detail than the longer-term plans and are one of the mechanisms used by managers as a basis for control and performance evaluation.

Control is the process of ensuring that the actual ~~outcome~~ with the planned outcome. The control process involves the setting of targets or standards (often derived from the budgeting process) against which actual results are measured. Performance is then measured and compared with the targets on a periodic basis.

SELF ASSESSMENT EXERCISE 2

- i) A significant proportion of the management accounting activity within most organization is concerned with the production and reporting of information for control purpose.
- ii) Some commentators have asserted that the control aspect of management accounting is over-emphasized. This over emphasis is, they believe, to the detriment of the prime functions of management accounting Which are to produce information to assist planning and decision making.

Required: Discuss the above assertion and give your view on its validity.

4.0 CONCLUSION

In this unit, which is our very first one, we have discussed generally the nature of management accounting. We also differentiated between management accounting and other field of accounting. We then looked at the seven factors involved in the decision-making process. Finally we tried to describe the functions of management accounting system.

5.0 SUMMARY

Accounting is defined as the process of identifying measuring and communicating financial and non-financial information to permit informed judgments and decisions by users of information. We have distinguished between internal users (management accounting) and

external users (financial accounting), and have considered a decision-making, planning and control model.

In order to provide customer satisfaction organizations must concentrate on four key success factors: cost efficiency, quality, time and innovation. Companies must manage their costs effectively if they are to become low cost suppliers and compete on the basis of selling price. It is therefore important that, where necessary, management accounting systems are modified to meet the requirements of today's manufacturing and global competitive environment.

6.0 TUTOR MARKED ASSIGNMENT

- 1) The management accountant must inform management and supervisors about vital facts known to him which affect the running of a business using suitably drafted reports and statements which are sometimes supported by charts, diagrams and statistical aids:
 - (a) Explain briefly the following basic forms of reports;
 - (b) Routine report;
 - (c) Special report
- 2) State briefly at least four fundamental principles of report preparation and presentation.

7.0 REFERENCES/FURTHER READINGS

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UNIT 2 COST ANALYSIS

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- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Cost Analysis
 - 3.2 Underlying terminologies and Definition
 - 3.3 Product costing Method
 - 3.3.1 Allocation and Apportionment of Costs
 - 3.3.2 Procedure for Allocation, Apportionment and Absorption
 - 3.3.3 Allocation
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 - 3.3.6 Apportionment of Service Centre Department Cost
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 - 3.4 Basis of Absorption
 - 3.4.1 Problems of Absorption
 - 3.5 Cost Estimation Techniques
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 - 3.5.3 High-Low Method
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings

1.0 INTRODUCTION

In the previous unit, it was pointed out that companies need cost and management accounting systems to perform a number of different functions. In this unit, we are going to concentrate on two of these functions they are (i) allocating costs between cost of goods sold and inventory for internal and external profit reporting and (ii) providing -relevant decision making information for distinguishing between profitable and profitable activities.

In order to perform the above functions, a cost accumulation system is required to assign costs to cost objects. The aim of this unit is to provide you with an understanding of how costs are analyzed and assigned to cost object.

2.0 OBJECTIVES

After studying this unit, you should be able to:

- Distinguish between cost unit, cost centre, cost activities, cost accounting and analysis.
- Discuss the different costing methods practice.
- Handle allocation and apportionment of cost.

3.0 MAIN CONTENT

3.1 Cost Analysis

The word 'cost' is described as the total amount of expenditure incurred or to be incurred in the course of manufacturing a product or rendering a service. The whole process of cost ascertainment is directed towards the establishment of what if actually article. The costs involved are past costs. The cost ascertainment the collecting, classifying, recording, analyzing and reporting upon the financial consequences of past actions. The position is, however, premise on the respective when it is vital to know the results of past activities. However from the view of management accounting, it is future costs that are relevant for purpose of planning and decision making.

3.2 Underlying Terminologies and Definition

It is instructive to posit at the onset, that the concept of cost analysis is based on the definition of certain terms as follows:

Cost Unit: A cost unit may be defined as a quantitative unit of product or service in relation to which cost are ascertained. It is a unit of output or services to which costs can be related. The unit chosen is what is most relevant for the activities of the organization; therefore the nature of the cost unit will depend on the type of business concerned.

Five main categories of business together with the peculiarities of the method of costing used in each case will be described later.

Cost Centres: This is any location, person or item or equipment for which costs may be ascertained and used for the purposes of cost control. A cost centre is very commonly a location in the sense of a department, or section of the business engaged in a particular set of activities, in some cases. The location will be occupied by one machine or by a, different machines carrying out a sequence of operations on an initial job in form of material.

Every cost centre must be the responsibility of one person though, that person may direct the operations of more than one cost centre. The object of defining a cost centre is that the costs of operating that cost centre will be ascertained and a major object of ascertaining them will normally be to control them.

Cost Accounting: This may be described as the process of accounting for cost from the point at which expenditure is incurred or committed up to the establishment of its ultimate relationship with cost centres or cost units. The techniques of cost accounting, in the sense of "cost finding" supplement those of financial accounting giving greater depth of analysis to the transactions which affect the profit and loss account. The purpose of this analysis is to provide information that will enable managers to:

- (a) Identify the profit or loss arising from each product or service marketed by the business, or from any other activities in which it is engaged. These basic data can be used when making decisions about future activities. Cost accounting is therefore a fundamental element in any management accounting system.
- (b) Identify and control those costs for which they are individual responsible.

Cost Analysis: it is the process of classifying and estimating the total amount of expenditure to be incurred in the course of manufacturing a product or rendering a service. Cost analysis therefore represents cost classification and estimation.

3.3 Product Costing Methods

As posited earlier on, there are five main ways of applying costing techniques to the establishment of unit cost, reflecting differences in the type of activity carried out by the business. They fall into categories.

- (a) **Operating Costing:** Methods of finding the average unit cost of a stream of identical cost unit. This may be further sub-divided into:
 - (i) Process Costing (relating to standardized goods)
 - (ii) Service Costing: (relating to standardized services)
- (b) **Specific order Costing:** Methods of finding the cost of unique costs units, further sub-divided into:

- (i) Job Costing
- (ii) Batch Costing
- (iii) Contract Costing

Process Costing: The simplest form of cost finding occurs when business as a whole is concerned with continuous operations leading to one standardized product. A more complex situation arises when the business has several products, each of which is produced by a separate department. An example might be a founding business with separate departments for ferrous and non-ferrous costing. In such a case costs would have to be identified with cost centres and the cost of a productive cost centre in any period would be spread over the number of cost units it had produced in that period.

There would however, be certain cost centres carrying out administrative or other, functions for the business as a whole. In order to arrive at total unit costs, the costs of those non-productive departments would have to be spread in some way over the [productive departments].

Finally, there will be many businesses in which the output of one department becomes the raw-material of another department, in other words, the initial input of raw material is subjected to a sequence of processes before the final product emerges. It is to these types of operations that the terms process costing is generally applied.

Service Costing: This form of operations applies where repetitive services are provided either by the business as a whole or by a particular cost centre within the undertaking. The services offered may not be completely standardized, in which case a cost unit may be defined which gives a broad representative of some common element. In the case of an hospital, for example, one cost unit might be the occupied 'bed day and in a transport undertaking, the carriage of one ton of goods for one mile.

Job Costing: This method applies to business which carries out individual jobs of, works in accordance with customers special requirements. Each job is a separate cost to the business. The latter will be collected under cost centres, some of which will be carrying out productive operations and other administrative or service activities. The total cost of each productive cost centre will then be absorbed into the cost of these jobs, passing through the cost centre. Where the job is of long duration, a modified form of costing is known as contract costing.

Batch Costing: This is a form of job costing under which each "job" in the manufacture of a batch of identical articles, whether for sale or for

use within undertaking. Housing established the cost of the batch (the cost unit in the Instance) It is of course possible if desired, to compute the average cost per unit within the batch.

Contract Costing: A 'Contract' for this purpose is a job of long duration (perhaps extending over more than one year), often involving some form of constructive activities. Possibly at a site remote from the business premises. As compared with short-term job costing:

- (a) There may be a relatively high incidence of direct expenses
- (b) The contract may be controlled by a special term of people constituting a separate cost centre
- (c) General consideration costs in consequence may be relatively small and may not be absorbed into the contract cost.
- (d) For the purpose of contract cost control, there may be problems in defining the degree of completion of the work from time to time and it may be necessary to break down the main cost unit into various places or stages.

3.3.1 Allocation and Apportionment of Costs

In order to be able to understand the process of allocation and apportionment of cost, certain standard definition of important terms must be established as follows:

- (a) Cost allocation: is the allotment of whole items of cost to cost centres or cost units
- (b) Cost apportionment: is the allotment of proportion of items of cost to cost centres or cost units.
- (c) Overhead absorption: is the allotment overhead to cost units. All overhead must however, eventually be absorbed into cost units.

3.3.2 Procedure for Allocation, Apportionment and Absorption

In practice, the principal difficulty in arriving at the cost of a unit of output will be determining how the indirect factory overheads are to be computed and absorbed into the unit. It is worthy; that while a factory is divided in a number of separate production departments and also many service departments, only the production departments are directly charged to one or more of the production departments and absorbed into the unit.

The total overhead of a production department has to be charged to the units produced by that department and the factory overhead charge to be attributed to a unit of production must be based on a predetermined rate.

The terms used for charging overhead to the unit is called overhead absorption or sometime, overhead recovery.

The procedure for dealing with factory overhead is as follows:

- (a) Allocate cost as far as possible. Many items can be directly charged to a production department e.g. the salary of the department's supervisor.
- (b) Other will refer to the factory (or works) as a whole (e.g. the salary of the works manager while some will in the first instance refer to the entire organization e.g. rent and rate. Apportion these costs in the following order;
 - (i) Ascertain the appropriate of total organization cost attributed to the factory
 - (ii) Apportion total factory cost over departments (production or service, as appropriate).
 - (iii) Apportion the cost of service departments to the relevant production department.
- (c) Absorb the total cost of a production department by charging the relevant amount I of the units produced by that department at a predetermined rate.

3.3.3 Allocation

It is preferable that every incoming cost should be allotted in the first instance to the cost centre responsible for authorization. This allotment of whole item of cost to a cost centre is known as cost "allocation". In many cases, the authorizing centre is also the using centre and no further accounting action is needed after the initial allocation.

3.3.4 Apportionment

On the other hand, services specially may be procured which benefit a number of cost centres, and the cost of these, after the initial control, will be apportioned between I. the user cost centres on some basis which gives a reasonable representation of the benefits they obtains.

Examples of such costs are:

Nature of cost	Cost Centre where controlled	Possible Bases of Apportionment
Rent and Rates	Company Secretary or Property Manager	Floor space occupied
Lighting and Heating	Plant Engineer or Company Secretary	Electric capacity of locations or numbers of take-off points metered usage
Workmen compensation Insurance	Insurance Officer Company Secretary, Chief Accountant	Numbers of employees in the various cost centres of payroll amount.
Insurance and Stocks	Insurance officer, Company Secretary	Value of stock holdings in various locations
Advertising for staff	Personal Manager	Number of vacancies notified or filled

3.3.5 Internal Service Departments

It will be appreciated that services are not all obtained from suppliers. Many cost centres within the organization will exist to provide services to other departments. All the administration departments are providing services to the operations and selling departments, whilst within the production or operating function there will be cost centres which provide management, planning, storekeeping inspection and other -services to those cost centre actually engaged in manufacturing products or providing saleable services to customers.

There are strong arguments for allotting the costs of these departments to the benefiting departments. Particular benefits include:

- That if such charges are made the user department is made aware of the total company cost to which their activities give rise.
- That better control of service department cost is achieved if the user departments have an opportunity of challenging them and; where possible comparing them with the cost of similar service obtained from outside the business.
- That if by progressive-re-apportionment it is possible to identify all costs with those cost centres which either produce or sell the products of the business, this total cost of each product can be calculated.

3.3.6 Apportionment of Service Centre Department Cost

If every service department is involved solely in servicing production department, there will be no difficulty in transferring service department overhead to production centres. However, it is usual of a service department's output to be used by other service department as well as by production departments. Consequently, in clearing the overhead [of one service department, a transfer may be necessary to the other service departments, some of which service the first department. When the overhead of one of those departments is apportioned, a share of the total will be transferred back to the first r mentioned department. Although, a computer may be used to deal with the problem of recognized methods of affecting the required apportionment.

- (a) Continuous allotment
- (b) Algebraically, using simultaneous equations
- (c) Following a specified order of choosing accounts (the 'step method).

3.3.7 Absorption of Indirect Costs

The absorption of indirect cost into the total cost of products poses problems, when different product emerges from the use of common resources. It is then necessary to find some measure of the relative demand on those resources between the various -.products.

It might be found, for example, that the number of direct labour hours required to ' -create the products differed from one to another, and it might be decided to use an overhead absorption rate per direct labour hours for each of the manufacturing departments. The implication of this is that departmental cost would vary mainly in -proportion to total direct labour hours.

The amount of material used in the different product might be different. There is --no doubt that some indirect costs would vary with the quantity of materials produced in -particular buying and materials handling costs.

3.4 Bases of Absorption

There are a number of absorption base commonly used.

- (a) Percentage of material cost
- (b) Percentage of wage cost
- (c) Percentage of prime cost
- (d) Rate per direct labour hour
- (e) Rate per machine
- (f) Race per unit.

Whatever method or combination of methods that is in use the result will only be a relative valuation of the different products and it will be only be an approximation even to that relative rating. Total costing of products will never give a specific answer to that a product cost, purely because it is of the nature of indirect costs that they are not direct cost.

It is not normally practicable to re-calculate overhead absorption rates evenly for all organization. In practice businesses produce their absorption rates by:

- (a) Estimating the overhead likely to be incurred during the coming year,
- (b) Estimating the total hours, or other suitable base on which the overheads absorption rate will be calculated.

SELF ASSESSMENT EXERCISE 1

ADETAYO LIMITED estimated that its total factory costs for the coming year will be as follows:

Direct material 100,000
Direct wages 160,000
Prime cost 260,000
Factory overhead 140,000
Total factory cost 400,000

And that there will be 50,000 direct labour hours and 100,000 machine hours, while 200,000 units will be produce. Compute the various rating by which the factory overhead might be absorbed.

3.4.1 Problems of Absorption

Because the absorption rate is base on estimates (of both numerator and denominator), it is almost inevitable that at the end of the accounting year there would have been an over-absorption or under-absorption of the overhead actually incurred, for two main reasons.

- (a) The actual overhead will certainly differ from estimate. Thus in the above illustration, assume that absorption is based on the percentage of material cost, that the actual material cost is ~~N~~100,000 (as estimated) but that the actual overhead is ~~N~~90,000.

Amount absorbed will be $140\% \times \text{N}100,000 = 140,000$
Actual overhead = 90,000
Therefore over-absorbed production overhead = 50,000

- (b) The available overhead which absorption rate is base may vary again, in the above illustration, assume that the absorption is based on percentage of material cost the actual material cost is ₦120,000 and that actual overhead is ₦80,000 (as estimated).

Amount absorption will be 140% x 80,000	= 112,000
Actual overhead	<u> = 120,000</u>
Therefore, the overhead not absorption into production cost	<u> = 8,000</u>

3.5 Cost Estimation Techniques

The determination of how cost will react to changes in output of other measurable activity level is of vital importance for decision-making planning and control. The preparation of budget, performance report, standard costing and the provision of relevant cost for pricing and other decisions will all depend on reliable estimates of fixed and variable level, of activity.

Unfortunately, cost is not easy to predict since they behave differently under different circumstances. However, whether a cost is fixed or variable with respect to a particular activity measure is affected by the length of the time span under consideration. ! The longer the time span, the more likely the cost will be variable. It is therefore instructive to note, that the important of accurately estimating cost and complexity of cost behaviour means that accountant and decision-maker alike must use increasingly sophisticated techniques.

Cost estimation is a term used to describe the measurement of historical cost with a new to helping in the predication of future costs for management decision making i.e. historical information is analyzed to provide estimates on which to base future expectation. It is however, important to note that cost estimate is premise on the ability of the Accountants to ascertain the activity measure or cost driver that exerts the major influence of the cost of a particular activity. A cost driver can be defined as any factor whose change causes a change in the total cost of an activity. Examples of cost drivers include direct labour hours, machine hour, unit of output and number of production run- ups. Mixed costs can be segregated into fixed and variable element by adopting any of the following methods:

3.5.1 Engineering Method

This approach is based on the use of engineering analysis of technological relationships between inputs and outputs e.g. methods study, work sampling and time motion studies. The procedure in such a study is to make an analysis based on direct observations of the underlying physical quantities required for an activity and then convert the final results into cost estimates. Engineers, who are familiar with the technical requirements, estimate the quantities of material, labour and machine hours required for various operations, prices and rates are then applied to the physical measure to obtain the cost estimates. The Engineering method is useful for estimating cost of repetitive processes where input-output relationship is clearly defined. The method is usually satisfactory for estimating cost that are usually associated with direct materials, labour and machine time, because these items can be directly observed and measured.

Time and motion studies can also be applied to well structured administrative and selling activities such as typing, invoicing and purchasing. It is not generally appropriate, however, for estimating cost that are difficult to associate directly with individual unit of output, such as many types of overhead costs, since these items cannot easily be directly observed and measured.

One disadvantage of engineering methods is that methods study, work sampling and time and motion study technique can be expensive to apply in practice. The use is most appropriate when direct cost forms a large part of the total cost and when input output relationships are fairly stable over time.

3.5.2 Inspection of the Accounts or Account Classification

This represents a subjective way of segregating the mixed cost into fixed and variable element based on the personal experience of the accountant. In applying this method, the total cost schedule of an organization is presented for scripting and after, a cost function is determined for the organization.

The inspection of accounts methods required that the departmental manager and the accountant inspect each item of expenditure within the accounts for some output level, and they classify each item of expenses as a wholly fixed, wholly variable or semi-variable cost. A single average unit cost figure is selected for items that are categorized as variable, whereas a single total cost for the period is used for items that are categorized as fixed.

This approach is rarely applied in practice due to its level subjectively.

3.5.3 High-Low Method

This represents an objective way of segregating the mixed cost into fixed and variable elements by applying the following procedures:

- 1) Identify the highest and least activity levels among the observed data.
- 2) Determine the difference between the two activity levels.
- 3) Identify the corresponding cost to both the highest and lowest activity levels.
- 4) Determine the difference between the two corresponding cost.
- 5) In order to determine variable cost per unit or the level of variability, divide the difference in cost by the difference in activity level.
- 6) Use the variable cost per unit to determine total variable cost. The difference between the total variable cost and the corresponding mixed cost will represent the total fixed cost.

ADVANTAGES

1. It is capable of providing consistent result from different user
2. It eliminates subjectivity
3. On like regression analysis, high and low method is simple to calculate.

LIMITATION

- a. The method relied solely on the two extreme values, that is highest and lowest L which may be recorded at a abnormal period to the organization.
- b. The final result of the method may not represent the actual cost position of the

SELF ASSESSMENT EXERCISE 2

MUST ASSOCIATE LTD, manufactured a single product known as ACA. The company's total overhead cost fluctuates considerably from diet to diet according to the ' number of student admitted to the school. The cost at high and at low level of activity for recent diets are given below.

	<u>High</u>	<u>Low</u>
Student population	40,000	30,000
Total overhead cost (₦)	141,000	122,000

The total overhead cost above consists of indirect materials, rent and maintenance cost. The company has analyzed the cost of 30,000 students and has determined that at this activity level the cost exist in the following proportion.

Direct material, (packages) (V)	45,000
Rent of classrooms (F)	50,000
Maintenance (M)	<u>27,000</u>
	<u>122,000</u>

For planning purposes the company wants to break the maintenance cost into variable and fixed cost element:

REQUIRED:

- Identify how much of ~~the~~ N141,000 overhead cost at the high level of activity above consist of maintenance cost.
- By means of high and low method of cost analysis, determine the fixed cost element for maintenance cost.
- Express the company's maintenance cost in a liner equation form
 $y = a + bx$
- What total overhead cost would you expect the company to incur at an operating level of;
 - 20,000 students
 - 25,000 students.
 - 29,000 students
 - 35,000 students
 - 50,000 students

4.0 CONCLUSION

In this unit, we have discussed generally the distinction between cost unit, cost center, cost activities and cost analysis. We then looked at the different costing method in practice. Finally, we tried to handle issues relating allocation and apportionment of r' cost.

5.0 SUMMARY

The aim of this unit has been to provide you with an understanding of how costs are assigned to cost centres. Direct costs can be accurately traced to cost centres whereas indirect costs cannot. Allocation bases which are significant determinants of costs that are being allocated are described as cause-and-effect allocations where arbitrary allocations refer to allocations bases that are not the significant determinant of the costs. To accurately measure the cost of resources used by cost objects cause-and-effect {allocations should be used.

6.0 TUTOR MARKED ASSIGNMENT

As the cost Accountant of Yabatech Consult Limited, you have been asked to prepare an analysis between fixed cost and variable cost in your department in relation to power cost. This is due to the fact that power cost does not seem to fit into either II category easily. The historical details are as follows:

WEEK	POWER COST	MACHINE HOURS
1	3,600	8000
2	3,950	9000
3	3,050	6000
4	3,380	7400
5	3,870	8600
6	4,020	9200
7	2,095	3700
8	3,530	7800

REQUIRED

- Using the linear regression analysis separate the cost, findings the closest estimate of the fixed element and the variable cost per machine hour.
- Estimate the total cost likely in week 9, if expected level of machine is 7,200 hours.

7.0 REFERENCES/FURTHER READINGS

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UNIT 3 MARGINAL COSTING

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1.0 INTRODUCTION

In marginal costing, costs are classified into fixed and variable costs. The concept of marginal costing is based on the behaviour of costs that vary with the volume of output. Marginal costing is known as variable costing in which only variable costs are accumulated and cost per unit is ascertained only on the basis of variable costs. Sometimes, marginal costing and direct costing are treated as inter-changeable terms. The major difference between these two is that, marginal cost covers only those expenses which are of variable nature whereas direct cost may also include cost which besides being fixed in nature identified with cost objective.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- Explain the importance of marginal costing in short-term decision.
- Prepare a contribution margin statement
- Describe how to embark on the following short-term decision
- Adding a new product
- Joint product sell or process further.

- Discontinuance of product content.

3.0 MAIN CONTENT

3.1 Marginal Costing

3.2 Marginal Costing Techniques

This is a technique used in determining the income realized by an organization for a specific period of time as well as determining the valuation of stock. Marginal costing technique is a technique which distinguished between fixed costs and variable cost and whereby variable cost are charged to cost units, and the fixed cost attributable to the relevant period is written off in full against the contribution of that period.

3.2.1 Formulae Used In Marginal Costing

Sales = variable cost + fixed cost + profit

Sales -variable cost = contribution

Sales -variable cost = fixed cost + profit

Contribution = fixed cost + profit

Contribution -fixed cost = profit.

3.3 Features of Marginal Costing

The main features of marginal costing are as follows:

- All costs are categorized into fixed and variable costs. Variable cost per unit is same at any level of activity. Fixed costs remain constant in total regardless of changes in volume.
- Fixed costs are considered period costs and are not included in production cost, only variable costs are considered as product costs.
- Stock of work-in-process costing, products are transferred from one process to another are valued at marginal cost only.
- In marginal process costing, products are transferred from one process to another are valued at marginal cost only.
- Prices are determined with reference to marginal cost and contribution margin from each product.

- vi. The difference in the magnitude of opening stock and closing stock does not affect the unit cost of production since all the product costs are variable costs.

3.4 Criticism against Marginal Costing

The criticism leveled against marginal costing is summarized below:

- i. Difficulty may be experienced in trying to separate fixed and variable elements of overhead costs unless this can be done with reasonable accuracy, marginal costing cannot be very accurate.
- ii. The misuse of marginal costing approach may result in setting prices which do not allow for the full recovery of overhead.
- iii. The main assumption of marginal costing is that variable cost per unit will be the same at any level of activity.
- iv. The assumption that fixed cost remains constant in total regardless of changes in volume will be correct up to a certain level of output.
- v. The exclusion of fixed overheads from cost may lead to erroneous conclusions. It may create problems in interfirm comparison, higher demand for salaries and other benefits by employees, higher demand for tax by the Government authorities.

3.5 Application of Marginal Costing Techniques

3.5.1 Optimizing Product Mix

In case of multi-products and multi lines of activity, the problem arises as to which product or sale mix will yield maximum profit. Problems can be solved by marginal costing technique. It helps in discontinuance of non profitable products and lines of activity which will not even cover its variable costs.

In marginal costing technique, limiting factors will be considered for managerial decision making, which will limit the volume of output. The limiting factor may consist of specified raw material, a specific type of labour skill, a tool, a service facility, floor space, cash resources etc. Limiting factor is expressed in financial terms i.e., contribution per unit of the limiting factor and it serves as an indicator to select the course of action to achieve optimum profitability mix.

When an alternative method of manufacturing a product or alternative is available, the marginal contribution analysis should be made to arrive at the decision. The alternative yielding the highest contribution will be selected.

Example

A manufacturer has three product A, B and C, currently. Sales, cost and selling price details and processing time requirements are as follows:

Particulars	Product A	Product B	Product C
Annual sales (units)	6,000	6,000	750
Selling price (N)	20	31	39
Unit cost (N)	18	24	30
Processing time required Per unit (Hours)	1	1	2

The firm is working at full capacity- (13,500 processing hours per year). Fixed manufacturing overheads are absorbed into unit costs by a charge of 200% of variable of costs. This procedure fully absorbs the fixed manufacturing overhead.

- (i) Processing time can switched from one product line to another
- (ii) The demand at current selling price is

Product A	Product B	Product C	
11,000 units	8,000 units	2,000 units	

(iii) The selling prices are not to be altered.

You are required to calculate the best production programme for the next operating period and to indicate the increase in net profit that this should yield. In addition identify the shadow price of a processing hour.

SOLUTION

According to the problem, the fixed manufacturing costs are absorbed into the unit, cost by charge of 200% of variable cost. It, therefore, means that variable cost is one third of total unit cost.

Computation of contribution per processing hour

Particulars	Product A	Product B	Product C	
Selling price	20	31	39	
Variable cost	(6)	(8)	(10)	
Contribution per unit	14	23	29	
Processing per	1	1	2	

unit(hr)			
Contribution per Processing hour	14	23	13.50
Ranking	III	I	II

Computation of contribution as per existing programme

Product	Output	Hours used	Contribution=(N)
A	6,000	6,000	84,000
B	6,000	6,000	138,000
C	750	1,500	21,750

Computation of contribution as per optimal programme

Product	Output	Hours used	Contribution=(N)
B	8,000	8,000	184,000
C	2,000	4,000	58,000
A	1,500	1,500	21,000

The above analysis shows that contribution and profit will increase by ~~N~~19,250 (i.e. N263,000 ~~N~~243,750) if optimal production programme is implemented.

An additional hour of processing would be used to increase the production of product A by one unit. This will increase contribution by ~~N~~14. Hence, the shadow price (or opportunity cost) of one processing hour is ~~N~~14.

3.5.2 Adding New Product

Most new product decisions will involve capital expenditure on fixed assets, additional stock-holdings, launching cost and so on. The most important thing to do is to examine the incremental effects of the decision on revenue and operating costs.

Example

A company is considering the manufacture of a sponge case known as product C. This product will be sold for one year; the estimated sales are 4,500 at price of W2 each.

You are given the following information in order to advice whether the venture should be added to the existing product range or not.

- a) Raw materials: This type of material (A8B) will be required. Material A is used in stock but is no longer required for original purpose. It cost N500 six months ago. Replacement would be by special order only, and would cost N600. This material could also be used in the manufacture of another

product. Rago as a substitute for a material costing N400. Material B is not in stock and the necessary supply could be purchased for ₦700.

- b) Direct Labour: Total direct labour hours are estimated as 1,000 hours. Product C will be manufacture in normal- working hours but 400 hours additional overtime work will be necessary on the other products, because of the disruption of work schedules. Labour is paid ₦2 per hour, and the overtime rate is time and a half.
- c) Supervision: Total supervisory time is estimated at 100 hours. Supervisors are salaried but their effective hourly rate— is ₦1.25. No new supervisors will be employed.
- d) Machine: Product C will be made on a machine which cost ₦2,000 a year ago and has an estimated total life of five years. The machine would otherwise never be used, and has no scrap value for any date. The running costs of this machine are estimated at 75k per hour.
- e) Other overheads: These are apportioned at 200% on direct labour cost.

SOLUTION: CONTRIBUTION MARGIN STATEMENT FOR PRODUCT C

	₦	N	=
Estimated Revenue (N2 x 4,500)			9,000
Less: <u>Relevant cost</u>			
<u>Material</u>			
A 400			
B 700		1,100	
<u>Labour:</u>			
Direct (2 x 100)		2,000	
Overtime (2 x Y2 x 400)		1,200	
Machine running cost (0.75 x 1000)	750	5,500	
Surplus			<u>3,500</u>

3.5.3 Joint Products-Sell or "Process Further

When considering whether a product should be sold or processed further, the methods for allocating joint product cost should be used only the contribution or incremental approach must be used.

SELF ASSESSMENT EXERCISE 1

The Arewa chemical company produces two joint product chloride and sodium from the same process. Joint processing cost of N200,000 are incurred up to split off point when 100,000 units of chloride and 500,000 units are produced. The selling prices at split off point are:
Chloride N2.25 per unit
Sodium N2. per unit

The unit of chloride could be processed further to produce 80,000 units of fertilizer but an extra fixed cost of =N20,000 and variable cost of 30k per unit of chloride. The selling price of fertilizer would be N3.75 per unit should the company sell chloride or fertilizer.

3.5.4 Discontinuance of Product Line

The marginal costing technique is used in taking decisions regarding discontinuance of a product. If any products performance is not impressive, then such product should be discontinued only if there is no contribution margin from that product. In other words, any contribution from that product will reduce the burden of total fixed costs of the firm and this will help in better profits than if such product is discontinued.

SELF ASSESSMENT EXERCISE 2

The skyrock Ltd. Produces and sells three types of products P, Q and R. The management committee has decided to continue the production of 'Q' since there is no much profit in it. From the following information find out the profitability of the products and give your short comments on the decision of the management.

Products	Selling price per unit N	Direct Material Per unit =N	Direct wages Per unit		
			Dept. A N	Dept. B N	Dept. C N
P	300	60	20	15	10
Q	275	30	20	20	10
R	305	70	12	10	20

The absorption rates of overhead on direct wages as:

	Dept. A	Dept. B	Dept. C
Variable overhead	150%	120%	200%
Fixed overhead	200%	240%	150%

4.0 CONCLUSION

In this unit, we have discussed generally the concept of marginal costing. We also looked at the features of contributions. These features make it distinctive with conventional profit. Finally, we tried identify the application area of the marginal costing techniques.

5.0 SUMMARY

This unit treated in a greater depth the concept of marginal costing and its contribution towards the provision of information for managerial decision making.

6.0 TUTOR MARKED ASSIGNMENT

A paint manufacturing company manufactures 200,000 per annum medium-sized tins of "spray lac-paints" when working at a normal capacity. It incurs the following costs of I manufacturing per unit.

Direct material	7.80
Direct labour	2.10
Variable overheads	2.50
Fixed overheads	4.00
Product costs (per unit)	<u>16.40</u>

Each unit (tin) of the product is sold for ₦21 with variable selling and administrative expenses of 60 kobo per tin.

During the next quarter, only 10,000 units can be produced and sold. Management plans to shut down the plant, estimating that the fixed manufacturing costs can be reduced to ₦74,000 for the quarter.

When the plant is operating, the fixed overheads are incurred at a uniform rate throughout the year. Additional costs of the plant shut-down for the quarter are estimated at ₦14,000.

You are required:

- (a) to express your opinion, along with the calculations, as to whether the plant should shut down during the quarter.

7.0 REFERENCES/FURTHER READINGS

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UNIT 4 COST VOLUME PROFIT ANALYSIS

CONTENTS

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- 2.0 Objective
- 3.0 Main Content
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 - 3.2 Assumption of Break-even Analysis
 - 3.3 Application of Break-even Analysis
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1.0 INTRODUCTION

In this unit, we shall look at the presentation of financial information for decision making and cost control. We began by considering how the management accountant can be of assistance in providing answers to questions about the consequences of following a particular course of action. Such questions might include 'what would be the effect on meet the additional fixed charges arising from an advertising campaign?' 'Should we pay, our sales people on the basis of a salary only, or on the basis of a commission only, or by a combination of the two?' These and other related questions can be answered using cost-volume-profit (CVP) analysis.

This is a systematic method of examining the relationship between changes in activity (i.e. output) and changes in total sales revenue, expense, and net profit. As a model of these relationships CVP analysis simplified the real-world conditions that firm will face. Like most models, which are abstractions from reality, CVP analysis is subject to a number of underlying assumption and limitations, which will be discussed later in this unit; nevertheless, it is a powerful tool for decision-making in certain situations.

The CVP analysis is an attempt to establish what will happen to the financial result if a specific level of activity or volume fluctuates. This information is vital to management, since one of the most important variables influencing total sales revenue, total costs and profits is output or volume. For this reason output is given special attention, since

knowledge of this relationship will enable management to identify the critical output levels, such as the level at which neither a profit nor a loss will occur (i.e. break-even point).

CVP analysis is based on the relationship between volume and sales revenue, costs and profit in the short run, the short run normally being a period of one year, or less, in which the output of a firm is restricted to that available from the current operating capacity.

2.0 OBJECTIVES

After studying this unit, you should be able to:

- Explain cost-volume-profit (CVP) analysis.
- Identify the underlying assumptions of CVP
- Share the basic CVP formulae
- Prepare simple income statement
- Explain margin of safety and contribution margin ratio
- Describe multi-product CVP analysis
- Know the limitations of CVP

3.0 MAIN CONTENT

3.1 Cost-Volume-Profit (CVP) Analysis

Given an analysis between marginal, contribution and fixed costs, it is possible to predict the net product which should emerge at various volume of sales whether expressed in units or in value. C- V represent an application of marginal costing that seeks to study the relationship between cost, volume and profit at different activity levels and can be relied upon for short-term planning and decision making.

Also referred to as break-even analysis, it represents the position where total cost will equate the total revenue. The concept of break-even analysis relied heavily on the application of the behavioural classification of cost that is to provide solution to the under mentioned questions:

- (a) How many units must an organization produce and sell in order to equate the total cost of production or what is the break-even in unit?
- (b) What is the total turn-over required by an organization in order to equate the total cost of production or what is the break-even point in sale value.

- (c) What will be turn-over required by organization for the purpose of achieving a pre-determined level of profit?
- (d) Under a pre-determined amount of profit, how many units must an organization produce and sell in order to achieve the desired profit target.

3.2 Assumption of Break-Even Analysis

It is instructive to note that the application of C- V -P analysis depends largely on the following basic assumptions:

1. It is assumed to be no uncertainty
2. All other variable cost remaining constant
3. All cost can be accurately divided into fixed and variable element
4. There are no stock level changes or that stocks are valued at marginal cost only.
5. The analysis applies to the relevant range only
6. Profit are calculated on a variable costing basis
7. The only factor affecting revenue and cost is activity level
8. The analysis of C- V -P relates to a single product or constant sales mix.
9. Fixed costs will remain constant within the relevant range
10. That method of production, level of technology and efficiency remaining unchanged.
11. That within the relevant range, cost and revenue behave in a linear fashion.

3.3 Application of Break-Even Analysis

- (a) To determine the break-even point in units. The total fixed cost of an organization will be divided by contribution per unit.
$$\text{Break-even-point (unit)} = \frac{\text{Fixed costs}}{\text{Contribution/unit}}$$
- (b) To obtain the Break-even point in sales value divide the total fixed costs by the contribution margin ratio or multiply the BEP (units) by the associated selling price. i.e.

$$\text{BEP (sale: ₦)} = \frac{\text{fixed cost}}{\text{Contribution Margin ratio}}$$

$$\text{BEP (sale: ₦)} = \text{BEP (unit)} \times \text{selling price OR}$$

$$\text{BEP (sale: ₦)} = \frac{\text{Fixed costs}}{\text{Contribution/unit}} \times \text{sale price/unit}$$

- (c) (i) The level of sales in unit required to achieve a predetermined profit before tax (PBT) will represent the summation of fixed cost and the profit before tax divided by the contribution per unit i.e.

$$\text{Units required (PBT)} = \frac{\text{Fixed cost} + \text{PBT}}{\text{Contribution/unit}}$$

- (ii) In the case of sale volume required to achieve a pre-determined after tax profit r (PAT) then apply this formular. (ABT)

$$\text{Units required (P AT)} = \frac{\text{Fixed cost} + \text{I-tax rate}}{\text{Contribution/unit}}$$

Where; PAT = profit after tax.

PBT = profit before tax.

- (d) (i) The level of sale value to result in target profit before tax is determined as follows:

$$\text{Sales required (PBT)} = \frac{\text{Fixed cost} + \text{PBT}}{\text{Contribution/margin ration}}$$

OR

$$\begin{aligned} \text{Sales required (PBT)} \\ = \frac{(\text{Fixed cost} + \text{Target profit}) \times \text{sales price/unit}}{\text{Contribution/unit.}} \end{aligned}$$

- (ii) However, the level of sales value that will result in target profit after tax is determined as follows: { fAT }

$$\text{Sales required (P AT)} = \frac{\text{Fixed cost} + \{1 - \text{tax rate}\}}{\text{Contribution margin ratio}}$$

3.4 Contribution Margin Ratio

The word contribution represents the difference between the selling price and the marginal cost or the summation of fixed cost with the net profit. The ratio of contribution to a particular sale value is described as contribution margin ratio. Also referred to as profit volumes ratios, it is designed to measure the level of contribution derivable from a specify amount of sales. Contribution margin ratio will be determined according to the nature of information provided as follows:

(a) $\text{CMR (in unit)} = \frac{\text{Selling Qrice} - \text{variable cost Qer unit}}{\text{Selling price.}}$

(b) $\text{CMR (in total)} = \frac{\text{Total sale} - \text{Total variable cost}}{\text{Total sale.}}$

- (c) Where selling price or sale value is completely omitted then
CMR will be determined as follows:

$$\text{CMR} = \frac{\text{Fixed cost} + \text{Qprofit}}{\text{Contribution} + \text{variable cost.}}$$

- (d) It is also possible to compute CMR where net profit is presented at different activity levels as follows:

$$\text{CMR} = \frac{\text{Changes in profit}}{\text{Changes in sales value}}$$

- (e) Where the existing information are to be altered as a result of additional fact then;

(i) $\text{CMR (in units)} = \frac{\text{Revised selling price} - \text{Revised variable cost}}{\text{Revised selling price.}}$

(ii) $\text{CMR (in total)} = \frac{(\text{Revised total sale} - \text{Revised total variable cost})}{\text{Revised total sale.}}$

3.5 MARGIN OF SAFETY

This will represent the difference between break even point and the budgeted activity level. Margin of safety (MOS) indicates by how much sales may decrease before a company will suffer a loss.

Margin of safety may be determined either in unit or in sales value as follows:

(a) $\text{Margin of safety (unit)} = \text{Budgeted unit} - \text{BEP (unit)}$

(b) $\text{Margin of safety (unit)}$

$= \text{Budgeted sale} - \text{BEP (sales value).}$

SELF ASSESSMENT EXERCISE 1

The following figures relates to company manufacturing a varied range of products:

YEAR	TOTAL SALES	TOTAL COST
	—N	—N
1	39,000	34,800
2	43,0,00	37,600

Yon are required to:

Assuming stability in prices with variable costs carefully controlled to reflect pre-determined relationships and an unvarying figure for fixed costs:

Calculate:

- (a) the fixed costs
- (b) the profit/volume ratio !
- (c) the break-even point
- (d) the margin of safety for years 1 and 2.

3.6 Multi-Product Break-Even Analysis

One of the earlier assumptions of Break-even analysis is that an organization manufactures a single product; therefore the Break-even point of that product will denote Break-even analysis of the entire organization. However, in a multi-product organization, it is instructive to note that the BEP of a particular product line will not represent the break-even analysis of the entire organization.

This is due to the fact that individual product is expected to operate under different cost structure, marketing strategy and also different market altogether.

It is however possible to identify the individual product BEP by applying the following sets of predetermined rules.

1. Identify the total fixed cost for the entire organization irrespective of the number of product line.
2. Compute the contribution margin ratio for the entire organization using the total value method.
i.e.
$$\frac{\text{Total sales} - \text{Total variable cost}}{\text{Total sales}}$$
3. Use the information obtained in 1 and 2 above to determine the BEP in sales value for the entire organization irrespective of the number of product.
4. Determine the individual product sales proportion as a percentage of the total turn over level.
5. Apply the individual product sales percentage to total BEP in sales value obtained in (3) above. The effect of this analysis will be individual product BEP in sales value.
6. In order to identify the individual product BEP in sales value by their corresponding or associated selling prices.

3.7 Limitation of Break-Even Analysis

- (a) The result of the analysis can only be relied upon within the relevant range i.e. within the activity level that the associated costs can be accurately determined.
- (b) The assumption that fixed cost will remain the same at all activity levels may be faulty. This is because fixed costs are likely to change at different activity level.
- (c) It is also improper to conclude that variable cost and sales will be linear. This is because the effect of extra discounts, experience, learning curve, special price contracts and other similar matters will make variable cost and revenue as a curve rather than straight line.
- (d) The cost volume profit analysis merely represents relationships which are essentially short-term. However, where the time scale involves several years, then the analysis will be appropriate.
- (e) The concept of C-V-P analysis relies heavily on the behavioural classification of cost i.e. only activity level determine the changes in Revenue and cost whereas in practice, there are numerous factors that will influence changes in cost and revenue in addition to the activity

SELF ASSESSMENT EXERCISE 2

For the forth coming year, the management accountant of PZ Limited has projected that sales and contributions will have the following

PRODUCT	SALES	SELLING PRICE	CONTRIBUTION	CMR
A	180,000	18	54,000	0.3
B	42,000	21	(4,200)	-0.1
C	90 000	45	-	-
D	168,000	42	67,200	0.4
E	120,000	30	60,000	0.5

Required:

Determine the number of units of each product to be sold to earn an after tax profit of W16,400 assuming the total fixed cost is W120,000 and tax rate is 20%.

4.0 CONCLUSION

In this unit, we have discussed generally the cost-volume-profit analysis. We looked limitations of cost-volume profit analysis. Finally, we tried to know the basic formulae of calculating the cost-volume-profit analysis.

5.0 SUMMARY

We have seen that for decision-making a numerical presentation provides more precise information. Given that the cost and revenue functions will already have been determined at the decision-making stage, the major area of uncertainty relates to the actual level of output. It is essential when interpreting CVP information that you are aware of the important assumptions on which the analysis is based.

6.0 TUTOR MARKED ASSIGNMENT

Dangote Group Plc. manufactures and sell a unique product as Bsc, the selling price of which is N20. The summarized profit and loss statement for 31/12/2000 as follows:

	N	N
Sales		600,000
Direct material	90,000	
Direct wages	120,000	
Variable production overhead	60,000	
Fixed production overhead	75,000	
Selling and distribution	56,000	
Administration	45,000	446,000
Net profit before tax		154,000
Less Tax at 40%		61,600
Profit after tax		92,400

Required:

Calculate the break-even point for the last year in both units and sales value.

7.0 REFERENCES/FURTHER READINGS

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UNIT 5 ACTIVITY BASED COSTING (ABC)

CONTENTS

- 1.0 Introduction
- 2.0 Objective
- 3.0 Main Content
 - 3.1 Activity-Based Costing (ABC)
 - 3.2 Cost Drivers and Cost Pool
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 - 3.4 Inadequacies of Tradition Method of Overhead absorption
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 - How ABC System Support Corporate Strategy?
- 4.0 Conclusion
- 5.0 Summary
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1.0 INTRODUCTION

The cost Accounting includes collecting, classifying, analyzing and reporting of information to managers in their planning and activities and information system to be developed to help in decision making within the firm. Traditional accounting focused on product costing by tracing direct costs to the product and indirect costs allocated through cost centres. The direct cost will be in proportion to the volume of production and the indirect costs like production, administration, selling and distribution overheads etc are proportioned depending upon the method used and absorbed to the individual product. The basis of apportionment of overheads may be based on machine-hours, labour hours, direct costs, input, output etc. These normal methods of apportionment have some bottle-necks which tend to misinterpret regarding proration of common costs of different functions added to the product cost.

The conventional allocation of common costs is shown in figure 1.1

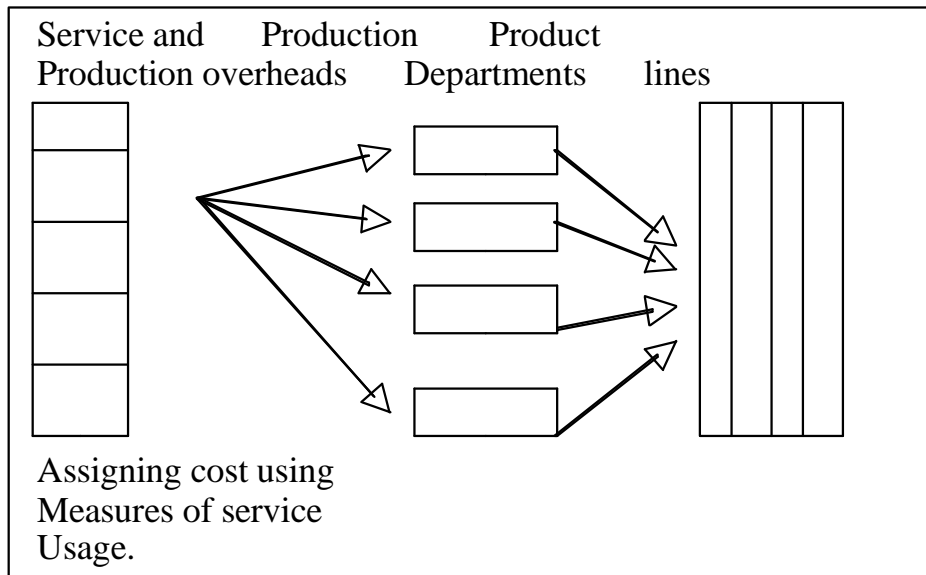


Figure 1.1 conventional allocations of common costs

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- Explain activity based costing (ABC)
- Discuss the inadequacies of the traditional methods of overhead absorption
- Explain steps to develop ABC system
- Describe the benefits from adaptation of ABC system

3.0 MAIN CONTENT

3.1 Activity Based Costing (ABC)

ABC has been defined as the collection of financial and operation performance information tracing the significant activities of the firm to product cost".

ABC is a recent development in accounting which attempts to absorb overheads into product costs on a more realistic basis. 'Common costs are unnecessarily treated and are arbitrarily absorbed using a basis such as direct labour hours, machine hours etc. Recently many organizations have adopted advanced manufacturing technology (AMT), with the result that overheads are increasing and labour costs are becoming a smaller I portion of total costs.

Costing systems which absorb overheads on a direct labour basis are therefore, not relevant in an (AMT) environment. The basic idea of ABC is that costs are grouped according to what drives them or causes them to be incurred. The cost drivers are then used as an absorption rate.

3.2 Cost Drivers and Cost Pools

The assumptions underlying ABC is that virtually all of a company's activities exist to support the production and delivery of goods and services. They should therefore, all be considered as product costs. And because nearly all factory and corporate support costs are separable, they can be split apart and traced to individual products or product families. On the basis of this assumption, the philosophy of ABC is that costs can be controlled more effectively by focusing directly on managing the forces that cause the activities -the 'cost drivers' -rather than cost. Thus, ABC provides better and more accurate information for decision-making on prices and product mix and for the control of manufacturing operations.

The ABC technique aims to overcome the drawbacks by cutting across conventional departmental boundaries. Costs are grouped into 'pools' according to the activities which drive them e.g. a cost pool may be of procurement (ordering, inspection, storing, etc) would be included in this cost pool and cost driver identified.

Product costing using ABC technique is shown in figure 1.2

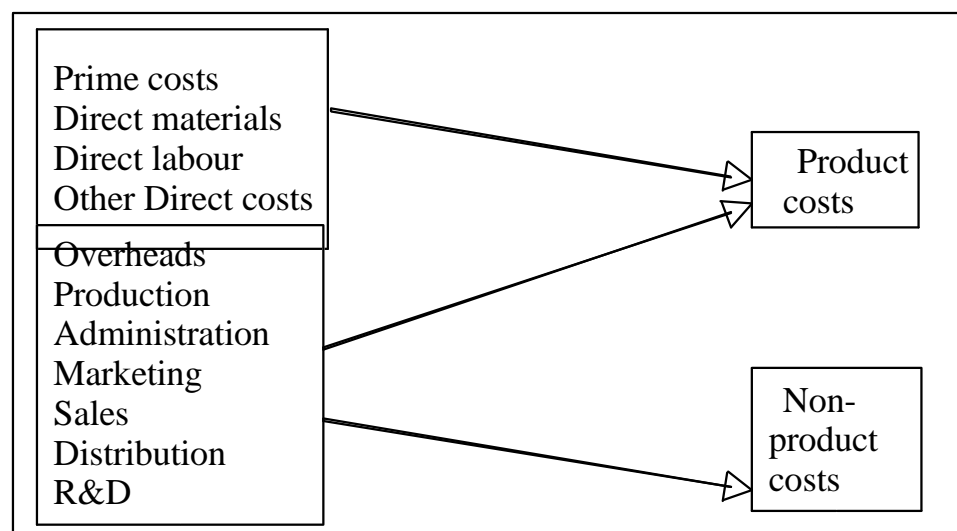


FIGURE 1.2: PRODUCT COSTING USING ABC

3.3 Characteristics of ABC

The important characteristics of ABC are noted below:

- i. Simple traditional distinction made between fixed and variable cost is not enough guide to provide quality information to design a cost system
- ii. The more appropriate distinction between cost behaviour patterns are volume (scale) related, diversity (scope) related, events (decisions) related and time related.
- iii. related.
- iv. Cost drivers need to be identified. A cost driver is a structural determinant, of cost related activity. The logic behind is that the cost behaviour pattern must be understood so that behaviour pattern is dictated by cost-drivers. In tracing overhead cost to product, a cost behaviour pattern must be understood so that appropriate cost driver could be identified.

The allocation of service department's costs and factory overheads to product lines under ABC system is shown in figure 1.3

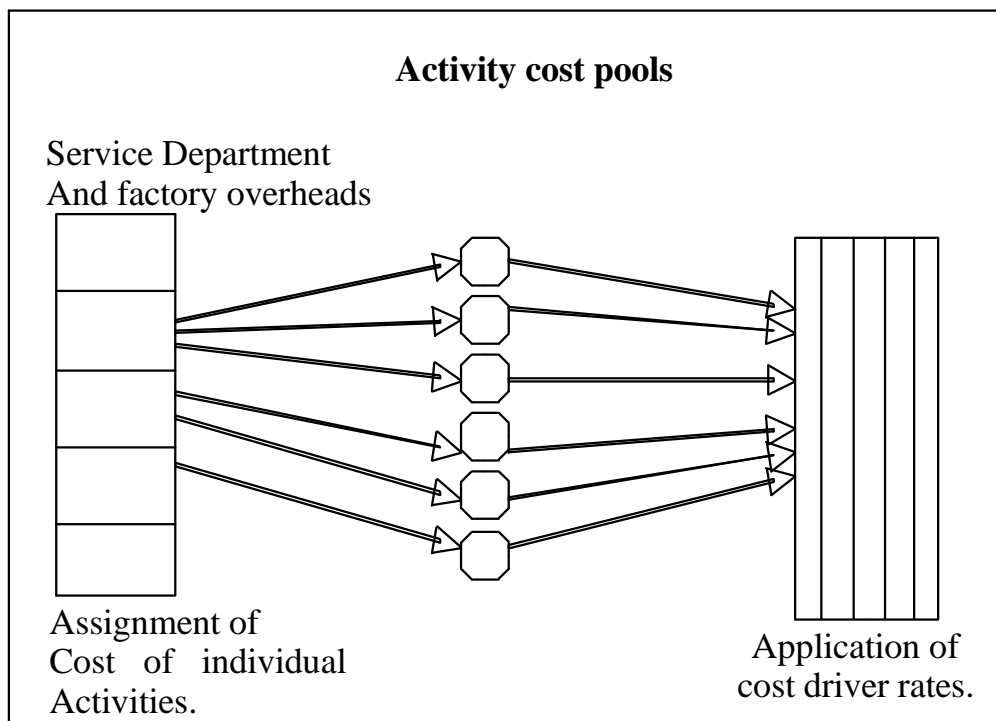


FIGURE1.3 ALLOCATION OF OVERHEAD COSTS UNDER ABC

3.4 Inadequacies of Traditional Methods of Overhead Absorption.

The cost of product arrived in traditional accounting system is not so accurate due to the following reasons:

- i. The present costing system has developed overhead recovery basis and blanket overhead recovery are acceptable when valuing stocks for financial reporting, but they are inappropriate when used for decision making and typical product strategy decisions.
- ii. The traditional fixed versus variable cost split is often unrealistic since, as business grows they often become more complex.
- iii. In case of companies manufacturing and selling multiple products usually make decisions on pricing, product mix, process technology etc., based on distorted cost information due to difficulties in traditional system of collection, classification, allocation and recovery of overheads to individual products.
- iv. The cost structure is changing especially when making direct labour component to small proportion.
- v. There is also an urgent need to integrate the activity measurement and financial measurement.

3.5 How to Develop an ABC System

The following are the three key areas of ABC

- (a) Product cost differentiation
- (b) Activities and their cost drivers
- (c) Identification of non-value added cost.

3.5.1 Steps to Develop ABC System

ABC is the planned and systematic study and determination of cost of each of the branches of business that add to the value of product and services. The steps required to develop an ABC system are as follows:

- (i) Identify the main activities performed in the organization, such as manufacturing, assembly etc., as well as support activities, including, purchasing, packing and dispatching.
- (ii) Identify the factors which influence the cost of each activity-the cost drivers.

- (iii) Collect accurate data on direct labour, material and overhead costs.
- (iv) Establish the demands made by particular product on activities, using the cost drivers as a measure of demand.
- (v) Trace the cost of activities to products according to a product's demand for each activity.

3.6 How to Implement ABC System

The technique of ABC lays the importance of different costs for different purposes and the identification of just those costs which are relevant to a particular decision. However, it does not challenge the conventional accounting methods and theory; instead, it refines the ideas and concepts of conventional methods. Subsequent analysis traces these activities to specific products. The relevant questions that could be asked are:

- (i) How many people work in the department? i (ii) What do they do?
- (iii) What determines the time required to process an incoming shipment? Does it matter if the shipment is larger or small?
- (iv) What other factors affect your department's work load?
- (v) Do you usually disburse the total amount of materials required for a production run all at once or does it go out in smaller quantities.

After the interview, the system design can use the number of people required in each activity to allocate the department costs. ABC calls for high level costing policy, cost technology and modules for activities effectiveness in a competitive economy for survival and prosperity.

SELF ASSESSMENT EXERCISE 1

A company manufactures two products L and M, using the same equipment and similar processes. An extract of the production data for these products in one period is shown below:

Particulars	L	M
Quantity produced in (units)	5,000	7,000
Direct labour hours per unit	1	2
Machine hours per unit .	3	1
Set ups in the period	10	40
Orders handled in the period	15	60

Overhead costs

Relating to machine activity	220,000
Relating to production run set-ups	20,000
Relating to handling of orders	45,000
	285,000

Required:

Calculate the production overheads to be absorbed by one unit of each of the products using the following costing methods.

3.7 Benefits from Adaptation of ABC System

ABC system ensures that management accounting information is not merely a by-product of external financial accounting systems. While it provides a more accurate basis for calculating products costs, perhaps its greatest benefit is that it is a mechanism for managing cost. It is this area of cost management and resources planning, rather than product costing, that ABC has the greatest potential.

Many of the benefits of ABC can still be obtained by implementing a partial system which focuses only on the most important ~~Traditional~~ methods can be used for that, leaving ABC to ~~strategic~~ decision making, profitability analysis and the control of manufacturing costs.

3.7.1 How ABC Systems Support Corporate Strategy?

ABC supports corporate strategy in many ways such as:

- (i) ABC system can effectively support the management by furnishing data, at the operational level and strategic level. Accurate product costing will help the management to compare the profits that various customers, product lines, brands or regions generate and to decide on pricing strategy, dropping unprofitable products, lines etc.
- (ii) Information generated by ABC system can also encourage management to re-design the products.
- (iii) ABC system can change the method of evaluation of new process technologies, to reduce set up times, rationalization of plant layout in order to ~re reduce or lower material handling improve quality etc.

- (iv) ABC analysis help managers focus their attention and energy on improving the activities and the actions allow the insights from ABC to be translated into ~d increased profits.
- (v) The provision of accurate information on product costs enables better decision to be made on pricing, marketing, product design and product mix.

SELF ASSESSMENT EXERCISE 2

Why the traditional cost system is not accurate in allocation of common costs?

4.0 CONCLUSION

In this unit, we have discussed the concept of Activity base costing. We then looked at the relationship between traditional costing system and ABC system. Finally we tried to identify how ABC system supports corporate strategy.

5.0 SUMMARY

This unit treats Activity-Based system. The inadequacies of the traditional method of overhead absorption. We have discussed the steps to develop an effective ABC system.

6.0 TUTOR-MARKED ASSIGNMENT

Define and explain Activity Based Costing (ABC). What are its characteristics?

7.0 REFERENCES/FURTHER READINGS

Ravi M, C. K. (2003): Cost Accounting. Taxman's publishers, India

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UNIT 6 OPERATING STATEMENT

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Operating Statement
 - 3.2 Absorption Costing
 - 3.3 Marginal Costing
 - 3.4 Reconciliation statement
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings

1.0 INTRODUCTION

Unfortunately, costs are not easy to predict, since they behave differently. For example, costs may behave differently when they are tightly controlled compared with a situation where control is relaxed or removed.

Whether a cost is fixed or variable with respect to a particular activity measure or cost L drive is affected by the length of the time span under consideration. The longer the time span the more likely the cost will be variable. For example, maintenance staff salaries are likely to be fixed in the short run and will this remain unchanged when the volume of maintenance remain unchanged when the volume of maintenance hours changes. However, in the long run, maintenance salaries are likely to vary with the maintenance time required. If maintenance activity expands, extra staff will be appointed but, if activity contracts, staff will be redeployed or made redundant. It is therefore important to specify the length of the time period under consideration when predicting costs for different activity levels.

The importance of accurately estimating costs and the complexity of cost behaviour means that accountants must use increasingly sophisticated technique. The introduction of the microcomputer, With Its supporting software, has made It possible for more Sophisticated techniques to be used for estimating costs, even by small business. These development have led to an increasing awareness of the important potential of mathematical and statistical techniques for estimating costs, and it is the aim of this unit to provide an understanding of how these cost statement are prepared.

2.0 OBJECTIVES

After studying this unit, you should be able to:

- Prepare income statement using absorption costing method.
- Discuss the advantages and disadvantages of absorption costing method. Prepare income statement using the marginal costing approach.
- Discuss the advantages and disadvantages of marginal costing techniques
- Reconcile the income statement together.

3.0 MAIN CONTENT

3.1 Operating Statement

This will represent the various method of presenting the income statement of an organization in order to show the operating result at a particular period. The statement may also be used for the purpose of evaluating performances. In practice, two different approaches could be identified:

3.2 Absorption Costing

Under the absorption costing concept, all costs, which includes fixed and variable costs are ultimately charge? or allocated to cost it and total overheads are then absorbed according to a given level of activity in order to ascertain the total cost of each unit. The cost to be absorbed may be production costs only or costs of all function whether production or other wise the argument in favour of absorption costing in practice includes:

- i) Absorption costing is used for financial accounting because costs and revenue must match in the period when the revenue arises and not when the costs are incurred.
- ii) The computation of marginal cost and emphasis on contribution may lead to under pricing of product where the quoted prices are below total cost of production.
- iii) Where production is constant but sales fluctuate, net profit fluctuation are less with absorption costing than marginal costing.
- iv) Fixed cost represents a substantial and increasing proportion of costs in modern industry. Production may not be possible without incurring fixed cost therefore it is logical to include fixed production overhead in stock valuation.

- v) In order to eliminate the possibilities of fluctuation losses being shown in the financial statement especially where stock building is a necessary part of operations, fixed costs must be included in stock valuation.

Advantages

The advantages from adaptation of absorption costing methods are as follows:

- Absorption costing conforms with accounting standards, by matching costs with revenue for a particular accounting period.
- Stock valuation complies with the accounting standards, and fixed production costs are absorbed into stocks.
- It avoids separation of costs into fixed and variable elements, which is not easily and accurately achieved.
- The analysis of under/over absorbed overheads reveals any inefficient utilization of production resources.
- The apportionment and allocation of fixed production overhead cost centres (e.g. departments), makes managers aware of the costs and services provided.
- Cost plus pricing under absorption costing ensures that all costs are covered. Pricing at the margin may, in the long-run, result in contribution falling to cover the fixed costs. It is important in absorption costing that sales are equal to or exceed the budgeted level of activity otherwise fixed costs will be under absorbed.

Limitations

Absorption costing suffers from the following limitations:

- This method employs highly arbitrary way of apportionment of overheads which reduces the practical utility of cost data for control purposes. Neither the actual nor the predetermined method of absorption distinguished clearly the extent to which total unit costs are affected by volume changes and other causes respectively. Thus there is no one unit cost that may be used as a guide to decision-making when the decisions involve a change in volume.

- In this method all fixed costs are not charged against the revenue of the year in which they are incurred. It is an unsound practice.
- Behavioural pattern of costs is not given importance. In reporting enterprise results, the profit of a particular period will be affected by the amount of overheads absorbed into closing inventories or work-in-progress or finished stock or charged against the period when opening inventories are sold.
- Absorption costing produces a means of determining selling prices, but in most cases accuracy can not be achieved due to the nature of overheads included in the calculations.
- The complaint is sometimes made that absorption costing often deals only with production costs and ignores selling and administration costs.
- The decision-maker needs to know the costs that will vary as a result of his decision, and the costs that will remain unchanged. Absorption costing does not provide a convenient basis for making such calculations. Its main purpose is to provide cost information for stock valuation and the measurement of reported profits.

3.3 Marginal Costing

This is a principle whereby variable costs are charged to cost units and the fixed costs attributable to the relevant period is written off in full against the contribution for that period.

In marginal costing, costs are classified into fixed and variable costs. The concepts that vary with the volume of output. Marginal costing is known as variable costing in which only variable costs are accumulated and cost per unit is ascertained only on the basis of variable costs.

Advantages of Marginal Costing

The supporters of marginal costing technique put forward the following points in support of their argument.

- Fixed costs are period costs in nature and it should be charged to the concerned period irrespective of the quantum or level of production or sale.
- Marginal cost method is simple in application and is easy for exercise of control. It is more informative and simple to understand.

- It helps the management -with more appropriate information in taking vital business decisions like make or buy, sub-contracting, export order pricing, pricing under recession, continue or discontinue a product/division/sales territory, selection of (Suitable product mix etc.
- Profit-volume analysis is facilitated by the use of break-even charts and profit- volume graphs, and so on.
- The analysis of contribution per key factor or limiting resource is a useful aid in budgeting and production planning.
- Pricing decisions can be based on the contribution levels of individual products.
- The profit and loss statement is not distorted by changes in stock levels. Stock valuations are not bordered with a share of fixed overhead, so profits reflect sales volume rather than production volume.

Criticism against marginal costing:

The criticism leveled against marginal costing is summarized below:

- Difficulty may be experienced in trying to separate fixed and variable elements of overhead costs. Unless this can be done with reasonable accuracy, marginal costing cannot be very accurate.
- The misuse of marginal costing approach may result in setting selling prices, which do not allow for the full recovery of overhead. This may be most likely in times of depression or increasing competitors when prices set to undercut competitors may not allow for a reasonable contribution margin.
- The main assumption of marginal costing is that variable cost per unit will be same at any level of activity. This is only partly within a limited range of activity.
- The assumption that fixed costs remain constant in total regardless of changes in volume will be correct up to a certain level of output. Some fixed costs are liable to change from one period to another. For example, salaries bill may go up because of annual increments or due to change in the pay rates and due to pay structure.
- Increased in automation and mechanization has resulted the reduction in labour costs and, increased fixed costs, like installation, maintenance and operation costs, depreciation of machinery .

- Exclusion of fixed overheads from costs may lead to erroneous conclusion. It may create problems in inter firm comparison, higher demand for salaries and other benefits by employees, higher demand for tax by the government authorities etc.

Example

XYZ Ltd manufacturer of industrial valves provides the following information for the year ended 31st March, 2003:

Particular	Per unit	Total
Sales (15, 000 valves). (1)	25	375,000
Product overhead:		
Variable	15	225,000
Fixed	3	45,000
Total (ii)		
Cost profit		
Admin; selling and distribution o/H (Fixed)	18	270,000
Net profit.	7	105,000
		321,000
		73,000

The actual sales, production and stock for the year are:

Particulars	Quarter					Total
	I	II	III	IV		
Opening stock	2,000	1,000	4,000	-		
Production	6,000	4,000	5,000	3,000	18,000	
Sales	4,000	5,000	2,000	4,000	15,000	
Closing stock	2,000	1,000	4,000	3,000	3,000	

You are required to:

- (i) Prepare Quarterly statements of profitability on the basis of Absorption costing and marginal costing
- (ii) Reconcile the result profits.

SOLUTION

Profitability statement of XYZ. For the year ended 31st March, 2003 (under Absorption costing).

Particulars Quarter					Total
	I	II	III	IV	
Sales (@ N25)	100,000	125,000	50,000	100,000	375,000
Less: production overhead (@ N18 per unit)	72,000	90,000	36,000	72,000	270,000
Gross profit :					
Less: Admin; selling and Distribution overhead	28,000	35,000	14,000	8,000	105,000
		8,000	8,000	8,000	32,000
(under)/Over absorbed fixed overheads	8,000				
Net profit					
Budgeted production	20,000	27,000	6,000	20,000	73,000
Actual production		750	3,750	(2250)	9,000
	6,750				
(Under)/over absorption of fixed overhead @ N3	26,750	27,750	9,750	17,750	82,000
			Unit		
	3,750	3,750	3,750	3,750	15,000
	6,000	4,000	5,000	3,000	18,000
	2,250	250	1,250	750	
	6,750	750	3,750	(2,250)	9,000

Profitability statement of XYZ. For the year ended 31st March, 2003

Particulars	Quarter				Total
	I	II	III	IV	
Sales	100,000	125,000	50,000	100,000	375,000
Less: variable production overhead @ N15	60,000	75,000	30,000	60,000	225,000
Contribution					
Fixed cost: (i)					
Production overheads.	40,000	50,000	20,000	40,000	150,000
Admin. Selling & Dist. Overhead	11,250	11,250	11,250	11,250	45,000
Total fixed costs (ii)	8,000	8,000	8,000	8,000	32,000
Net profit (i) -(ii)					
	19,250	19,250	19,250	19,250	77,000
	20,750	30,750	75,000	20,750	73,000

Reconciliation of profits

Particulars	Quarter				Total
	I	II	III	IV	
Absorption profit	26,750	27,750	9,750	17,750	82,000
Marginal profit.	20,750	30,750	750	20,750	73,000
Difference.	+6,000	-3,000	+9,000	-3,000	+9,000

Unit

Particulars	Quarter				Total
	I	II	III	IV	
Opening Stock	-	2,000	1,000	4,000	-
Closing Stock	2,000	1,000	4,000	3,000	3,000
Difference.					
Fixed production overhead absorption (@ N3)	+2,000	-1,000	+3,000	-1,000	+3,000s
	+6,000	-3,000	+9,000	-3,000	+9,000

Note:

The reasons for the differences between absorption profit and marginal profit are as follows:

- 1) The difference is unaffected by the under/over absorption of fixed overheads in the absorption costing approach.
- 2) Where stock level are nil there is no differences
- 3) In case where stocks are decreasing, higher profits are reported under marginal costing.

SELF ASSESSMENT EXERCISE 1

Rainbow products Ltd. has several product lines with sales manager in charge of each. He is paid a bonus based on income generated by his product line.

In analyzing the performance of one product line the sales manager noted that sales declined from N8 last year. However the product line manager received a larger bonus than last year because net income increased from N90,000 last year to N120,000 for the current year.

The G.M (sales) wonders how the product line manager got entitled to a bonus with a decline in sales. He also wants to know how income increased when sales declined. What do you think of the present method of paying the bonus? Can you suggest some other method? The data given in support of the bonus payment is:

	Year 1	Year 2
Unit sold at N120	40,000	30,000
Standard variable production cost/unit	N8	N8
Fixed factory overhead	N200,000	N200,000
Fixed selling and distribution O/H	N140,000	N140,000
Standard fixed factory O/H per unit	N5	N5
Units produced	N30,000	N50,000
Opening finished goods in units	-10,000	-

All factory overhead variances are written off to the cost of goods sold.

3.4 Reconciliation Statement!

The principal difference between these two costing systems lies in the treatment of fixed overheads. Under the absorption costing system, stock is valued at total cost of production. However, using a marginal costing system a stock is valued at variable cost and fixed overhead are

written off as period expenses when they arise. Therefore, the difference between the net incomes under the two approaches will equate the difference in the value of their stocks.

SELF ASSESSMENT EXERCISE 2

Below are given standard unit costs for the production of a face towel manufactured Carl Lewis Product Company Limited.

		N
Direct material		1.60
Direct labour	1.50	
Variable manufacturing overheads	1.20	
Fixed manufacturing overheads	3.00	
	—	<u>7.30</u>

At normal operating capacity, 200,000 units of product should be manufactured. Variable selling and administrative expenses amount to 50 kobo a unit, and the fixed selling and administrative expenses amount to N75,000 a year. Income taxes at 40% of net income before taxes.

Production and sales data for year 2001 – 2002.

(Inventory on hand, January 2001 – 28,000 units)

Production for year 2001	200,000 units
Sales for year 2001	160,000 units
Production for year 2002	150,000 units
Sales for year 2002	180,000 units
In both years each towel is sold for N10.50	

Required:

Prepare income statement for the two years by the absorption costing method.

4.0 CONCLUSION

In this unit, we have discussed preparation of income statement using absorption costing and marginal method. We saw the advantages and disadvantages of absorption and marginal costing. Finally, we tried to reconcile the two-income statement together.

5.0 SUMMARY

Total costs for a particular expenses may be a function of the number of units produced, direct labour hours of inputs, machine hours of input, quantities of materials and so on. When technological changes occur in the production process, past costs cannot be used to predict future costs.

If the labour content per unit is expected to decline as workers become more familiar with process learning curve principles can be applied.

6.0 TUTOR-MARKED ASSIGNMENT

Your company has a production capacity of 200,000 units per year. Normal capacity utilization is renewed at 90%. Standard variable production costs are N11 per unit. The fixed costs are N360,000 per year. Variable selling costs are N3 per unit and fixed selling cost are N270,000 per year. The unit selling cost are N270,000 per year. The unit-selling price is N20. In the year just ended on 31 5t March, 2003 the production was 160,000 units and sales were 150,000 units. The closing inventory on 31-3-2003 was 20,000 units. The actual variable production costs for the year were N35,000 higher than the standard. Required: (i) calculate the profit for the year by the absorption costing method.

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UNIT 7 PRICING DECISION

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- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Pricing Decision
 - 3.2 Factors that Influence Pricing Decision
 - 3.3 Calculating Optimum Selling Prices using differential calculus
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1.0 INTRODUCTION

Accounting information is often an important input to pricing decisions. Organizations that sell products or services that are highly customized or differentiated from each other by special features, or who are market leaders, have some discretion in setting selling prices. In these organizations the pricing decision will be influenced by the cost of the product. The cost information that is accumulated and presented is therefore important for pricing decisions.

In other organizations prices are set by overall market and supply forces and they have little influence over the selling prices of their products and services. Nevertheless, cost information is still of considerable importance in these organizations for determining the relative profitability of different products and services so that management can determine the target product mix to which its marketing effort should be directed.

In this unit, we shall focus on both of the above situations. We shall consider the role that accounting information plays in determining the selling price by a price setting firm. Where prices are set by the market our emphasis will be on examining the cost information that is required for product-mix decisions. In particular, we shall focus on both product and customer profitability analysis.

2.0 OBJECTIVES

After studying this unit, you should be able to:

- Discuss the numerous factors that will influence pricing decision, in practice.
- Identify the optimal selling price through the use of differential calculus.
- Use the application of cost-plus pricing models
- Explain the limitations of cost-plus pricing
- Describe the different pricing policies.

3.0 MAIN CONTENT

3.1 Pricing Decisions

Irrespective of the nature, size and complexity of an organization it is important to posit that the most strategic decision that top management will have to contend with on a regular basis will be the relevant price to charge for the company's productions and services. For many products, services and commodities, the price is the most important determinant of demand. Even -when other factors such as quality, reliability, and durability are important, price will normally remain, an important determination of demand.

Pricing decision is crucial for many reasons. Price will affect contribution per unit and volume of demand and so be an important influence on both profit and cash flow.

3.2 Factors that influence pricing decision

Although, we usually think of pricing as a decision which must be made and reviewed regularly and therefore as a short-term decision policy can be used as a weapon of LJ managers in trying to achieve or eliminate competition. Apart from price, other factors that will influence the demand of a particular product or services are:

- (a) Product research and development
- (b) Market research
- (c) Advertising and sales promotion
- (d) A well trained and organized sales force.
- (e) Effective distribution.

3.3 Calculating optimum selling prices using differential calculus

We have established that optimal output is determined at the point where marginal revenue equals marginal cost. The highest selling price at which the optimum output can be sold determines the optimal selling price. If demand and cost schedule are known, it is possible to derive simultaneously the optimum output level and selling price using differential calculus.

Example

A division within the Arewa textile company sells a single product. Divisional fixed costs are N700,000 per annum and a variable cost of N70 is incurred for each additional unit produced and sold over a very large range of output. The current selling price for the product is N160, and at this price 10,000 units are demanded per annum. It is estimated that for each successive increase in price of N2 annual demand will be reduced by 500 units. Alternatively, for each N2 reduction in price demand will increase by 500 units.

Calculate the optimum output and price for the product assuming that if prices are set within each N2 range there will be a proportionate change in demand.

Solution

The first step when calculating the optimum selling price is to calculate total cost and revenue functions. The total cost (TC) function is

$$TC = N70,000 + 70x$$

Where x is the annual level of demand and output.

At present the selling price is N60 and demand is 10,000 units. Each increase or decrease in price of N2 results in a corresponding decrease or increase in demand of 500 units. Therefore, if the selling price were increased to N200, demand would be Zero. To increase demand by one unit, selling price must be reduced by N0.004 (N2/500units). Thus the maximum selling price (sp) for an output of x units is

$$SP = N200 - N0.004x$$

Assuming that the output demand is 10,000 units $SP = N200 - N0.004(10,000) = N160$. Therefore if demand is 10,000 units, the maximum selling price is N60, the same selling price given in the question.

We shall now use differential calculus to derive the optimal pricing

$$TC = N70,000 + 70x$$

$$SP = N200 - N0.004x$$

Therefore total revenue (TR) for an output of x units = $N200x - N0.004x^2$
Marginal cost (MC) = $\frac{dTC}{dx} = N70$

$$\text{Marginal revenue (MR)} = \frac{dTR}{dx} = N200 - N0.008x$$

At the optimum output level

$$\frac{dTC}{dx} = \frac{dTR}{dx}$$

And so

$$N70 = N200 - N0.008x$$

$$X = 16250 \text{ units}$$

The highest selling price which this output can be sold is

$$SP = N200 - N0.004(16250)$$

$$\text{So } SP = N135$$

Thus the optimum selling price and output are N135 and 16,250 units respectively.

3.4 Cost Plus Pricing Models

The most widely used method of pricing a product is to estimate the unit cost and thus added a percentage mark-up to this cost to provide a reasonable level of profit. This approach is termed cost-plus-pricing. In general, these pricing systems are concerned with two elements.

- (i) What is the relevant cost to include in the price? And.
- (ii) What is the 'profit' margin that must be added to the costs to arrive at the selling price?

3.4.1 Full Cost Pricing

Also referred to as absorption cost pricing, the approach uses conventional cost accounting principle to establish the total for a product to which is added a mark up of any percentage to arrive at a selling price. In the case of a manufacturing company this would be either:

(i) Unit price
=
$$\frac{\text{Total Factory cost at expected volume} + \text{OP margins}}{\text{Expected unit volume.}}$$

OR

(ii) Unit price
=
$$\frac{\text{Total Factory cost at expected volume} + \text{other cost} + \text{profit margin}}{\text{Expected unit volume}}$$

Other cost in this context may include selling, distribution, research and development and administration costs depending on how far the identification of these costs with particular

SELF ASSESSMENT EXERCISE 1

SUZUKI LTD. has recently developed a new product called ZIP and its selling price must now be determined. The pricing policy of SUZUKI LTD requires that products earn a return on invested capital of 20% per annum. The company expects a 30% gross profit margin or a 10% net profit margin.

Marketing the product is expected to cause a rise in total selling and distribution cost of N32,000. before Zip was considered, the general administration costs were forecast to rise by N24,000 in the coming year but, with the introduction of Zip, this increase would be N36,000. zip incurred development cost of N70,000 which will be capitalized and written over five years, if Zip is marketed, but written immediately if it is not marketed. Depreciation of new plant equipment and other fixed assets is allowed for in the allocation of general factory overhead.

Plant equipment and other fixed capital invested required to produce Zip will cost N120,000 and investment in working capital amounting to N5 per unit of output will also be required.

3.4.2 Limitation of cost-plus pricing model

The limitations of this model are as follows:

- (i) Ignores demand -The main objection to cost-plus pricing is that it ignores demand. The price is set by adding a margin to cost and this may bear no relationship to the price demand relationship.
- (ii) Circular reasoning- The approach is circular reasoning, because price changes affect volume of sales, which in turn affects unit fixed cost, which also leads to further price changes.
- (iii) Common fixed cost- There are many different ways by which fixed costs can be apportioned to product and the effect of this is

that the cost will be different depending on which apportionment method is used.

- (iv) Pricing factor- It is often opined this approach serve as a pricing "floor" shielding the seller from a loss.

3.3.3 Target Return Pricing Model

Another approach is to estimate the amount of investment attributable to a product and then set a price that ensures a satisfactory ~~investment~~ ^{return} for a given volume. Target mark-up percentages are likely to be varied from product line to product line to correspond with well-established and likely demand.

Under this approach the unit selling price is estimated as follows:

$$\text{Unit price} = \frac{\text{Total cost} + (\% \text{ Returns} \times \text{Required Investment})}{\text{Expected unit volume.}}$$

3.4 Determination of Pricing Policy

An element that creates sales revenue is price, however, several factors that will determine, the "correct" price will depend on:

- (i) The nature of the company's product. Inc. necessity or a Luxury item.
- (ii) The actual cost of manufacturing the product.
- (iii) Availability of close substitute to the company's product.
- (iv) The market value of the available close substitute.
- (v) The elasticity of demand for the company's product i.e. perfectly elastic or perfectly inelastic.
- (vi) Nature of the product market i.e. a monopolistic, duopolistic or oligopolistic market.
- (vii) The position of the product within the product market i.e. a market leader or market followed
- (viii) The present product circle i.e. introductory, growth, development, maturation or decline stages.
- (ix) The specific pricing policy being adopted by the organization i.e. theoretical pricing approach, marginal pricing, absorption pricing or contribution pricing approach.

SELF ASSESSMENT EXERCISE 2

As management accountant to a group of companies manufacturing footwear, you have been asked to consider the following two subjects that are to be discussed at the next group pricing r committee meeting.

- (a) The possibility of differential pricing for different sizes of shoes.

- (b) The levels of prices at which contracts with a large multiple retailer for 'own label' shoes might be negotiated.

Required:

Describe briefly the major topics under each of the above headings that you would include in the agenda for discussion.

4.0 CONCLUSION

In this unit, we understand the numerous factors that will influence pricing decision, in price. We looked at the limitation of cost plus pricing. Finally we tried to identify the different pricing policies.

5.0 SUMMARY

Many firms are price takers and do not have to make pricing decisions. Prices are set by overall market supply and demand. Here accounting information plays an important role in determining the mix of products to sell, given their market prices. Other firms are price setters. They sell highly customized or differentiated products and have some discretion over setting selling prices.

For both price takers and price setters the decision time horizon determines the cost information that is relevant for product pricing or output-mix decisions.

6.0 TUTOR-MARKED ASSIGNMENT

- 1) What are the factors to be considered in pricing decisions?

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UNIT 8 CAPITAL BUDGETING DECISION

CONTENTS

- 1.0 Introduction
- 2.0 Objective
- 3.0 Main Content
 - 3.1 Capital Budgeting Decision
 - 3.2 Characteristics of Capital Investment
 - 3.3 Investment Appraisal Techniques
 - 3.3.1 Accounting Rate of Return
 - 3.3.2 Payback Period
 - 3.3.3 Net Present Value Method
 - 3.3.4 Internal Rate of Return
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1.0 INTRODUCTION

Capital investment decisions are those decisions that involve current outlays in return for a stream of benefits in future year. It is true to say that all of the firm's expenditure are made in expectation of realizing future benefits. The distinguishing feature between short term decisions and capital investments (long -term) decisions is time. Generally, we can classify short-term decisions as those that involve a relatively short time horizon, say one year, from the commitment of funds to the receipt of the benefit. On the other hand, capital investment we shall see that this commitment of funds are committed only for short periods of time, and the interest cost is normally so small that it can be ignored.

Capital investment decisions normally represent the most important decisions that an organization makes, since they commit a substantial proportion of a firm's resources to actions that are likely to be irreversible. Such decisions are applicable to all sectors of the ~~business~~ **Business** firms investment decisions include investments in plant and machinery, research and development, advertising and warehouse facilities. Investments decisions in the public sector include new roads, schools and airports. Individuals; investment decisions include house-buying and the purchase of consumer goods. The economic evaluation of the desirability of investment proposals. We shall concentrate on the investments decisions of business firms, but the same principles, with modifications, apply to individuals, and the public sector.

To simplify the introduction to capital investments decisions, we shall assume initially that all cash inflows and outflows are known with certainty, and that sufficient funds are available to undertake all profitable investments. We shall also assume a world where there are no taxes and where there is an absence of inflation. These factors will be brought into the analysis in the next unit.

2.0 OBJECTIVES

After studying this unit, you should be able to:

- explain the capital budgeting decisions.
- Explain the concept of pay back period, ARR, IRR and NPV;
- Calculate NPV, IRR, payback period and accounting rate of returns;
- Explain the advantages and limitations of ARR, payback, IRR and NPV.

3.0 MAIN CONTENT

3.1 Capital Budgeting Decision

A very important part of a management accountant's job is to provide information which will assist the making of decisions concerning the investment of capital funds. This is the process known as capital budgeting. Examples of such decisions are:

- i. Replacement investment e.g. decision is to replace a semi-automatic machine with a fully automated machine;
- ii. Investment for expansion;
- iii. Investments for product improvement and for cost reduction
- iv. New ventures;
- iv. Strategic investments where investments may be undertaken to the benefit of the overall objectives but might not satisfy the normal financial criteria.
- v. Investments because of statutory requirements or employee or community welfare. Such investments will not usually have a positive NPV but may be essential, for example to
- vi. satisfy environmental or safety regulations.

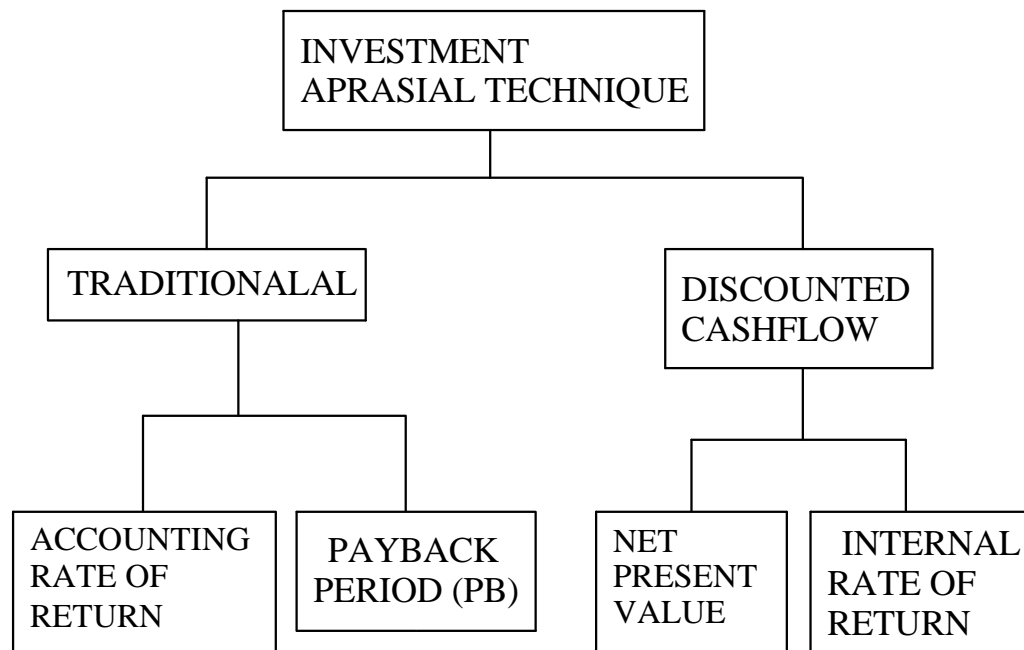
3.2 Characteristics of Capital Investment

The distinctive features of capital investments which make it worthwhile developing and applying a special set of techniques for appraising it are:

- a) The sums involved are relatively large so that bad decisions may have very serious consequences
- b) The time scale over which the benefits will be received is relatively long so that a business has a live with any mistakes for a consideration period.
- c) The whole nature of a business and its direction and rate of progress is ultimately governed by its overall investments programme.
- d) Capital investments involve waiting for the recoupment of expenditure. Because money can be used to earn interest waiting has cost.

3.3 Investment Appraisal Techniques

In practice, it is possible to examine the Viability or otherwise of project using four different methods which may be properly classified graphically into two main approaches as follows



3.3.1 Accounting Rate of Return

This can be described as measure of profitability associated with a given investment. This approach is specifically designed in line with the return on capital approach where total return is expressed as a percentage of capital employed or net profit as a percentage of capital employed. Accounting rate of return may therefore be determined through any of the following formula.

$$\text{ARR} = \frac{\text{Average Annual Accounting Profits Before This Tax}}{\text{Initial Investments}} \times 100$$

or

$$\text{ARR} = \frac{\text{Average Annual Accounting Profit Before Tax}}{\text{Average investments}} \times 100$$

$$\text{Where average investments} = \frac{\text{Initial outlay} + \text{scrap value}}{2}$$

DECISIONS RULE

Accept or otherwise of any project under the concept of ARR will depend on the following ..." conditions

- i. Where many projects under the concept of ARR will depend on the following conditions than the minimum established ARR of the organization.
- ii. Where two mutually exclusive projects are being considered, the rule is to select the project " with a higher ARR provided the higher ARR also greater than the minimum established .J ARR 0 the organization.

EXAMPLE

The management of WySE investments Plc are considering the possibility of selecting one of the following mutually exclusive projects. From the position of the chairman, any investment with an accounting rate of return of below 20% for total investments and 35% for average investments will be rejected. The two possible projects have the following cash flow characteristics.

Year	A	B
0	(200,000)	(400,000)
1	30,000	80,000
2	40,000	75,000
3	84,000	80,000
4	34,000	100,000
5	40,000	300,000
Scrape value	40,000	50,000

The two projects to be depreciate on a straight line basis over their useful lives.

Requirement

- i. Using the total investment method. Identify the project to be selected:
- ii. By adopting the average investments method, re-examine your position in (i) above

Solution

Project A

Year	Cash Flow	Depreciation	Profit
1	30,000	32,000	(2,000)
2	40,000	32,000	8,000
3	84,000	32,000	52,000
4	34,000	32,000	2,000
5	40,000	32,000	8,000
			<u>68,000</u>

$$\text{Total Accounting Profit} = 68,000 = \frac{\text{N}13.600}{5} \quad \underline{\hspace{2cm}}$$

Workings

$$1. \text{ Depreciation (A)} = \frac{\text{initial outlay} - \text{scrap value}}{\text{No of years}} = \frac{200.000 - 40.000}{5 \text{ years}}$$

$$= \frac{160.000}{5} = \text{N}132.000 \quad \underline{\hspace{2cm}}$$

$$2. \text{ Depreciation (B)} = \frac{400.000 - 50.000}{5}$$

$$= \frac{350.000}{5} = 70.000 \quad \underline{\hspace{2cm}}$$

PROJECT B

Year	Cash flow	Depreciation	Profit
1	60,000	70,000	(10.000)
2	75,000	70,000	5,000
3	80,000	70,000	10,000
4	100,000	70,000	30,000
5	300,000	70,000	230.000
			<u>265.000</u>

Average annual accounting profit $\frac{265,000}{5} = \text{N}53,000$

$$\text{i. ARR} = \frac{\text{Profit}}{\text{Total investment}} = \frac{13,600}{200,000} = 6.8\% \quad \text{A} \quad \frac{53,000}{400,000} = 13.25\% \quad \text{B}$$

$$\text{ii. ARR} = \frac{\text{Profit}}{\text{Ave. investment}} = \frac{13,600}{120,000} = 11.33\% \quad \text{A} \quad \frac{53,000}{225,000} = 23.56\% \quad \text{B}$$

Working Average Investment

$$\text{Initial outlay} + \text{Scrape Value} = \frac{200,000 + 40,000}{2} = 120,000 \quad \text{A} \quad \frac{400,000 + 50,000}{2} = 225,000 \quad \text{B}$$

Decisions

Based on the analysis above, the management of WySE investments Plc are hereby advised to reject the two projects. Although, the two projects are profitable, but their overall ratio of return are below the minimum established ARR of the organization. i.e. both of the total in terms of the total investment s well as average investments.

Advantages of Accounting Rate of Returns

- It is simple to calculate and understand.
- It considers all the cashflow associated with the entire the life of the project.
- It is a rate fro return approach which manages in a divisions structure will be comfortable with.
- As a measure of profitable project viability or otherwise will be easy to identify.

Disadvantages of Account Rate of Returns

- The method ignores time value of money by assuming that N10,000 in one year one will have the same value even in year ten.

- ii. The method also ignores risk and management attitude towards risk.
- iii. It makes use of accounting depreciation instead of a more relevant capital allowances.
- iv. The approach ignores the actual size of the cashflows.
- v. The method ignores differences in project ratios
- vi. It ignores impact of inflation on project cashflow.
- vii. The approach will not consider the effect of working capital on the project viability.

3.3.2 Payback Period

This may be described as a traditional method of appraising the viability or otherwise of a project where emphasis is placed on liquidity rather than profitability. Payback simply refers to the actual duration it will take a project to recoup on initial outflow from the accumulated cash inflows or the actual duration it will take a project to recoup the initial outflow from the accumulated cash inflows or the actual period the accumulated cash inflow will equate the cash outflow. The specific approach to be adopted in the process of identifying the actual payback period will depend on the nature of the cash flow as follows.

- a. Constant Equal Cash Inflows: where the cashflows associated with a given investment is constantly the same amount throughout the duration of the investments, then the actual payback period of the project is determined as follows.

$$\text{Payback period} = \frac{\text{Initial outlay}}{\text{Cash inflow}}$$

Determine the payback period of a project whose initial outlay is N200,000 and returns of N50,000.

Through the duration of a project.

Solution. initial outlay 200,000

$$\text{Payback period} = \frac{200,000}{50,000} = 4 \text{ years}$$

Unequal Cash inflows

Where the cash inflows associated with an investment varies from year to year. It is therefore instructive to note that the actual payback period will depend on the accumulated cash inflows.

Illustration

Identify the payback period of projects with the following cash-flow characteristic.

Year	CF	CCF
0		(200,000) (200,000)
1	80,000	(120,000)
2	70,000	(50,000)
3	40,000	(10,000)
4	50 000	

Decision: From the analysis above. It is possible to have two different payback periods. This is because the examiners ignore the actual timing of the cashflows.

Payback Period with Bail-Out factor

This is may be described as a situation where the scrape value of a project may be relied upon as a basis of recouping the initial outlay. It is therefore note worthy that under a bail-out factor. It will n not possible for the actual payback period to be prorated into months. However, if the cash inflows are receivable at the end of the year, then pay back period must not include months I irrespective the actual amount involve as at the period of recouping the initial outlay

Determine the actual payback period or a motor vehicle under bail- out factor which will be obtained in year zero for N400, 000 and the following cash flow analysis are also relevant the project

Year	Cashflow	scrape value
	N	N
0	400,000	
1	200,000	150,000
2	80,000	1 10,000
3	40,000	70,000
4	50,000	40,000
5	40,000.	20,000

Solution

Year	CF	scrape value	CCF
0	(400,000)		- (400,000)
1	200,000	150,000	(200,000)
2	80,000	110,000	(120,000)
3	40.000	70,000	(120,000)
4	50,000	40,000	-
5	40,000	20,000	-

Payback period = 4years

Decision rule

- i. Where many projects are being considered the rule is to all the projects whose payback period are shorter than the established payback period of the organization.
- ii. Where mutually exclusive projects are being considered the rule is to select the projects with a shorter payback period provided that shorter payback is also lower than the minimum established payback of the organization.

Advantages of Payback Period

- i. It is simple to calculate and understand.
- ii. It represent a quick screening device for an investors facing liquidity problem.
- iii. By relying on the actual cash flows payback period represents an objective measure of evaluating projects.
- iv. Payback period may be used as a safeguard against risk;
- v. The approach can be used identifying the project breakeven period or the margin of safety.

Disadvantage of Payback Period.

- i. The approach also ignores the time value of money
- ii. Payback period ignores cash flows immediately after the payback period.
- iii. The approach ignores the wealth maximization objective of the organization.
- iv. The method also ignores management attitudes towards risk i.e. whether a risk take or a risk averse (avoider)
- v. The approach also ignores the effect of inflation on the actual cash flow.
- vi. Choice of cut-off payback period is arbitrary.
- vii. Unable to distinguish between projects with same payback period.
- viii. It may lead to excessive investment in short term projects.

3.3.3 Resent Value Method

Under this approach, the viability or otherwise of a project is determined by comparing the, discounted cash inflow with the discounted outflows. The difference therefore represents the net present value. Meanwhile, by equating the discounted cash flows against the

discounted, cashflows, it is possible for any of the following result to emerge.

- i. $NPV > 0$ i.e. positive NPV
- ii. $NPV < 0$ i.e. negative NPV
- iii. $NPV = 0$ i.e. breakeven NPV.

Decision Rule under NPV

- i. Where many projects are being considered, the rule is to accept with positive. Net present value.
- ii. Where mutually exclusive projects are being considered the rule is to select a period with a higher a positive present value.

Example

The management of SWOT Plc is considering the possibility of selecting one of the following mutually exclusive project, which has the following cashflow characteristics.

Year	A	B
0	100,000	120,000
1	30,000	38,000
2	40,000	48,000
3	40,000	50,000
4	20,000	30,000
Scrape value	50,000	10,000

From the viewpoint of the provider of funds, the expected rate of return rate of return is 15%. You are hereby required to assist the management of SWO11 on the optimal course to select.

SOLUTION

Year	A: B	15%	Net Cash flow	Dec	Present Value	A	B
0	(100,000)	(120,000)			1,00000	(100,000)	(120,000)
1	40,000	50,000		0.8696		34,784	43,480
2	30,000	38,000		0.7561		22,683	28,732
3	40,000	48,000		0.6575		26,300	31,560
4	40,000	50,000		0.5718		22,872	28,590
5	20,000	30,000		0.4972		9,948	14,916
					NPV	<u>19,069</u>	<u>32,250</u>

Decision: The management of SWOT Plc are hereby advised to select project B. this is because the project is having a higher NPV of N32,250.

EFFECT OF TAXATION ON DISCOUNTED CA

The actual tax payable on any returns will represent a ~~deductible~~ expense from the annual returns of the following year. This implies that tax payments are to be deducted on a proceeding year basis.

SELF ASSESSMENT EXERCISE 2

Examine viability or other wise of a project with the following cash flow characteristics.

Year Cash flow

0	120,00
1	40,000
2	40,000
3	50,000
4	80,000
5	60,000

The cost of capital associated with this investment is 12% while the rate of company tax is 10%.

Advantages of Net Present Value

- i. The approach is consistent with the theory of wealth maximization,
- ii. The approach considers the time value of money.
- iii. It can be use to rank project under capital rationing decision.
- iv. The approach makes use of all the project cash flows throughout the duration of the project's life;
- v. It is a clear method of either accepting or rejecting the project

Disadvantages

- i. The method over-relies on the accurate estimated of the market determined cost capital;
- ii. The approach ignores risk and management attitude rewards risk
- iii. The word: NPV: may mislead the investors because it does not represent the actual returns associated with the project.
- iv. Since it is not a rate of return method, divisional management may not be comfortable by relying on the approach for performance evaluation.

3.3.4 Internal Rate Of Ret

This may be described as a specific rate of return that will produce a break-even NPV or a discounting rate that will equate discounted cash inflow with the discounted cash outflows. Also refereed as discounted cashflow yield. It will represent a specific rate which will produce NPV that will equate zero. IRR is determined through a trail and error method of interpolation as stated below.

$$IRR = a + \frac{A}{A+B} (b-a)$$

Where a represents lower discount rate or the discount rate with the positive NPV

A = positive NPV

B = discount rate with a negative NPV or a higher discount rate

C = negative NPV

DECISION RULE

1. Where many projects are being considered, the rule is to accept all projects whose internal rate of the return are both higher than the cost of capital or the hurdle rate of the organization.
2. Where mutually exclusive projects are being considered, the rule is to select the project with a higher IRR provided the higher IRR also more than the minimum established IRR of the organization.

Example

Identify the internal of return of a project with the following cashflow characteristic

Year	profit
0	(100.000)
1	10,000
2	40,000
3	20.000
4	40.000
5	70,000 .

The minimum rate of return expected by the provider of funds is 18%

Solution

Step 1 computer the NPV of the data using 18%

Year	NCF	DF (18%)	PV
0	(100,00)	1	(100,000)
1	10,000	0.8475	8,475
2	40,000	0.7182	28,728
3	20,000	0.6086	12,172
4	40,000	0.5158	20,632
5	70,000	0.4371	30,597
			NPV <u><u>609</u></u>

Step 2: computer the NPV of the data using 22%

Year	NCE	DF (18%)	PV
0	(100,00)	1,	(100,000)
1	10,000	0.819	
2	40,000	0.8196	26,876
3	20,000	0.5507	11,014
4	40,000	0.451	18,05
5	70,000	0.37	25.900
			NPV (9.958) <u><u> </u></u>

$$\text{IRR} = a + \frac{a(b-a)}{A+B}$$

$$= 18\% + \left[\frac{609}{609 + 9958} \right] 22\% - 18\%$$

$$= 18\% + 0.23\%$$

$$= 18.23\%$$

Advantages of IRR

- It makes use of all the cash flow associated with the entire life of the project;
- It is a rate of return approach which is considered to be appropriate for performance evaluation under a divisionalized structure;
- The approach is easier to adopt in accepting or rejecting a project by merely comparing the rate of return with the cost of capital.

Disadvantages of IRR

- i. It is too complex to operate in practice i.e. the problem associated with trail and error.
- ii. The approach also ignores risk and management attitude towards risk.
- iii. The method ignores the market determined cost of capital.
- iv. The approach also ignores the effects of inflation on investments appraisal.

4.0 CONCLUSION

In this unit, we have discussed generally on the capital budgeting decisions. We then looked at the relationship between NPV, IRR payback period and accounting rate of return we tried to identify the advantages and limitations of ARR, payback, IRR and NPV

5.0 SUMMARY

In this unit, we have noted that capital investments decisions are vital importance, since they involve the commitment of large sums of money and they affect the whole conduct of the business for many future years. The commitment of funds for long period of time entails a large interest cost, which must be incorporated into the analysis.

6.0 TUTOR-MARKED ASSIGNMENT

Identify the internal rate of returns of a project with the following cash flow characteristic which are not of depreciation.

Year	profit
0	(100,000)
1	10,000
2	40,000
3	20,000
4	40,000
5	70,000

The company depreciate such asset on a straight line method over its useful life. The rate of company tax is 30% and the minimum rate expected by the provider of funds is 18%.

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UNIT 9 CAPITAL RATIONING DECISION

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1.0 INTRODUCTION

In the previous unit the major techniques that can be used for evaluating capital investment decision were introduced and their relative merits were assessed. To simplify the discussion, we made a number of assumption first, that cash Inflows and outflows were known with certainty; secondly, that sufficient funds were 'avalanche to enable acceptance of all those projects with positive Jet present values; thirdly, that firms operated in an environment where there was no taxation and no inflation; and finally, that the cost of capital was the risk-free rate.

In this unit, we shall relax these assumptions and discuss how capital investment techniques can be applied to more complicated situations. In addition, we shall consider the various methods of administering and controlling capital expenditure.

2.0 OBJECTIVES

After studying this unit, you should be able to:

- Evaluate mutually exclusive projects with unequal lives
- Formulate multi- period capital rating decision model
- Describe the two approaches for adjusting for inflation when apprising capital project.

- Evaluate the effect of taxation on capital budgeting decision.

3.0 MAIN CONTENT

3.1 Capital Rationing Decision

In the course of project evaluation, decision on whether a project should be selected or not will depend on the viability or otherwise of the project based on the result of the cash flow analysis. However there are situations where a project would be rejected even though the project is viable but due to inadequacy of finance. Capital rationing is therefore the process of allocating the available limited resource of an organization among the various competing project with positive NPV's a judicious manner in order to maximize the total net present value of the organization.

3.2 The Basic Assumptions of Capital Rationing Decision

- 1) Financial restriction is limited to a single period i.e. funds will be freely available at subsequent periods
- 2) All project are divisible i.e. it is possible to invest in a fractional part of a project
- 3) There is a linear relationship between the NPV of a project and the capital outlay i.e. by investing 20% in a particular project, the investor is also entitled to 20% of the NPV of the project.
- 4) Funds are always available at a cost
- 5) There is a perfect information with regards to the acquisition of finance
- 6) The risk attached to all project are the same.

3.3 The Basic Steps in Single Period Capital Rationing Decision

- 1) Identify the period of financial restriction together with the actual amount available.
- 2) Compute the net present value of all the projects.
- 3) Use the NPV to calculate the profitability index of all project by relying on any of the following method:
 - a. Profitability index =
$$\frac{\text{NPV}}{\text{Capital required in year financial restriction.}}$$
 - b. P.I =
$$\frac{\text{Gross Present value}}{\text{Capital required in the year of financial restriction}}$$

4. Rank the result obtained in (3) above in a descending order
5. Allocate the available finance based on the order of ranking established above

3.4 Multi- Period Capital Rationing Decision

Where the duration of financial restriction extend beyond a single period or beyond a year, the available finance will only be distributed among the various competing projects by adopting the simple method under the linear programming technique. This will however invite the following steps

- 1) Identify the periods of financial restrictions together with their associated funds
- 2) Compute the NPV of each of the investment
- 3) Express the period of financial restrictions in a form of inequalities in order to represent the associated constraints
- 4) Establish the doctrine of non-negativity at the end of the model formulation

3.5 Important Issues Associated With Capital Rationing Decision

- A. Exclusive Projects/Mutually exclusive investments:-** Where two or more project are mutually exclusive, this will simply imply that the two projects cannot be accepted together. However, under a ranking situation in capital rationing decision, all the projects are to be categorized along the line of mutually exclusive projects and as such the group with the highest NPV will be selected.
- B. Mutually dependent project:-** Where two or more project are mutually dependent, this will simply means that the dependent project will either be accepted together or jointly rejected. Mean while in rationing decision, mutually dependent project will be II merged together to represent a single project and as such, weighted profitability index will be j computed and will be subject to normal ranking.
- C. Mon-Divisible Project:-** Where a project is not divisible, this will mean that it will be possible to have a surplus funds under financial restrictions but this will not be possible where project are divisible. It is therefore, the responsibility of the examiner to ascertain the treatment to be given to excess funds.

D. Project Delay:- In capital rationing decision, it is a fundamental assumption that no project shall be delayed to another period.

However, if project can be delayed, the problem associated with the financial restriction will be avoided

SELF ASSESSMENT EXERCISE 1

Maza-Maza Limited has N1,000,000 available for investment and the under listed project which are not mutually exclusive have been identified.

Project	A	B	C	D	E			
Initial/outlay				80,000	360,000	400,000	340,000	240,000
Residual Value				10,000		Nil	Nil	5,000
Nil								
Net cash flow during 6 years life of the projects								

Project A N80,000 annually

B. N160,000 for each of the first 3 year and N12,000 for next 3 years respectively

C. N120,000 for each of the 3 years and N160,000 for each of the remaining 3 years

D. N80,000 annually for the First 3 years being 29% less than annual amount for the next 3 years

E First year nil and the remaining 5 years at N100,00 per annum.

The expected rate of return on capital is 15% with supporting calculations advise management which of the projects should be selected for investment.

3.6 Investment Appraisal and Inflation

Inflation is an additional factor which will increase the difficulty of investment appraisal calculations. The impact of inflation is to depreciate the real value of money; wrong investment decision can be taken if the impact of inflation is ignored because both the cash flows and the cost of capital are affected by inflation.

MONEY INTEREST RATE AND REAL INTEREST RATE

Money interest Rate: This is an interest rate which has been adjusted for inflation that it is also called market or Nominal interest, Rate. When interest rates are quoted they are always money -rates unless otherwise stated.

Real interest Rate: -Real interest rate excludes inflation that is it assumes there is no inflation. It is possible to convert money interest rate to real interest rate and vice versa using the following formula $(1 + m) = (1 + R) (1 + i)$

M = Money interest rate

R = Real interest rate

I = Inflation rate

Example

Real interest rate is 5%. Inflation rate is 10% Calculate money interest rate

$$\begin{aligned} M &= (1 + R) (1 + i) - 1 \\ &= (1.05) (1.1) - 1 \\ &= 0.155 = 15.5\% \end{aligned}$$

INFLATION AND CASH FLOWS

Just as one identifies two interest rates, one including inflation (money rates), and one excluding inflation (Real rates). It is also possible for one to identify two types of cash flows i.e. money cash flows and real cash flows usually money cash flows.

Money cash flow: Money cash flow includes the effects of future inflation and are the actual money amount, which are expected to be received or spent in the future. When cash flows are stated they are usually money cash flow unless otherwise told.

Real Cash flow: Real cash flow excludes inflation and are stated in terms of today prices (at current prices). It is important to remember that real cash flow are not present values, they merely exclude the effect of future inflation.

It is possible to convert money cash flow into real cash flow and vice versa using the following formula

$$MCF = RCF (1 + i)$$

NOTE

Where inflation is zero money cash flow and real cash flow will be the same $RCF = MCF (1 + i) - i$

Example

Your company has just bought a car for ₦200,000 and it will be replaced in 5 years time when the scrap value is expected to be ₦25,000. Annual inflation rate is expected to be 10%

Required

- (a) Determine the replacement amount of the motor car. Express your answer in (i) Money terms
(ii) Real terms
- (b) Express the scrap values in (i) Money
(ii) Real terms

Calculation of Replacement Amount

- 1. Money of (includes Inflation)

$$MCF = ₦200,000 (1.1)^5 = ₦322,102$$

- (ii) RCF (excludes Inflation)

$$RCF = ₦322,102 (1.1)^{-5} = ₦200,000$$

(b) Scrap Value

- (i) MCF = ₦25,000 - Because we are not otherwise directed

- (ii) RCF = MCF (1 + i)⁻ⁿ

$$₦25,000 (1.1)^{-5} = ₦15,523$$

INFLATION AND DCF CALCULATIONS

There are two possible ways of incorporating inflation into calculation of present values. These are

- (a) Discount Real cashflow at real interest rate
- (b) Discount Real cashflow at nominal interest rate. Each answer of the two methods should be the same

Example

Consider the data in example II above. Calculate the PV of both the replacement amount and the scrap value of the existing motorcar using calculation based on

- (a) Money Cash flow

- (b) Real cash flow

Assume market interest rate is 18.8% per annum.

(I) Calculation of PV of Replacement Using MCF

- MCF = N322,402 (Year 5)
- MCC (Market rate) = 18.8%
- $PV = N322,402 (1.188)^{-5} = N136,117$

(II) Scrap Value:

- MCF N25,000 (Year 5)
- MCC 18.8%
- $PV = N25,000 (1.188)^{-5} = N10,565$

b. Calculation of PV using RCF.

* Replacement Amount

- RCF = N200,000 (Year 5)
- $$RCC = \frac{1 + MCC - 1}{1 + 1}$$
- $= 1.188 - 1 = 8\%$
- $PV = N200,000 (1.08)^{-5} = N136,117$
- + Scrap value
- RCF = N15,523
- RCF 8%
- $PV = N15,523 (1.08)^{-5} = N10,565$

Which of the methods for finding present value is used in investment appraisal calculations will depend upon the particular circumstances faced. In every case however they will produce the same answer.

DIFFERENTIAL INFLATION RATE

In practice, different cash flows may be affected by different inflation rates. Where cash flows are given in money terms, there is no conversion as the assumption is that individual inflation rate has been used to different rate of the cash flow to bring it to the inflated level in which case money cost of capital will be used discount the cash flow. Complication will arise however where cash flow the stated in real terms and to inflate cash flow, differential inflation rate be used for cash of the cash flow, so as to bring it to the inflated level to be discounted with the money cost of capital similarly reducing cash flows to real where differential inflation rate. Inflation must be excluded using the differential inflation rate be discounted at the cost capital. In extreme case, it may be necessary to cost of capital for each cash flow.

SUMMARY

- 1) Where cash flows are state terms i.e. year term prices, real cost of capital must be used to discount such cash flows.
- 2) Where cash flows are stated in terms of actual cash receivable in future i.e. at the price ruling at the date of transaction, such cash

flows are money cash flows and money cost of capital must be used discount such cash flows

- 3) Where expressions such as future estimated or contracted are used, there is influence that such cash flows are already in money terms and will used cost of capital to discount them

EXAMPLE

DAID Limited has under review a project involving the outlay of N555,000 and expected to yield the following net cash savings in current terms

Year N

1	10,000
2	20,000
3	30,000
4	5,000

The company's cost of capital, incorporating a requirement growth in dividends to keep peace with cost inflation is 20% and used for the purpose of investment appraisal. On the above basic Division Manager involved has recommended rejection of the proposal.

Having regard to your own for cast that the rate of inflation is likely to 15% in year 1 and 10% cash of following year. You are asked to comment fully on his recommendation.

SOLUTION TO EXERCISE DAID LIMITED

Year	Rf	Adjustment	factor	Mf Dfat	20% Pv	
1	10,000	X 1.15	11,500	0.8323	9,585	
2	20,000	X 1.15x1.10	25,300	0.6944	17,568	
3	30,000	X 1.15x1.02	41,745	0.5787	24,158	
4	5,000	X 1.15x1.103	7,653	0.4823	3,691	

PV cash flows 55,000

PV of cash outflow 55,000

The project earns exactly require rate return. It will not matter whether or not the project accepted since the market value per share remains unchanged.

EXAMPLE

A new project a available to a company will involved expenditure on plant and machinery of N20,000 although this will be payable in two

equal installments-one at the date of acquisition and another, a year later. The scrap value of the plant is estimated at N4,000 in present day prices.

The life of the project has been set at 3 year. Annual cash inflows are N25,000 per annum in real terms. Annual cash outflows are estimated at N18,000 in year I and N19,000 per annum thereafter sated in terms year I prices. The general inflation rate is 8% per annum and all cash flow rise with general inflation except the annual cash outflows which will be subject to inflation of 10% per annum. The appropriate money discount rate is 18% per annum. Find the Net present value of this project Ignore taxation.

SOLUTION TO EXAMPLE

A NEW PROJECT

Scrap = $4,000 \times 1.083 = 5,039$

Inflows	Year	RF	Adjusting factor	Mf
1	25,000	$\times 1.08$		27,000
2	25,000	1.082		29,160
3	25,000	1.083		4,930
Outflows	1	18,000		18,000
	2	19,000	1.101	20,900
	3	19,000	1,102	22,990

To Computer the NPV

Year	0	1	2	3
Plant (10,000)	(10,000)	-	5,039	
Inflow		27,000	29,160	37,493
Outflow	(18,0000)	(20,900)	(22,990)	
NCF	(10,000)	(1,000)	8,260	13,542
DFat18%	1	0.8475	0.7182	0.6086
PV (10,000)	(848)	5,932	8,242	
NPV	3326			

3.7 Investment Appraisal and Taxation

Taxation forms an important element in investment appraisal calculations. As the objective of financial management is the maximization of shareholders wealth, the company is only interested in the after tax cash flows of a project (i.e. it is only interested in those cash flows which are available for its shareholders).

Therefore project cash flow should reduce by the tax charge which they. Account should also be taken of any tax. Relief, such as allowances, which are attached to the project. In order to determine the timing of cash flow arising from taxation effects, a number of assumptions are normally made, although it is important to act in accordance with the, 'tax law' if any, set out in a particular question. The simplifying assumptions are:

- (a) The basic of the tax liability is the net cash flow resulting from the project.
- (b) The company has sufficient profits from other projects to utilize all allowances, in full, as soon as they available.
- (c) Regarding the timing of tax payments and savings, the simplest assumption is that these are lagged by one year from the original cash flows to which they relate. However, care must be taken with the situation where tax payments/ receipts are stated to be made/ received' one year after the end of the financial year in which the original cash flows occur'. In these circumstances, the tax affect can be lagged by two year For instance if a company has a year end of 31 December, the purchase of plant in January 2000 will give rise to a first year allowance in the year ended 31 December 2000, the effect of which will not be realized in cash flow terms until 31 December 2001
- (d) Generally we assume that rate of corporating tax will remain constant over the life of a payment we could cope with a future change of rate but it is extremely unlikely that we would ever be in a position to predict this eventuality in practice
- (e) In the same way that additional receipts will give rise to pay payments we assume that additional cost will give rise to savings
- (f) For computed allowances; we always assume (include specifically told otherwise; that we are both interred to claim, and indeed to clam a full 100% fund year allowance on any acquisition.
- (g) Working capital cash flows are assumed to have tax implications whatsoever

3.7.1 Importance of tax taxation in investment appraisal

1. Cost of capital

The interest payable on loan interest is tax deductible. The implication of this is that tax reduces the cost of debt and by extension the weighted average cost of capital.

2. Tax Differential

It cannot be assumed that the consequences are the same for the project... projects which promise identical pre-tax cash flow may produce very different post-tax cash flows if, for example, capital expenditure is awarded different levels of capital allowance.

3. Sensitive analysis

Management should be aware of the likely impact of changes in the tax system or rates on the desirability of each project.

4. Nature of profit

Where a company has erratic profit levels, the taxation consequences of a project are dependent not, only on the project itself but also on the success of the rest of the company.

Example

ADEBOLA AHMED' is considering the purchase of a block molding equipment at a cost of NI00, 000. The investment cash flow are projected as follows:

Year	0	1	2	3	4
Cash flow	(100,000)	30,000	30,000	40,000	38,000

The following may be assumed.

- The existence of soap business with tax profit
- 20% written. Down allowances (on the reducing balance method
- Company tax is 30% while the costs of capital is 15%
- The equipment was disposed off for NI0, 000 at the end of 4 years
- Tax effect are based on preceding year basis

Required

Using the NPV methods, consider the viability or otherwise of this project

SOLUTION

ADEBOLA AHMED L TD

Year	NCF (WI)	Def
0	(100.000)	1 (100.000)
1	37.500	0.8695 32.606
2	26.625	0.7561 20.131
3	35.219	0.6575 23,156
4	39,164	0.5717 22,390
5	(10,751)	0.4971 5344

NPV 3,627_____

Decision the project is viable although the positive of N3.627 is too low for an investment of N100,000.

Working

(i) NET CASHFLOW

Years	Cash flow		Tax effect		Tax on		Net cash flow
					<u>On capital</u>		<u>profit (30%)</u>
					<u>Allowance (ii)</u>		
	N	N	N	N			
1	30,000	7,500					37,500
2	30,000	5,625	(9,000)	26,625			
3	40,000	4,219	(9,000)	35,219			
4. S/V	38,000	+10,000	31,64	(12,000)			39,164
5.			649	(11,400)			(10,751)

Exercise

Curie Limited has calculated its cost of capital in money terms to be 15%. The company wishes to undertake a project making heavy-duty locks requiring an initial investment of N400,000 payable in two equal installments. It is expected that the project will generate an additional cash flow of N300,000. This large contribution will not be maintained throughout the 11 years life of the project since whilst revenue is expected to rise by 5% annually, costs will rise by 10% annually. If the annual receipts of revenue and payment of costs occur at the same time as the second payment of N200,000 find:

- Whether the project is worth accepting
- The contribution in the final year, and
- Whether it might be advantageous to terminate the project before the 11 years life expires, and if so when to terminate the project.

4.0 CONCLUSION

In this unit, we discussed capital rationing and the selection of the optimum investment when capital is rationed for a single period. We then looked at how multi-period capital rationing is formulated.

Finally, we looked at the effect of taxation on capital budgeting decisions.

5.0 SUMMARY

In this chapter we have discussed how capital investment technique can be applied to more complicated situations. We have seen that when a choice must be made between mutually exclusive investments with unequal lives, it is necessary to compare the projects over equal time periods. One method is to convert the time periods into common time horizon and assume the replacement of identical assets.

Capital rationing applies to a situation where there is a constraint on the amount of funds that can be invested during a specific period of time. In this situation the net present value is maximized by adopting the profitability index method of ranking and selecting projects up to the amount of the investment funds available.

When taxation is included in the capital investment evaluation, the cash flows from a project must be reduced by the amount of taxation paid on these cash flows. In addition, the investment cost must be reduced by the taxation saving arising from the capital allowance. Because taxation payments do not occur at the same times as the associated cash inflows or outflows; the precise timing of the taxation payment must be identified.

The net present value calculations can be adjusted in two basic ways to take inflation into account. First, a discount rate can be used, based on the market-determined required rate of return, which includes an allowance for inflation. Remember that cash flows must also be adjusted for inflation. Secondly, the anticipated rate of inflation can be excluded from the discount rate, and the cash flows are subject to uncertainty, they should be discounted at a risk-adjusted discount rate using the capital asset pricing model. Several traditional methods exist for quantifying risk: standard deviations of NPV, simulation and sensitivity analysis. However, traditional risk measures involve discounting the cash flows at the risk-free rate. Therefore they fail to deal with the risk/return trade-off and do not provide a clear-cut answer to the basic question: should the project be accepted or rejected?

In the final section we have considered alternative methods of authorizing and reviewing capital investment decisions. In spite of the difficulties involved in carrying out a post-audit review of capital investment decision, such a review is necessary so that lessons can be learned from past mistakes and to discourage the proposals of capital investment projects from submitting overoptimistic estimates. I'

6.0 TUTOR-MARKED ASSIGNMENT

A company is considering the following independent projects:

Project	Year 0	Year 1	NPV
	N'000	N'000	N'000
	-100	-500	+25
B	-200	-90	+36
C	-150	-220	+44
D	-300	-100	+30
E	-50	+100	+10
F	-100	+80	-12

The maximum external finance available in Year I is N290, 000. This figure can however be added to any internally generated funds that arise from projects in year 1

Required: Advise the company what project to accept under the following independent conditions

- The company operates in it perfect capital market
- The available capital in Year 0 is limited to N450,000 and capital is freely available at the company's cost of capital in future year
- In addition to (b) above, projects A and C are mutually exclusive
- In addition to (b) above, projects. A and E are mutually dependent.
- Now assume that there is no capital rationing in year 0 but the maximum external finance available in year I is ~~N~~290, 000. This figure can however be added to by any internally generated funds that arise from projects in Year 1.

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UNIT 10 BUDGET AND BUDGETARY CONTROL

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 - 3.3 Requirements of a sound budgeting system
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1.0 INTRODUCTION

Every organization makes plans. Some plans are more formal than others and some organizations plan more formally than others but all makes same attempt to consider the risk and opportunities, which lie ahead, and how to confront them. In most businesses this process is formalized at least in short-term, with considerable effort put into preparing annual budgets and monitoring performance against those budgets. Budgeting is a management tool used for short-term planning and control. Traditionally budgets have been employed as devices to limit expenditure, but a much more useful and constructive view is to treat the budgeting process as a means for obtaining the most effective and profitable use of the company's resources via planning and control. Short-term planning is formalized in the budgetary process.

A budget is merely a collation of plans and forecasts, expresses largely but not exclusively in financial terms. Even though many organizations do not plan formally for more than a year ahead, the annual budget must be set in the context of longer-term plans, which are likely to exist even if they have not been made explicit. Budgets should be a management *tool rather than merely an accounting exercise.*

2.0 OBJECTIVES

After studying this unit, you should be able to:

- Explain how budgeting fits into the overall framework of decision-making, planning and control.
- Describe the six different purposes of budgets
- Describe the various stages in the budget process
- Discuss the advantages and problems of budgeting.

3.0 MAIN CONTENT

3.1 Budget and Budgetary Control

It is a plan quantified in monetary terms, prepared and approved prior to a defined period of time, usually showing planned income to be generated or expenditure to be incurred during that period and the capital to be employed to attain a given objective. It is a plan of future activities for an organization. It is expressed mainly in financial terms, but also usually incorporates many non- financial quantitative measures as well.

Budgeting

Budgeting is the whole process of designing, implementing and operating budgets. The main emphasis in this short term budgeting is involving the provision of resources to support plans which are being implemented.

Budgetary Control

Budgetary control is the establishment of budgets relating the responsibilities of executives to the requirements of a policy, and the continuous comparison of actual with budgeted results, either to secure by individual action the objective of that policy or provide a basis for its revision.

- CIMAS Official Terminology

3.2 Forecast Vs. Budget

A forecast is a prediction of the future state of world, in connection with those aspects of the world, which are relevant to and likely to affect on future activities. Forecast is calculation of probable events. Both forecasting and planning involve recognition of the relevant factors in a given situation and understanding of what each factor has contributed to it and how each is likely to affect the future. Any organized business

cannot avoid anticipating or calculating future conditions and trends for the framing of its future policy and decision. Forecast is concerned with 'probable events' and the budgeting relates to 'planned events'. Budgeting should be preceded by forecasting, but forecasts may be made for purpose other than budgeting.

A forecast is an assessment of probable future events. Budget is an operating and financial plan to a business enterprise. At planning stage it is necessary to prepare forecasts of probable course of action for the business in future. Budget is a sort of commitment or a target, which the management seems to attain on the basis of the forecasts made. Forecasts are made regarding sales, production cost and financial requirements at the business. A forecast denotes some degree of flexibility which a budget denotes a definite target. The following points of difference can be noted between forecast and budget as shown in Table 14.1.

Forecast	Budget
1. Forecast is merely an estimate of what is likely to happen. It is a statement of probable events, which are likely to happen under anticipated conditions during a specified period of time	1. Budget shows the policy programme to be followed in a period under planned conditions.
2. Forecasts, being statements of future events, do not connote any sense of control.	2. A budget is a tool of control since it represents actions, which can be shaped according to will so that it can be suited to the conditions, which may or may not happen.
3. Forecasting is a preliminary step for budgeting. It ends with the forecast of likely events.	3. It begins when forecasting ends. Forecasts are converted into budgets.
4. Forecasts are wider in scope and it can be made in those spheres also where budgets cannot interfere.	4. Budgets have limited scope. It can be made of phenomenon capable of being expressed quantitatively.

TABLE 1.1: DEFERENCE BETWEEN FORECAST AND BUDGET

3.3 Requirements of a Sound Budgeting System

The following are the essential requirements of a sound budgeting system

- Clear lines of authority and responsibility have to be established throughout the organization and the authority and responsibility of different levels of management and departmental executives are clearly defined.
- The organizational goal should be quantified and clearly stated. These goals should be within the framework of organizations strategic and long range plans. The setting of budgets is not a process detached from planning of the company's overall policy. A well-defined business policy and objective is a prerequisite for budgeting.
- The budget system should be established on the highest possible level of motivation.. All levels of management should participate in setting budgets. Since this can produce more realistic targets, lead to better understanding of corporate objectives and the constraints within which organization works. Participation in budgeting process will motivate the personnel to achieve budget levels of efficiency and activity.
- The budget control system should provide for a degree of flexibility designed to change in relation to the level of activity attained and the impact of changes in sales and production levels on revenue, expenses are known. It enables more accurate assessment of managerial and organizational performance.
- Proper communication systems should be established for management reporting and information services so that information relating to actual performance is presented to the manager responsible for it promptly to enable the manager to know the nature of variations so that remedial action is taken wherever necessary.
- Educating the budget process and creation of cost awareness atmosphere will lead to effective implementation of budgets.
- The top management's involvement in budget process is essential for successful implementation of the budgets. It should take interest not only in setting the budgets and targets but also to check upon the actual attainment, motivating the personnel, rewarding for achievements, investigation into reasons for any deviation of actual from budgeted results, taking punitive action wherever necessary.
- A sound system for generating accurate and reliable and prompt accounting information is basic for successful implementation of budget system in an organization.

3.4 Advantages of Budgeting

- Budgetary control establishes a basis for Internal audit by regularly evaluated departmental results.
- Only reporting information, which has not gone according to plan, it economizes on managerial time and maximizes efficiency. This is called 'Management by exception' reporting.
- Scarce resources should be allocated in an optimal way, thus controlling expenditure.
- It forces management to plan ahead so that long-term goals are achieved.
- Communication is increases throughout the firm and coordination should be improved.
- An effective budgetary control system will allow people to participate in the setting of budgets, and thereby have a motivational impact on the work force. Individual and corporate goals are aligned.
- Areas of efficiency and inefficiency are identified. Variance analysis will prompt remedial action where necessary.
- The budget provides a yardstick against which the performance of the firm can be evaluated. It is better to compare actual with budget rather than with the past, since the latter may no longer be suitable for current and expected conditions.
- People are made responsible for items of cost and revenue, i.e., areas of responsibility are clearly delineated.

3.5 Problems in budgeting

- Budgets are perceived by the work force as pressure devices imposed by top management. This can have a adverse effect on labour relations.
- It can be difficult to motivate an apathetic work force.
- The pressure in the budgeting system may result in inaccurate record keeping.
- Managers may over-estimate costs in order that they will not be held responsible in the future for over spending. The difference between the minimum necessary costs and the costs built into the budget is called slack.
- Departmental conflict arises because of competition for resource allocation. Departments blame each other if targets are not achieved.
- Uncertainties can occur in the system, e.g. uncertainty over demand, inflation, technological change, competition, weather, etc.

- It may be difficult to align individual and corporate goals. Individual goals often change and may be much lower than the firm's goals.
- It is important to match responsibility with control; otherwise a manager will be defoliated. Costs can only be controlled by a manager if they occur within a certain time span and can be influenced by that manager. A problem arises when a cost can be influenced by more than one person.
- Managers are often accused of wasting expenditure when they either:
 - a. Demand a greater budget allowance than is really needed, or
 - b. Unnecessary spending in order to fully utilize their allowance through fear of future cutbacks. Zero base budgeting can overcome this problem.
- Sub-optimal decisions may arise when a manager tries to enhance his short-run performance in a way, which is detrimental to the organization as a whole, e.g. delaying expenditure on urgently needed repair
- They are based on assumed conditions (e.g. rates of interest) and relationships (e.g. product-wise held constant) that are not varied to reflect the actual circumstances that come about.
- They make allowance for tasks to be performed only in relation to volume rather than time.
- They compare current costs with estimates based only on historical analysis.
- Their short-term horizon limits the perspective, so short-term results may be sought at the expense of longer-term stability or success.
- They have a built-in bias that tends to perpetuate inefficiencies. For example, next year's budget is determined by increasing last year's by 15 per cent, irrespective of the efficiency factors in last year.
- As with all types of budgets the game of 'beating the system' may take more energy than is being devoted to running the business.
- The fragile internal logic of static budget will be destroyed if top management reacts to draft budgets by requiring changes to be made to particular items, which are then not reflected through the whole budget.

3.6 Budgeting Process

The method by which the annual budget is prepared will differ from organization to organization. In some organizations budgeting may be a well organized, well documented procedures while in others the budget may be prepared in a rather ad hoc and disorganized manner. The budget process is shown in figure 1.1. The steps in budgeting process representative to all organizations is given below:

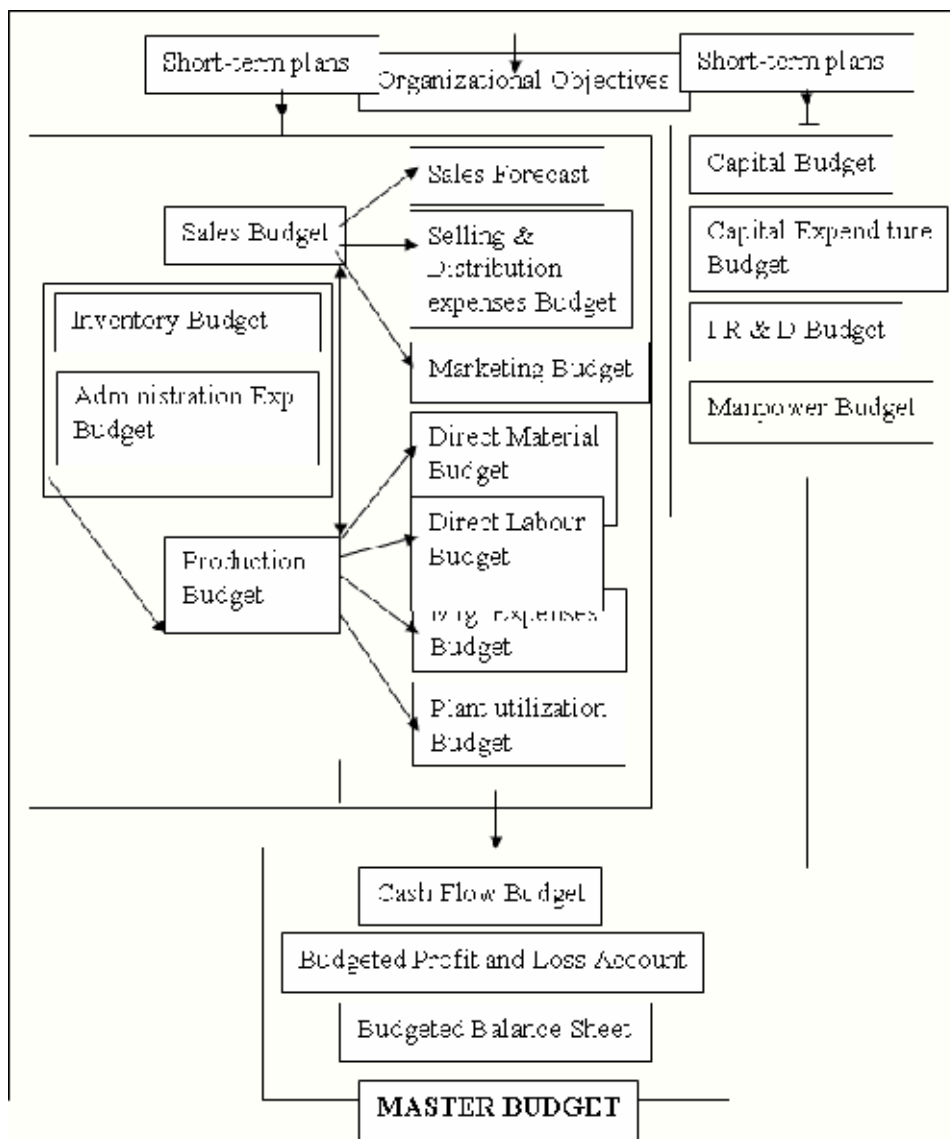


FIGURE 1.1: BUDGETING PROCESS

planning and control. This classification of activities into short-term and strategic long-term and communication to the managers will lay down a sort of guide for budgeting the activities within the specified objectives and activities.

2) Determination of key success factors: The performance of every organization will be particularly influenced by certain critical success factors, key factor will influence the activities of an undertaking and it will limit the volume of output and will have direct impact on the profitability of the organization. Critical success factors may consist of a specified raw material, a specific type of labour skill, a tool, a service facility, floor space, cash resources etc. The limitation or shortage of such critical factors may result in restricting capacity utilization. The limiting factors may shift from time to time due to external and internal circumstances. In organizations which are --, already operating at maximum capacity; the most critical success factors is likely to be productive capacity. In majority of organizations the critical factor is likely to be consumer demand or the expected level of revenues or funds. Because of this, the sales or funds budget is usually the first budget to be prepared. It will determine the content of other related budgets.

3) Establishment of clear lines of authority and responsibility: -

An organizational chart defining the lines of authority and responsibility of the managers responsible for accomplishment of organizational objectives is to be prepared. The organizational chart should define the following

- The responsibility of individual functional manager
- Delegation of authority to the concerned functional manager.
- Inter-functional relationship of the organization.

4) Establishment of budget centres: Budget Centre is a section of an organization for which separate budgets can be prepared and control exercised (CIMA office terminology). The entire organization is divided into different segments, which are clearly defined for the purposes of budgetary control are technically referred to as budget centres.

5) Determination of budget period: Budget period is a period for which the budget is prepared. A budget can be a long-term or short-term budget. A short-term budget is generally prepared for one year or lesser period. Quarterly, monthly or even weekly budget can be prepared for certain operations of the company. The short-term budget will generally not exceed the full accounting year. The long-term budget, which extend to five or even more year This long-term budget will agree with the long-term forecast of sales, organizational schemes for expansion, modernization, diversification etc. the long-term budgets are used for planning whereas short-term budget is used for implementation of long range plans, activities, objectives and

also for control purposes. Capital expenditure budget and Research and development expenditure budget are the examples of long-term budgets. Annual sales budget, Income and expenditure budget are the examples of short-term budgets.

6) Establishment of budget committee: In small organizations, the person in charge of finance and accounting functions will involve in preparation of budgets. The setting up of a budget Committee is necessary in case of large and complex organizations. As the budget involves the various functional activities, the closest association of functional managers is essential for its satisfactory formulation and implementation of the budget. The budget committee will be composed of major functional heads. It can be an effective medium for co-ordination and review of the budget programme. The main functions of budget committee are as follows:

- To review the functional budget estimates.
- To recommend the functional budgets for revision.
- To review and advise on the general policies affecting more than one function.
- To review, approval and adoption of revised budgets.
- To receive and analyze the periodic performance reports from budget centres.
- To examine the budget reports showing actual compared with budget.
- To locate the responsibility for discrepancies between actual and budgets, and recommends the corrective action.
- To participate in decision making in strategic issues like, expansion, modernization, diversification and revision of organizational activities, which have direct relationship to the company's budgets.

7) Appointment of budget controller: Proper budget administration is facilitated by the budget controller who is made responsible for the preparation of the budget and co-ordinating activities of the individual departments. His functions and responsibilities will include the following:

- (a) Generation and dissemination of information needed for decision making a planning to each person in the organization having such responsibilities. The information may include, but is not limited to, forecasts of economic and social conditions, governmental influences, organization goals and standards for decision-making, economic and financial guidelines, performance data, performance standards and the prerequisite plans of others in the enterprise.

- (b) Establishing and maintaining a planning system which:
 - Channels of information to each of persons responsible for planning,
 - Schedules the formulation of plans,
 - Structures the plans of sub-sections of the enterprise into composites at which points tests are made for significant deviations from economic and financial guidelines and from goal achievement and repeats the process for larger segments to and including the enterprises as a whole, and
 - Disseminates advice of approval or revision of plans to affected individuals in accordance with established lines of authority and organizational responsibilities.
- (c) Constructing and using models of the enterprise both in total and by sub-sections, to test the effect of internal and external variables upon the achievement of organization goals.
- (d) Ensuring the accumulation of performance data related to responsibility centres within the organization, measured against the plans, whether period or project, for each centre, transmitted to each centre, and the analysis of deviations of actual planned performance.

SELF ASSESSMENT EXERCISE 1

A budgetary planning and control system may include many individual budgets, which are integrated into a "master budget".

You are required to outline and briefly explain with reasons the steps, which should normally be taken in the preparation of master budgets in a manufacturing company, indicating the main budgets, which you think, should normally be prepared.

3.7 The Multiple Functions of Budgets

Budget serves a number of useful purposes. They include:

1. Planning annual operations;
2. Coordinating the activities of the various parts of the organization and ensuring that the parts are in harmony with each other;
3. Communicating plans to the various responsibility centre managers;
4. Motivating managers to strive to achieve the organizational goals;
5. Controlling activities;
6. Evaluating the performance of managers; Let us now examine each of these six factor

PLANNING

The major planning decisions will already have been made as part of the long-term planning process. However, the annual budgeting process leads to the refinement of those plans, since managers must produce detailed plans for the implementation of the long-range plan. Without the annual budgeting process, the pressures of day-to-day operating problems may tempt managers not to plan for future operations. The budgeting process ensures that managers do plan, for future operations, and that they consider how conditions in the next year might change and what steps they should take now to respond to these changed conditions. This process encourages managers to anticipate problems before they arise, and hasty decisions that are made on the spur of the moment, based on expediency rather than reasoned judgment, will be minimized.

COORDINATION

The budget serves as a vehicle through which the actions of the different parts of an organization can be brought together and reconciled, into a common plan. Without any guidance, managers may each make their own decisions, believing that they are working in the best interests of the organization. For example, the purchasing managers may prefer to place large orders so as to obtain large discounts; the production manager will be concerned with avoiding high stock levels; and the accountant will be concerned with the impact of the decision on the cash resources of the business. It is the aim of budgeting to reconcile these differences for the good of the organization as a whole, rather than for the benefit of any individual area. Budgeting therefore compels managers to examine the relationship between their own operations and those of other departments, and, in the process, to identify and resolve conflicts.

COMMUNICATION

If an organization is to function effectively, there must be definite lines of communication so also that all the parts will be kept fully informed of the plans and the policies, and constraints, to which the organization is expected to conform. Everyone in the organization should have a clear understanding of the part they are expected to play in achieving the annual budget. This process will ensure that the appropriate individuals are made accountable for implementing the budget. Through the budget, top management communicates its expectations to lower level management, so that all members of the organization may understand these expectations and can coordinate their activities to attain them. It is not just the budget itself that facilitates communication - much vital information is communicated in the actual act of preparing it.

MOTIVATION

The budget can be a useful device for influencing managerial behavior and motivating managers to perform in line with the organizational objectives. A budget provides a standard that under certain circumstances, a manager may be motivated to strive to achieve. However, budgets can also encourage inefficiency and conflict between manager. If individuals have actively participated in preparing the budget, and it is used as a tool to assist managers in managing their departments, it can act as a strong motivational device by providing a challenge. Alternatively, if the budget is dictated from above, it imposes a threat rather than a challenge, it may be resisted and do more harm than good.

CONTROL

A budget assists managers in managing and controlling the activities for which they are responsible. By comparing the actual, results with the budgeted amount or different categories of expenses, managers ascertain which costs do not conform to the original plan and require their attention. This process enables management to operate a system of management by exception, which means that a manager's attention and effort can be concentrated on significant deviations from the expected results. By investigating the reasons for the deviations, managers may be able to identify inefficiencies such as the purchase of inferior quality materials. When the reasons for the inefficiencies have been found, appropriate control action should be taken to remedy the situation.

PERFORMANCE EVALUATION

A manager's performance is often evaluated by measuring his or her success in meeting the budgets. In some companies bonuses are awarded on the basis of an employee's ability to achieve the targets specified in the periodic budgets, or promotion may be partly dependent upon manager's budget record. In addition, the manager may wish to evaluate his or her own performance. The budget thus provides a useful means of informing managers of how well they are performing in meeting targets that they have previously helped to set. The use of budgets as a method of performance evaluation also influences human behavior, and for this reason we shall consider the behavioral aspects performance evaluation.

SELF ASSESSMENT EXERCISE 2

For many organizations in both the private and public sectors the annual budget is the basis of much internal management information. When

preparing and using budgets, however, management and the accountant must be aware of their behavioral implications. Required:

- (a) Briefly discuss four purpose of budgets
- (b) Explain the behavioral factors which should be borne in mind and the difficulties of applying them in the process of budgeting and budgetary control.

4.0 CONCLUSION

In this unit, we have explained how budgeting fits into the overall framework of decision- making, planning and control. We also looked at the six different purpose of budgeting. Finally we identify the various stages in the budget process.

5.0 SUMMARY

Every organization needs to plan and consider how to confront future potential risks and opportunities. In most organizations this process is formalized by preparing annual budgets and monitoring performance against the budgets. Budgets are merely a collection of plans and forecasts. They reflect the financial implications of business plans, identifying, the amount, quality and timing of resources needed.

6.0 TUTOR MARKED ASSIGNMENT

There is an extensive literature on participation by managers in the budgeting process, and wide discussion of all employees to participate in some way in the management and control of their work.

Some firms have introduces systems of works councils in response to the new environment; some have voluntarily used these systems for some considerable time.

Required

- a) Explain the arguments for, and problems arising from, managers participating in setting their budget targets.
- b) Explain the arguments for, and problems arising from, employee participation in budgeting and in the determination of company policy.
- c) Explain the circumstances in which systems of participation (for managers and/or employees) are likely to operate successfully

Many organizations have tried to reduce the level of budgetary slack. However some directors believe that removing all budgetary slack can be disadvantageous.

Required:

Explain the arguments that can be advanced for accepting budgetary control and the advantages and disadvantages for an organization.

7.0 REFERENCES/FURTHER READINGS

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UNIT 11 THE BUDGET PROCESS

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 The Budget Process
 - 3.2 Preparation of sales or Revenue Budget
 - 3.3 Preparation of Other Budgets
 - 3.4 Preparation of Master Budget and its Implementation
 - 3.5 Cash Budgeting
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings

1.0 INTRODUCTION

This unit considers the role of budgeting within the process and the relationship between the long range plan and the budgeting process. The unit in particular considers the implementation of decisions through the planning and control process. Planning involves systematically looking at future, so that decisions can be made to day which will bring the company its desired results. Control can be defined as the process of measuring and correcting actual performance to ensure that plans for implementing the chosen course of an action are carried out.

2.0 OBJECTIVES

After studying this unit, you should be able to

- Design budgetary control report
- Explain preparation of sale or revenue budget
- Describe to prepare other budgets.
- Describe how to prepare a detailed cash budget

3.0 MAIN CONTENT

3.1 The Budget Process

3.2 Preparation of Sales or Revenue Budget

The sales revenue budget is the starting point of most master budgets. In manufacturing organization sales budgeting begins with the forecasting

of the sales of individual products. These forecasts may be by geographical area, by class of customer or by some other segment. In case of manufacturing companies, the budgeting will begin with the revenue budget of the organization. Forecasting sales is a difficult task as a many assumptions need to be made about consumers demand, environmental conditions likely customers demand different prices, the probable prices for similar products sold by competitors, the number of economics activity in the regions where the products is sold, advertising and promotional expenditures, the impact of anticipated changes in exchange rates and changes in the taxes such as value added tax or customs and excise duties.

3.3 Preparation of other budgets.

Once the sales budget has been determined from a range of forecast it is possible to construct i.e. the following other budgets.

1) Production budget: the production budget is an estimate of the quantity of goods that must be produced during the period. The aim of the production function will presumably be to supply finished goods of a specific quality to meet demands. The sum of sales requirements plus changes in stock levels of finished goods gives the production requirements for the period being budgeted. In order to construct the production budget we need the level of sales expected and the desired levels of stock of finished goods. The following formula is used for calculation of units to be produced.

$$\text{Production} = \text{sales} + \text{closing stock} - \text{opening stock}$$

Production budget should be developed keeping in view the optimal balance between sales, inventories and production so as to result in minimum cost. once the production level is determined, it becomes the starting point for the direct materials, direct labour and manufacturing overhead budgets.

2) Plant utilization budget: Plant utilization budget is prepared for the estimation of plant capacity to meet the budgeted production during the period considered under the budget. For this purpose the plant capacity is expressed in terms of convenient units of measurement like production in hours, production in weight (M. T/Kg), production in units etc. budgeted machine load in each department should be worked out. In case the budgeted plant utilization is more than the plant capacity the contracting etc.

when the budgeted plant utilization is lesser than the capacity management should consider the ways to increase sales volume.

3) Direct materials budget: the direct materials budget specifies the budgeted quantities of each raw material required for the budgeted production. The requirement to purchase of direct materials can be calculated with the help of the following formula.

$$\text{Production} = \text{sales} + \text{closing stock} - \text{opening stock}$$

The materials budget provides basis for fixing optimum levels of inventory stocks, establishment of control over material usage and purchase cost budget.

4) Direct labour budget: the direct labour budget will ensure that the plan will make the required number of employee of relevant grades and suitable skills available at the right times. It specifies the direct labour requirement or various products as envisaged in the production budget. The direct labour budget will be developed for both labour hours and direct cost. After the labour requirements relating to different grades are finalized estimated rate per hour and labour cost per unit is arrived at.

The direct labour hour requirements of three of the products manufactured in a factory each involving more than one labour operation, are estimated as follows:

Direct labour hour/per unit (in minutes).

Product			
Operation	1	2 3	
1	18	42	30
2	-	12	24
3	9	6	

The factory works 8 hours per days in a week. The budget quarter is taken as 13 weeks and during a quarter lost hours due to leave and holidays and other causes are estimated to be 124.

The budgeted hourly rates for the workers manning the operations 1,2 and 3 are N2.50 and N300 respectively. The budgeted sales of the products during the quarter are:

Produce 1	9,000 units
2	15,000 units
3	12,000 units

There is a carry-over of 5,000 units of Product 2 and 4,000 units of Product 3 and it is proposed to built up a stock at the end of the budget quarter as follows:

Produce 1	1,000 units
2	2,000 units

Prepare a manpower budget for the quarter showing for each operation
(i) Direct labour hour N (ii) Direct labour cost and (iii) Number of workers required

SOLUTION

Before prepare the quarterly manpower budget for 3 products operation-wise, it is necessary to work out the following:

- Production budget
- Direct labour hours for each production wise.
- Number of workers required for each operation.

These are worked out as given below:

a. Production budget for the quarter ending....

Particular	Product 1	Product 2	Product 3
Direct labour hour N per (minutes)	9,000	15,000	12,000
Budget production (units)	10,000	15,000	14,000
Budgeted sales		5,000	4,000
Add: Stock to be built up (Closing)	1,000	10,000	10,000
Less: Carry-over stock (opening)			
Budgeted production			

**b. Direct labour hour for each product (operation wise)
operation 1**

Particular	Product 1	Product 2	Product 3
Direct labour hour N Per unit (minutes)	18	42	30
Budget production (units)	10,000	10,000	10,000
	(10,000 x 18)	(10,000 x 42)	(10,000 x 30)
	60	60	60
Budget labour hour N Require:	3,000 hrs	7,000 hrs	5,000 hour

PREPARATION OF OTHER BUDEGETS

Total labour hours require for Operation 1 = 15,000 hours

Operation II

Particular	Product 1	Product 2	Product 3
Direct labour hour N Per unit (minutes)		12	24
Budget production (units)	10,000	10,000	10,000
		(10,000 x 12)	(10,000 x 24)
		60	60
Budget labour hour N Require:		2,000 hrs	4,000 hrs N

Total Labour hour required for Operation II = 6,000 hours

Operation III

particular	Product 1	Product 2	Product 3
Direct labour hour N per unit (minutes)	9	6	10,000
Budget production (units)	10,000	10,000	
	(10,000 x 9)	(10,000 x 6)	
	60	60	
Budget labour hour N Require:	1,500 hr N	1,000 hr N	

Total labour hours required for Operation III = 2,500 hours

C. Number of workers required for each operation

First find out the total available hours per man for Quarter

Working hour N of factory in a quarter = 13 weeks x days week
x 8 hours a day

$$= 624 \text{ hours}$$

Less: Loss of hours due to leave:

Holidays and other causes = 124 hours

Total available hours per man = 500 hours

Now, requirement:

Total direct labour hour N I Total available hours required per man

- Operation I = $15,000/500 = 30$ men
- Operation II = $6,000/500 = 12$ men
- Operation III = $2,500/500 = 5$ men

Now, Manpower budget for the quarter can be prepared for the three products and for each operation. The same is given below:

Operation rate/hour	Product 1		Product 2		Product 3		Total No. of		workers
N D.L	Hour/N	Cost ₦	D.L Hrs	Cost ₦	D.L Hrs	Cost ₦	D.L Hrs	Cost ₦	
I 2.00	3,000	6,000	7,000	14,000	5,000	10,000	15,000	30,000	30
II 2.50	-	0	2,000	5,000	0	0	6,000	15,000	12
III 3.00	1,500	-	1,000	0	4,000	10,000	2,500	0	5
		4,500		3,000	0	-		-	
Total 4.50	9,000	10,000	22,000	20,000	23,500	47			

5 Manufacturing expenses budget: Manufacturing overhead

refers to the aggregate of factory indirect material, indirect labour and indirect expenses which can be divided into fixed and variable elements of manufacturing overhead. The fixed manufacturing overhead will not vary with the change in the level of activity and it can be estimated with a fair degree of accuracy. On the other hand, variable manufacturing overhead per unit will be estimated and the total variable manufacturing overhead will be determined with the help of the activity level. Preparation of variable overhead budget is based on scheduled production and operation conditions.

Example

Gama Engineering Company Limited manufactures two products X and Y. An estimate of the number of units expected to be sold in the first seven months of 2004 given below:

Months	Product X	Product Y
January	500	1,400
February	600	1,400
March	800	1,200
April	1,000	1,000
May	1,200	800
June	1,200	800
July	1,000	980

It is anticipated that:

- There will be no work-in progress at the end of any month
- Finished units equal to half the anticipated sales for the next month will be stock at the end of each month (including June 2004).

The budgeted production and production costs for the year ending 31st June, 2004 are as follows.

Particulars	Product X	Product Y
Production (units)	11,000	12,000
Direct material per unit)	12	19
Direct wages per unit)	5	7
Other manufacturing charge apportionable to each type of product)	33,000	48,000

You are required to prepare.

- Production budget showing the number of units to be manufactured each month.
- Summarized production cost budget for the 6-month period January to June 2004.

SOLUTION

- Production budget (in units) (for the 6 months ending 30th June, 2004)

Particulars	Jan	Feb.	March	April	May	June			
Product X									
Closing stock			300	400	500	600	600	600	500
Stocks			500	600	800	1,000	1,200	1,200	1,200
			800	1,000	1,300	1,600	1,800	1,700	1,700
Less: Opening stock			250	300	400	500	600	600	600
Production (in units)			550	700	900	1,100	1,200	1,100	1,100
Product Y									
Closing stock			700	600	500	400	400	400	450
Sales			1,400	1,400	1,200	1,000	800	800	800
			2,100	2,000	1,700	1,400	1,200	1,250	1,250
Less: Opening stock			700	700	700	500	400	400	400
Product (in units)			1,400	1,300	1,100	900	800	850	850

- b. Summarized production cost budget (for the 6 months ending 30th 2004)

Production X-5,550 Units	Y -6,350 Units		
Unit cost	Total cost	Unit cost	Total cost
Direct materials	12 66,600	19 1,20,650	
Direct wages	5 27,750	7 44,450	
Manufacturing charges	3 16,650	4 25,400	
	120 1,11,000	30 1,90,500	

Note: Manufacturing charges have been presumed to be variable costs in the absence of any other information. They could, however, be presumed to be fixed charges also for the whole year. In such a case they will be taken as 50% of the annual charges for the first six months in each case.

6. Administrative expenses budget: Administrative expenses in an organization will be incurred for the following activities:

- Formulation of policies
- Directing the organization, and
- Controlling the operations of an organization etc.

The administrative expenses will not include those expenses, which are incurred manufacturing, setting and distribution, R & D functions. The administrative overheads are of a fixed nature and the change in the level of activity will not bring any change in the administrative expenses incurred. On study of behaviour of costs, if any administrative expenses are of variable or semi-variable nature, those expenses can be budgeted with the level of activity.

7. Selling and distribution expenses budget: Selling expenses refers to expenses incurred relating to the activity:

- Creation and stimulation of demand of company's product, and
- Secure order

Selling expenses include salesmen's salaries, commissions, expenses and related administrative cost etc.

Distribution expenses refer to expenses incurred relating to the following activities:

- a. Maintaining and creating demand of products, and
- b. Making the goods available in the hands of the customer.

Distribution expenses include transportation, freight charges, stock control, warehousing etc. preparation of selling and distribution expense budget is based on the sales budget. The selling and distribution expenditure can be estimated with the help of flexible budgeting technique.

8. Capital expenditure budget: This will cover materials, equipment and suppliers, salaries, expenses and other costs relating to design, development and technical research projects.

9. Capital expenditure budget: This capital expenditure budget represents the expected expenditure on fixed assets during the budget period. It is an outlay on assets that are required and held for the purpose of generating income e.g. Plant and machinery, motor vehicles, premises etc. It is plan for capital expenditure, in monetary terms. Capital expenditure may be incurred for expansion, diversification modernization plans. It relates to projects involving huge capital outlay and long-term commitments. A capital expenditure budget must reveal following information project wise:

- Original appropriation
- Cumulative expenditure up-to-date
- Unutilized appropriation
- Fresh appropriation, and
- Limit carried over to next period

Programme budgeting technique as discussed in the later part of this chapter, is more appropriate for capital expenditure budgeting.

Capital expenditure authorization is the formal authority to incur capital expenditure which meets the criteria defined to achieve the results laid down under a system of capital appraisal. Levels of authority must be clearly defined and the reporting structure of actual expenditure must be to the equivalent authority levels. Procedures for the control of capital expenditure through prior authorization on a formal proposal basis and monitoring as expenditure is incurred.

10. Manpower budget: Manpower budget will take an overall view of the organizations needs for manpower for all areas of activity- sales, manufacturing administrative, executive and so on for a period of year

11. Marketing expenditure budget: marketing budget include estimate expenditure to be incurred for advertising promotional

activities, public relations, marketing research, customer services etc during the budget period.

3.4 Preparation of Master Budget and its Implementation.

Master budget is a budget which is prepared from, and summarizes the functional budgets. It is a summary budget that incorporates the key figures and totals of all budgets.

The master budget must closely reflect two dimensions of the organizations;

- Organizational structure: all revenue and expenditures must be attributed to the budget centre and managers responsible for them. At the control stage. Later, a system of responsibility reports must be built up to inform responsible managers of the progress of that result against budgets.
- Products or programmes: in this dimension, the budget information is organized to show the relevant, cost, contributions, profits and levels of production/sales activity for each product or programmes produced by the organization.

Look ahead Ltd. Produces and sells a single product. Sales budget for the calendar year 2004 by quarter is as under:-

Quarter	No of units to be sold.
i	12,000
ii	15,000
iii	16,000
iv	18,000

The year 2004 is expected to open with an inventory of 4,000 units of finished product and close with an inventory of 6,500 units production is customarily scheduled to provide for two thirds of the current quarter sales demand plus one-third of the following quarter's demand. Thus production anticipated sales volume by about one months. The standard costs details for one unit of the product is as follows:-

Direct materials	10lbs @N50 per lb
Direct labour	I hour 30 minutes @ N4 per hour.
Variable overheads	I hour 30 minutes @ NI per hour.

Preparation of Master Budget

Fixed overheads 1 hour 30 minutes @ 2 per hour based on a budgeted production volume of 90,000 direct labour hours for the year.

- (1) Prepare a production budget for 2004, by quarter, showing the number of units to be produced, and the total costs of direct materials, direct labour, variable overheads and fixed overheads.
- (2) If the budgeted selling price per unit is N17, what would be the budgeted profit for the year as a whole?
- (3) In which quarter of the year, is the company expected to break-even?

3.5 Cash Budgeting

A cash budget is a tabulation by defined periods of anticipated cash receipts and payments, disclosing cash balances or cash deficit at the end of each defined period. The defined period could be monthly, weekly or even daily. Cash budget, we must warn, is only as good as the forecast used in preparing it. Cash anticipated should be handled with absolute care while cash disbursements should be well anticipated and fully provided for.

SELF ASSESSMENT EXERCISE 2

The Ohemu limited and its fiscal year on 31st December every year. Early January, 2004, the company's financial controller was asked to prepare a cash budget for the three months of 2001, showing the cash balance or deficiency of cash at the end of each month. The following information is available regarding the company's operations.

- (a) Management believes that the 2003 sales pattern is a reasonable estimates of the 2004 sales

Sales in 2000 were:

January	February	March	April	May	June
N 720,00	N840,000	N1,200,000	N1,080,000	N960,000	800,000
July	August	September	October	November	December
N700,000	N1,100,000	N 1,000,00	N800,000	1,200,000	N1,600,000

- (b) On 31st December, 2003 debtors totaled N760,000 sales collections are generally made as follows:

During month of sale - 60%
In the first month following sales - 30%
In the second month following sales - 9%
Uncollectible accounts - 1 %

- (c) The purchase costs of goods average 60% of the selling prices.
On 31st December, 2003 the costs of closing stocks in January, 2004 at half of the normal selling price on cash on delivery terms.

The company wants to maintain the inventory as of the 1st of each at a level of three months' sales as determined by the sales forecast for the next three months.

All purchase are paid for on the 10th of the following month on 31st December, 2003 creditors for purchases amounted to N740,000.

- (d) Recurring fixed expenses amount to N240,000 including a depreciation of N40,000. Variable expenses amount to 10% of sales. Payments for expenses are made as follows.

	During month incurred	Following month
Fixed expenses	55%	45%
Variable expenses	70%	30%

The fixed expenses are appointed to the months in proportion to their sales.

- (e) Annual property taxes amount to N100,000 and are paid in equal installments on 31st December and 31st march.
(f) It is anticipated that cash dividends of N40,000 per year will be paid on the 15th day of the I third of the month of each quarter.
(g) During the harmattan, usually advertising cost will be incurred that require cash payments of N20, 000 in February and N30,000 in march.
(h) Equipment replacement costs are paid for at the rate of N 6, 000
(i) The company must take a corporation tax payment of N120,000 in march.
(j) On 31st December, 2003 the company had a bank loan with an unpaid balance of N560,000.

The loan requires principal payment of N40,000 on the last day of each month plus interest at Y2% per month on the unpaid balance at the first of the month. The entire balance is due on 31st march, 2004.

- (k) On 31st December, 2001 the cash balance was N200,000 required.

As the company's financial controller, prepare the required cash budget with schedules.

4.0 CONCLUSION

In this unit, we have discussed generally the preparation of sales budget and other budget preparation. We also looked at the master budget- finally, we tried to prepare cash budget.

5.0 SUMMARY

The annual budget should be set within the context of longer-term plans, which are likely to exist even if they have not been made explicit. Long-term planning involves strategic planning over several years on the identification of the basic strategy of the firm (i.e. the future direction the organization will take) and the gaps which exist between the future needs and present capabilities.

A long-term plan is a statement of the preliminary targets and activities required by an organization to achieve its strategic plans together with board estimate for each year of the resources required because long-term planning involves 'looking into the future' for several years ahead, the plans tend to be uncertain, general in nature, imprecise and subject to change.

Annual budget is concerned with the implementation of the long-term plan for the year ahead of the long-term plan for the year ahead. Before the annual budgeting process is begun, top management must communicate the policy effects of the long-term plan to those responsible for meeting budgeted performance should prepare the budgets for those areas for which they are responsible and submit them to their superiors for approval. As the budgets move up the organizational hierarchy, they must be examined in relation to each other to ensure that all the parts combine to produce an acceptable whole. When all the budgets are in mutual harmony, they will be summarized into a master budget consisting of a budgeted profit and loss account a balance sheet and a cash flow statement. The approval of the master budget will constitute authority for the managers of each responsibility centre to carry out the plans contained in each budget. The process should not stop when all the budgets have been agreed; periodically, the actual results should be compared with the budget and remedial action taken to ensure that the results conform to plan.

Budgeting is a continuous and dynamic process, and should not end once the annual budget has been prepared.

With conventional budgeting the budgeted expenses for the forthcoming budget for support activities are normally based on the previous year's budget plus an adjustment for inflation. Support activities are normally based on the previous year's budget plus an adjustment for inflation. Support costs are therefore considered to be fixed in relation to activity volume. In contrast, activity-based the amount of resources that are required to achieve the budgeted level of activity. By comparing the amount of resources that are required with the amount of resources that are required with the amount of resources that are in place, upwards or downwards adjustment can be made the budget setting phase.

In non-profit organization the annual budgeting process compares budgeted and actual imputes, but does not provide information on the efficiency with which activities have been performed, or the effectiveness in achieving objective. PPBS attempts to overcome these deficiencies.

6.0 TUTOR-MARKED ASSIGNMENT

The annual flexible budget of a company is as follows:

Production Capacity	40%	60%	80%	100%
Costs:		N	N	N
Direct labour	16,000	24,000	32,000	40,000
Direct material	12,000	18,000	24,000	30,000
Production overhead	11,400	12,600	13,800	15,000
Administration overhead	5,800	6,200	6,600	7,000
Selling and distribution overhead	6,200	6,800	7,400	8,000
		<u>51,400</u>	<u>67,600</u>	<u>83,800</u>
				<u>100,000</u>

Owing to the trading difficulties, the company is operating at 50% capacity. Selling prices have had to be lowered to what the directors maintain is an uneconomic level and they are considering whether or not their single factory should be closed down until the trade recession has passed.

A market research consultant has advised that in about two months time. There is every indication that sales will increase to about 75% of normal capacity and that revenue to be produced in the second year will amount to N90,000. The present revenue from sales at 50% capacity would amount of only N49,500 for a complete year. If the directors decide to close down the factory for a year it is estimated that.

- a. The present fixed cost would be produced to N11,000 per annum;
- b. Closing down costs (redundancy payments etc) would amount to N7, 500;
- c. Necessary maintenance of plant would cost N1,000 per annum;
- d. On re-opening the factory, the cost of overhauling plant, training and engagement of new personnel would pay to N4,000.

You are required to:

Prepare a statement for the directors presenting the information in such a way as to indicate whether or not it is desirable to close down the factory.

7.0 REFERENCES/FURTHER READINGS

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UNIT 12 STANDARD COSTING

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1.0 INTRODUCTION

In this unit we shall consider a financial control system that enables the deviations from budget to be analyzed in detail, thus enabling costs to be controlled more effectively. This system of control is called standard costing. In particular, we shall examine how a standard costing system operates and how the variances are calculated.

Standard costs are predetermined costs, they are target costs that should be incurred under efficient conditions. They are not the same as budgeted costs. A budget relates to an entity activity or operation, and presents the same information on a per unit basis. A standard therefore provides cost expectation per unit of activity and a budget provides the cost expectation for the total activity.

2.0 OBJECTIVES

After studying this unit, you should be able to:

- Explain how standard costs are set.
- Explain the meaning of standard.
- Explain how a standard costing system operates.
- Identify the causes of labour, material, overhead and sale margin variances.

3.0 MAIN CONTENT

3.1 Standard Costing

'Standard costing' is a technique, which uses standards for cost and revenues for the purpose of control through variance analysis. 'Standard' is a predetermined measurable quantity, set in defined conditions against which actual performance can be compared, usually for an element of work operation or activity.

Standard costing involves the setting of predetermined cost estimates in order to provide a basis for comparison with actual cost. A standard cost is a planned cost for unit of product or service rendered. Standard costing is universally accepted as effective instrument for cost control in industries. Although the terms budgeted and standard cost are sometimes used interchangeably, budgeted costs normally describe the total plane costs for a number of product. Usually budgetary control is operated with a system of standard costing because both systems are inter-related but they not inter-dependent.

A summary of the above study, we can understand what a 'standard' means:

- Predetermine estimates.
- Established for input and outputs.
- Applicable to all routine aspects of organizations operations.
Accounting for standard costs and obtaining variances.
- reporting to managing for taking appropriate action whenever necessary.

With the use of standard costing the organization achieves the objectives in a planned and systematic manner. Standard costing can be used in direct absorption, job or process costing. It is not a method of costing but a system which can be fitted in any method.

3.2 Objectives of Standard Costing

The objectives of standard costing technique are as follows:

- i. To provide a formal basis for assessing performance and efficiency.
- ii. To control cost by establishing standards and analysis of variances.
- iii. To enable the principle of managing by exception to be practiced at the detailed, operational level.
- iv. To assist in setting budgets.
- v. The standard cost are readily available substitutes for actual average unit cost and can be used for stock and work-in-progress valuation, profit planning and decision making as and a basis of pricing where 'cost -plus' system are used.
- vi. To assist in assigning responsibility for non-standard performance in order to correct deficiencies or to capitalizes on benefits
- vii. To motive staff and management.

Formula: Actual number of units sold (standard selling price per unit- standard cost per unit) standard profit may be at the level of net profit, gross profit or combination. Profit which relate only to trading activities is often referred to as operating profit.

3.3 Types of Standard

- Current standard: current standard is standard established for use over short period of time, related to current conditions. The problem with this type of standard is that it does try to improve on current levels of efficiency.
- Basic standard: basic standard is standard established for use over a long period from which a current standard can be developed. The main disadvantage of this type of standard is that because it has remained unaltered over a long period of time, it may be out of date. The main advantage is in showing the changes in trend of price and efficiency from year to year.
- Ideal standard: ideal standard is a standard which can be attained under the most favorable conditions. No provision made, e.g. for shrinkage, spoilage or machine breakdowns. Uses believe that the resulting unfavorable variances will remind management of the need for improvement in all phase of operation. Ideal standard are not widely used in practice because they may influence employee motivation adversely.
- Attainable standard: attainable standard is a standard, which can be attained if a standard unit of work is carried out efficiency,

on a machine properly utilized or material proper use. Allowances are made for normal shrinkage, waste and machine breakdowns. The standard represents future performance and objective, which are reasonably attainable. Besides having a desirable motivational impact on employees, attainable standards serve other purposes, e.g. cash budgeting department performance. If correctly set attainable standards are the best type of standard to use, since they provide employees with a realistic target. Attainable standard have the greatest motivational impact on the workforce.

3.4 Setting Standard

In order to use predetermine standard cost, standards have to be set for each element of cost for each line of product manufacture of service supplied. Standard cost shows what the cost should be keeping in mind the most favorable production conditions, and on the assumption that plant will operate at maximum possible efficiency.

The collaboration of all functional departments is a must in setting standards. The quantities, price or grades, terms of purchase, product substitution etc. have to be kept in mind while setting standards. The success of standard cost system depends on the reliability, accuracy and acceptance of the standards. Standard must be set and the system implemented whatever may be faults or delay or cost, otherwise the whole exercise will go waste.

3.4.1 Responsibility for Setting Standards

The line manager who have to work with and accept the standards must be involved in establishing them. There are strong behavioral and motivational factors involved in this process. The line managers must be involved in the critical part of standard setting. The human aspect of budgeting apply equally to standard costing. The costing accountant has to determine for each production cost centre.

After the standards have been fixed, the management is interested in calculation of variance from the standards with the purpose of making the members of it. The purpose of setting standards is to fix yardsticks for measuring the performance of various activities and helps in responsibility accounting. Overheads recovery rate has to be determined in advance and applied on that basis to product cost centre. There is always a difference in actual expenditure and overheads absorbed.

3.4.2 Problems in setting Standard Cost

The problems involved in setting costs, apart from the probable forecasting errors, include the following:

- Deciding how to incorporate inflation into planned unit costs.
- Agreeing a labour efficiency standard (for example should current times, expected (improved) time or ideal times be used in the efficiency standard?)
- Deciding on the quality of material to be used, because a better quality of material will cost more, but perhaps reduce material wastage.
- Deciding on the appropriate mix of component materials, where some change in the mix possible.
- Estimating materials prices where seasonal price variations or bulk purchase discount may be significant.
- Possible 'behavioral' problems. Manager responsible for the achievement of standard might resist the use of a standard costing control system for fear of being 'blamed' for any adverse variances.
- The cost of setting up and maintaining a system for establishing standards.

3.5 Advantages of Standard Costing

A standard costing system has many advantages, which include the following:

- Budgeting are compiled from standard.
- Standard costing highlight areas of strengths and weakness.
- Actual cost can be compared with standard cost in order to evaluate performance.
- The setting of standard should result in the best resources and methods being used and thereby increase efficiency.
- Standard costs can be used to value stock and provide a basis for setting wage incentive schemes.
- Standard costing simplifies bookkeeping, as information is recorded at standard, instead of a number of historic figures.
- It acts as a form of feed forward control that allows an organization to plan the manufacturing inputs required for different levels of output.
- It act as a form of feed back control by highlighting performance that didn't achieve the I' standard predicted, thus altering decision

makers to situation that may 'out of control' and in need of corrective action.

3.6 Criticism of Standard Costing

The following criticism is leveled against standard costing:

- A lot input data is required which can be expensive.
- Standard costing is usually confined to organizations whose processes or jobs are repetitive.
- Unless standard are accurately set any performance evaluation will be meaningless.
- Uncertainty in standards costing can be caused by inflation, technological change, -economic and political factor etc. standard therefore need to be continually updated and
- revised
- It may be difficult to set standard at a level, which both motivates the workforce and achieves the corporate goals.
- The maintenance of the cost database is expensive.
- The research evidence shows that overly elaborate variances are imperfectly understood by line managers and thus they are likely to be ineffective for control purpose.
- Virtually all aspects of setting standard involve forecasting and subjective judgments with I inherent possibilities of error and argument.
- The usefulness of a number of variances relating to overhead, sale margins, mix and yield C is questionable.
- All forms of variance analysis are post-mortem on past events. Obviously the past cannot be altered so the only value variance can have is to guide management if identical or similar circumstances occur in future.

3.7 Variance Analysis

'Variance' is the difference between planned, budgeted or standard cost and actual costs and similarly in respect of avenues. This should not be confused with the statistical variance, which measures the dispersion of a statistical population.

'Variance accounting' is a technique whereby the planned activities of an undertaking are quantified in budgets, standard costs, standard selling prices and standard profit margins, and the differences between these and the actual results are compared. The procedure is to collect, compare, comment and correct. 'Variance analysis' is the analysis of variances arising in a standard costing system into their constitution parts. It is the analysis and comparison of the factors which have caused

the differences between predetermined standards and actual, with a view of eliminating inefficiencies.

For understanding of the 'Variance Analysis' Topic, variances are classified into the following:

- (i) Material Variances
- (ii) Labour Variances
- (iii) Variable Overhead Variances
- (iv) Fixed Overhead Variances
- (v) Sales Variances
- (vi) Profit Variances

Each of these variances are discussed elaborately in the following paragraphs:

3.7.1 Material Variances

For the purpose of Material Variance analysis the following two types of standards need be fixed:

- Materials Price Standards

Price factor is controlled by external factors if the price changes during the period due to inflation rise in price of controlled items like cement, steel, etc. there is going to be wide variation. Material prices are fixed keeping in mind the terms of contract of purchases, nature of items and other relevant factor. Some organizations have regular system of purchases (Rate contract) for the whole period/year at predetermined price irrespective of the prevalent market rates.

- Material Quantity Standards

Quantity usage standards are set on the basis of various test runs and guideline provided by R&D department or Engineering department and specifications on the basis of past experience. The standard should also take into consideration allowances for acceptable level of waste, spoilage, shrinkage, seepage, evaporation, leakage, etc.

1) Material Cost Variance

The material cost variance is also called material total variance, is the difference between standard direct material cost of production and the actual cost of direct material.

$$\text{Material Cost variance} = \frac{\text{Standard} \times \text{Standard}}{\text{Units} \quad \text{price}} - \frac{\text{Actual} \times \text{Actual}}{\text{Units} \quad \text{Price}}$$

$$\text{Or} = \text{Standard cost of Material} - \text{Actual cost of Material used}$$

2) Material Price Variance

The material price variance is the difference between the standard price and the actual purchase price for each unit of material multiplied by the actual quantity of material purchased.

$$\text{Material price variance} = \frac{\text{Actual quantity} \times \text{standard price per unit of material} - \text{Actual price per unit of material} \times \text{Actual quantity}}{\text{Price per unit of material}}$$

3) Material Usage Variance

The material usage variance is the difference between the actual quantity of material used and the standard quantity of material that should be used for actual, multiplied by standard price per unit of material.

$$\text{Material usage variance} = \frac{\text{Standard price per unit of material} \times \text{standard quantity} - \text{Standard price per unit of material} \times \text{Actual quantity}}{\text{Unit of material}}$$

Material Usage Variance is further segregated into the following:

3(a) Material Mix Variance

If a process uses several different materials which could be combined in a standard proportion, a mix variance can be calculated which shows the effect on cost of variances from the standard proportion.

There are two recognized ways of calculating this mix, variance. Some authorities regard the variance as a sub-set of the usage variance but others treat it as part of the price variance. If the mix variance is treated as a sub-set of the usage variance, then the material mix variance is the actual quantity of material used priced at the standard price.

$$\text{Material Mix Variance} = \text{Standard Price} \times \frac{\text{revised Standard Quantity} - \text{Actual Quantity}}{\text{Quantity}}$$

$$\text{Revised Standard Quantity} = \frac{\text{Total Quantity of Actual Mix} \times \text{Standard Quantity}}{\text{Total Quantity of Standard Mix}}$$

3(b) Material Yield Variance

Apart from operator or machine performance, output quantities produced are often different to those planned, e.g. this arises in chemical plants where plant should produce a given output over a period for a given input but the actual output differs for a variety of reasons.

Material yield variance is the difference between the standard yield of the actual material input and the actual yield, both valued at the standard material cost of the product.

Material Yield Variance

$$= \text{Standard Cost Per unit} \times \left(\frac{\text{Standard output for actual mix}}{\text{Actual output}} - 1 \right)$$

Exercise 1.1

Gemini Industries provide the following information from their records:-
For making 10kgs. Of Gemco, the standard material requirement is

Material	Quantity kgs	Rate per kg N	
A	8	6.00	
B	4	4.00	

During April, 4003 1000 kgs. Of Gemco were produced. The actual Consumption of materials is as under:-

Material	Quantity kgs	Rate per kg N	
A	750	7.00	
B	500	5.00	

Calculate: (a) Material cost variance (b) Material price variance (c) Material Usage variance.

3.7.2 Labour Variances

Normally it is taken that labour is a variable cost but at times it becomes fixed cost as it is not possible to remove or retrench in case of stopping in production.

- Labour rate standard and grades of labour

This is basically dependent on the agreement with the labour union or rate prevalent in the particular area.

- Labour efficiency standard

The labour (quantities) efficiency means the number of hours that the appropriate grade of worker will take to perform the necessary work. It is based on actual performance of a worker or group of workers possessing average skill and using average effort while performing manual operations or working on machine under normal conditions. The standard time is fixed keeping in mind the past performance records or

work-study. This is on the basis that is acceptable to the worker as well as the management.

1) Labour Cost Variance

The labour cost variance is also called the labour total variance, is the difference between the standard direct labour cost and the actual labour cost incurred for the production achieved.

Material price variance =

$$\frac{\text{Standard labour hours produced} \times \text{Standard Rate Per hour} - \text{Actual labour hours per hour} \times \text{Actual Rate per hour}}$$

Or = Standard cost actual output - Actual cost

2) Labour Rate Variance

The labour rate variance is the difference between the actual direct labour rate per hour and the standard direct labour rate per hour, multiplied by the actual hours paid, i.e. the rate per hour paid to the direct labour force more or less than standard use of higher/lower grade of skilled workers than planned or wage inflation causes this variance.

Labour Rate variance = Actual time (Standard rate - Actual rate)

3) Labour Efficiency Variance

The labour efficiency variance is the difference between the actual hours taken to produce the actual output and the standard hours that this output should have taken, multiplied by the standard rate per hour. The possible cause for this variance is due to use of higher/lower grade of skilled workers than planned or the quality of material used, errors in allocation time to jobs.

Labour Efficiency Variance = Standard Rate

$$(\text{Standard time for actual output} - \text{Actual time}) \times \text{Standard Rate}$$

The labour efficiency variance can be segregated into the following:

3(a) Labour Mix Variance

The labour mix variance arises due to change in composition of labour force

Labour Mix Variance = Standard Rate (revised Standard Time - Actual Time)

Revised Standard Time = $\frac{\text{Total actual time}}{\text{Total standard time}} \times \text{Standard time}$

3(b) Labour Yield Variance

The labour Yield variance arise due to difference in the standard output specified and the actual output obtained.

Labour Yield Variance = Standard Cost per unit
Standard output for Actual
actual time

3(c) Idle Time Variance

The idle time variance represents the difference between hours paid and hours worked, i.e. idle hours multiplied by the standard wage rate per hour. This variance may arise due to illness, machine break-down, hold-ups on the production line because of lack of material. Idle time variance = Idle hours X Standard rate.

3(d) Net Efficiency Variance

This variance is calculated after deducting idle hours from actual hour. The efficiency variance less idle time variance is called net efficiency variance.

Net Efficiency variance

= Standard rate $\left(\frac{\text{Standard time for Actual output}}{\text{Actual time worked}} \right)$

Or = Standard rate $\left(\frac{\text{Standard - Actual Time}}{\text{Hours Paid}} \right)$ Idle Paid

Example

100 skilled workmen, 40 semi-skilled workmen and 60 unskilled workmen were to work 39 weeks to get a contract job completed. The standard weekly wages were N60, N36 and N24 respectively. The job was actually completed in 32 weeks by 80 skilled, semi-skilled and 70 unskilled workmen who were paid N65, N40 and N20 respectively as weekly wages.

Find out the labour cost variance, labour rate variance, labour mix variance and labour efficiency variance.

Basic data for calculation of Labour Variances

Category of Workmen:	Standard			Actual		
	Weeks	Rate	Amount	Weeks	Rate	Amount
			N		N	N
Skilled	3,000	60	1,80,000	2,560	65	1,66,400
Semi-skilled	1,200	36	43,200	1,600	40	64,000
unskilled	1,800	24	2,200	2,240	20	44,800
	6,000		2,66,400	6,400		2,75,200

Calculation of Labour Variance

1. Direct Labour Cost Variance

Std. Cost for actual -Actual cost
= 2,66,400 -2,75,200

2. Direct Labour Rate Variance

Actual time (Std. Rate -Actual rate)
 Skilled = 2,560 (60-65) = 12,800 (A)
 Semi-skilled = 1,600 (36 -40) = 6,400 (A)
 Unskilled = 2,240 (24 -20) = 8,960 (F) = N 10,240 (A)

3. Direct Labour Variance

Std. rate (std. time for actual output -Actual time)
 Skilled = 60 (3,200 -2,560) = 26,400 (F)
 Semi-skilled = 36 (1,200 -1,600) = 14,400 (A)
 Unskilled = 24 (1,800 -2,240) = 10,560 (A) =N 1,440 (F)

Direct Material Efficiency Variance can be further analyzed into:

a. Direct Labour Mix Variance

Std. rate (revised std. time -Actual time)
 Skilled = 60 (3,200 -2,560) = 38,400 (F)

$$\text{Semi-skilled} = 36 (1,280 - 1,600) = 11,520 \text{ (A)}$$

$$\text{Unskilled} = 24 (1,920 - 2,240) = \underline{7,680 \text{ (F)}} = \text{N } 19,200 \text{ (F)}$$

***Revised Std. time**

$$\text{Skilled} = 6,000 \times \frac{3,000}{6,400} = 3,200$$

$$\text{Semi-skilled} = 6,000 \times \frac{1,200}{6,400} = 1,280$$

$$\text{Unskilled} = 6,000 \times \frac{1,800}{6,400} = 1,920$$

b. Direct Labour revised Efficiency Variance

Std. rate (Std. time for actual output - revised std. time)

$$\text{Skilled} = 60 (3,000 - 3,200) = 12,200 \text{ (A)}$$

$$\text{Semi-skilled} = 36 (1,200 - 1,280) = 2,880 \text{ (A)}$$

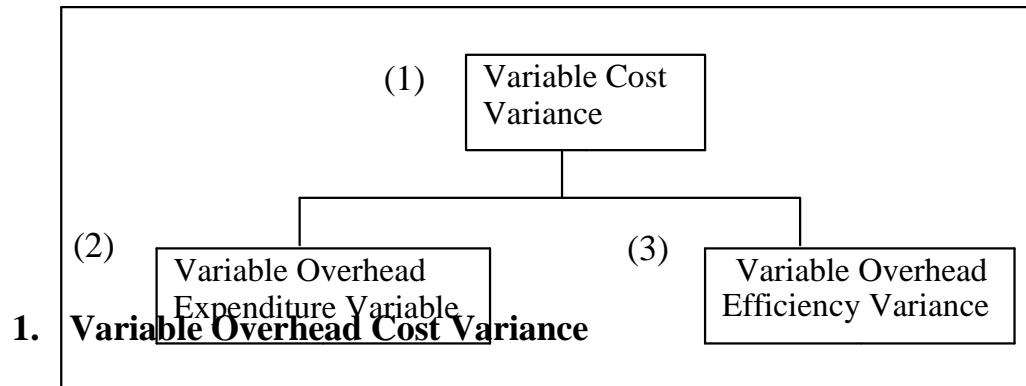
$$\text{Unskilled} = 24 (1,800 - 1,920) = \underline{2,800 \text{ (F)}} = \text{N } 17,760 \text{ (A)}$$

Summary of Labour Variances

Rate Variance	10,240 (A)
Efficiency Variance	
a. Mix Variance 19,200 (F)	19,200 (F)
b. revised efficiency variance	<u>17,760 (A)</u>
Direct Material Cost Variance	8,800 (A)

3.7.3 Variable Overhead Variances

For fixation of costs for overheads, a survey of overheads will be necessary and with the data available for budgetary control, the overheads will be charged to various cost centre/products, etc. on the basis of standard costs. For this, after dividing the overheads into fixed and variable the calculation of standard overhead rate for each cost centre/product is done. The number of hours representing the capacity of manufacture is to reduce by various idle facilities, etc. the choice of method of absorption (Direct wage rate machine hour) will depend upon the circumstances. The main object is to establish a normal overhead rate based on total factory overhead at normal capacity volume.



The variable overhead cost variance represents the difference between the Standard cost of variable overhead allowed for actual output and the actual variable overhead incurred during the period. The variance represents the under absorption or over absorption of variable overheads.

$$= \frac{\text{Actual output} \times \text{Standard variable overhead rate per unit}}{\text{Standard variable overhead rate per unit}} - \text{Actual variable overhead cost}$$

$$= \frac{\text{Standard hours for X} \times \text{Standard variable overhead rate P.H.}}{\text{Standard variable overhead rate P.H.}} - \text{Actual variable overhead cost}$$

2. Variable Overhead Expenditure Variance

It is the difference between the actual variable overhead rate per hour and the standard variable overhead rate per hour multiplied by the actual hours worked. The actual hours worked must be used not the actual hours paid because the latter may include ideal time and it is usually assumed that variable overhead will not be recovered in idle time.

Variable Overhead Expenditure Variance

$$= \frac{\text{Standard variable overhead} \times \text{Actual output}}{\text{Standard variable overhead}} - \text{Actual variable overheads}$$

$$\text{Or} = \frac{\text{Standard hours for X} \times \text{Standard variable overhead rate P.H.}}{\text{Standard variable overhead rate P.H.}} - \text{Actual variable overheads}$$

$$\text{Or} = (\text{recovered Variable Overheads}) - (\text{Actual Variable Overheads}).$$

3. Variable Overhead Efficiency Variance

The variable overhead efficiency variance is calculated by taking the difference in standard output and actual output multiplied by the standard variable overhead rate.

Variable Overhead Efficiency variance =

$$\frac{\text{Standard Variable Overheadrate} \times \text{Standard Quantity}}{\text{Standard Variable Overheadrate} \times \text{Standard Quantity}} - \text{Actual Quantity}$$

Example

The budgeted variable overheads for March are N3,840. Budgeted production for the month is 38,400 units. The actual variable overheads incurred were N3,80 and actual production was N 38,640 units. Calculate variable production overhead variance.

$$\begin{aligned} &\text{Variable Production Overhead} \\ &= \text{Standard Variable Overhead} - \text{Actual Variable Overhead} = \text{N } 3,864 - \text{N } 3,830 = \text{N } 34 \text{ (F)} \end{aligned}$$

Note:

$$\begin{aligned} \text{Standard Variable Overhead per units is} &= \frac{\text{Budgeted Variable Overhead}}{\text{Budgeted Production}} \\ &= \frac{38,400}{38,400} = \text{N. } 0.10 \end{aligned}$$

$$\begin{aligned} \text{Total standard variable overhead} &= \text{AQ X SVO per unit} = \\ &38640 \times \text{N}0.10 = 3864 \end{aligned}$$

3.7.4 Fixed Overhead Variance

Fixed overhead represents all items of expenditure which are more or less remain constant irrespective of the level of output or the number of hours worked. The fixed overheads are classified as follows

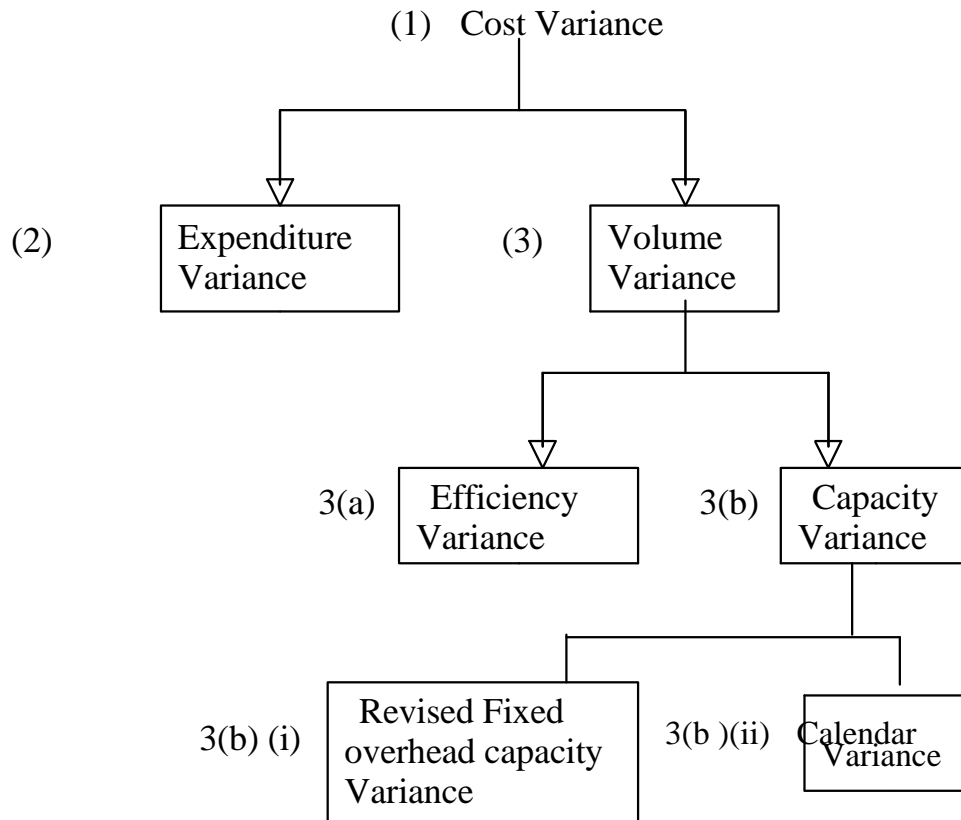


Figure 1.2:CLASSIFICATION OF FIXED OVERHEAD VARIANCES

The formulae for calculation of fixed overhead variances are given below:

1) Fixed Overhead Cost Variance

The fixed overhead cost variance represents the under/over absorbed fixed production overhead in the period. This under/over absorbed overhead may be due to differences between actual and budgeted fixed overheads, i.e., expenditure variances, and /or differences between the actual and budgeted levels of activity i.e. volume variances.

$$\text{Fixed Overhead Cost Variance} = \frac{\text{Actual} \times \text{Standard Fixed}}{\text{Output} \quad \text{Overheadrate}} - \text{Actual fixed Overheads}$$

Standard hours X -Actual fixed overheads produced

Or = recovered Fixed Overheads -Actual Fixed Overheads.

2) Fixed Overheads Expenditure Variance

This variance is also called budget variance, obtained by comparing the total fixed overhead cost actually incurred against the budgeted fixed overhead cost.

Fixed Overhead Expenditure Variance = Budgeted Overheads - Actual Overheads

3. Fixed Overhead Volume Variance

The volume variance is computed by taking the difference between absorption on actual output and those on budgeted output.

Fixed Overhead Volume Variance

= (Actual Output X Standard rate) - Budgeted fixed overheads or
= Standard rate (Actual output - Standard output)

Or = Standard rate per hour Standard hours X Budgeted
Produced hours

3(a) Fixed Overhead Efficiency Variance

The efficiency variances arise due to the difference between budgeted efficiency to production and the actual efficiency is achieved.

Fixed Overhead Efficiency Variance

= Standard Rate Actual Output in units X Standard output in units

Or = Standard rate per hour $\frac{\text{Actual hours} \times \text{Standard hours for}}{\text{Worked} \quad \text{actual output}}$

3(b) Fixed Overhead Capacity Variance

The capacity variance represents that part of volume variance, which arise due to working at higher or lower capacity than standard capacity.

Fixed overhead Capacity Variance = Standard Rate (Budgeted Quantity - Standard Quantity)

3(b) (i) Revised Fixed Overhead Capacity Variance

The revised capacity variance is calculated as follows:
Revised Fixed Overhead Capacity Variance

$$\text{Or } = \text{Standard fixed Overhead rates} \left[\begin{array}{l} \text{Revised Budgeted-Standard} \\ \text{Quantity} \quad \quad \quad \text{Quantity} \end{array} \right]$$

3(b) (ii) Fixed Overhead Calendar variance

The Calendar Variance arise due to the volume variance which is due to the difference between the number of working days anticipated in the budget period and the actual working days in the period to which the budget is applied.

$$\text{Fixed Overhead Calendar Variance} = \left[\begin{array}{l} \text{Standard fixed} \quad \text{Budgeted-revised} \quad \text{Budgeted} \\ \text{Overhead rates} \quad \text{Quantity} \quad \text{Quantity} \end{array} \right]$$

3.7.5 Sales Variance

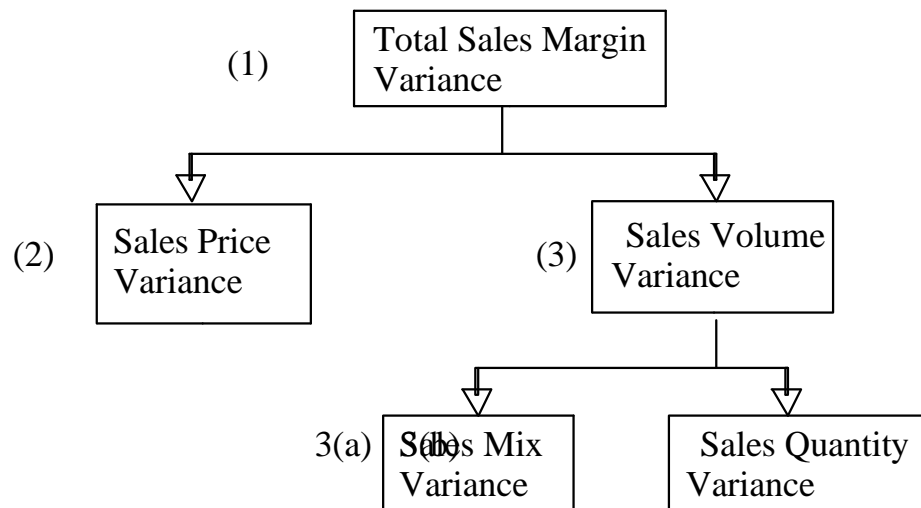
All of the variances discussed previously have been concerned with costs; the effects on profits due to adverse or favourable variances affecting direct materials, direct labour or overheads. Some companies calculate cost variances only, but to obtain the full advantages of standard costing, many companies also calculated sales variances. Sales variances affect a business in terms of changes in revenue: changes which have been caused either by a variation in sales quantities or in sales prices.

There are two distinctly separate systems of calculating sales variances, which show the effect of a change in sales as regards:

- I. Sales margin variance (on the basis of profit) and,
- II. Sales value variance (on the basis of turnover)

i. Sales Variances based on profit: - The sales variances based on profit are also called sales margin variances which indicates the deviation between actual profit and standard or budgeted profit.

The fixed overheads are classified as follows:



FIGUN 1.3: CLASSIFICATION OF FIXED OVERHEAD VARIANCES

1. Total Sales Margin Variance

This variance takes into account the difference between actual profit and standard or budgeted profit.

Total Sales Margin Variance = Actual Profit - Budgeted Profit

$$\text{or} = \frac{\text{Actual Quantity of Sales} \times \text{Actual Profit per unit}}{\text{Budgeted Quantity of Sales} \times \text{Budgeted Profit per unit}} - \text{Budgeted Profit per unit}$$

2. Sales Price Variance

The price variance is the difference between standard price of the quantity of sales effected and the actual price of those sales.

$$\text{Sales Price Variance} = \frac{\text{Actual Profit} - \text{Standard Profit}}{\text{Actual Quantity of sales per unit}}$$

$$\text{Or} = \frac{\text{Actual Quantity of Sales} \times \text{Standard Price} - \text{Actual Profit}}{\text{Standard Price per unit}}$$

3. Sales Volume Variance

It represents the difference between the actual units sold and the budgeted quantity multiplied by either the standard profit per unit or the standard contribution per unit.

In absorption costing standard profit per unit is used, but in marginal costing, standard contribution per unit must be used.

$$\text{Sales Volume Variance} = \frac{\text{Standard Profit}}{\text{unit}} \frac{\text{Actual Quantity} - \text{Standard Quantity}}{\text{of sales of sales}}$$

$$\text{Or} = \frac{\text{Standard Profit on}}{\text{Actual quantity of sales}} \frac{\text{Standard on}}{\text{standard quantity of sales}}$$

Sales Volume Variance can be further segregated into:

3(a) Sales Mix Variance

The sales mix variance arises when the company manufactures and sells more than one type of product. This variance will be due to variation of actual mix and budgeted mix of sales.

$$\text{Sales Mix Variance} = \frac{\text{Standard Profit/unit}}{\text{of sales}} \frac{\text{Actual Quantity} - \text{Standard Proportion}}{\text{of actual sales}}$$

$$\text{Or} = \text{Standard Profit} - \text{revised Standard Profit}$$

3(b) Sales Quantity Variance

The sales quantity is the difference between the budgeted profit on budgeted sales and expected profit on actual sales.

$$\text{Sales Quantity Variance} = \frac{\text{Standard Profit/unit}}{\text{for actual sales}} \frac{\text{Standard proportion Budgeted quantity}}{\text{of sales}}$$

$$\text{Or} = \text{revised Standard Profit} - \text{Budgeted Profit}$$

$$\text{Or} = \frac{\text{Budgeted Margin}}{\text{Per unit on budgeted mix}} \frac{\text{Total actual} - \text{Total budgeted}}{\text{Quantity Quantity}}$$

SELF ASSESSMENT EXERCISE

AB Ltd. is manufacturing and selling thousand of standard products. The company has a standard cost system and analyses the variances between the budget and the actual periodically. The summarized working results for 2002-2003 were as follows:

Product Budget Actual

Product	Budget			Actual		
	Selling price Per unit (N)	Cost per Unit (N)	No. of unit to be sold	Selling price per unit (N)	Cost per unit (N)	No. of units sold
A 50 32	10,000 48 30	12,000				
B 40 24	14,000 42 25	12,000				
C 30 18	16,000 31 20	15,000				

- (a) Calculate the variance I profit during the period.
 (b) Analyze the variance in profit into: (i) Sales price variance; (ii) Sales volume variance; (iii) cost variance; (iv) Sales margin quantity variance; (v) Sales margin mix variance.

4.0 CONCLUSION

In this unit, we have discussed the standard setting process. We then looked at the relationship between budgetary control and standard costing. Finally, we calculate material; labour, overhead and sales margin variance.

5.0 SUMMARY

In this unit, we have explained the variance computations for a standard variable costing system. Sales margin variances are therefore reported in terms of contribution margins and a single fixed overhead expenditure variance is reported.

To enable you to review your understanding of variance calculations, the formulae for the variances that we have considered in this unit are summarized. In each case the formula is arranged so that a positive variance is favourable and a negative variance unfavourable.

6.0 TUTOR-MARKED ASSIGNMENT

What is standard costing?

7.0 REFERENCES/FURTHER READINGS

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UNIT 13 DIVISIONAL FINANCIAL PERFORMANCE MEASURES

CONTENTS

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- 2.0 Objectives
- 3.0 Main Content
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 - 3.2 Divisional Performance Evaluation
 - 3.2.1 Advantages of Decentralized
 - 3.2.2 Problem of Decentralization
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1.0 INTRODUCTION

Large companies produce and sell a wide variety of products throughout the world. Because of the complexity of their operations, it is difficult for top management to directly control operations. It may therefore be appropriate to divide a company into separate self-contained segments or divisions and to allow divisional managers to operate with a great deal of independence.

A divisional manager has responsibility for both the production and marketing activities of the division. The danger in creating autonomous divisions is that divisional managers might not pursue goals that are in the best interest of the company as a whole. The objective of this chapter is to consider financial performance measures that will motivate managers to pursue those goals that will best benefit the company as a whole. In other words, the objective is to develop performance measures that will achieve goal congruence.

In this unit, we shall focus on financial measures of divisional performance. However, financial measures cannot adequately measure all those factors that are critical to the success of a division. Emphasis should also be given to reporting key non-financial measure relating to such areas as competitiveness, product leadership, quality, delivery

performance, innovation and flexibility to respond to changes in demand. In particular, performance measures should be developed that support the objectives and competitive strategies of the organization. Divisional financial performance measures should therefore be seen as one of a range of measures that should be used to measure and control divisional performance.

2.0 OBJECTIVES

After studying this chapter, you should be able to:

- Distinguish between functional and divisionalized organization structures;
- Explain the factors that should be considered in designing financial performance measures for evaluating divisional managers.
- Explain why it is preferable to distinguish between managerial and economic performance;
- Explain the meaning of return on investment.

3.0 MAIN CONTENT

3.1 Divisional Financial Performance Measures

3.2 Divisional Performance Evaluation

In a organization, the degree of authority delegated by top management to lower level operating management can be viewed as a continuum. At one end, where complete executive control over activities is maintained by head office, and all decisions are made at the top level, the organization is totally centralized. At the other end, where the degree of autonomy exercised by lower level managers gives them full control over activities and decision, it would be described as totally decentralized. Neither end of this continuum is seen as desirable. In the case of total centralization, routine decision best handles (From the point of view of timeliness and detailed knowledge) by the manager at local level will divert valuable top management time and attention from the broader policy and strategic issues which face the firm as a whole. In the case of total decentralization, it is extremely difficult to obtain sufficient number of competent subordinate managers to operate the system successfully; not all will have equally good decision-making skills, and top management must therefore be willing to let them makes some costly mistakes. Furthermore, head office is faced with the problem of selecting an appropriate performance measurement system that will ensure that the managers of the operating units (often called

divisions) act in a way which is consistent with the goals of the organization as a whole (goal congruence.) in reality of course, few organizations operate at these extremes, but as any movement away from complete centralization necessarily involves a degree of decentralized activity, the problems associated with it must be recognized and solved.

3.2.1 Advantages of Decentralization

- Creates greater responsiveness to local needs: Information is the key to intelligent decisions. Compared with top managers, submit managers are better informed about their customers, competitor, suppliers and employees, as well as about factors that affect the performance of their job such as ways to decrease costs and improve quality.
- Lead to quicker decision making: An organization that gives lower-level managers the responsibility for making decisions can make decisions quickly, creating a competitive advantage over organizations that are slower because they send the decision-making responsibility upward through layer after layer of management.
- Aids management development and learning: Giving managers more responsibility promotes the development of an experienced pool of management talent—a pool that the organization can draw from to fill higher-level management positions. The organization also learns which people are not management materials.
- Sharpens the focus of managers: In a decentralized setting, the manager of a small submit has a concentrated focus. A small submit is more flexible than a larger submit and better able to adapt itself quickly to a fast-opening market opportunity. Also, top management, relieved of the burden of day-to-day operating decisions, can spend more time and energy on strategic planning for the entire organization.

3.2.2 Problem of Decentralization

Lead to sub-optimal (also called b incongruent) decision making, which arises when a decision's benefit to one submit is more than offset by the costs or loss of benefits to the organization as a whole. This cost arises because top management has given up some of control over decision making.

3.3 Functional and Divisionalized Organizational Structures

A functional organizational structure is one in which all activities of a similar type within a company are placed under the control of an appropriate department head. A simplified organization chart for a functional organizational structure is illustrated in Figure 1.1 (a).

It is assumed that the company illustrated consists of five departments - production, marketing, financial administration, purchasing and research and development. In a typical functional organization none of the managers of the five departments is responsible for more than a part of the process of acquiring the raw materials, converting them into finished products, selling to customers, and administering the financial aspects of this process. For example, the production department is responsible for the manufacture of all products at a minimum cost, and of satisfactory quality, and to meet the delivery dates requested by the marketing department. The marketing department is responsible for the total sales revenue and any cost associated with selling and distributing the product, but not for the total profit. The purchasing department is responsible for purchasing supplies at a minimum cost and of satisfactory quality so that the production requirements can meet.

You will see from Figure 1.1 that the marketing function is a revenue centre and the remaining departments are cost centers. Revenues and costs (including the cost of investments) are combined together only at the chief executive, or corporate level, which is classified as an investment center.

Let us now consider Figure 1.1 (b), which shows a divisionalized structure, which is split up into divisions in accordance with the products which are made. You will see from the diagram that each divisional manager is responsible for all of the operations relating to his or her particular product. To reflect this greater autonomy each division is either an investment center or a profit center. To simplify the presentation it is assumed that all of the divisions in Figure 1.1 (a) are Investment centers (we shall discuss the factors influencing the choice of investment or profit centers later in the chapter). Note that within each division there are multiple cost and revenue centers and also that a functional structure is applied within each division. Figure 1.1 (b) shows a simplified illustration of a divisionalized organizational structure. In practice, however, only part of a company may be divisionalized. For example, activities such as research and development, industrial relations, and general administration may be structured centrally on a functional basis with a responsibility for providing services to all of the divisions.

The distinguishing features between the functional structure Figure 1.1 (a) and the divisionalized structure Figure 1.1 (b) is that in the functional structure only one organization as a whole is an investment center and below this level a functional structure applied throughout. In contrast, in a divisionalized structure the organization is divided into separate investment or profit centers and a functional structure applies below this level.

General, a divisionalized organizational structure will lead to a decentralization of the decision-making process. For example, divisional manager will normally be free to set selling prices, choose which market to sell, in make product mix and output decisions, and select suppliers (this may Include buying from other divisions within the company or from other companies). In a functional organizational structure pricing within the company of from other companies). In a functional organizational structure pricing, product mix and product decisions will be made by central management. Consequently, the functional managers in a centralized organization will have far less independence than divisional managers. One way to express the difference between the two organizational structures is to say that the divisional managers have profit responsibility. They are responsible for generating revenues, controlling costs and earning a satisfactory return on the capital. invested in.

Figure 1.1 A functional and divisionalized organizational structure.



Their operation. The managers of the functional organizational structure do not have profit responsibility. For example, in Figure 1.1 (a) the production manager has no control over sources of supply, pricing or product mix and output decisions.

3.3.1 Profit Centers and Investment Centres

The creation of separate may lead to the delegation of different degrees of authority, for example, in some organizations a divisional manager may, in addition to having authority to make decisions on sources of supply and choice of markets, also have responsibility for capital investment decision. Where this situation occurs, the division is known as an investment center. Alternatively, where a manager cannot control the investment and is responsible only for the profits obtained from operating the fixed assets assigned to him or her by headquarters, the segment is referred to as a profit center. In contrast, the

term cost center is used to describe a responsibility center in a functional organization structure where a manager is responsible for costs but not profit.

Many firms attempt to simulate a divisionalized profit center by creating separate manufacturing and marketing divisions in which the supplying division produce a product and transfer it to the marketing division, which then sells the product in the external market. Transfer prices are assigned to the products transferred between the division. This practice creates pseudo-divisionalized profit centers. Separate profits can be reported for each division, but the divisional managers have limited authority for sourcing and pricing decisions. To meet the true requirements of a divisionalized profit center, a division should be able to sell the majority of its output to outside customers and should also be free choose the sources of supply.

3.3.2 Advantages of Divisionalization

Divisionalization can improve the decision-making process both from the point of view of the quality of the decision and the speed of the decision. The quality of the decisions should be improved because decisions can be made by the person who is familiar with the situation and who should therefore be able to make more informed judgments than central management who cannot be intimately acquainted with all the activities of the various segments of the business. Speedier decisions should also occur because information does not have to pass along the chain of command to and from top management. Decisions can be made on the spot by those who are familiar with the product lines and production processes and who can react to changes in local conditions in a speedily and efficient manner.

In addition, delegation of responsibility to divisional managers provides them with greater freedom, thus making their activities more challenging and providing the opportunity to achieve self-fulfillment. This process should mean that motivation and efficiency will be increased not just at the divisional manager level but throughout the whole division. A study by Dittman and Ferns (1978) of the attitudes of managers in companies in the USA found that those managers in charge of profit centers has greater job satisfaction than the managers of cost center. They conclude, that wherever possible, system designers ought to try to construct profit centers for organizational Units.

Another important reason for adopting a divisional zed structure is that the distribution of decision-making responsibility to divisions frees top management from detailed involvement in day-to-day operations, and enables them to devote more effort to strategic planning. It is also

claimed that divisions can provide an excellent training ground for future members of top management by enabling trainee managers to acquire the basic managerial skills and experience in an environment that is less complex than managing the company as a whole.

3.3.3 Disadvantages of Divisionalization

If a company is divisionalized, there is a danger that divisions may compete with each other excessively and that divisional managers may be encouraged to take action which will increase their own profits at the expenses of the profits of other division. This may adversely affect co-operation between the divisions and lead to a lack of harmony in achieving the overall organizational goals of the company. This in turn may lead to a reduction in total company profits.

It is also claimed that the costs of activities that are common to divisions may be greater for a divisionalized structure than for a centralized structure. For example, a large central accounting department in a centralized organizational structure may be less costly to operate than separate accounting department for each division within a divisionalized structure. If top management are contemplating a divisionalized structure, it is important that they assess whether the additional benefit will exceed the additional cost.

A further argument against divisionalization is that top management loses some control by delegating decision-making to divisional managers. It is argued that a series of control reports is not as effective as detailed knowledge of a company's activities. However, with a good system of performance evaluation together With appropriate control Information, top management should be able to effectively control operations.

SELF ASSESSMENT EXERCISE 1

- i) Compare and contrast the use of residual income and return on investment divisional I performance measurement, stating the advantages and disadvantages of each.
- ii) Division Y of Yaro Ltd currently has capital employed of N100,000 and earns an annual profit after depreciation of N18,000. The divisional manager is considering an investment of N10,00 in an asset which will have a ten year life ~~residual~~ value and will earn a constant annual profit after depreciation of N1,600 the cost of capital is 15%.

Calculate the following and comment on the results.

- a) The return on divisional investment, before and after the new investment.
- b) The divisional residual income before and after the new investment.
- c) The net present value of the new investment.

3.4 Distinguishing Between the Managerial and Economic Performance of the Division.

Before discussing the factors to be considered in determining how divisional profitability should be measured, we must decide whether the primary purpose is to measure the performance of the division or that of the divisional manager. The messages transmitted from these two measures may be quite different. For example, a manager may be assigned to an ailing division to improve performance, and might succeed in substantially improving the performance of the division. However, the division might still be unprofitable because of industry factors, such as overcapacity and a declining market. The future of the division might be uncertain, but the divisional manager may well be promoted might report significant profit but, because of management deficiencies, the performance may be unsatisfactory when the favourable economic environment is taken into account.

If the purpose is to evaluate the divisional manager then only those items directly controllable by the manager should be included in the profitability measure. Thus all allocations of indirect costs, such as central service and central administration costs, which are not controllable by divisional managers, ought not to be included in the profitability measure. Such costs can only be controlled where they are incurred; which means that they can be controlled only by central service managers and central management.

Corporate headquarters, however, will also be interested in evaluating a division's economic performance for decision-making purposes, such as expansion, contraction and divestment decision. In this situation a measure that includes only those amounts directly controllable by the divisional manager would overstate the economic performance of the division. This overstatement occurs because; if the divisions were independent companies they would have to incur the costs of those services provided by head office. Therefore, to measure the economic performance of the division many items that the divisional manager cannot influence, such as interest expenses, taxes and the allocation of central administrative staff expenses, should be included in the profitability measure.

Return on Investment

Instead of focusing purely on the absolute size of a division's profits, most organizations focus on the return on investment (ROI) of a division. ROI expresses divisional profit as a percentage of the assets employed in the division. Assets employed can be defined as total divisional assets, assets controllable by the divisional manager or net assets. We shall consider the alternative measures of assets employed later in the chapter:

ROI is the most widely used financial measure of divisional performance. Why? Consider a situation where division A earns a profit of N1 million and division B a profit of N2 million. Can we conclude that Division B is more profitable than Division A? The answer is no, since we should consider whether the divisions are returning a sufficiently high return on the capital invested in the division. Assume that N4 million capital is invested in division A and N20 million in division B. Division A's ROI is 25%

($\frac{N1m}{N4m}$) whereas the return for division B is 10% ($\frac{N2m}{N20m}$). Invested capital has alternative uses, and corporate management will wish to ascertain whether the returns being earned on the capital invested in a particular division exceed the division's opportunity cost of capital (i.e. the returns available from the alternative use of the capital). If, in the above illustration, the returns available on similar investments to that in division B is 15% then the economic, the ROI measure suggests that division A is very profitable.

ROI provides a useful overall approximation on the success of a firm's past investment policy by providing a summary measure of the ex post returns on capital invested. Kaplan and Atkinson (1998) also draw attention to the fact that, without some form of measurement of the ex post returns on capital, there is little incentive for accurate estimates of future cash flows during the capital budgeting process. Measuring returns on invested capital also focuses managers' attention on the impact of levels of working capital (particularly stocks and debtors) on the ROI.

Another feature of the ROI is that it can be used as a common denominator for comparing the returns of dissimilar businesses, such as other divisions within the group or outside competitors. ROI has been widely used for many years in all types of organizations so that most managers understand what the measure reflects and consider it to be of considerable importance.

Despite the widespread use of ROI, a number of problems exist when this measure is used to evaluate the performance of divisional managers. For example, it is possible that divisional ROI can be increased by actions that will make the company as a whole worse off, better off. In other word, evaluating divisional managers on the basis of ROI may not encourage goal congruence. Consider the following example:

	Division X	Division Y
Investment project available	N10 million.	N10 million
Controllable contribution	N2 million	N1.3 million
Return on the proposed project	20%	13%
ROI of divisions at present	25%	9%

It is assumed that neither project will result in any changes in non-controllable cost and that the overall cost of capital for the company is 15%. The manager of division X would be reluctant to invest the additional N10 million because the return on the proposed project is 20%, and this would reduce the existing overall ROI of 25%. On the other hand, the manager of division Y would wish to invest the N10 million because the return on the proposed project of 13% is in excess of the present return of 9%, and it would increase the division's overall ROI.

SELF ASSESSMENT EXERCISE 2

- i) Explain the meaning of each of the under noted measures which may be used for divisional performance measurement and investment decision-making. Discuss the advantages and problem associated with the use of each.
 - a) Return on capital employed.
 - b) Residual income
 - c) Discounted future earnings.

4.0 CONCLUSION

It this unit, we focus on financial measure: of divisional performance. The objectives are to develop performance measures that will achieve goal congruent.

5.0 SUMMARY

The major organizational device for maximizing decentralization is the creation of divisions. These may consist of investment center or profit centers. In an investment center a divisional manager can significantly influence the size of the investment, whereas in a profit center managers

are only responsible for obtaining profits from the assets that assigned to them. The major challenge to the accountant is to design performance measures that create a situation where managers acting in their own best interests also act in the best interest of the company as a whole.

6.0 TUTOR-MARKED ASSIGNMENT

- 1) Explain the value and use of non-financial performance measures
- 2) Describe the main characteristic and objectives of profit center and Investment centers.
- 3) Explain what conditions are necessary for the successful introduction of profit centers and investment centers.

7.0 REFERENCES/FURTHER READINGS

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UNIT 14 TRANSFER PRICING IN DIVISIONALIZED ORGANIZATION

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- 2.0 Objectives
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1.0 INTRODUCTION

All of the financial measures outcomes will be significantly affected when divisions transfer goods and services to each other. The established transfer price is a cost to the receiving division and revenue to the supply division which means that what ever transfer price is set, will affect the portability of each division. In addition, this transfer price will also significantly influence each division's input and output decisions, and thus total company profits.

In the unit, we shall examine the various approaches that can be adopted to arrive at transfer prices between divisions. Although our focus will be on transfer pricing between division (i.e. profit or investment cente).

2.0 OBJECTIVES

After studying this chapter, you should be able to:

- Describe the different purpose of a transfer pricing system.
- Describe the five different transfer pricing methods.
- Explain why cost-plus transfer prices will not result in optimum output being achieved.

3.0 MAIN CONTENT

3.1 Transfer Pricing in Divisionalized Organization

3.2. Transfer Pricing

Where the supplying division has no capacity constraints, the theoretically correct transfer price is the marginal cost of producing the intermediate product at the optimal output level for the company as a whole. Where unit marginal cost is constant (and thus equals variable costs) and fixed costs remain unchanged, this rule will give a transfer price equal to the variable cost per unit of the supplying division. However, when capacity constraints apply and the profit maximizing output cannot be achieved transfer prices based on marginal cost will not ensure that optimal output is achieved and in the situation it may be necessary for staff at the central headquarters to establish the optimum production programme for each division based on the output derived from a linear programming model.

3.3 Purpose of Transfer Pricing

A transfer pricing system is required to meet the following purposes:

- 1) To provide information that motivates divisional managers to make good economic decision. This will happen when actions that divisional managers take to improve the reported profit of their divisions also improves the profit of the company as a whole.
- 2) To provide information that is useful for evaluating the managerial and economic performance of the division.
- 3) To intentionally move profits between divisions or locations
- 4) To ensure that division autonomy is not undermined.

1) PROVIDING INFORMATION FOR MAKING GOOD ECONOMIC DECISIONS

Goods transferred from the supplying division to the receiving division are known as intermediate products. The products sold by a receiving division to the outside world are known as final products. The objective of the receiving division is to subject the intermediate product to further processing before it is sold as a final product in the outside market.

The transfer price of the intermediate product represents a cost to the receiving division and a revenue to the supplying division. Therefore transfer prices are used to determine how much of the intermediate

product will be produced by the supplying division and how much will be acquired by the receive division.

2) EVALUATING MANAGERIAL PERFORMANCE

When goods are transferred from one division to another, the revenue of the supplying division becomes a cost of the receiving division. Consequently, the prices at which goods are transferred can influence each division's reported profit, and there is a danger that an unsound transfer price will result in a misleading performance measure that may cause divisional managers to believe that the transfer price is affecting their performance rather than unfairly. This may lead to disagreement and negative motivational consequences.

3) CONFLICT OF OBJECTIVES

Unfortunately, no single transfer price is likely to perfectly serve all of the four specified purpose. They often conflict and managers are forced to make trade -offs. In particular the decision -making and the performance evaluation purpose may conflict with each other.

For examples, in some situations the transfer price that motivates the short-run optimal economic decision is marginal cost. If the supplier has excess capacity, this cost will probably equal variable cost. The supplying division will fail to cover any of it's fixed costs when transfers are made at variable cost, and will therefore report a loss. Furthermore, if a transfer price equal to variable cost (N 1 00 in the above example) is imposed on the manager of the supplying division, the concept of divisional autonomy and decentralization is undermined.

In the other hand, a transfer price that may be satisfactory for evaluating divisional performance (N150 in the above example) may lead divisions to make sub optimal decisions ~hen viewed from the overall company perspective.

3.4 Alternative Transfer Pricing Methods

There are five primary types of transfer prices that companies can use to transfer goods and services.

1) Market-base transfer prices: These are usually based on the listed price of an identical or similar products or services, the actual price the supply division sells the intermediate product to external customers (possibly less a discount that reflects the lower selling costs for inter-group transfers or the price a competitor is offering.

- 2) **Marginal cost transfer prices:** Most accountants assume that marginal cost can be approximated by short-run variable cost which is interpreted as direct costs plus variable costs.
- 3) **Full cost transfer prices:** The term full cost or long-run cost are used to represent the sum of the cost of all used resources that are committed to a product or service in the Long-term. Some firm add an arbitrary mark-up to variable cost in order to cover fixed costs and thus approximate full cost. Such an approach is likely to result in inaccurate estimate of full cost.
- 4) **Cost plus a make-up transfer prices:** With cost-based transfer prices the supplying divisions do not make any profits on the products or services transferred. Therefore they are not suitable for performance measurement. To overcome this problem a mark-up is added to enable the supplying divisions to earn a profit on inter-divisional transfer.
- 5) **Negotiated transfer prices:** In some cases transfer prices are negotiated between the manager of the supplying and receiving divisions. Information about the market prices and marginal or full costs often provide an input into these negotiations although there is no requirement that they must do so.

SELF ASSESSMENT EXERCISE 1

- i) Transfer between processes in a manufacturing company can be made at (i) Cost or (ii) I sales value at the point of transfer.
- ii) Discuss how each of the above methods might be compatible with the operation of a responsibility accounting system.

3.5 Desirable Attributes of a Good Transfer Pricing System

- i) **GOAL CONGRUENT** -The prices should be set so that the divisional management's desire to maximize divisional profit is consistent with the objectives of the company as a whole. The transfer prices should not encourage suboptimal decision making
- ii) **DIVISIONAL AUTONOMY:** The prices should seek to maintain the maximum divisional autonomy so that the benefits of decentralization (motivation, better decision making, initiative etc) are maintained. The profit of one division should not be dependent on a action of the division.
- iii) **TAX MINIMIZATION:** In multinational companies, the prices should lead to the minimization of tariffs and income taxes and observance of legal restrictions.

In practice there are extreme difficulties in establishing prices, which meet all the desirable objectives. If prices are set centrally at levels where over all company objectives are met, then the autonomy of divisions is compromised motivation may diminish and some of the benefits of decentralization will be lost.

3.6 Cost-Plus Mark-Up Transfer Prices

Cost-plus a mark-up transfer prices represent an attempt to meet the performance evaluation purpose of transfer pricing by enabling the supplying division profit on the goods and services transferred. Where full cost issued as the cost base the mark-up is intended to cover both fixed cost and a profit contribution.

Where such an approach is adopted the estimate of full cost will be even more inaccurate than traditional costing system. A further problem arises if we extend our analysis beyond two divisions' to several divisions.

SELF ASSESSMENT EXERCISE 2

- i) Shadow prices (net opportunity costs or dual prices) may be used in the setting of transfer , prices between divisions in a group of companies, where the intermediate products being transferred are in short-supply.
- ii) Explain why the transfer prices thus calculate are more likely to be favoured by the management of the divisions supplying the intermediate products rather than the management of the divisions receiving the intermediate products.

4.0 CONCLUSION

In this unit, we have discussed the different purpose of transfer pricing. We also describe the five methods of transfer pricing and explain cost-plus transfer prices will not result in the optimum output.

5.0 SUMMARY

A transfer pricing system is required for meeting the following purposes:

- 1) to provide Information that motivates divisional managers to make good economic decisions.
- 2) to provide information that is useful for evaluating performance of the managerial and economic performance of the divisions;

- 3) to intentionally move profits between division or locations.
- 4) To ensure that divisional autonomy is not undermined.

In most circumstances, where there is a perfectly competitive market for an intermediate product it is optimal for both decision-making and performance evaluation purposes to set transfer prices at the competitive market prices. If there is no external market for the intermediate product or the market is imperfect, marginal cost transfer prices will motivate both supplying and receiving divisions to operate at output levels, that will maximize overall company profits.

6.0 TUTOR-MARKED ASSIGNMENT

Division X IS a profit center which produces three products, A,B and C. Each product has an external market, but B can also be transferred to Division Y. The maximum quantity that might be required for transfer is 3 unit of B. information on the product is as follows:

	A	B	C
External market price per unit	N84	N81	N70
Variable production cost in			
Division X, per unit	N57	N41	N49
Labour hours required per unit			
In Division X	3	4	2
Maximum external sales in units	1,400	875	525

Required:

- 1) If labour hours in Division X are Limited to 1,170, what is the appropriate transfer price for a unit of B?
- 2) If Labours in Division X are Limited to 3,670 what is the appropriate transfer price for a unit B?

7.0 REFERENCES/FURTHER READINGS

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Omolehinwa A., (2005): Work out management Accounting. Pye Nigeria Limited, Lagos.

UNIT 15 CASH FLOW STATEMENT

CONTENTS

- 1.0 Introduction
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 - 3.1 Cash Flow Statement
 - 3.2 Cash flow Analysis
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 - 3.3 Fund flow Vs Cash Flow
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 - 3.5 Cash flow Statement: The Present Status
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1.0 INTRODUCTION

The importance of cash in the entire economic life of a firm can hardly be exaggerated. A firm may operate profitably, yet it may find it difficult to meet its commitments, including payment of wages, taxes, dividends, etc. This may be because either the amount of cash available may be far less than the profit earned during the period or the cash may have been used for some other purposes. Again, at times, cash may be flowing in much faster than it is being disbursed. So, during periods of temporary cash accumulation, the finance manager may seek some outlet for these funds (temporary Investments). The Opposite of this situation generally requires the arrangement of the required amount from appropriate sources. Thus, the management must know the movement of cash during a period of efficiently running its operations. A cash flow analysis is considered to be a tool in the hands of the management in this respect.

A cash flow statement shows changes in the financial position of a firm on a cash basis. In other words, it shows the net effects of the various transactions of a firm during a period on cash and explains the causes of changes in the cash position of a firm between two balance sheet dates. It is called the 'cash flow statement' because it shows the various sources and applications of cash during a period and their net impact on the cash balance.

A cash flow statement is similar to a funds statement in some respects. But a funds flow statement, as discussed in the previous section, generally shows its impact on working capital position; it can also be prepared on the basis of other concepts. But a cash flow statement always focuses its attention on the cash position. However, when a funds flow statement is prepared on the basis of the 'cash concept' of fund, there is no distinction between funds flow and cash flow analysis.

It may be mentioned here that the cash flow analysis may be based on actual data or I estimated data. While the former provides only an analysis of past results, the latter is very useful for planning and control purposes. A cash budget (prepared adjusted profit and loss method) may also be called cash flow statement. But in the usual cash flow statement, the I net effect of cash expenses and cash incomes (i.e. cash operating profit) are considered in the addition to other sources of receipts (share capital, debentures, institutional loan, sale of fixed asses,, etc.) payments (e.g., capital payment, payment of dividends, etc.). The term cash is used In Its literal' sense, VIZ., It Includes state and bank money In hand and bank deposits withdraw-able by cheques on demand.

2.0 OBJECTIVES

After studying this unit you should be able to:

- Explain purpose of cash flow analysis,
- Define of cash flows; and
- Preparation of cash flow statement

3.0 Main Content

3.1 Cash Flow Statement

3.2 Cash Flow Analysis

The primary purpose of a cash flow statement is to provide information about the cash receipts and cash payments of the firm during a period, and their impact on the ending cash balance. More specifically, a cash flow statement helps to assess the firm's ability to:

- a) Generate cash flows from operating, financing and investing activities;
- b) Meet its obligations (e.g. payment of wages, expenses, creditors, taxes, interest, etc.) and pay dividends;
- c) Determine net increase or decrease in cash during any period and consequently the amount of the ending cash balance; and

- d) Explain the difference between net profit and net cash flows from operations

A cash flow statement also gives information about non-cash investing and financing activities. A cash flow statement thus gives a true picture of a firm's liquidity and solvency position.

Cash flow analysis based on passed figures, however, has limited usefulness. A projected cash flow statement helps the management in the area of financial planning and control. In other words, it can serve the following purposes:

1. A projected cash flow statement gives the management a better idea as to the nature of the estimated cash transactions during the period and their impact on cash balance.
2. In case of expected cash surplus, it helps the management to take short term investment decisions.
3. In the event of shortage of cash, it highlights the amount that is to be arranged from appropriate sources for meeting the expected commitments of the firm.

It may be mentioned that for both investment and financing decisions, the amount and the period involved are two important pieces of information that the management should know well in advance. A projected cash flow statement can provide them. The usefulness of cash flow statements to the users of published accounts hardly needs any emphasis. For example, prospective investor should also consult this statement not only for determining the profitability of the firm but also for ensuring that his investment would get regular return (cash dividend) in future. Banks do insist, on, among other things, projected cash flow statement while considering application from firms for term-loans or cash credit. Likewise, the income tax department may also require this statement under certain circumstances.

Because of their usefulness' to the management and the users of accounts, it is desirable that cash flow and funds flow statements do accompany the conventional profit and loss account, and balance sheet. It is true that, at present, the law does not require both these statements to be annexed to conventional financial statements. But there is no embargo on their inclusion. Cash flow statement has been made mandatory for listed companies and other specified organizations with effect from 1 April, 2001 pursuant to revised Accounting Standard 3. Inclusion of the cash flow statement further enhances the utility of financial statements to various user groups

3.2.1 Meaning of Cash Flows

'Cash flows' are inflows and outflows of 'cash' and 'cash equivalent'. In other words, a cash flow statement is prepared on the basis of 'cash and cash equivalent'

Cash comprises cash on hand and at bank, and demand deposits. Cash equivalents are short-term, highly liquid investments that are held for purpose of meeting short-term cash commitments. These short-term, highly liquid investment are: (a) readily convertible into known amount of cash, and (b) subject to insignificant risk of changes in value.

Cash equivalents are defined as short-term, highly investments which can be converted into cash within three months from the date of acquisition and which are subject to insignificant risk

3.3 Funds Flow Vs. Cash Flow

Both funds flow and cash flow statements are prepared to show the changes in the financial position of a firm during a particular period. They can be used as tools in the hands of the management for planning and control. For preparation of both the funds flow and cash flow statements, relevant figures in the balance sheets and those in the profit and loss account for a period, and certain other information, are necessary. As a matter of fact, funds flow and cash flow statements are complementary to each other and should be prepared simultaneously to facilitate an in depth analysis of the financial position of a firm during any particular period. Yet the following distinctions may be made between the two:

- 1) A funds statement may be prepared on the basis of alternative concepts of funds (e.g. cash, working capital, total financial resources, etc.), though the working capital concept is more popular and widely used. A cash flow statement can be prepared on 'cash' concept only. Thus, the latter statement uses the narrower concept of funds while analyzing the financial position of a firm during a period.
- 2) A cash flow statement is based on the 'cash basis' of accounting while a funds flow statement is based on the 'accrual basis of accounting. That is why, while preparing the cash flow statement, operating profit or loss as per the accrual system needs some adjustment in order to arrive at the cash operating profit.
- 3) A funds flow statement is generally accompanied by a statement showing changes in the working capital during the period under

consideration. A cash flow statement does not accompany any such statement.

- 4) Although both can be used for planning and control purposes, funds flows are generally used for intermediate and long-range planning.

3.4 Preparation of Cash Flow Statement

As already stated, a cash flow shows the impact of various transactions in the cash position of a firm. For preparing a cash flow statement, one has to take the help of balance sheets, the profit and loss account, and certain other relevant information. More precisely, it starts with the opening cash and bank balance. From the aggregate figure as above, the cash outflows are deducted. The resultant figure will be the closing cash and bank balance. In other words, opening cash along with cash inflows during the period should equal the aggregate of cash outflows and the closing balance. When closing balance is given (actual or estimated figure), a reconciliation between the two, i.e., the closing balance as per the cash flow statement and that as per the cash flow statement and that as per the balance sheet, may be made.

The cash flow statement may be prepared either in vertical form or in T-form. **A proforma cash flow statement is shown in Figure 1.1**

Opening cash and bank balance				XX
Additions during the year:				
Cash operating profit (or cash from operations)		XX		
Sales of fixed assets, investments, etc.	XX			
Issue of share capital		XX		
Long-term loan (debentures Institutional loan, etc.)	XX			
Non-trading income, if any		<u>XX</u>	XX	
Total				<u>XX</u>
Less: Applications during the year:				
Cash used in Operations (loss), if any	XX			
Purchase of fixed assets, Investments etc.	XX			
Redemption of preference shares		XX		
Repayment of long-term loan		XX		
Repayment of dividend, tax, etc.		<u>XX</u>		
Closing cash and bank balance				<u>XX</u>

Proforma Cash Flow Statement (Using T- form)

	<u>N</u>	<u>N</u>
Opening balance	XX	Cash Outflows:
Add: Cash inflows:		Purchase of fixed assets
Cash trading		Redemption of preference share
Profit or cash	XX	Repayment of loan
From operations	XX	Payment of dividend, tax, etc.
Sales of fixed assets, etc.	XX	
Share capital	XX	Closing balance
Long-term loan, etc.	XX	
Non-trading income, if any	XX	
		<u>XX</u>
Total	XX	XX

Fig 1.2 Cash Flow Statement -an Alternative Form

While either of the two alternative methods of presentation may be used for the purpose, the vertical, form is a better method of presentation as it focuses attention on the flow of cash in a more prominent way.

3.4.1 Items of Cash Inflows and Outflows (Other than Cash from Operations)

Some of these items can be determined directly by simply comparing the relevant figures at two balance sheet dates. For example, if the share capital as at the beginning of the period is, say, N 60,000 while the same stands at N 75,000 at the end of the period, unless otherwise stated, it is apparent that during the period under consideration there has been cash inflow to the extent N15,000 on account of the issue of share capital. But in a majority of the cases, ledger accounts will have to be checked for finding out the amount of the cash inflow or outflow on various heads. The procedure to be followed in this respect is similar to what has already been explained in the chapter dealing with funds flow analysis.

Cash From Operations

This is nothing but operating or trading profit on cash basis. Therefore, when detail of cash transaction, e.g., sales, purchase, expenses, etc., are available, the cash trading profit can be easily ascertained as follows:

Profit and Loss a/c (Cash Basis)

To Cash purchases	XX	By Cash sales	XX
To Wages and Salaries paid	XX	By Misc. income received (trading)	XX
To Expenses paid	XX		
To Cash trading profit	XX		
(or cash from operations)	XX		
-balancing figure			
	XX		XX

Alternatively, one may start with net profit or loss and make necessary adjustments with respect to non-cash and non trading items which have been debited (e.g., outstanding wages and salaries, depreciations, provisions for bad and doubtful debts and inventory losses, write-offs, loss on sale of fixed assets, etc.) or credited (e.g., dividend, commission, etc. received, profit on sale of fixed assets, etc.), to profit and loss account as well as to the changes in current assets and current liabilities. A proforma statement showing the determination of cash operation profit is shown below:

Statement Showing Cash from Operations

Net profit as per profit and loss account				XX
Add: (i) <i>Non-cash and non-trading items debited</i>				
To profit and loss a/c:				
Outstanding wages, salaries, etc.	XX			
Depreciation		XX		
Provision for bad and doubtful debts	XX			
Allowance for inventory loss	XX			
Goodwill written off		XX		
Preliminary expenses written off	XX			
Loss on sale of fixed assets	XX			
				XX
(ii) Decrease in current assets				XX
(other than cash and bank balances)				
Decrease in current liabilities	XX	XX	—	<u>XX</u>
Less: (i) <i>Non-trading receipts like dividend, miscellaneous</i>				XX
Income credited to profit and loss a/c				
(ii) Decrease in current liabilities				<u>XX</u>
Cash operating profit or cash from operations -				
During the period				<u>XX</u>

SELF ASSESSMENT EXERCISE 1

From the profit and loss account for the year ended 31st December 20X2 of a company and balance sheets as on 31.12.20X1 and 31.12.20X2 respectively, prepare a cash flow statement for 20X2.

Profit and loss a/c for the Year Ended 31.12.20X2

To: Cost of materials consumed	162,000	By Sales	200,000
Expenses		20,000	By profit on sale of plant 5,000
Depreciation		5,000	By Misc. income 10,000
Deferred expense	2,000		
Net profit c/d	<u>26,000</u>		
	215,000		215,000
To Dividend	8,000		
To Balance c/d	—	18,000	By Net Profit b/d 26,000
	—		26,000 <u>26,000</u>

Balance Sheet

	20X1	20X2	20X1	20X2	
	N	N	N	N	
Share capital	80,000	90,000	Fixed assets	40,000	56,000
Profit and loss a/c	30,000	48,000	Inventories	20,000	14,000
Creditors	20,000	30,000	Debtors	60,000	90,000
Liabilities for expenses	6,000	10,000	Prepaid expenses	6,000	4,000
			Deferred expenses	4,000	2,000
	140,000	180,000		140,000	180,000

An old plant has been sold for ₦10,000

Starting with the trading profit (on mercantile basis), cash operating profit is arrived at by making necessary adjustments in respect of increase and/or decrease in current assets (other than cash and bank balance) current liabilities only.

A proforma statement showing how the cash operating profit is to be arrived at is given below:

Funds from Operations or Trading Profit	N	N	=	=
(on mercantile basis)				XX

Add: (a) Decrease in current assets (other than Cash and bank balances) XX

(b) Increase in current liabilities XX

XX

Less: (a) Increase in current assets (other than Cash and bank balances) XX

(b) Decrease in current liabilities XX

—

XX

Cash operating profit (or cash from operations)

It may be noted that with the increase in or creation of new liabilities (fixed or current), there is an inflow of actual or notional cash, as an increase in assets (fixed or current) represents out flow of cash. Increase in permanent or long-term liability (e.g., the issue of share capital, debentures, long-term loan, etc.) results in the inflow of actual cash. But an increase in current liabilities generally results in the inflow of notional cash. For example, the purchase of raw materials on credit increases sundry creditor, on the one hand, and inventories on the other.

The credit granted by the supplier, provides the channel, the source, and increase in the value of inventories, the application of the said fund. When credit is granted by supplier, no cash comes in but some fund of value is received with which the current asset item of raw materials is purchased. Current assets like inventories, debtor etc., can be increased either by the application of actual cash or through the creation of new liability. Thus, an increase in current liabilities results in a cash inflow while an increase in current asset represents the application of cash. Similarly, a decrease in stock, debtor, etc. results in a cash inflow. But current liabilities can decrease only on liquidation of the same in part or in full. Therefore, a decrease in current liabilities represents and outflow of cash.

Cash Flow Statement for 20X2

(Using T-form)

	N		N
Opening balance	10,000	Cash outflows:	
Add: Cash inflows:	N	Fixed Assets	26,000
Sale of fixed assets	10,000	Dividend	8,000
Share capital	10,000		34,000
Cash operating		Closing balance	14,000
Profit (note1)	<u>18,000</u>		
	<u>38,000</u>		
	<u>48,000</u>		<u>48,000.</u>

3.5 Cash Flow Statement: The Present Status

In view of the importance of the cash flow statement in measuring the liquidity and solvency position of a firm, its inclusion has been made mandatory as part of annual accounts in many countries, viz., Australia, Canada, Japan, New Zealand, the UK and the USA. In India, a cash flow statement does not form part of financial statement to be prepared under the companies Act, 1956. But the Securities and Exchange Board of India (SEBI) has mandated that, as part of the Listing Agreement, listed company is required to prepare, among other things, a cash flow statement and get it audited. Thus, SEBI has been instrumental in the cash flow statement as part of the financial statement. Under Section 11 of SEBI Act, 1992, SEBI has directed all recognized stock exchanges to amend Clause 32 of the Listing Agreement* to specify the requirement of annexing an audited cash flow statement as part of the annual accounts. In 1995 SEBI also issued 'Guidelines for cash flow statements' for compliance. Following the international trend, the Institute of Chartered Accountants of India revised AS-3 in March 1997 and replaced the fund flow statements with cash flow statement. The revised

AS-3 was initially only recommended but became mandatory with effect from 1.4.2001. Thus, during the period 1995-96 to 2000 -2001, listed companies prepared cash flow statements in accordance with SEBI guidelines. In order to avoid duplication of efforts and expenses, SEBI recently changed Clause 32 of the Listing.

Figure 1.3 gives a proforma cash flow statement for an enterprise other than financial I enterprise (AS-3) showing cash flows from operating activities under the indirect method.

Proforma Cash Flow Statement (AS-3)

Cash Flows from Operating Activities:

	₹ N	—
Net profit before taxation and extraordinary item		XX
Adjustment for:	XX	
(+) Depreciation	XX	
(+) Foreign exchange loss	XX	
(-) Interest income	XX	
(-) Dividend income	XX	
(+) Interest expense	<u>XX</u>	XX
Operating profit before working capital changes		<u>XX</u>
(+) Decrease in current assets	XX	
(+) Increase in current liabilities	XX	
	<u>XX</u>	
(-) Increase in current assets	XX	
(-) Decrease in current liabilities	<u>XX</u>	XX
Cash generated/used from operations:		<u>XX</u>
(-) Income tax paid		XX
Cash flow before extraordinary item		XX
(±) Extraordinary item		XX
Net Cash Flows from Operating Activities		XX
Cash Flows from Investing Activities		XX
(see Figure 5.3 for details)		
Cash Flows from Financing Activities		<u>XX</u>
(see Figure 5.3 for details)		
Net increase in cash and cash equivalents		XX
Cash and cash equivalents at beginning of period		<u>XX</u>
Cash and cash equivalents at end of period		<u>XX</u>

Figure 1.3 Cash Flow Statement Showing Cash Flows from Operating Activities I under the Indirect Method

Under the indirect method, net income as per the income statements is taken as the starting point and adjustments to net income are made in respect of non-cash items appearing in the income statement as also in respect of changes in current assets and current liabilities during the year to reconcile net income to net cash provided by operating activities. The direct method shows operating cash receipts and payments. It is thus more consistent with the Objective of the cash flow statement. The FASB has expressed preference for the direct method. But, in practice, an overwhelming majority of the firms in the USA (97.5 per cent) use the indirect method and only a handful of them (2.5 per cent) use the direct method. In India, most of listed companies use the indirect method for preparation of the cash flow statement. Companies favour the indirect method for two reasons: (1) it is simple and easy to prepare, and (2) it focuses on the differences between net income and net cash flows from operating activities.

SELF ASSESSMENT EXERCISE 2

From the Information given in the previous illustration, suppose the profit and loss account is dropped and the following additional information is given immediately after the balance sheets:

An old machine has been sold for W 10,000 (W.D.V. -N. 11,000) and paid during the period W 8,000 and depreciation charged to profit and loss account for the year amounted to W 5,000. Expenses w/o W 2,000.

Prepare a cash flow statement for 20 X 2.

4.0 CONCLUSION

In this unit we discussed generally cash flow statement and the purpose of cash flow analysis.

5.0 SUMMARY

A cash flow statement show changes in the financial position of a firm on cash basis. However, it shows the net effects of the transactions of a firm during a period on cash and explains the causes of changes in the cash position of a firm between two balance sheet dates.

6.0 TUTOR-MARKED ASSIGNMENT

You are given the comparative balance sheet as at 31st December 20X1 and 31st December 20X2, the profit and loss account for the year ended 31st December 20X2 and I additional information for 20X2 for ABC.

Ltd. Prepare a statement of cash flows for the year ended 31st December 20X2 using the (i) direct method, and (ii) indirect method.

ABC LTD.

Comparative Balance Sheet as on 31st December

	20X1	20X2
	₦ N	=
<i>Sources of Funds:</i>		
Share capital	60,000	80,000
Retained earnings	8,400	18,800
Bonds payable		18,000
Income tax payable		2,400
Accrued expenses	4,000	3,000
Sundry creditor	<u>12,000</u>	<u>1,400</u>
Total 84,000	<u>132,000</u>	
<i>Applications of Funds:</i>		
Land	16,000	36,000
Equipment		32,000
Accumulated depreciation		(3,200)
Inventory	32,000	26,000
Sundry debtors	3,000	2,400
Prepaid expenses	1,600	1,200
Cash and Bank	<u>31,800</u>	<u>38,200</u>
Total 84,400	<u>132,600</u>	

ABC LTD.

Profit and Loss Account for the Year Ended 31st December, 20X2

	₦	₦
I Cost of goods sold	132,000	Sales 36,000
Operating expenses		
(excluding depreciation)	35,200	
Depreciation expenses	3,600	
Loss on sale of equipment		200
Income tax	7,200	
Net profit	16,800	
	<u>195,000</u>	<u>192,000</u>

Additional Information:

- (a) In 20X2 ABC declared and paid ~~N~~6,400 dividend.
- (b) Bonds were issued at par in cash.
- (c) Equipment purchased worth =N 36,000. Equipment costing ~~N~~4,000 was sold for ~~N~~3,400 (book value ~~N~~3,600)
- (d) Shares of ~~N~~20,000 were issued to acquire land.

7.0 REFERENCES/FURTHER READING

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UNIT 16 WORKING CAPITAL MANAGEMENT

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Working Capital Management
 - 3.2 Working Capital- Its Nature
 - 3.2.1 Flow of Working Capital
 - 3.3 Working Capital Various Concepts
 - 3.4 Relation between Current Assets and Fixed Assets
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 - 3.6 Working Capital Management
- 4.0 Conclusion
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1.0 INTRODUCTION

The term working capital refers to the capital available for running the day to day I operations of an organization. It is defined as current assets less current liabilities.

In the previous units, we have discussed investment and management decisions. The implied focus is on fixed assets. Unlike fixed assets, working capital can be financed not only by long-term sources of finance but short-term sources of finance. In considering working capital management, it can be argued that the discussion on short-term finance cannot be separated from long-term finance.

2.0 OBJECTIVES

After studying this unit, you should be able to:

- Define the term working capital
- Explain the relationship between current Assets and fixed assets
- Describe the Liquidity Profitability tangle

3.0 MAIN CONTENT

3.1 Working Capital Management

3.2 Working Capital-Its Nature

In ordinary parlance, working capital is taken to be the fund available for meeting the day-to-day requirements of an enterprise. It cannot be denied that a part of the fixed or permanent capital is invested in assets, which are kept in the business permanently or for a long period, for the purpose of earning profit. These are usually known as fixed assets, viz land and buildings, plant and machinery, furniture and fittings and intangibles like goodwill, patent and trade marks and long-term investments. Another part of permanent capital, left in the business for supporting the day-to-day normal operations, is known as working capital. This working capital generates the important elements of cost, viz materials, wages and expenses. These costs usually lead to production and sales in case of manufacturing concerns, and sales alone in others. These costs occur gradually in a flow and do not come into being abruptly at a given moment.

Hence, the initial investment of cash as working capital for this specific purpose has to be continued till the moment when sales revenue starts flowing in substantially and in a regular way. From this stage, the business is found to acquire a momentum of its own. The flow of revenue is expected to continue to replace the cash lost in its day-to-day outflow for the generation of the costs mentioned above.

The investment from long-term source in current assets which go to make up the working capital has only been mentioned above. But in case of an ongoing concern additional provisions for the maintenance of current assets are received from short-term sources from outside the business. For example, stocks may be held for resale by a trading concern and in the process working capital may be used within the business; but the credit received from the suppliers serves the purpose of 'finance' as long as payment is not made. Thus, in practice, both long-term and short-term sources are used to provide funds to be used as working capital.

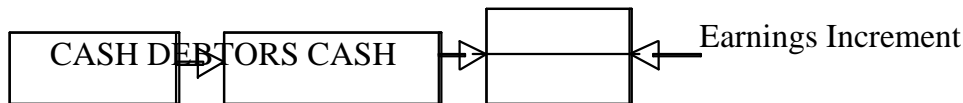
3.2.1 Flow of Working Capital

One of the distinguishing features of the fund employed as working capital is that it constantly changes its form to drive the business wheel. It is also known as circulating capital means current assets of a company, which are changed in the ordinary course of business from

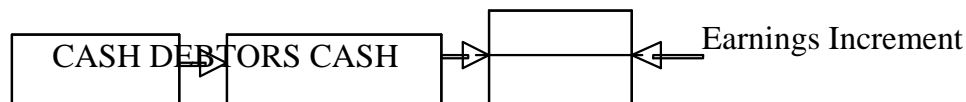
form to another, as for example, from cash to inventories, inventories to receivables, receivables to cash.

In case of a manufacturing concern, the flow:

(A) In the case of a purely financial enterprise.



(B) In the case of a purely trading enterprise:



(C) In the case of a manufacturing enterprise, the cycle is even wider,
e.g.

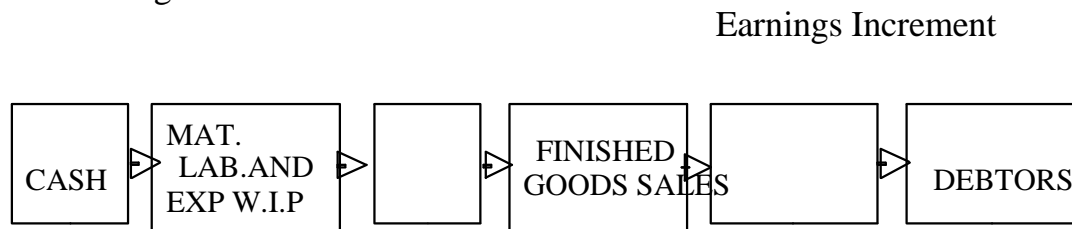


Figure 1.1 Working Capital Cycle.

Working capital may be explained as follows. In the first instance, the original funds invested used to meet expenses and wages. Raw materials are received on credit from the suppliers. Credit received on account of supply of materials, payment of wages, etc. serves the purpose additional fund till payment is made. The materials are then processed into finished goods, we are sold to the customers on credit. Ultimately credit sales are converted into cash. The cash will arises by means of these sales transactions flows into the enterprise and is used for various purposes, including the provision of funds to recommence the cycle.

3.3 Working Capital-Various Concepts

There are two possible interpretations of working capital

- Balance sheet concept
- Operating cycle concept.

Balance sheet concept

There are two interpretations of working capital under the conventional balance sheet concept

- Gross concept
- Net concept

According to the gross concept, working capital is used as a synonym for gross or total current assets. Current assets are considered as working capital as all of its helps to earn profits, and the management is more concerned with the total current assets as they constitute the total funds available for operational purposes. For determining the rate of return on investments in current assets like fixed assets, the gross working capital concept is more useful. It takes care of the fact that other things remaining constant, an increase in fund will increase working capital and vice versa. But where short-term debts are due to outsiders, it is advisable to deduct these from the gross current asset values to reveal the net effective working capital value. Thus, according to the net concept; working capital is represented by the excess of current assets over current liabilities, and is the amount normally available to finance current operations. It is argued that (a) in the long run, what matters is the surplus of current assets over current liabilities, (b) it is this concept which helps creditors and investors to judge the financial soundness of an enterprise (c) what can always be relied upon to meet contingencies, is the excess of current assets over the current liabilities since this amount is not to be returned; and (d) this definition helps to find out the correct financial position of companies having the same amount of current assets. The Institute of Chartered Accountants of India, while suggesting a vertical form of balance sheet, also endorsed the former view of working capital when it described 'net current assets' as the difference between current assets and current liabilities.

There is yet another view according to which the net working capital may be referred to as the 'qualitative' and the total current assets as the 'quantitative' aspect of the idea. Since both the categories, 'gross' and 'net' or 'quantitative', depend on Balance Sheet items for their contents, these two concepts of working capital are generally known as the Balance sheet concepts.

Composition of work capital. The constituent parts normally making up the figure of working capital, or, as otherwise called, the 'net current assets, will most frequently be items such as are given below: current assets; This includes assets which can be converted, in the ordinary course of business, into cash within one accounting year, such as:

- Stocks (including raw materials and spares, work-in-progress and finished goods)
- Sundry debtors (net of provisions) Bills receivables
- Advances/inter-company loan (short-term)
- Temporary investments of surplus funds
- Prepayments
- Accrued incomes
- Cash at bank
- Cash in hand.

Current assets components have one characteristic in common, that is, each component swiftly transformed into other asset forms. As for example, cash is utilized to replenish inventories are diminished when sales are effected that augment either accounts receivable (in of credit sales) or cash (in case of cash sales}; collection of accounts receivable increases the balance and so on. Current assets are, therefore, short-lived. As stated earlier, their life span not normally exceed one year. But in practice, some assets that violate this criterion may be classified as current assets. For example, tobacco companies keep their raw materials in storage more than a year, but nevertheless report these inventories as current assets.

Current Liabilities: This includes liabilities which are to be liquidated, in the course of business, within one accounting year normally out of current assets or funds for operations, such as:

- Trade creditors
- Bills payables
- Outstanding or accrued expenses
- Short-term loans
- Taxation
- Dividends
- Bank overdraft (of temporary nature)
- Outstanding liabilities currently payable (e.g. settlement of an action, amount payable respect of compensation. etc.

In order to get the true picture regarding the volume of working capital required to sustain given activity level, adjustments should be made with respect to items which are not considered normal in terms of the ordinary course of operations of a firm. For example, in computing world capital, the following figures should be deducted from the respective figures of current assets:

- i. Obsolete stock items, if any
- ii. Debts not expected to be received within a reasonably current period
- iii. Investments of long-term nature
- iv. Cash earmarked for the purchase of fixed assets or for liquidation of a long-term liability (e.g. redemption of debentures).

3.4 Relation between Current Assets and Fixed Assets

The composition of the total investment in assets of a firm (fixed vs. current) depends on a number of factors, viz. the nature of business, sources of finance available, and the risk-bearing capacity of a firm. However, given a particular set-up, a firm may have different levels of current assets to support the same volume of activity. Again, when output and sales increase, the need for current assets also increases. Generally, it can be stated that the requirement of current assets by a firm should increase at a rate which is lower than that of an increase in output and sales.

From the point of investment in current assets there may be three approaches.

1) Conservation approach: A relatively high level of investment is

made in current assets to support a given volume of activity. According to this approach, a firm does not want to take the risk of maintaining a lower level of current assets. But holding more and more current assets may adversely affect its profitability.

2) Aggressive approach: For supporting the same volume of

output, a firm may decide to have a lower level of current assets. By reducing investment in current assets, it may attempt to increase the return on investment but then it is likely to be exposed to more risk.

3) Moderate approach: This means that a firm decides to have

neither a very high level (conservative) nor a very low level (aggressive) of current assets-it strikes a balance between the two.

When the level of current assets is measured in terms of the current assets to fixed assets (C/F A) ratio, it may be stated that, fixed assets remaining constant, a high ratio indicates more investment in current assets and vice versa. The position may be explained with the help of

Figure 4.5

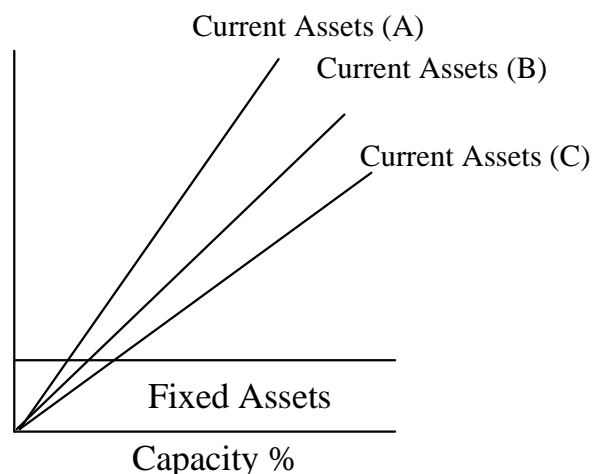


Figure 4.5 Level of Investment is fixed and current Assets (Different Approaches)

The above figure shows that at alternative A, the CNFA ratio is greatest at every level of production. This indicates a conservative approach. Alternative C represents the most aggressive policy by showing the lowest CNFA ratio at all levels. Alternative B, a moderate approach, lies between alternative A and C.

In medium and large public limited companies in India, the relation between current assets to fixed assets for a period of eight years since 1970-71 (year 1) shows the following position.

Year	1	2	3	4	5	6	7	8
CA/FA(%)	72.3	81.6	79.1	83.7	91.5	89.4	88.1	86.9

Average for the period: 85 per cent.

The question of level of current assets may also be considered from the point of view of risk-return trade-off or the liquidity-profitability tangle.

SELF ASSESSMENT EXERCISE 1

(Lowering working capital)

Praga Tools Ltd. Has investigated the profitability of its assets and the cost of its funds. The results indicate:

1. Current assets earn 6 per cent
2. Fixed assets earn 13 per cent
3. Current liabilities cost 3 per cent

4) Average cost of long term funds 10 per cent.

The present balance sheet of the firm is as follows:

Liabilities	N	Assets	N	=
Current liabilities	100,000	Current assets	200,000	
Long term funds		Fixed assets	600,000	I
Ownership and borrowed	700,000			
	<u>800,000</u>			<u>800,000</u>

The company is now contemplating lowering its net working capital to Rs. 70,000 by (a) either shifting Rs. 30,000 of current assets into fixed assets, or (b) shifting Rs. 30,000 of its long term funds into liabilities. In your opinion which one of these two alternatives would be more desirable for the company and why?

3.5 Liquidity-Profitability Tangle

Liquidity and its measurement

Liquidity refers to a firm's continuous ability to meet its maturing obligations. Since cash is used to meet a firm's obligations, emphasis is given on holding large investment in current assets which include cash and 'near-cash' items like receivable, short-term securities, etc. Thus, holding relatively large investment in current assets will cause no difficulty in paying the claims of the creditors and others.

The term liquid assets is used to describe 'money and assets that are readily convertible into money, 10 Different assets have different degrees of liquidity. Money is the most liquid of assets. Thus, for assets other than money, liquidity has two dimensions, viz. time and risk. The time dimension of liquidity concerns the speed with which assets other than cash can be converted into inventories, receivables and others into cash with as little sacrifice in price as possible. Viewed in terms of these factors, all assets will have a degree of liquidity and assets that comprise cash and 'near-cash' items are the most liquid assets. Liquidity management, therefore, involves the amount of investment in this group of assets to meet short-term maturing obligations of creditors and others. From the point of view of financing, normally a major portion of the fund required for financing current assets is obtained from long-term sources such as equity and/or debt, while the rest is met from short-term sources. It goes without saying that if the maturing obligations are met continuously as and when they become due, creditors and others will have a feeling of confidence in the financial strength of the firm, which will sustain the credit reputation of the firm, and an ongoing firm will accordingly face no difficulty in holding a particular level of current

assets. But failure to meet such obligations on a continuous basis will affect the reputation and hence the creditworthiness of a firm which will, in turn, make it more difficult for it to continue to finance the level of current assets from short-term sources.

The word liquidity suggests a kind of measurement or quantification of the prospect of meeting maturing obligations. Generally, it is measured by two ratios; the current ratio and the acid test ratio.

- 1. Current ratio: This ratio expresses the relation of the amount of** current assets to the amount of current liabilities. Conventionally, a 2:1 ratio, i.e. current assets are twice the current liabilities, is taken to represent a satisfactory liquidity position. However, nothing can be far from the truth and accordingly, each firm has to develop its own ratio from past experience and this can only be taken as a norm. Secondly, what is applicable to advanced countries may not be equally applicable under Indian conditions where there is a money market with a management pattern and other factors of its own.
- 2. Acid test ratio: All types of current assets are not equally liquid** and all liabilities do not take the same period of time for maturity. Three possible alternatives are, therefore, available to solve this problem. In order to make the current ratio more dependable and representative, weights may be assigned to individual items of current assets and liabilities in accordance with their respective degrees of liquidity or urgency of repayment.¹³ Under the second alternative, current assets, which generally take more time for conversion as compared to other assets, should be excluded from this group and similarly, current liabilities, which will take more time for maturity than others, should be excluded from the current liabilities group and then a relationship may be arrived at. This is what is known as the quick or acid test ratio. Thirdly, a system may be selected made to arrive at the real liquidity position.¹⁴

Since assigning weights for liquidity or quickness of payment involves some sort of arbitrariness and assignment of 'weights' will, therefore, vary from person to person, and the discounting method is fraught with certain difficulties, the second alternative may be resorted to for determining liquidity.

Normally, a 1: 1 ratio is considered to represent a satisfactory liquid position. But the ratio, like current ratio, may vary from industry to industry depending upon many internal factors and accordingly no acceptable rigid standard can be prescribed. Ordinarily, if the liquid

assets are adequate to payoff quick liabilities, a feeling of confidence in the financial strength, of the firm is automatically created and its credit reputation is sustained. This ratio is thus considered to be a more meaningful measure of, liquidity as compared to the current ratio. 15

Profitability and its Measurement

Profitability is the profit earning capacity of a product, process, plant or the firm, as the case may be. This indicates the efficiency or otherwise with which a firm is managed.

There are various measures of profitability. Some of them are:

- Gross profit to net sales
- Profit to capital employed
- Profit after tax to net worth.

As, for example, when the second ratio is selected for the purpose, the term capital employed may represent fixed assets plus working capital. The said ratio may be further elaborated as follows:

$$\text{Profitability} = \frac{\text{Profit} \times \text{Sales}}{\text{Sales} \times \text{Capital employed}}$$

Liquidity-profitability Tangle

When return on capital employed (i.e. taken as fixed assets plus working capital) is used as the measure of profitability, the relation between profitability and liquidity follows from the component of the ratio; example;

$$\text{Profitability} = \frac{\text{Profit}}{\text{Fixed assets} + \text{working capital}}$$

That is, other things remaining constant, with more and more reduction in the amount of working capital, there will be an improvement in the profitability and vice versa.

3.6 Working Capital Management

The object of working capital management is, as stated earlier, to ensure its optimum utilization for the overall profitability of a firm. An efficient manager will try to ensure that too much capital is not circulating in the business in the form of working capital.

Nor will he allow the working capital to fall below a particular level. He will strike a balance between the two, possibly by a careful study of the movement of working capital in successive periods. 19 Both the situations-too much working capital or too little working capital-will invite many dangers which may stand in the way of the profitable working of a firm. G.L. Gole lists out the respective dangers in this way:

Dangers of too little working capital

- 1) Acts as a contributing factor to business failures
- 2) Frustrates the enterprise objectives through lack of funds
- 3) Reduces the rate of return on total investment.
- 4) Influences the credit rating adversely.
- 5) Prevents discounts from being taken.
- 6) Prevents attractive opportunities from materializing.
- 7) Influences dividend policy adversely.
- 8) Influence management morale adversely.

Dangers of too much working capital

- 1) Management efficiency may deteriorate through complacency.
- 2) Speculation may be encouraged.
- 3) Unjustifiable expansion may be stimulated.
- 4) Dividend policy may be too liberal.
- 5) Total investment may be working inefficiently.

The above points will justify the need for ensuring optimum utilization of working capital in a firm. A mere fluctuation in the absolute figure of working capital does not necessarily indicate the degree of its effective or ineffective utilization.

SELF ASSESSMENT EXERCISE 2

You are the management accountant of West Ltd., a company that manufactures and distributes clothing. You have estimated the following figures for the coming year.

	₦
Sales	5,600,000
Average debtors	506,000
Gross profit margin	25% on sales
Finished goods	350,000
Work-in-progress (80%) complete)	550,000
Raw materials	220,000
Average creditors	210,000
Materials costs represent 50% of the total of sales.	

Required:

- i) Calculate the cash operating cycle, to the nearest day.
- ii) Suggest possible methods of reducing the length of the cash operating cycle.

4.0 CONCLUSION

In this unit, we discuss the important considerations in the management working capital. We also discuss the management of the components of working capital cash, debtors and cash.

5.0 SUMMARY

Some general remarks highlighting the need for effective utilization of working capital and some possible approaches for the same have been discussed in this unit. But the ingredients of the theory of working capital management should cover a wide range. The theory includes the following:

- Planning working capital requirement in advance.
- Financing from appropriate sources to maintain a desired financing-mix
- Adopting certain measures to ensure proper control on the positive and negative components of working capital.

6.0 TUTOR-MARKED ASSIGNMENT

Cashier Plc projects at annual cash usage of N30,000,000 will occur uniformly throughout the forthcoming year. Cashier plans to meet these demands for cash by periodically selling marketable securities from its portfolio. The company's marketable securities are invested to earn 24% and the cost per transaction of converting funds to cash is N160.

Required

- a) Use the Banmol model to determine the optimal transaction size for transfers from marketable securities to cash.
- b) What will be cashier's average cash balance?
- c) How many transfers per year will be required?
- d) What will be the total annual costs?
- e) What are the key limitations of this model?

7.0 REFERENCE/FURTHER READINGS

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UNIT 17 QUANTITATIVE MODELS FOR THE PLANNING AND CONTROL OF STOCKS

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Quantitative Models for the Planning and Control of Stocks
 - 3.2 Stock Control – Key Concepts
 - 3.2.1 Cost of holding or carrying stock
 - 3.2.2 Cost of Obtaining or ordering stock
 - 3.2.3 Stock out costs
 - 3.2.4 The Economic order quantity (EOQ)
 - 3.3 Basic EOQ-Formula
 - 3.4 Re-order Level
 - 3.5 Re-Order Point and Safety (Butter Stock)
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings

1.0 INTRODUCTION

Investment in stocks represents a major asset of most industrial and commercial organizations, and it is essential that stocks be managed efficiently so that such investments do not become unnecessarily large. A firm should determine its optimum level of investment in stocks-and, to do this, two conflicting requirements must be met. First, it must ensure that stocks are sufficient to meet the requirements of production and sales; and, secondly, it must avoid holding surplus stocks that are unnecessary and that increase the risk of obsolescence. The optimum stock level lies somewhere between these two extremes. Our objective models for chapter are to examine the application of quantitative models for determining the optimum investment in stocks, and describe the alternative methods of scheduling material requirements. We shall also consider the economic order quantity and the level at which stocks should be replenished. We shall concentrate here on manufacturing firms, but the same basic analysis can also be applied to merchandising and non-profit organizations.

2.0 OBJECTIVES

After studying this chapter, you should be able to:

- Justify which costs are relevant and should be included in the calculation of the Economic order quantity (EOQ);
- Calculate the EOQ using the formula method
- Determine whether or not a company should purchase larger quantities in order to take advantage of quantity discounts.
- Calculate the optimal safety stock when demand is uncertain;

3.0 MAIN CONTENT

3.1 Quantitative Models for the Planning and Control of Stocks

3.2 Stock Control- Key Concepts

Current development in advanced manufacturing environment emphasizes JIT purchases and zero inventory level. As already noted in chapter 15, JIT will be difficult to adopt in our environment for now due to our peculiar situations (telecommunication, transportation, etc). Companies still hold stock for a number of good reasons. Some of the reasons for holding stock include:

- (a) To ensure that sufficient goods are available to meet anticipated demand;
- (b) To absorb variations in demand and production;
- (c) To provide a buffer between production processes. This is applicable to work-in-progress stocks which effectively decouple operations.
- (d) To take advantage of bulk purchasing discounts;
- (e) To meet possible shortages in the future;
- (f) To absorb seasonal fluctuations in usage or demand;
- (g) To enable production processes to flow smoothly and efficiently;
- (h) As a necessary part of the production process, e.g. the maturing of whiskey;
- (i) As deliberate investment policy particularly in times of inflation or possible shortage.

The main objective of stock control is to minimize the total costs associated with holding and ordering stock. These costs are detailed below.

3.2.1 Cost of holding or carrying stock

- 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, stockholding or perpetual inventory costs.
- f) Insurance and security
- g) Deterioration and obsolescence
- h) Pilferage, damage, etc.

3.2.2 Costs of Obtaining or Ordering Stock

- 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.

3.2.3 Stock out Costs

These are the costs associated with running out of stock. The avoidance of these costs is the basic reason why stocks are held in the first instance. These costs include the following:

- (a) Lost and contribution through the lost sale caused by the stock-out
- (b) Loss of future sales because customers go elsewhere.
- (c) Loss of customer goodwill
- (d) Cost of production stoppages caused by stock-outs of W-I-P or raw materials.
- (e) Labour frustration over stoppages
- (f) Extra costs associated with urgent, often small quantity, replenishment purchases.

3.2.4 The economic order quantity (EOQ)

The EOQ is the ordering quantity which minimizes the balance of cost between inventory holding costs and re-order costs. To be able to calculate a basic EOQ certain assumptions are necessary.

- (a) That there is a known, constant stock holding cost,
- (b) That there is a known, constant ordering costs,
- (c) That rates of demand are known and constant,

- (d) That there is a known, constant price per unit, i.e. there are no price discount.
- (e) That replenishment is made instantaneously, i.e. the whole batch is delivered at once.

3.3 Basic EOQ-formula

The basic EOQ formula is: The economic order quantity (EOQ) or economic batch quantity for an item of stock which will minimize costs.

This model IS express mathematically as:

$$Q = H \sqrt{\frac{2DK}{H}}$$

Where

Q = the order quantity which will minimize total costs

D = annual demand (in units)

K = Cost of making one order

H = holding cost per unit per year.

Example

The demand for a commodity is 40,000 units per year, at a steady rate. It costs W20 to place an order, and 40k to hold a unit for a year.

(i) The EOQ is $H \sqrt{\frac{2DK}{H}} = \sqrt{\frac{2 \times 40,000 \times 20}{0.40}} = 2,000 \text{ units}$

(ii) This means that there will be: $\frac{40,000}{2,000} = 20$ orders placed p.a

(iii) The total costs of this policy per year is: N

-Ordering Cost = 20 x N20 = 400	=	
-Holding Cost = 2,000 x 0.40 = 400		
		800

Note: In the case of EOQ (not any other ROQ), the total cost can be calculated as follows:

Total cost = $\sqrt{2DKH} = \sqrt{2 \times 40,000 \times 20 \times 0.40} = 800$

SELF ASSESSMENT EXERCISE 1

A wholesaler wishes to establish the EOQ for calculators (which it buys from the manufacturer and sells to retailer), and has obtained the following information:

Annual demand 80,000 units
Holding cost per calculator p.a. 50k
Warehouse rent p.a
(specific to the calculators) 40,000
Delivery charge = ~~N~~30 per order plus ~~N~~2 per calculator.

Internal administration costs = ~~N~~20 direct costs per order plus ~~N~~60 per year apportioned I fixed overheads.

Required: a) Compute the EOQ, b) What is the total annual relevant cost?

Solution transfer

- a) Only costs which vary with the order size should be considered following costs are not relevant:
- i) Warehouse rent-it does not vary with the quantity ordered.
 - ii) Delivery charge of ~~W~~2 per calculator-does not vary with the order size
 - iii) The apportioned fixed costs of ~~N~~60 -does not vary with the order size.

H = 0.50 K = 30+20 = ~~N~~50 D = 80,000

$$\text{EOQ} = \sqrt{\frac{2DK}{H}} = \sqrt{\frac{2 \times 50 \times 80,000}{0.50}} = 4,000 \text{ units}$$

b) Total cost is given by $\sqrt{2DKH} = \sqrt{2 \times 50 \times 80,000 \times 0.50} = 2,000$

Alternatively, the total cost can be calculated as follows: ~~N~~—

$$\text{Holding cost} = \frac{2000}{2} \times 0.50 = 1,000$$

3.4 Re-order Level

Reorder level, which answers when to place an order, requires knowledge, about the lead time, which is the time interval between placing an order and receiving delivery. Reorder point can be computed as:

Reorder level = Lead time x Average usage per unit of time

This gives the level of inventory at which the new order should be placed. If there is need for safety stock, then it should be added in the reorder level formula.

Example

You are given the following data:

Annual (50 weeks) usage 35,000 units = 700 units

Lead time = 2 weeks

Re-order level = $700 \times 2 = 1,400$ units _____

Therefore, a replenishment order should be placed when stock drops to 1,400 units.

Safety Stocks: When a lead time and demand are not certain, the firm must carry extra units of inventory, called safety stock, as protection against possible stock outs. To decide on the optimal level of safety stock, one must take into account costs of not having enough inventory, known as stock out (shortage) costs. Two methods of computing safety stock size are presented using numerical examples. The first method does not recognize stock out costs whereas the second method does.

Example In respect of AB Plc, the following facts are available:

Annual usage (300-days) 120,000 units

Maximum daily usage 500 units

Average daily usage 400 units

Lead time 15 days.

a) Compute the safety stock, b) Calculate the reorder level

Solution

a) The safety stock is computed as follows:

Maximum daily usage 500 units

Average daily usage 400 units

Excess usage 100 units

X Lead time 15

Safety stock $(100 \times 15) = \underline{1,500 \text{ units}}$

b) Re-order level (ROL): = Average usage during lead time +
safety stock
= $(\underline{120,000} \div 50) \times 2 + 1,500 = 7,500 \text{ units}$

SELF ASSESSMENT EXERCISE 2

Kay Ltd is a restaurant supplier which sells a number of products to various restaurants in the area. One of their products is a special meat cutter with a disposable blade. The blades are sold in packages of 12 blades for N20,00 per package. After a number of years, it has been determined that the demand for the replacement blades is at a constant rate of 2,000 packages per month. The packages cost Kay Ltd N10.00 each from the manufacture and require a three-day lead time from date of order to date of delivery. The ordering cost is N1.20 per order and the carrying cost is 10 percent per annum.

- i) Calculate:
 - (a) The economic order quantity
 - (b) The number of orders needed per year
 - (c) The total cost of buying and carrying blades for the year.
- ii) Assuming that there is no safety stock and that the present inventory level is 200 packages, when should the next order be placed? (Use 360 days equals one year)
- iii) Discuss the problems that most firms would have in attempting to apply this formula to their inventory problems.

SHORT AGE OF FUTURE SUPPLIES

For various reasons, a firm may depart from quantitative models that provide estimates of economic order quantity and the re-order point. A company may not always be able to rely on future supplies being available if the major suppliers are in danger of experiencing a strike. Alternatively, future supplies may be restricted because of import problems or transportation difficulties. In anticipation of such circumstances a firm may over-order so that stocks on hand will be sufficient to meet production while future supplies are restricted.

FUTURE PRICE INCREASE

When a supplier announces a price increase that will be effective at some future date, it may be in a firm's interest to buy in excess of its immediate requirements before the increase becomes effective. Indeed, in times of rapid inflation firms might have an incentive to maintain larger stocks than would otherwise be necessary.

OBSOLESCENCE

Certain types of stocks are subject to obsolescence. For example, a change in technology may make a particular component worthless. Alternatively, a change in fashion may cause a clothes retailer to sell stocks at considerably reduced prices. Where the probability of obsolescence is high or goods are of a perishable nature, frequent purchases of small quantities and the maintenance of low stocks may be appropriate, even when the EOQ formula may suggest purchasing larger quantities and maintaining higher stock levels.

STEPS TO REDUCE SAFETY STOCKS

When demand is uncertain, higher safety stocks are likely to be maintained. However, safety stocks may be reduced if the purchasing department can find new suppliers who will promise quicker and more reliable delivery. Alternatively, pressure may be placed on existing suppliers for faster delivery. The lower the average delivery time, the lower will be the safety stock that a firm needs to hold, and the total investment in stocks will be reduced.

PERFORMANCE REPORTING

Formal performance reports may not record all the relevant costs used in the decision models for calculating the economic order quantity or optimum stock levels. A manager is likely to concentrate only on those variables that are measured.

3.6 Re-Order Point and Safety (Buffer) Stock

In the previous analysis, assumptions of constant usage rate, and constant Lead Time were made. In real life, however, both usage rate and acquisition lead time fluctuate in a manner not completely predictable. Hence, in order to avoid stock outs, the firm must carry extra inventory as Buffer or protection against the possibility of stock outs. The decision of how much safety stock to carry is based on optimal conditions. The optimal safety stock is determined in the light of two goals viz:

1. to minimize the costs of stock out and also
2. to minimize carrying costs of the safety stock.

An appropriate method for determining the optimal safety stock employs the probability theory and makes two assumptions:

1. a constant lead time ..
2. each lot carried is delivered all at one time.

Under these assumptions a stock out can only occur if there is increase in usage rate after the reorder point has been reached i.e. after order has been placed.

In order to determine how much safety stock to carry, we must have the following information:

1. Stock out cost per unit of inventory
2. EOQ in units
3. Average daily usage in units
4. Lead time in days
5. Carrying cost per unit
6. Number of orders p.a (per annum)

We shall also note that with known Safety Stock

$$\text{RE-ORDER POINT} = \text{SAFETY STOCK} + \text{LEAD TIME} \times \text{DAILY USAGE}$$

Definitions

1. Lead Time: Time between order placement and order receipt
2. Lead Time Demand: Usage of Inventory in units during Lead Time
3. Stock Outs: The condition that exists when inventory on hand is not sufficient to cover need
4. Buffer or Safety Stock: Extra Inventory held against the possibility of Stock out.

The following steps are adopted in determining the optimal Safety Stock and hence the optimal re-order point.

1. Note inventory usage during a number of past re-order periods
2. Assign probabilities to various levels of usage.
For example $\Pr(X \leq X) =$ the probability of no stock out where $X =$ the level of usage.
Hence $\Pr(X > X) =$ prob. of stock out.
3. Consider all possible levels of Safety Stock that can be chosen.
For each possible calculate.
 - i. Stock out cost possible at that level of usage
 - ii. Carrying cost on that level of safety stock carried
4. Choose that level of Buffer stock which yields the least total Stock-outs costs plus inventory holding costs.

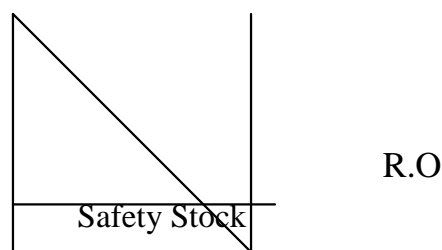
It is important to note that the danger of running out of stocks is greater whenever stock is nearing the Re-order point. It is thus necessary to take special note of how many times this situation occurs in a year. This will principally correspond with the number of orders placed in a year. Therefore, the company will be in danger of running out of stock that number of times in a year.

Example

Let the table below be the records of usage during 100 past re-order periods for a company with a Re-order point level of 105 units and optimal number of orders p.a. as 5.

For stock out cost of W30.00 per unit, carrying cost W4.00 per unit, we can go through the steps of determining the optimal Safety stock as follows:

Table 2.3 and optimal re-order point



LEAD TIME USAGE

Unit used during re-order period	No of times this was used	Probability of use during Re-order period
90	7	0.07
95	10	0.10
100	25	0.25
105	50	0.50
110	6	0.06
115	2	0.02
Total	100	1.00

Step 1: Determine the probability of Stock out: If re-order is made when the level of I stock is 105 units (the re-order point), the probability that the company will not run out of stock will be $PR(X < 105) = 0.07 + 0.10 + 0.25 + 0.50 = 0.92$

Hence the probability that the company will run out of stock at that level is $\Pr(X > 105) = 0.06 + 0.02 = 0.08$

This probability of stock out should be of concern. The company should carry extra inventory as Safety stock. The company could consider the following levels of Safety Stock

i) 0 Units of Safety Stock.

Prob. of stock out is zero if use is 105 only

Prob. of stock out is 0.06 if use is 110 in the period

Prob. of stock out is 0.02 if use extends to 115 in the period.

ii) 5 units of Safety Stock:

Prob. of stock out = 0 if use is 110 exactly

Prob. of stock out = 0.02 if use extends to 115 units.

iii. 10 units of Safety Stock:

Prob. of stock out = 0 if use is exactly 115 units.

Using the result above, we can now calculate stock out costs and carrying costs at each level noting that:

$$\text{STOCK OUT COST} = \text{No of units short} \times \text{probe of stock out} \times \text{units stock out Cost} \times \text{optimum no. of orders per year} \dots\dots\dots 2, 7$$

The full calculation is presented in tabular form as shown

Table 2.4

Chosen Safety stock	Probability of stock out	No of units short	Expected annual stock out cost per safety stock level	Total Annual stock-out cost	Carrying cost N	Total carrying and stock-out cost N
0	0.06 when use is 110, 0.02 when use is 115	5 10	$5 \times 30 \times 0.06 \times 5 = 45$ $10 \times 30 \times 0.02 \times 5 = 30$	75	0	75
5	0.02 when use is 115	5	$5 \times 30 \times 0.02 \times 5 = 15$	15	40	35
10	0.00 when use is 115	0	$0 \times 30 \times 0.00 \times 5 = 0$	0	80	80

From the table results, the minimum total for Stock out cost and carrying cost for any chosen level of Safety stock is N35 which occurs at 5 units of Buffer stock. Hence optimal Safety stock is 5 units. Therefore, Buffer stock + lead time usage x daily usage

$$\text{OPTIMAL RE-ORDER POINT} = 5 + \text{LEAD TIME} \times \text{DAILY USAGE}$$

SELF ASSESSMENT EXERCISE 3

Pye Company, a regional supermarket chain orders 1,920,000 cans of frozen orange juice per year from a Canadian distributor. A two-dozen-can case of frozen juice delivered to Pye's central warehouse costs ~1,920 including freight charges. The company borrows funds at 10 percent interest rate to finance its inventories. The Pye Company's purchasing agent has calculated that it costs =N1,500 to place an order for frozen orange juice and that the annual carrying expenses (electricity, insurance, handling) is N32 for each can of orange-juice.

- (a) What is the EOQ?
- (b) If the Canadian distributor offered a 10 per cent discount off the delivery price for minimum order of 72,000 cans. What would be the effect on (a) above.

4.0 CONCLUSION

In this unit, we discussed and justify costs that are relevant in the calculation of the economic order quantity (EOQ).

5.0 SUMMARY

The objective of stock control models is to determine the order quantity that minimizes the cost of holding stocks. The costs of maintaining stocks consist of ordering costs and holding costs. Ordering costs decline and holding costs increase when the order quantity is increased. The economic order quantity is at the point where ordering costs are equal to holding costs. This point can be derived by the EOQ formula. This formula can also be used to determine the optimum length of a production run, and It can be used as the starting point for determining whether a firm should increase the order discounts.

When uncertainty of demand and lead times are incorporated into the analysis, firms must hold safety stocks to cover the possibility that demand and lead time may be different from that used in the EOQ formula. Safety stocks should be determined using probability analysis.

6.0 TUTOR-MARKED ASSIGNMENT

Olori products are a retailer of materials used in the building trade, operating for 50 weeks each year. One of its fastest selling products is

bought in from an outside manufacturer at a cost of N8.50 per unit. Estimated weekly demand for this item is 4800 units. A three weeks lead time is required to obtain the product from the manufacturer and Olori's current practice is to order 24,000 units at a time. This order is placed when the stock level falls to 20,000 units.

Olori's financial analysts have established a cost of capital of 15% per annum for the use of inventory decisions within the company. In addition, an analysis of the purchasing operation shows that approximately 15 hours are required to process and co-ordinate an order for the item regardless of the quantity ordered. Purchasing charges N10 per hour, including employee benefits.

In addition, a detailed analysis of 40 orders showed that N1,425 was spent on paper, postage and telephone related to the ordering process. Also the cost of receiving delivery of an order is estimated to be N80.

Required:

- (1) Estimate K, the cost per order.
- (2) Calculate the annual cost of purchasing, ordering and storing the product using the current practice.

7.0 REFERENCES/FURTHER READINGS

Colin, D. (2000), Cost and Management Accounting London: Holborn House.

UNIT 18 THE APPLICATION OF LINEAR PROGRAMMING TO MANAGEMENT

CONTENTS

- 1.0 Introduction
- 2.0 Objective
- 3.0 Main Content
 - 3.1 The Application of Linear Programming to Management
 - 3.2 Linear Programming
 - 3.3 The Linear Programming (LP) Model
 - 3.3.1 Solving the LP Model
 - 3.3.2 The Graphical Approach
 - 3.3.3 The Simplex Method of Solving L.P. Problems
 - 3.4 Uses of Linear Programming
- 4.0 Conclusion
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1.0 INTRODUCTION

In the previous units we have seen that there is an opportunity cost for scarce resources that should be included in the relevant cost of calculation for decision making and variance calculations.

Our previous discussions, however, have assumed that output is limited by one scarce resource, but in practice several resources may be scarce. The opportunity costs of these scarce resources can be determined by the use of linear programming techniques. Our objective in this chapter is to examine linear programming techniques and to consider how they can be applied to some specific types of decisions that a firm may have to make.

2.0 OBJECTIVES

After studying this chapter, you should be able to:

- Formulate the linear programming model and calculate marginal rates of substitution and opportunity costs using the graphical approach;
- Describe how linear programming can be used in decision-making, planning and control;
- Formulate the linear programming model that will maximize net present value;
- Identify the major deficiencies of linear programming.

3.0 MAIN CONTENT

3.1 The Application of Linear Programming to Management Account

3.2 Linear Programming

The main objective in production planning usually is to select the best output mix that does not exceed the firm's resources capacity limitation while maximizing returns to the firm. For such and output problems, three principal factors are considered viz:

- i. The forecast demand for each output
- ii. The resources requirement for each output.
- iii. The relative return to each output.

The expected demand places an upper limit to the number of each output that will be provided. The firm's resources requirement for each output determines the maximum number of each type of output that can be produced constrained by the resources availability.

The returns to the firm from the production are the contribution margins of all the different output to the objective of maximizing the returns.

The linear programming question then is: How does the firm consider all three sets of factors to arrive at the best combination of output?

3.3 The Linear Programming (LP) Model

The linear programming Model is applied when limited resources are to be used for competing activities, and where the problem variables are assumed to have linear relationships.

The model identifies the following parts:

- i. Decision variable $X_1, X_2, X_3, \dots, X_n$ which are assumed linear, the numeric value of which are to be determined.
- ii. The Goal or Decision Criterion which is to find best decision value that will maximize or minimize the objective.
- iii. The Objective Function which is the mathematical equation that measures the outcome of any proposed alternative i.e. the returns.
- iv. The Constraints or restriction which define allowable (feasible) values quantities of the decision variable, and the Operating Rules governing the scarce resources The general linear programming model is:

Maximize (or Minimize)

$$Z = C_1X_1 + C_2X_2 + \dots + C_nX_n$$

Subject to

$$\begin{aligned} a_{11}x_1 + a_{12}x_2 + a_{13}x_3 + \dots + a_{1n}x_n &= b_1 \\ a_{21}x_1 + a_{22}x_2 + a_{23}x_3 + \dots + a_{2n}x_n &= b_2 \\ &\vdots \\ a_{m1}x_1 + a_{m2}x_2 + a_{m3}x_3 + \dots + a_{mn}x_n &= b_m \end{aligned}$$

Where $x_1, x_2, \dots, x_n \geq 0$

are the decisions variables which are non negative C_1, C_2, \dots, C_n are coefficients of the linear constraints, b_1, b_2, \dots, b_m are the initial amount of resources available.

3.3.1 Solving the L. P Model

Methods used solving LP problems are

- i. The Graphical Method
- ii. The Simplex Method
- iii. The Transportation Method

3.3.2 The Graphical Approach

If a Linear Programme problem has only two decisions variables, the graphical method gives a simple solution

Example Minimization Problem.

Minimize $C = -100X_1 + 100X_2$

subject to

$$X_1 + 2X_2 = 80$$

$$X_1 = 30$$

$$X_2 = 20$$

$$X_1, X_2 \geq 0$$

Solution: 1 Draw graphs, and by shading, identify the feasible region

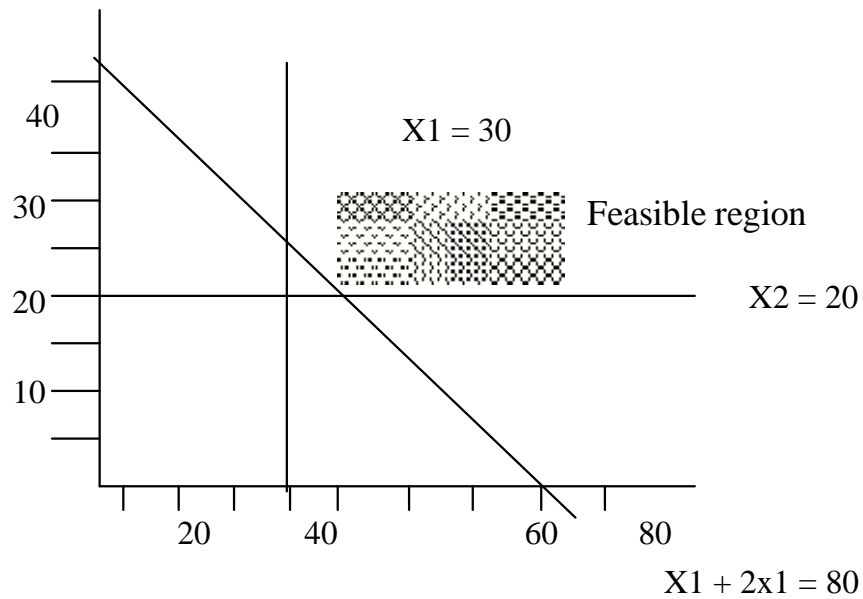


Fig 3.1

Identify the vertex in the feasible whose x_1, x_2 components yield the least value of C in the objective function $C = N5,500.00$ 1 Example Maximization Problem

Maximize $Z = 4x + 6X_2$
subject to

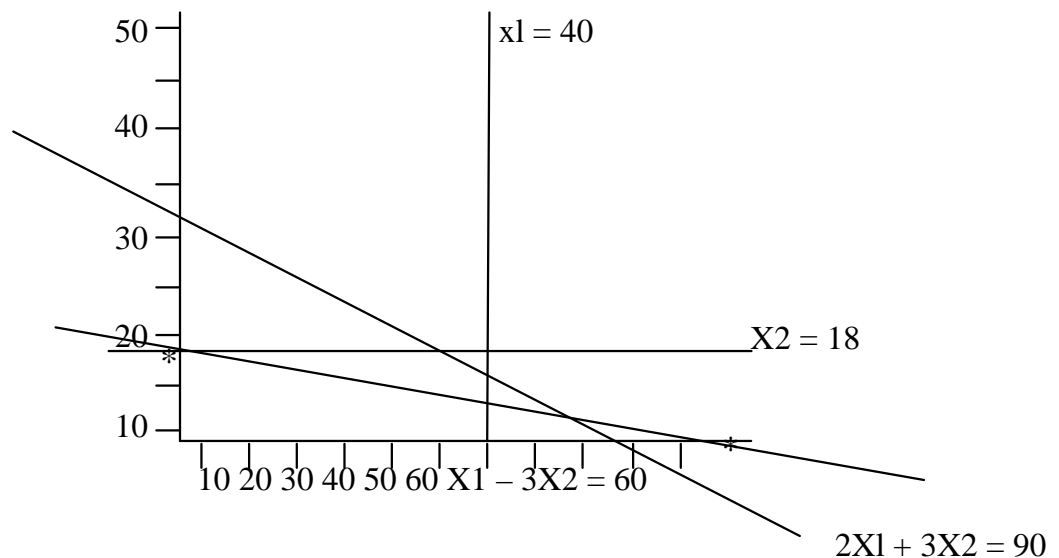
$$X_1 + 3X_2 = 60$$

$$2X_1 + 3X_2 = 90$$

$$X_1 = 40$$

$$X_2 = 18, X_1, X_2 = 0$$

The graphical solution given below gives the feasible vertex as D where $X_1 = 40, X_2 = 3$ (approx.) I Giving the largest value of $Z = 252$



3.3.3 The Simplex method of Solving L.P. Problems

The simplex procedure is for solving a set of Linear inequalities simultaneously for n decision variables. To prepare an LP problem for solution using the Simplex method, the following steps are taken.

- 1) Formulate the problem
- 2) Set up the Standard form representation of the problem introducing Slack or surplus variables where appropriate
- 3) Set up the Simplex tableau representation of the problem.

SELF ASSESSMENT EXERCISE 1

The management accountant of PYE Enterprises Ltd. Has suggested that a linear programming model might be used for selecting the best mix of five possible products, A,B,C,D,E.

The following information is available

a.	Permit of Product							
	A	B	C	D	E			
	N	N	N	N	N	=	=	=
Selling price	<u>48</u>	<u>42</u>	<u>38</u>	<u>31</u>	<u>27</u>	—	—	—
Costs								
Materials	15	14	16	15	16			
Direct labour	18	16	6	4	4			
Fixed overheads	9	8	3	2	2	—	—	—
Total costs	<u>42</u>	<u>38</u>	<u>25</u>	<u>21</u>	<u>22</u>	—	—	—
Net profit	6	4	13	10	5			

* Based on 50% of direct labour cost.

- b. Expected maximum unit demand per week for each product at the prices indicated:

A	B	C	D	E
1500	1200	3900	600	600

- c. Cost of materials includes a special component which is in short supply; it costs ~~N~~ 3 a unit. Only 5,800 unit will be available to the company during the week. The number of units of the special component needed for a unit of each product is:

A	B	C	D	E
1	1	3	4	5

- d. Labour is paid at a rate of N1~~50~~ per hour and only 20,000 hours will be available in a week.
- e. The management of PYE Enterprises Ltd. Has ruled that expenditure on materials must not exceed a sum of ~~N~~N30,000.
- f. All other resources are freely available in sufficient quantities for planned needs:

Required: Formulate a linear programming model stating clearly the criterion you use. (You are not expected to produce a numerical solution to your model)

3.4 Uses of Linear Programming

- Calculation of relevant costs:
The calculation of relevant cost is essential for decision making. When a resources is scarce alternative uses exist that provide a contribution. An opportunity cost is therefore incurred whenever the resource for a scarce resources is calculated as;

Acquisition Cost of Resource + Opportunity

- Selling different product
Opportunity costs is incorporate in the calculation of the relevant costs for each resources, and so I the relevant information for decision making is obtained.
- Control:
Opportunity costs are also important for cost control. This process highlights the true cost of the inefficient usage of scarce resources and encourages responsibility heads to pay special attention to the control of scarce factors of production
- Capital Budgeting
Linear programming can be used to determine the optimal investment programme when capital I rationing exists.

SELF ASSESSMENT EXERCISE 2

The instruments department of max Ltd. Makes two product are shown below:

	XL	YM
	(N) (N)	(N) (N) =
Selling price	200	180
Variable costs:		
Material A (N 10 per kg)	(40)	(40)
Direct labour (N 8 per hour)	(32)	(16)
Plating (N 12 per hour)	(12)	(24)

Other variable costs (76) (70) _____
(160) (156)

Fixed overheads (allocated at
~~N~~7 per direct labour hour) (28) (14) _____

Standard profit per unit 12 16 _____

Plating is a separate automated operation and the costs N 12 per hour are for plating materials and electricity.

In any week the maximum availability of inputs is limited to the following:

Material A 120kg
Direct labour 100 hours
Plating time 50 hours

A management meeting recently considered ways of increasing the profit of the instrument department. It was decided that each of the following possible changes to the existing situation should be examined independently of each other.

- (1) The selling price of product YM could be increased
- (2) Plating time could be sold as a separate service at N 16 per hour.
- (3) A new product, ZN, could be sold at N 240 per unit. Each unit would require the following:

Material A 5kg
Direct labour 5 hours
Plating time 1 hour
Other variable costs N90 =

- (4) Overtime could be introduced and would be paid at a premium of 50% above normal rates. Requirements :
 - (a) Formulate a linear programme to determine the production policy which maximizes the profits of Max Ltd. In the present situation (i.e. ignoring the alternative assumptions in 1 to 4 above), solve, and specify the optimal product mix and weekly profit.
 - (b) Show how the linear programme might be modified to accommodate the sale of plating time at N 16 per hour (formulate but do not solve).

4.0 CONCLUSION

In this unit, we have discussed the formulation of linear programming model and calculate marginal rates of substitution. Finally we described the uses of Linear programming.

5.0 SUMMARY

When there is more than one scarce input factor, linear programming can be used to determine the production programme that maximizes total contribution. This information can be obtained by using either graphical approach, or simplex method. The graphical approach, however, is inappropriate where more than two products can be produced from the scarce inputs, and in such a situation the Simplex method should be used. This method should be used. This method has the added advantage that the output from the model provided details of the opportunity costs and the marginal rates of substitutions for the scarce resources.

Linear programming can be applied to a variety of management accounting problems. In particular, the technique enables the relevant cost of production inputs to be computed. This information can be used for decision-making, standard costing variance analysis and the setting of transfer prices in divisionalized companies. It can also be applied to capital budgeting in multi-period capital rationing situations.

Linear programming has a number of limitations when applied to real world situations, but some of these problems can be overcome by establishing more complex models and using integer programming techniques. Linear programming is a technique that can be applied to establish the optimum allocation of scarce resources. In the long-term resource constraints can be removed by requiring resources. Therefore linear programming is only appropriate for short-term allocation decisions.

6.0 TUTOR MARKED ASSIGNMENT

KK Chemicals produces two products that are sold as raw materials to companies manufacturing bath soaps and laundry detergents. Based on an analysis of current inventory levels and potential demand for the coming month, KK's management has specified that the combined production of products A and B must total at least 1,400 units. Separately, a major customer's order of 500 units of product A must also be satisfied. Product A requires 2 hours of processing time per unit, and for the month, 4,800 hours of processing time are available. The objective is to satisfy the above requirements at a minimum production

cost. Production costs are ₦8 per unit of product A and ₦12 per unit for product B.

Required

- 1) Determine the required output level and the resulting total product cost

7.0 REFERENCES/FURTHER READINGS

Colin, D. (2000): Cost and Management Accounting. Holborn House.
London

Omolehinwa, A. (2005): work out management accounting. PYE Nig.
Ltd., Lagos

UNIT 19 LEARNING CURVE THEORY

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Principles of Learning Curve Theory
 - 3.2 Learning Curve Theory
 - 3.3 Learning Curve Tables
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- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
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1.0 INTRODUCTION

This theory postulates that whenever a repetitive task is being performed, the average time spent in producing a unit falls by a specific percentage whenever the activity Level is double.

2.0 OBJECTIYES

After studying this chapter, you should be able to:

- Distinguish between learning curve and experience curve.
- Illustrate the theory of learning as it relates to labour:
- Identify the relevance of learning curve theory in management accounting
- Itemize the practical difficulties or limitations of learning curve theory.

3.0 MAIN CONTENT

3.1 Principles of Learning Curve Theory

Whenever an individual start a job which is fairly repetitive in nature, and provided that his speed of working is not dictated to him by the speed of machinery (e.g. in a production line), he is likely to become more confident and knowledgeable about the work as he gains experiences to become more efficient and to do the work more quickly. Eventually however when he acquires enough experience there will be nothing more for him to learn, and so the learning process will stop.

In a large work force with a regular labour turnover, there will be mix of experienced people and people who are still gaining experience, but on average, the standard level of efficiency for the work force as a whole will roughly be the same over time.

In some industries and in some situations, however the work force as a whole may gain experience in certain work, and become more efficient as it gains experiences. Learning curve theory applies to situations such as this.

This speeding up of a job with repeated performance is known as the learning effect or learning curve effect, and the reduction in the required direct labour time for job may be quantified for use in management planning and control decisions.

Learning curve theory was first developed in the United States and aircraft industry in the 1920's and 1930s. Since then the learning curve concept has been extended to other industries and it has been:

Found that the time required to do most tasks of a repetitive nature gets shorter as the tasks are more and experience in doing them is built up. The concept of a learning curve or experience curve has extended to non-production activities, such as marketing efforts.

The first time a new operation is performed both the workers and the operating procedures are untried. As the operation is repeated the workers become more familiar with the work, labour efficiency increases and the labour cost per unit declines. This process continues for some time, and a regular rate of decline in cost per unit can be established at the outset. This rate of decline can be used in predicting future labour cost. The learning process starts from the point when the first unit comes off the production line. From then on, cumulative production is doubled; the average time taken to produce each unit of cumulative production will be a certain percentage of the average time per unit of the previous cumulative production.

Direct labour time should be expected to get shorter, with experience, in the production of items which are made largely by labour effort rather than by a highly mechanized process, and which are either of the following:

- (a) Relatively short lived products with a high rate of obsolescence.
This is because the learning process does not continue indefinitely and so new products must be continually introduced if the learning curve phenomenon is to be a permanent feature of the industry.

- (b) Products which are complex and made in small quantities for special orders.

3.2 Learning Curve Theory

This theory postulate that whenever a repetition task is being performed, the average time spent producing a unit falls by 20% then a learning phenomenal of 80% is present within the labour force, but if the average time falls 30% then the effect of learning will be 70%. The underline logic behind this theory is premised on the fact that human being unlike machine acquire a lot of skills, experience exposure, specialization and dexterity for performing a repetitive assignment.

The theory of learning curve therefore disagrees with the popular notion being held in various quarters that labour costs is a variable cost per unit is constant. The CIMA official terminology states that the learning curve is The mathematical expressions of times tend to decrease at a constant rate. The learning curve models mathematically results in this reduction in unit production time. In the U.S aircraft industry, an 80% learning curve was found to apply so that the cumulative average time to produce an aircraft fell by 20% for each doubling of out put of that type of aircraft.

By cumulative average time, we mean the average time per unit for all units produced so far, back to and including the first unit made this is a very important point to note in learning. Now read the following again to ensure that you took It in.

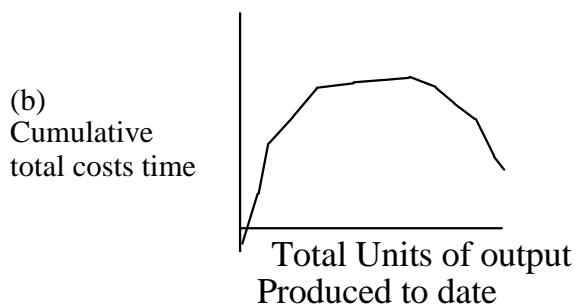
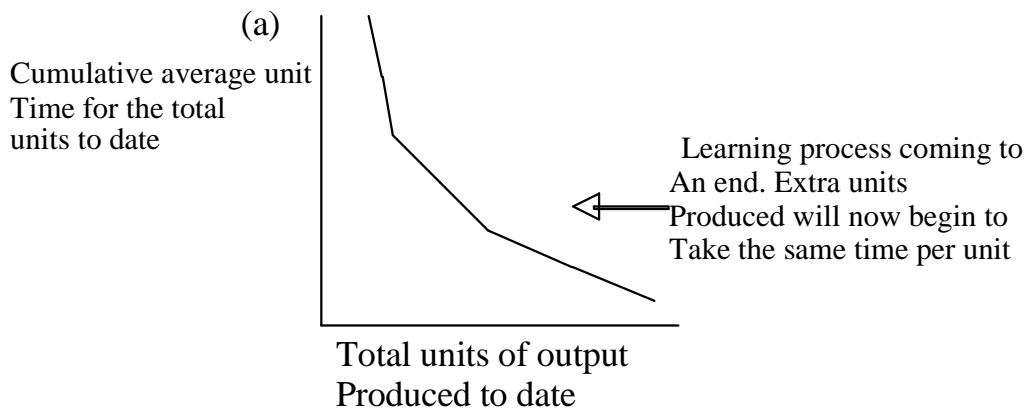
- (i) An 80% learning curve will be used for illustration since 80% appears to be a learning factor which commonly applies but it is also possible to apply other percentage like 70% 60% etc
- (ii) Where an 80% learning effect occurs, the cumulative average time required per unit of out put is reduced to 80% of the previous cumulative average time when output is doubled.
- (iii) The doubling of out put is an important feature of the learning curve measurement. With a 75% learning curve, the cumulative average time per unit of out put will fall to 75% of what it was before, every time out put is doubled. (iv) If for example, the first unit of out put requires 1000 hours and an 8% learning curve applies the production times would be as follows:-

A Number of Units produced	B Cumulative Units	C Workings	D Cumulative average Time or hour	E (BxD) Total Hrs)	F Time per Batch	G Incremental Per Unit
1 1 Given	1000 1000 1000	-				
1 2 (80%)	x	1000)	800 1600 600 600			
2 4 (80%)	x	800)	640 2560 960 480			
4 8 (80%)	x	640)	512 4096 1536 387			
8 16 (80%)	x	512)	409.6 6553.6 2457.6 307.2			

N.B

- Output is being doubled each time
- The incremental time per unit is reducing at a much factor rate the average time per unit. The learning effect can be shown on a graph as a learning curve, either for unit times (graph) or for cumulative total times or costs (graph b)

Diagram



Note

The curve on graph becomes horizontal once a sufficient number of units have been produced, that is, the learning effect is lost and production time should become a constant standard to which a standard efficiency rate may be applied.

The learning curve is a term used when the time taken by the skilled labour element in shop in floor production reduces. It is most relevant to new productions and processes involving skilled repetitive labour operations.

On the other hand, experience curve is a term usually applied to shop floor, managerial and technological and organizational changes not just learning by skilled workers. The experience curve is best exploited by growth and achieving a sizable market share, so that an organization can benefit from many production techniques.

Example

The learning curve effect

Femork Automobile Ltd has designed a new type of security motor, for which the cost and sales price of the first motor to be produced has been estimated as follow.

	N000
Materials	5,000
Labour (800 hours x N5/hr)	4,000
Over head (150% off labour cost)	6,000
	15,000
15,000 Profit mark-up (20%)	3,000
Sales price	<u>18,000</u>

It is planned to sell all the motor at full cost plus 20%. An 80% learning curve is expected to apply to the production work. Only one customer has expressed interest in buying the motor so far, but he thinks N 18m is too high a price to pay. He might want to buy two or even four of the motor during the next six months.

Required:

He has asked the following questions and you should provide answers

- If he paid N18m for the first motor what price would he have to pay later for a second motor?
- Could Femgork Automobiles. Ltd quote the same unit price for two motors, if the customer ordered two at the same time?

- (c) If the customer buys two motors now at one price, what would be the price per unit for a third and fourth motor, if he ordered them both together later on?
- (d) Could Femgork auto ltd quote a single unit price for
- 4 motor
 - 8 motor if they were all ordered now?

Solution: Working

No of motors	Cumulative motor	Workings	Cum average time per motor	Total for all motor to date	workings	Incremental time for additional motor/hr
1	1	Given	800	800	-	-
1	2	80% x 800	640	1280	1280-800	480
2	4	(80% x 640)	512	2048	2048-1280	768
4	8	(80% x 512)	409.6	3276.8	3276.8-2048	1228.8

- (a) Separate price for a second motor N 000

Materials	5,000
Labour 480 hrsxN5)	2,400
Overhead (150% x lab cost of 2400)	3,600
Total cost	11,000
Profit (20% x 11000)	2,200
Sales Price	13,200

- (b) A single Price for first two motor the

	N 000
Materials cost for two motors (N5000x2)	10,000
Labour (1280 hours xN5)	6,400
Overhead (150% of labour cost ofN6400)	9,600
Total cost for two motors 26,000 Profit (20% x N26,000)	5,200
Total sales price for two motors	31,200
Price per motor $\frac{31,200}{2} =$	<u>N15,600</u>

- (c) A price for the third and fourth motors

	N 000
Materials cost for two motor (N500x2)	10,000
Labour (768 hours x N 5)	3,840
Overhead (150% oflabour cost of N38409)	5,760
Total cost	19,600
Profit (20% x 19600)	3,920
Total sale price for motors	2,352
Price per motor (N23.520) =	<u>11.760</u>

(d) A price for the first 4 motors together and 8 motors together

	<u>First 4 motors</u>	<u>first 8 motors</u>
	N000	N000
Material (N5000x4) 20,000 (45,000x8) 40,000		
Labour (N5 x 20 48hr) 10,240 (N5 x 3276.8 hrs) 16,384		
Overhead (150% x 10240) <u>15.360</u> (150% x 16,384) <u>24,576</u>		
Total 45,600 80,960		
Profit (20% x 45,600) 9120 (20% x 80960) 16,192		
Total sales price 54,720		<u>97.152</u>
Price per motor <u>(N54720)</u> N13,780 (<u>97152</u>) 12,144		
	4	8

3.3 Learning Curve Tables _

An 80% learning curve on ordinary graph paper would show the following relationship between the x -axis (volume) and y-axis (cumulative average time per unit for the total units to date)

X	y	x	Y
		%	%
1.0	100.0	2.1	78.0
1.1	96.9	2.2	77.8
1.2	93.3	2.3	76.8
1.3	91.7	2.4	76.0
1.4	89.5	2.5	74.9
1.5	87.6	2.6	74.0
1.6	86.1	2.7	73.2
1.7	84.4	2.8	72.3
1.8	83.0	2.9	71.5
1.9	81.5	3.0	70.7
2.0	80.0	3.1	70.0

Thus if the table were extended, when x = 4, Y would be 80% of 80% = 64%, and when x = 8, Y would be 80% of 80% = 51.2% and so on.

This table may be used to calculate the cost of each extra unit made, or the cost of each extra batch of unit made, when we do not have a convenient "doubling" of output,

Example: Using the learning curve tables

A company supplied ten special machines to a customer in January. Average direct cost per unit were as follows:

	N
Material	300
Labour department A (200 hrs)	400
Labour department B (150hrs)	300
	<u>1,000</u>

Department A is Labour intensive, and work on the machines would benefit from a learning effect to which an 80% learning curve may be applied. Department B is highly mechanized and no learning effect will apply to the work done in this department.

In May, the customer requests an additional 15 special machines, and ask for a quotations

Required

Estimate the direct costs of production

Solution

Estimate for the 15 machines (direct cost)

	N
Materials (N300 x 15)	4,500
Department A (1745hrs x N2)	3,490
Department B (N300 x 15) No learning	4,500
	<u>12,490</u>

The average direct cost is therefore N832.67 (i.e. N 12, 490:- 15) which is considerable less than I the N 1 000 average cost of the first ten machines.

Workings

The average time in department A for the first 10 machines was 200 hours per machine. From the learning curve table it could be found that the average time to produce each of the 25 machines when production increases from 10 to 25 in total would be (74.9% of 200 hours) = 149.8 hours per machine, since $x = 25/10 = 2.5$

Total production cumulative average total time

.....	
25 machines 149.8 x 25	3745
10 machines 200 x 10	2,000
Additional 15 machines	<u>1,745</u>

Therefore to produce additional 15 machines would require 1745 hours in department A.

LEARNING CURVE EORMULAR

It is also possible to identify the effect of learning at different level of activity through a standard formula. This approach is developed for the purpose of determining the level of efficiency of workers at all levels without the need to double the existing activity level. The learning curve formula stipulates that:

$Y = ax^b$ where

Y = the average time of defined cumulative output or cumulative average time or unit

A = the total hours spent in producing the unit or the average time Spent in producing the first batch

X = number of units made so far or
a defined Cumulative output
Number of unit in the first batch

B = log of learning curve percentage
Log 2

SELF ASSESSMENT EXECISE 1

Regina Company Limited has been making annual purchases of 80,000 water pumps from water Engineering Nigeria Limited. The price has increase each year, reaching a level of N 136 per unit last year. Because purchase price has increased significantly, Regina Company Limited management has asked that an estimate be made of the cost to manufacture the pumps in its own facilities. The company has no experience with products requiring assembly. The engineering manufacturing and accounting departments have prepared a report for management which includes the estimates shown below for an assembly run of 10,000 unit. No additional production employees would be hired to manufacture the subassembly. However, no additional equipment space or supervision would be needed. The report stated that total cost for, 10,000 units would be N1,914,000 or 191.40 a unit. The current purchase price is N136 a unit, so the report recommended a continued purchase of the product.

	N
Component (outside purchases)	240,000
Assembly Labour (i.)	600,000
Factory overhead (ii)	900,000
General and administrative overhead (iii)	174,000

- (i) Assembly Labour consists of hourly production workers
- (ii) Factory overhead applied to products on a direct Labour cost basis. Variable overhead costs vary closely with direct Labour costs.
 - Fixed factory overhead is 50% of direct labour
 - Variable factory overhead is 100% of direct labour.
- (iii) General and administrative overhead is applied at 10% of the total cost of material (or components) assembly labour and factory overhead.

Required:

- (i) Assuming on 80% learning curve, what would be cumulative the Labour cost for producing 80,000 pumps during the first year.

3.4 The Practical Application of Learning Curve

THEORY

What costs are affected by the learning curve?

Direct Labour time and costs are obviously affected by the learning curve effect and output capacity increases as the workforce gains experience.

Variable overhead costs will also be affected by the learning effect, but only to the extent that variable overhead varies with direct Labour hours worked. Material costs are usually unaffected by learning curve, although some problems might be caused in an organization that uses absorption costing. If fewer hours are worked in producing a unit of output, and the factory operates at full capacity, then the fixed overheads recovered or absorbed per unit in the cost of the output will decline as more units are made.

The relevance of learning curve effects in management accounting
Learning curve theory can be used in the following situations.

- (a) To calculate the marginal (incremental) cost of making extra units of a product
- (b) To quote selling prices for a contract, where prices are calculated at cost plus a percentage mark-up for profit
- (c) To prepare realistic production budgets and more efficient production schedules
- (d) To prepare realistic standard costs for cost control purposes
- (e) To establish a realistic and workable incentive scheme for workers.

When a company operates in competitive industry, where contracts are won by the companies who quotes the best price and yet where quoted price must be high enough to give the contractor a reasonable profit, an awareness of the learning curve can make all the difference between winning contract and losing them, or between making and selling at a loss-making price.

The further considerations that should be borne in mind are follows.

(a) Sales projections advertising expenditure and delivery date commitments

Identifying a learning curve effect should allow an organization to plan its advertising and delivery schedule to coincide with expected production schedules. Production capacity obviously affects sales capacity and sales projections.

(b) Budgeting with standard costs: companies that use standard costing for much of their production output cannot apply standard times to output where a learning effect is taking place.

This problem can be overcome in practice by establishing standard times for output once the learning effects has worn off or become insignificant and introducing a supplementary cost or "launching cost" budget for the product for the duration of the learning period. Alternatively, a standard average time per unit can be estimated for a budgeted volume of output, which makes allowance for the expected learning rate.

(c) Cash budgets: Since the learning effect reduces unit variable costs as more units are produced, it should be allowed for in cash flow projections.

(d) Work scheduling and overtime decisions: To take full advantage of the learning effect, idle production time should be avoided and work scheduling/overtime decisions should take account of the expected learning effect.

(e) Pay: where the work force is paid a productivity bonus, the time needed to learn a new production process should be allowed for in calculating the bonus for a period. When learning is still taking place, it would be unreasonable to compare actual times with the standard times that ought eventually to be achieved when the learning effect wears off.

- (f) **Recruiting new labour:** when a company plans to take on new labour to help with increasing production, the learning curve assumption will have to be reviewed.
- (g) **Marketing share:** The significance of the learning curve is that by increasing its share of the market, a company can benefit from shop -floor managerial and technological learning to achieve economies of scale.

3.5 Limitations of Learning Curve Theory

The limited use of learning curve theory is due to several factors.

- (a) The learning curve phenomenon is not always present. There ought to be evidence of a learning curve effect in previous experience with similar work before it can be assumed that a learning rate can be applied to estimating production times and costs for new items production.
- (b) It assumes stable conditions at work (for example of the labour force and labour mix) which will enable learning to take place. This is not always practicable (for example because of labour turnover).
- (c) It must also assume a certain degree of motivation amongst employees.
- (d) Breaks between repeating production of an item must not be too long, or workers will forget' and the learning process would have to being all over again.
- (e) It might be difficult to obtain enough accurate data to decide what the learning curve IS
- (t) Learning will ease eventually once the job has repeated often enough.
- (g) The trade unions might not readily agree to a gradual reduction in production times per unit, in which case management might try to establish a low standard time per unit from the outset, and accept, adverse efficiency variances until the learning effect has taken place.
- (h) If the work force is paid a productivity bonus, there might be dissatisfaction amongst employees at the gradual reduction in standard times for production, because this might appear to be threat to the size of the bonus they earn.
- (i) Production techniques might change, production design alterations might be made, so that it takes a long time for standard production method to emerge, to which a learning effect will apply.
- (j) In variance analysis, a choice between average or incremental hours as being the most relevant measure of time taken to produce a certain number of units has to be made. Incremental

hours probably gives the most meaningful results but the merits of the two approaches depend on circumstances

SELF ASSESSMENT EXERCISE 2

A company is considering investment in a project that will produce on type of product whose total budgeted sales are 120 units at a selling price of N8,500 per unit.

Sales are to be 20 units in the year to 31 st December, 19 x1, 40 units in each of 19 x 2 and 19 x 3, and the balance in 19 x 4. Production will be in line with sales.

Direct Wages: The first will take 2,335 man-hours work at wage rate of N. 50 per man-hour. An 80% learning curve is expected to operate.

Direct Material: N 2,000 per unit

Variable Production overhead: 60% of direct wages

Fixed overhead relating to the project is N 47,500 per annum including depreciation on new plant to be purchase for the project which is charged on a straight line method over its life.

The net plant will cost N 110,000 payable on 31st December, 19 x O. It will have a life of four years after which it will have no resale value.

For investments of this type the company requires a return of 16% on the asset investments only.

You are required to:

- (a) Recommend, with supporting calculations, whether the company should proceed with project if either of the following bases of calculations, were used over four years.
 - (i) The total quantity of 120 units produced/sold or
 - (ii) A year-by-year production/sales schedules.
- (b) Recommend, with reasons which of bases a (i) or a (ii) above should be used as the criterion for the company's decision.
- (c) Suggest alternative courses of action that the company might take to improve the profitability of the project.

Note: An 80% learning curve on ordinary graph paper would show the following relationship between (volume) and y axis (cumulative average cost of elements subjects to learning curve).

x	y	x	Y	%	%
1	100	60	26.77		
2	80	70	25.48		
19	47.65	80	24.40		
20	38.13	90	23.50		
30	33.46	100	22.71		
40	30.50	110	22.03		
50	28.39	120	21.41		

4.0 CONCLUSION

In this unit, we did discuss generally the principles learning curve. We then looked at the distinction between Learning curve and experience curve. Finally, we itemize the practical difficulties or limitations of learning curve theory.

5.0 SUMMARY

The underline Logic behind this theory is premised on the fact that human being unlike machine acquires a lot of skills, experience, exposure, specialization and dexterity for performing a I repetitive assignment.

6.0 TUTOR-MARKED ASSIGNMENT

Captain Ayo Ltd. Designed a new type of sailing boat, for which the cost and sales price of the first boat to be produced has been estimated as follows.

	₦
Materials	5,000
Labour (800hrs x W 5 per hr)	4,000
Overhead (150% of labour cost)	2.000
	15,000
Profit mark-up (20%)	3,000
Sales price	18,000

It is planned to sell all the boat at full cost plus 20%. An 80% learning curve is expected to apply to the production work. Only one customer has expressed interest in buying the boat so far, but thinks N18,000 is too high a price to pay. He might want to buy two, or even four of the boat during the next six months.

He has asked the following questions.

- (a) If he paid N 18,000 for the first boat, what price would he have to pay later for a second boat?
- (b) Could Capital Ayo Ltd. Quote the same unit price for two boat, if the customer ordered two at the same time?
- (c) If the customer bought two boats now at on price, what would be the price per unit for a third and fourth boats, if he ordered them both together later on/
- (d) Could Capital Ayo Ltd. Quote a single unit price for
(i) four boats; (ii) eight boats? If they ordered now/

Assuming there are no other prospective customers for the boat, how would the questions be answered?

7.0 REFERENCES /FURTHER READINGS

- Colin, D. (2000): Cost and Management Accounting. Holborn House. London
- Omolehinwa, A. (2005): work out management accounting. PYE Nig. Ltd., Lagos