



ATSWA

ACCOUNTING TECHNICIANS SCHEME WEST AFRICA

STUDY TEXT

COST ACCOUNTING

PUBLICATION OF ASSOCIATION OF ACCOUNTANCY BODIES IN WEST AFRICA (ABWA)

**ASSOCIATION OF ACCOUNTANCY BODIES IN WEST AFRICA (ABWA)
ACCOUNTING TECHNICIANS SCHEME
WEST AFRICA (ATSWA)**

STUDY TEXT FOR

COST ACCOUNTING

THIRD EDITION

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This book is published by ABWA; however, the views are entirely those of the writers.

PREFACE

INTRODUCTION

The Council of the Association of Accountancy Bodies in West Africa (ABWA) recognised the difficulty of students when preparing for the Accounting Technicians Scheme West Africa examinations. One of the major difficulties has been the non-availability of study materials purposely written for the scheme. Consequently, students relied on text books written in economic and socio-cultural environments quite different from the West African environment.

AIM OF THE STUDY TEXT

In view of the above, the quest for good study materials for the subjects of the examinations and the commitment of the ABWA Council to bridge the gap in technical accounting training in West Africa led to the production of this Study Text.

The Study Text assumes a minimum prior knowledge and every chapter reappraises basic methods and ideas in line with the syllabus.

READERSHIP

The Study Text is primarily intended to provide comprehensive study materials for students preparing to write the ATSWA examinations.

Other beneficiaries of the Study Text include candidates of other Professional Institutes, students of Universities and Polytechnics pursuing undergraduate and post graduate studies in Accounting, advanced degrees in Accounting as well as Professional Accountants who may use the Study Text as reference material.

APPROACH

The Study Text has been designed for independent study by students and as such concepts have been developed methodically or as a text to be used in conjunction with tuition at schools and colleges. The Study Text can be effectively used as a course text and for revision. It is recommended that readers have their own copies.

FORWARD

The ABWA Council, in order to actualize its desire and ensure the success of students at the examinations of the Accounting Technicians Scheme West Africa (ATSWA), put in place a Harmonisation Committee, to among other things, facilitate the production of Study Texts for students. Hitherto, the major obstacle faced by students was the dearth of study texts which they needed to prepare for the examinations.

The Committee took up the challenge and commenced the task in earnest. To start off the process, the existing syllabus in use by some member Institutes were harmonized and reviewed. Renowned professionals in private and public sectors, the academia, as well as eminent scholars who had previously written books on the relevant subjects and distinguished themselves in the profession, were commissioned to produce Study Texts for the twelve subjects of the examination.

A minimum of two Writers and a Reviewer were tasked with the preparation of Study Text for each subject. Their output was subjected to a comprehensive review by experienced imprimaturs. The Study Texts cover the following subjects:

PART I

- 1 Basic Accounting Processes and Systems
- 2 Economics
- 3 Business Law
- 4 Communication Skills

PART II

- 1 Principles and Practice of Financial Accounting
- 2 Public Sector Accounting
- 3 Quantitative Analysis
- 4 Information Technology

PART III

- 1 Principles of Auditing
- 2 Cost Accounting
- 3 Preparation of Tax Computation and Returns
- 4 Management

Although, these Study Texts have been specially designed to assist candidates preparing for the technicians examinations of ABWA, they should be used in conjunction with other materials listed in the bibliography and recommended text.

PRESIDENT, ABWA

STRUCTURE OF THE STUDY TEXT

The layout of the chapters has been standardized so as to present information in a simple form that is easy to assimilate.

The Study Text is organised into chapters. Each chapter deals with a particular area of the subject, starting with learning objective and a summary of sections contained therein.

The introduction also gives specific guidance to the reader based on the contents of the current syllabus and the current trends in examinations. The main body of the chapter is subdivided into sections to make for easy and coherent reading. However, in some chapters, the emphasis is on the principles or applications while others emphasise method and procedures.

At the end of each chapter is found the following:

- Summary
- Points to note (these are used for purposes of emphasis or clarification);
- Examination type questions; and
- Suggested answers.

HOW TO USE THE STUDY TEXT

Students are advised to read the Study Text, attempt the questions before checking the suggested answers.

ACKNOWLEDGMENTS

The ATSWA Harmonisation and Implementation Committee, on the occasion of the publication of the first edition of the ATSWA Study Texts acknowledges the contributions of the following groups of people. The ABWA Council, for their inspiration which gave birth to the whole idea of having a West African Technicians Programme. Their support and encouragement as well as financial support cannot be overemphasized. We are eternally grateful.

To The Councils of the Institute of Chartered Accountants of Nigeria (ICAN), and the Institute of Chartered Accountants, Ghana (ICAG), and the Liberia Institute of Certified Public Accountants (LICPA) for their financial commitment and the release of staff at various points to work on the programme and for hosting the several meetings of the Committee, we say kudos.

We are grateful to the following copyright holders for permission to use their intellectual properties:

- The Institute of Chartered Accountants of Nigeria (ICAN) for the use of the Institute's examination materials;
- International Federation of Accountants (IFAC) for the use of her various publications;
- International Accounting Standards Board (IASB) for the use of International Accounting Standards and International Financial Reporting Standards;
- Owners of Trademarks and Trade names referred to or mentioned in this Study Text.

We have made every effort to obtain permission for use of intellectual materials in this Study Texts from the appropriate sources.

We wish to acknowledge the immense contributions of the writers and reviewers of this manual;

Our sincere appreciation also goes to various imprimaturs and workshop facilitators. Without their input, we would not have had these Study Texts. We salute them.

Chairman
ATSWA Harmonization & Implementation Committee

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PAPER 10

COURSE TITLE: COST ACCOUNTING

AIM:

To examine candidates' knowledge and understanding of Cost Accounting Principles, Methods and Techniques.

LEARNING OBJECTIVES:

On completion of this paper, candidates are expected to be able to:

- a. understand the concepts and principles of cost accounting and their applications to support management processes of planning, decision-making, and control;
- b. identify the various types of cost by behaviour and classification;
- c. collect , classify and present cost information using appropriate methods and techniques;
- d. accurately determine product and service costs ;
- e. relate the various costing methods to different business entities and other activities; and
- f. prepare information for performance appraisals.

STRUCTURE OF PAPER:

The paper is a three –hour paper divided into two sections:

SECTION A	<u>WEIGHT OF</u>
<u>MARKS</u> 50 compulsory questions made up of 30 multiple-choice questions and 20 short answer questions covering the entire syllabus.	50
SECTION B Six questions out of which candidates are expected to answer any four {Each of the questions attracts 12½ marks}.	50
TOTAL	100

CONTENTS:

1. **Introduction to Costing Accounting** 10%
 - a. Definition of Cost Accounting and related terms
 - b. Nature, purpose and scope of Cost Accounting
 - c. Value of Cost information (financial and non-financial) in management decision-making process
 - d. Impact of information technology on the generation, evaluation and presentation of cost information.
 - e. Differences between Cost Accounting and Financial Accounting
 - f. Designing a Cost Accounting system

2. **Cost Classification, Codification and Behavioral Aspect** 5%
 - a. Classifications of cost according to nature, functions, elements, responsibilities and behavioural patterns.
 - b. Cost coding systems
 - c. Identification and use of fixed, variable and semi-variable costs in cost analysis.
 - d. Analysis of the effect of changing activity levels on unit costs

3. **Elements of Cost:** 25%
 - (a) Materials:
 - (i) Definition and basic classifications
 - (ii) Procedure and documentation of:
 - Purchasing Control
 - Stores Planning Operation: Re-ordering procedures and Economic Order Quantity(EOQ)
 - Inventory valuation using FIFO,LIFO, Weighted Average, Standard Cost and Replacement Cost
 - Storage Control: Bin cards and store ledgers, ABC analysis Techniques, Physical and Continuous stocktaking
 - Just-In-Time (JIT) production and purchasing
 - (b) Labour
 - (i) Job evaluation, merit rating, work study, methods study and work measurement
 - (ii) Time-keeping and Time-Booking Functions
 - (iii) Treatments of overtime and idle time in labour costing
 - (iv) Basic methods of remuneration

- (v) General features of incentive schemes including computation of individual incentive scheme
 - (vi) Labour Cost Accounting
 - (vii) Labour Turnover
- (c) Overheads
- (i) Definition, classifications and analysis
 - (ii) Allocation and apportionment
 - (iii) Absorption - bases and calculation of overhead absorption rates
 - (iv) Treatment of under- and over-absorption of overhead
 - (v) Activity Based Costing.
4. **Interlocking and Integrated Accounts** 5%
- a. Book keeping entries and ledger for interlocking systems
 - b. Reconciliation of financial and cost accounting profits
 - c. Integrated Accounts - Bookkeeping entries and ledgers
5. **Costing Methods** 15%
- a. Specific Order Costing methods – Job, Batch and Contract costing
 - b. Continuous Operation costing:
 - i. Process costing including determination of work-in –process, equivalent units, Treatment of Losses, Gains and Accounting for Scrap
 - ii. Accounting treatment of By-Products and Joints Products
 - iii. Output costing
 - c. Non-specific order costing Methods - service costing.
6. **Costing Techniques and Decision-making Tools** 15%
- a. Decision making:
 - i. Use of marginal Costing and Absorption Costing Techniques in the preparation of Income Statements.
 - ii. Concept of Relevant Cost
 - iii. Short Term decisions: Make or buy, products mix, special order pricing, shut down problems with simple illustration, etc.
 - b. Cost –Volume-Profit (CVP) Analysis
 - i. Break-even Analysis
 - Limitations of Break-Even Analysis
 - Computation of Break-Even point and other levels of activities
 - Contribution Margin Ratio (CMR) / Profit Volume (P/V) Ratio

- Margin of Safety
 - Target Profit/Target Loss
 - Graphical Presentation of simple CVP Graphs such as BEP Graph and P/V Graph
 - Contribution/Sales (CS) ratio
- ii. Simple Investment Appraisal Techniques
- Payback period without discounting techniques
 - Discounted cash flow limited to Net Present Values.
7. **Performance Measurement** 15%
- a. Budgeting and Budgetary Control
- i. Types of Budget; meaning and objectives of budgetary control
 - ii. Budget Procedures, Budget Committee, Budget Manual
 - iii. Preparation of Budgets - functional, master, cash and capital budgets
 - iv. Flexible Budgeting.
 - v. Zero-Based Budgeting methods, Programme Planning Budgeting systems
- b. Standard Costing Technique
- i. Types and bases of setting standards
 - ii. Methods of determining standard cost and the uses of standard cost
 - iii. Basic materials, labour, overheads and sales variances
 - iv. Computation of standard Ratios - activity, capacity and efficiency Ratios.
8. **Developments in Cost Accounting** 5%
- a. Just – In- Time (JIT)
 - b. Kanban Inventory Control
 - c. Backflush Accounting
 - d. Life Cycle Costing
 - e. Target Costing
 - f. Advanced Manufacturing Technique (AMT)
9. **Cost Reduction** 5%
- a. Meaning of Cost Reduction
 - b. Cost Reduction Techniques
 - c. Comparison of Cost Reduction with Cost Control
 - d. Value Analysis
 - e. Value Engineering
 - f. Organisation and Methods (O & M)
 - g. Work Study: methods study and work measurement
 - h. Cost Audit.

RECOMMENDED TEXT BOOKS

1. ATSWA Study Text on Cost Accounting
2. Adeniyi A. Adeniyi Cost Accounting: A Managerial Approach, EL-TODA Ventures Limited, Lagos
3. Appiah –Mensah, K.B. Principles of Cost Accounting, Fiona Press, Accra
4. Iwarere, H.T. An In-depth Approach into Cost Accounting, BIPL, Egbe

CHAPTER ONE

INTRODUCTION TO COST ACCOUNTING

CHAPTER CONTENTS

- a. Definition of Cost Accounting and related terms
- b. Nature, purpose and scope of Cost Accounting
- c. Value of Cost information (financial and non-financial) in management decision-making process
- d. Impact of information technology on the generation, evaluation and presentation of cost information.
- e. Differences between Cost Accounting and Financial Accounting
- f. Designing a Cost Accounting system

1.0 OBJECTIVES

After studying this chapter, readers should be able to:

- a. define cost accounting;
- b. state the objectives of cost accounting;
- c. explain the scope of cost accounting;
- d. explain the different ways of cost classification; and
- e. explain the various patterns of cost behaviour.

1.1 INTRODUCTION

Business organisations exist to provide goods and services at a profit. In order to earn profit, organizations must know the cost incurred in producing the goods and services so that a desired profit margin will be added to the cost to determine the selling price. This chapter explains what constitutes cost, the forms of classifying cost and different patterns of cost behaviour.

1.2 Definition of Cost

Cost is the amount of expenditure incurred on or attributable to a specified thing or activity. Mathematically, cost is the product of the quantity of a given resource used and the price per unit of the quantity of resource.

Costs are usually ascertained in respect of cost units or cost objectives

1.2.1 Definition of Cost Accounting

Cost Accounting is the application of accounting and costing principles, methods and techniques in the ascertainment of cost and the analysis of savings and or excesses as compared with previous experience or standard. (CIMA Terminology).

The points to note about this definition are that:

Cost accounting involves:

- The application of costing principles, methods and techniques
- The ascertainment of cost
- Analysis of savings or overage

Again cost accounting could be defined as:

“That part of management accounting which establishes budgets and standard cost and actual cost of operations, processes, departments or products and the analysis of variances, profitability or social use of funds”. (CIMA Terminology)

The issues to remember about this definition are that, cost accounting is

- Part of management accounting
- Concerned with establishing budgets
- Standard costs and revenues
- Actual cost and revenues

About establishing costs and revenues relating to

- Operations
- Processes
- Departments
- Products

Whether such costs or revenues are standard or actual

- The analysis of variances
- The analysis of profitability of ventures and projects
- The analysis of the social use of funds.

Costing can also be defined as the ascertainment of cost. That is, finding out how much is

incurred to produce a given product or unit of service.

1.2.2 **Cost Objective**

A cost objective is any activity for which a separate measurement of cost is desired. A cost unit is a cost objective. However, there are some cost objectives which are not cost units. Examples of cost objectives include a product, a service, a department or segment of the business, a function, a process or activity or indeed anything for which one wants to measure the cost of resources used.

Sometimes it is impossible to trace some costs direct to cost units. Under such situations, costs are first traced to cost centres for further spreading to cost units.

1.2.3 **The Objectives of Cost Accounting**

The objectives of cost accounting include the following:

- a. To ascertain cost and facilitate pricing
- b. To provide information to assist planning
- c. To provide information to facilitate decision making
- d. To provide information to aid control
- e. To provide motivation and to promote cost consciousness at all levels of the management hierarchy
- f. To provide a formal means of gathering detailed information on operations.

These objectives are achieved through the processes of cost ascertainment and cost control. These processes form the subject matter of this study.

1.2.4 **Functions of Cost Accounting**

The functions of cost accounting include the following:

- a. The application of costing principles, methods and techniques in ascertaining the cost of units (products or services or process). This helps in pricing decisions.
- b. The provision of information to management for the purpose of planning. Planning is the process of establishing goals and suitable courses of action to achieve the goals.

The cost system generates information such as:

- resource availability e.g. materials, labour, other facilities
- cash flow pattern within a given time horizon
- expected returns from alternative projects etc.

Information such as these will enable management to make a commitment about the way

scarce resources may be utilized and set good priorities.

- c. The provision of information to management for decision making. Decision making entails choosing from among a given set of alternatives to achieve defined objectives. Cost accounting system generates a pool of information that facilitates informed decisions. Examples of such decisions include various costs, their behaviour, composition and nature, that is, whether the costs are fixed or variable, sunk cost or opportunity cost, incremental or avoidable or unavoidable cost, etc. With information such as these, prudent choices may be made regarding whether to make or buy a component, sell or further process an item, continue or discontinue a product line or division, accept or reject a special order, etc.
- d. Provision of information to management to control the activities of the business organization. Control is the process of ensuring that plans are achieved. Control may be broken down into three essential elements.
 - i. Set targets and goals in a budget statement (planning)
 - ii. Measure actual achievements during the control period and compare same with the set goals and targets.
 - iii. Any resultant variance should be analysed, investigated and corrective action taken to remedy the situation.

1.2.5 Advantages of Cost Accounting

- a. It helps to identify profitable and unprofitable products and services. This kind of information helps management to make prudent decisions regarding the adoption of a new product or discontinuing a product line, etc.
- b. It helps to identify efficient and inefficient methods, and helps departments to take corrective measures to improve efficiency
 - areas of wastage are indicated
 - idle time is highlighted
- c. It helps to generate comparative information on jobs, products, projects, etc. over a period of time allowing for temporary comparative analysis for a given cost centre and cross sectional comparison from among a number of cost centres. This makes for effective control.
- d. It facilitates production control. Costing principles are used to maintain costs consisting of material cost, labour cost and expenses at desirable levels. This

enhances production planning and scheduling.

- e. It facilitates stock control costing and establishes procedures for the procurement, storage and issue of stock items within the organization.
- f. It facilitates accurate estimation of cost of various cost units. Cost estimation in turn is essential for the pricing of the cost units involved.

1.2.6 **Disadvantages of Cost Accounting**

- a. The analysis of cost data involves some amount of expenses and cost.
- b. Some costing systems are complex and cumbersome to handle and are thus not well understood by the managers who need to operate the system.
- c. The production of basic data requires the completion of many forms, sometimes inaccurate data is provided. Under such conditions, the foundation of subsequent analysis is weakened.

1.2.7 **Relationship between Cost Accounting and Financial Accounting**

The definition of cost accounting has already been noted. Financial accounting is the recording, classification and analysis of financial transactions and the ascertainment of the financial position of a business enterprise.

Alternatively, financial accounting can be defined as that part of accounting that records actual transactions of an entity in monetary terms in accordance with established concepts, principles, accounting standards and legal requirements and presents as accurate, a view as possible, of the effects of those transactions over a period of time and at the end of that time.

It involves the recording of financial transactions of an enterprise as and when they take place and their final inclusion in a periodical financial statement for the use of persons outside the business to assess the financial performance and position of the business. It deals with an enterprise's relationship with creditors, debtors, banks, revenue authorities, etc.

Weaknesses of financial accounting

Financial accounting has been criticized for the following deficiencies:

- a. Information is not given about individual jobs, products or processes.
- b. It is historical, and financial information is not available until the end of the accounting period. That is, cost data relates to the past.

- c. It does not require costs to be classified into direct and indirect, controllable and non-controllable, normal and abnormal, variable and fixed, etc.
- d. Detailed records are not kept of stock movement. This inhibits the efficient control of stock.
- e. Generally, there is no budget plan.

Fig 1.1 **Differences between Cost and Financial Accounting**

<ul style="list-style-type: none"> · <u>Factor</u> · Nature of costs / revenue · Users of Information · Objectives · Conformity to concepts and standards. · Scope and form of presentation · Precision of Information 	<ul style="list-style-type: none"> · <u>Cost accounting</u> · Predetermined estimates, standards and budgets · Management of a business enterprise. · Provide information to aid planning, decision making and control · No need to comply with standards and concepts · Determined by management on the basis of relevance and cost-benefit considerations · Approximations are permitted due to uncertainties in making estimates, but must be sufficiently precise and accurate 	<ul style="list-style-type: none"> · <u>Financial accounting</u> · Historical and past costs / revenue. · Management as well as external stakeholders such as shareholders, creditors, debtors, tax authorities, investors, etc. · Satisfy the stewardship function of management i.e. account for the use of resources entrusted to management · Absolute need to comply meticulously with accounting concepts and standards. · Determined by concepts, standards and legal provisions. · Information must be more precise. There is usually an audit by independent external auditors to confirm the reliability of information.
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1.2.8 Conditions Necessary for an Effective Cost Accounting System

The purpose of cost accounting can only be achieved when an effective cost accounting system is in place. The system should be tailor-made to suit the environment of the business. It should be simple, economical and practical.

The following are some conditions for a successful cost accounting system:

- a. There must be co-operation and co-ordination among all staff members of the organization including management.
- b. There must be a proper system of stores and stock control
- c. There must be adequate payroll procedures

- d. There should be an improved system of data capture, in this regard, it is recommended that standardized preprinted forms be used for recording:
 - receipts of materials
 - issue of materials
 - labour attendance time and hours worked
 - wages calculations etc.
- e. There must be a sound plan for the collection of all indirect costs under suitable headings and for its absorption to products or service departments on a predetermined basis.
- f. A costing department or section should be established and the responsibilities and duties of the cost accountant should be clearly defined.
- g. The cost accounts and financial accounts should be maintained in such a way that their results can be reconciled easily.

1.2.9 Steps in Installing a Cost Accounting System

The installation of a cost accounting system is a substantial task and thus requires very detailed discussions with management and staff and a careful analysis of correct procedures and records.

The following stages are generally recommended:

- Establish the objectives and scope of the proposed system through discussions and agreement with management
- a. Analyse the current system:
 - Are there cost centres?
 - Is there a coding system?
- What accounting records are maintained by the existing system? etc.
- b. Study the current system:
- Staff composition by qualification, experience and competence
- Production system and methods:
 - Is it a jobbing or engineering business?
 - Is it a contract business?
 - Is there service provision?, etc.
- Store keeping systems
- Wage systems etc.

- Start to think about the type and nature of the cost accounting system required:
 - Is it a job costing system or batch costing system?
 - Is it a contract costing system?
 - Is it a process costing system?
 - Is it a service costing system?
 - What approach or technique of costing is required? Is it full absorption costing, marginal costing or standard costing?
 - What methods will be used to price store issues?
 - What methods of remuneration are desirable?
 - What will be the basis of overhead absorption? etc.
- Design the system in collaboration with management and the staff who will operate it.
- Prepare an operating manual for all personnel showing procedures, objectives and codes.
- Arrange for training and instruction for all staff who will be involved in implementing the system.
- Implement the system with full publicity.
- Monitor the system closely and periodically report to management.
- Build a feedback mechanism into the system

1.2.10 Problems Inherent In the Installation of a Cost Accounting System

- a. The following factors define different problems for cost accounting system:
 - Size of organization
 - Type of product/service
 - The production process
 - The methods of manufacture
 - Availability of staff
- b. Other specific problems include:
 - definition of responsibility
 - definition or designation of cost centres
 - compilation of a comprehensive cost system
 - availability of staff

- labour hours worked
 - machine utilization time
- c. Scrap treatment
 - d. Rectification cost, etc.
 - e. The difficulty of accurate classification of cost

1.2.11 Principles of a Good Cost Accounting System

For a cost accounting system to be effective, certain principles must be observed. These include:

- a. The system itself must be appropriate to the organization and its processes or business.
- b. Reports, statements and analyses produced by the system should contain relevant information for the intended purpose. Information is relevant when it has value, which helps to resolve a problem.
- c. Reports, statements and analyses should be produced between appropriate time intervals and promptly, to make them useful and relevant. Reports submitted late lose relevance.
- d. Reports should be addressed to the appropriate responsible persons who have the capacity to act on the subject matter of the report.
- e. Information generated from the system must be sufficiently accurate to make them reliable else decisions will be made on totally invalid foundations or premises.
- f. Reports should be so presented as to make them simple and understandable. Jargons and complex terminologies should be avoided as much as possible
- g. The benefits from generating information should outweigh the cost before such information is generated.

1.3 Scope of Cost Accounting

1.3.1 Elements of Cost

There are three elements of cost, namely: materials, labour and expenses. These result in the following classes of cost:

- a. materials cost
- b. labour cost
- c. expenses

a. *Material Costs*

These are the costs of materials or commodities other than fixed assets, introduced into a product or consumed in the operations of an organisation. In other words, they are the cost of materials input into the production of goods and services. For example, the cost of:

- i. raw materials
- ii. component parts
- iii. work in progress
- iv. primary packing materials
- v. lubricating oil
- vi. consumable tools
- vii. stationeries
- viii. cleaning materials

b. *Labour Cost*

This is the cost of employee remuneration. In other words, payments made to and on behalf of employees for offering labour services in the production function.

c. *Expenses*

These are costs other than material costs and labour costs. For example the cost of:

- i. Hiring special equipment and maintaining such equipment
- ii. Royalty payments
- iii. Copyrights and patent payments
- iv. Utilities such as electricity and water charges
- v. Rent etc.

Each of the elements of cost can either be direct or indirect

- Direct Cost

These are costs that can be directly identified and charged to a cost unit without apportionment. Direct costs comprise of:

- Direct material cost
- Direct labour cost
- Direct expenses

a. *Direct material cost*

These are the costs of material that can be physically identified with a specific cost unit. They are the cost of materials entering into and becoming constituent elements of a product or saleable service. Direct materials costs are allocated directly to cost units.

Note:

Some materials which could qualify as direct materials may be treated as indirect materials for purposes of materiality and convenience.

The following groups of material are examples of direct materials:

- i. Materials specifically purchased for a particular job order or process.
- ii. Materials requisitioned from store for a particular production order
- iii. Work in progress and component parts
- iv. Primary packing materials e.g. cartons, wrapping material, etc.

b. *Direct labour or wages*

This is the cost of remuneration for employees' efforts and skill applied directly to a product or saleable service. Such wages is allocated directly to cost units. Examples of direct labour cost are:

- i. Wages of production operatives who are involved in transforming the raw materials into finished goods.
- ii. Wages of waiters who serve meals at a hotel.
- iii. Wages of sales assistants involved in selling goods in a retailing shop, etc.

c. *Direct Expenses*

These are costs other than material cost and labour cost which can be identified with and charged or allocated to a cost unit. In other words, they are costs other than material cost and labour cost which are incurred for a specific product or saleable service.

Examples of direct expenses are:

- i. the cost of hiring a special equipment for a particular production order.
- ii. the maintenance cost of special equipment hired for particular production orders
- iii. royalty payments.
- iv. travelling expenses to site of contracts, etc.

The sum of all direct costs is prime cost.

d. Indirect Cost

All costs that cannot be identified with and allocated to a cost unit but that has to be apportioned to a number of cost centres and further absorbed by cost units are described as indirect cost. Another term for all indirect costs is overhead costs.

Indirect costs comprise of:

- Indirect material cost
- Indirect labour cost
- Indirect expenses

The sum of all indirect costs is overhead.

i. *Indirect Material Cost*

These are the costs of material items that cannot be identified with any one product because they are used for the benefit of all products rather than for any one specific product. In other words, these are material costs which cannot be allocated to cost units but are apportioned and absorbed by cost units.

For example;

- The cost of materials required for operating and maintaining plant & equipment such as
 - lubricating oil
 - consumable tools
- cost of stationeries
- cost of cleaning materials
 - soap and detergents
 - rugs and dusters
 - brooms and brushes, etc.

ii. *Indirect Labour Cost*

These are wages of employees who do not work on the product itself but who assist in the manufacturing process. Such costs cannot be allocated to cost units; rather they are apportioned to cost centres and further assigned to cost units through absorption.

For example:

- salaries of factory supervisors
- wages of the store department employees
- wages of cleaners, etc.

iii. *Indirect Expenses*

These are expenses incurred in general, not for the production of a specific cost unit.

For example

selling and distribution expenses

- advertising
- sales promotion, etc.

administrative expenses

- stationaries
- audit & consultancy fees
- secretarial charges

production expenses

- rent
- insurance
- electricity

1.3.2 **Methods of Costing**

The cost of products or services is determined using several methods. The use of a given method is dictated by such factors such as: the nature of cost units, the production process, the mode of cost accumulation, the duration of work, etc.

The following are the well established methods of costing:

- a. Job / Batch costing
- b. Contract costing
- c. Process costing
- d. Service costing

All these methods will be discussed in details in subsequent sections.

1.3.3 **Techniques of Costing**

Irrespective of the type of costing method being applied there are various approaches that could be adopted. These are:

- Absorption Costing
- Marginal Costing
- Standard Costing using
- Absorption Costing

- Marginal Costing

These approaches will be discussed in detail later on.

1.3.4 **Information Exclusively Generated From a Cost Accounting System**

- Statements of material, direct labour and machine utilization showing trends and values.
- Cost of products and services broken down to material cost, labour cost and other expenses showing a comparison with estimates.
- Cost control statements for each section and department showing actual results compared with budgets.
- Periodic stock valuation reports.
- Scrap and rectification cost reports.
- Budgets for planning and control purposes including cash budgets for monitoring liquidity.

1.3.5 **Cost Accounting as Part of the Management Information System**

Management requires information for decision making, planning and control. To obtain the information, there is the need for a management information system.

Cost accounting and for that matter management accounting, form an integral part of the management information system. As part of the management information system, cost accounting provides information required by management for such purposes as:

- formulation of policy
- planning and controlling the activities of the enterprise
- decision making
- disclosure to stakeholders external to the enterprise
- disclosure to employees
- safe guarding the assets of the enterprise

The cost accounting function is particularly useful in the managerial function in the following ways:

i. *Policy formulation*

The cost accounting system provides information to help in deciding:

- what products to sell
- in what markets to operate

- at what selling prices
- ii. *Planning*
Information is also provided by the cost accountant to help in the evaluation of proposals for capital expenditure.

The cost accountant provides data on past performance that may guide future performance. The cost accounting function is at the centre of the establishment of budgetary procedures and budget time tables and the co-ordination of short term plans from all sections of the business to ensure their harmony. The role of the cost accounting function in the preparation of the master budget of the business cannot be over emphasized.
- iii. *Control*
The cost accounting function aids the control process by producing performance reports that compare the actual results with intended results for each responsibility centre. Management attention is drawn to trouble spots.
- iv. *Decision Making*
The analysis of costs and revenues contained in most cost accounting reports is very useful in guiding decision making.
- iv. *Others*
Indeed the cost accounting function provides a rich database for making disclosures to all stakeholders of an enterprise and then ultimately assists the enterprise to achieve its objectives and safeguard its assets.

1.3.6 **Organisations Other Than Manufacturing Companies Where Cost Accounting Can Be Applied**

- a. Local Authorities: District, Municipal or Metropolitan Assemblies. e.g. Accra Metropolitan Authority, Kumasi Metropolitan Authority, Kano Municipal Local Government or Lagos Island Local Education Authority.
- b. Health Sector Organisations:
 - Hospitals
 - Clinics, etc.

- c. Educational institutions
 - Colleges
 - Polytechnics
 - Universities
- d. Financial institutions
 - Banks
 - Insurance companies, etc.
- e. Transport businesses
- f. Consultancy firms
 - Accounting and audit firms
 - Economic and management consultancies
 - Legal chambers, etc.
- g. Utility companies
 - Water company
 - Electricity company
- h. Farming ventures
- i. Trading outlets
 - Retailing
 - Wholesaling
 - Departmental stores
 - Super markets, etc.

In respect of the organizations outlined, the following are some information that could be generated to assist their control:

- a. Cost per unit of a product / service.
- b. Cost of running the organization analysed into: sections, departments, etc.
- c. Wages cost per unit and material cost per unit.
- d. Cost per patient per consulting hour, per bed, etc.
- e. Budgetary control statements.
- f. Cost per full time equivalent student
- g. Branch operating statement

1.3.7 **Value of Cost Information in Management Decision-Making Process**

Business activities, being dynamic, require decisions by management almost on a daily basis. There is need to regularly review decisions which are currently being implemented to ensure that they are still relevant in the face of changing circumstances. There is also the need to take fresh decisions for the immediate and distant future in line with industry trends if a business must remain afloat.

Inflation for instance, renders cost structures obsolete as a decimal point shift in the indices requires a reworking of the elements. Economic items like a change in foreign exchange rates may adversely affect the costing of products in industries which depend on imports or exports. If the cost of products changes, so also must the selling prices, and such changes take place sometimes as rapidly as on a daily basis or even more frequently.

Without cost information, management may not be able to respond to the demands for on-the-spot decisions which today's dynamic business situations require.

1.3.8 **Impact of Information Technology on the Generation, Evaluation and Presentation of Cost Information:**

Because of the need to keep abreast of current trends in business, management cannot afford to obtain information late because an untimely piece of information is more damaging than no information at all.

Financial information most times comes in arrears; sometimes the damage it reveals for a particular period may have continued midway into the succeeding period because the period being reported on must necessarily expire before the complete figures could be compiled. Whilst this is acceptable for historical purposes, it may spell doom for a business facing stiff competition or operating under very tight conditions, a day's delay may be critical to the survival of such a business.

Information Technology comes handy to support businesses in the area of on-line, real-time presentation of reports to management. With a good information network, top management can access figures almost as soon as they are being generated at the lowest level of the shop floor.

In some cases, controls are already built into the system either to raise danger signals or to require authorization of some actions at some points in the business process. For example, where credit limits and credit periods are established and built into the system, there would be need for a very high level of authorization before supplies could be made to a debtor who has exceeded the limits set for him/her.

Also, with information technology, time wasted on generating papers and obtaining physical authorizations are reduced to the lowest minimum as the system does most of the groundwork and passes the results to the various levels of management on-line.

1.3.9 Roles Required of Accounting Technicians in Collection, Analysis and Presentation of Cost Information

The accounting technician, as the name implies, is the person who drives the nitty-gritty of information presentation. Any laxity in the performance of his/her tasks has a profound adverse effect on the quality and timeliness of the information generated for use by management in decision making.

Specifically, the accounting technician is expected to perform the following roles:

- a. Ensure that established formats for data compilation are being correctly followed at the various levels.
- b. Monitor the regularity of entry of data to ensure timeliness. Hourly, daily, weekly and monthly reports are to be given by the responsible officers when they are required.
- c. Check the accuracy of figures supplied through reasonableness checks or other independent sources.
- d. Raise flags where extraneous or extraordinary figures are presented.
- e. Prepare summaries of raw data collected showing the results from various perspectives to give a total picture for example, sales by branch, sales by period, sales by salesman, sales by season, etc. would reveal the total sales figures from different perspectives.
- f. Draw summaries in a simple, straightforward and concise manner which would not be too voluminous for a busy executive, without also losing its relevance.
- g. Pre-empt questions by providing explanatory notes on the trends and movement observed in the reports.

CHAPTER TWO

COST CLASSIFICATION, CODIFICATION AND BEHAVIOURAL ASPECT

CHAPTER CONTENTS

- a. Classifications of cost according to nature, functions, elements, responsibilities and behavioural patterns
- b. Cost coding systems
- c. Identification and use of fixed, variable and semi-variable costs in cost analysis.
- d. Analysis of the effect of changing activity levels on unit costs

2.0 OBJECTIVES

After studying this chapter, readers should be able to:

- a. define classification of cost
- b. know the method of cost classification;
- c. explain the various patterns of cost behaviour.
- d. cost codification

2.1 INTRODUCTION

Cost accounting is concerned with controlling operations or products or services. Cost control can be possible subject to first introducing cost classification into the business activities. CIMA terminology defines cost classification as ‘Arrangement of cost into logical groups, with respect to their nature (fixed, variable, value adding), function (production, selling) or use in the business of the entity’

2.1.1 Classification of Cost

Cost can be classified variously for different objectives

Classification According To Elements of Cost

Costs can be classified by element. There are three basic elements of cost. These are materials, labour and other facilities or resources other than materials and labour.

Thus when classified according to elements, there are the following classes of cost:

- materials cost
- labour cost
- expenses

i. **Material Costs.**

These are the costs of material or commodity other than fixed assets, introduced into product or consumed in the operations of an organisation. In other words, they are the cost of materials input into the production of goods and services. For example, the cost of:

- raw materials
- component parts
- work in progress
- primary packing materials
- lubricating oil
- consumable tools
- cleaning materials
- stationary, etc.

ii. **Labour Cost**

These are the cost of employee remuneration. In other words, payments made to and on behalf of employees for offering services in the production function.

iii. **Expenses**

These are costs other than material costs and labour costs. For example the cost of:

- Hiring special equipment and maintaining such equipment
- Royalty payments
- Copyrights and patent payments
- Utilities such as electricity and water
- Rent, etc.

b. **Classification according to Nature**

Cost can also be classified either as direct cost or as indirect cost.

1. **Direct Cost**

These are costs that can be directly identified and charged to a cost unit without apportioning. Direct costs comprise of:

- Direct material cost

- Direct labour cost
- Direct expenses

i. **Direct Material Cost**

These are the costs of material that can be physically identified with a specific cost unit. They are the cost of materials entering into and becoming constituent elements of a product or saleable service. Direct material costs are allocated to cost units.

Note

Some materials which could qualify as direct materials may be treated as indirect materials for purposes of materiality and convenience.

The following groups of materials are examples of direct materials:

- a. Materials specifically purchased for a particular job order or process.
- b. Materials requisitioned from store for a particular production order
- c. Work -in -progress and component parts
- d. Primary packing materials e.g. cartons, wrapping materials, etc.

ii. **Direct Labour or Wages Cost**

These are the costs for employees' efforts and skills applied directly to a product or saleable service. Such wages are allocated directly to cost units.

Examples of direct labour cost are:

- Wages of production operatives who are involved in transforming raw materials into finished goods.
- Wages of waiters who serve meals at a hotel
- Wages of sales assistants involved in selling goods in a retailing shop, etc.

iii. **Direct Expenses**

These are costs other than material cost, labour cost which can be identified with and charged or allocated to a cost unit. In other words, they are costs other than material cost and labour cost which are incurred for a specific product or saleable service. Examples of direct expenses are:

- the cost of hiring a special equipment for a particular production order
- the maintenance cost of special equipment hired for particular production orders
- royalty payments

- travelling expenses to site of contracts, etc.

The sum of all direct costs is prime cost.

2. **Indirect Cost**

All costs that cannot be identified with and allocated to a cost unit but that has to be apportioned to a number of cost centres and further absorbed by cost units are described as indirect cost. Another term for all indirect costs is overhead.

Indirect costs comprise of:

- a. Indirect material cost
- b. Indirect labour cost
- c. Indirect expenses

i. **Indirect material cost**

These are the cost of material items that cannot be identified with any particular product because they are used for the benefit of all products rather than for any one specific product. In other words, these are material costs which cannot be allocated to cost units but are apportioned and absorbed by cost units.

For example;

The cost of materials required for operating and maintaining plant & equipment such as

- lubricating oil
- consumable tools
- cost of stationery
- cost of cleaning materials
- soap and detergents
- rugs and dusters
- brooms and brushes, etc.

ii. **Indirect labour cost**

These are wages of employees who do not work on the product itself but who assist in the manufacturing process. Such costs cannot be allocated to cost units; rather they are apportioned to cost centres and further related to cost units through absorption.

For example:

- Salaries of factory supervisors
- Wages of the store department employees
- Wages of cleaners, etc.

iii. **Indirect Expenses**

These are expenses incurred in general and not for the production of a specific cost unit. For example

- Selling and distribution expenses
 - i. Advertising
 - ii. Sales promotion, etc.
- Administrative expenses
 - i. Stationary
 - ii. Audit & consultancy fees
 - iii. Secretarial charges
- production expenses
 - i. Rent
 - ii. Insurance
 - iii. Electricity

When the classification according to element and nature are combined, a cost build-up can be made as follows:

COST CARD

Direct material cost	xx
Direct labour cost	xx
Direct Expenses	<u>xx</u>
Prime cost	xxx
Indirect material cost	xx
Indirect labour cost	xx
Indirect expenses	xx
Overhead cost	<u>xxx</u>
Total cost	<u>xxx</u>

c. **Classification According To Function**

All the indirect costs, that is, overhead cost, can also be classified according to function. Thus, overhead can be classified as:

- i. Production overheads
- ii. Selling overheads
- iii. Marketing overheads
- iv. Distribution overheads
- v. Administrative overheads
- vi. Research and development overheads.

✓ **Production Overheads**

These are the indirect costs of manufacturing a cost unit. It comprises of indirect materials consumed in the factory, indirect factory wages and other indirect expenses incurred in connection with production.

✓ **Selling Overheads**

These are marketing costs incurred in securing orders, e.g. sales promotion cost.

✓ **Marketing Overheads**

These are the costs incurred in publicising and presenting to customers the products of the undertaking in suitably attractive forms at acceptable prices together with the cost of all relevant research work, the securing of orders and delivery of the goods to customers. It also includes the costs of after sales services or processes. Thus, marketing costs comprise of: selling costs, distribution costs and other connected costs.

✓ **Distribution Overheads**

These are the costs incurred in making the finished goods ready for dispatch and the delivery of the product to customers, e.g. cost of carriage outwards.

✓ **Administrative Overheads**

These are the costs of formulating policies, directing and controlling operations not related directly to production, selling, distribution or research and development.

✓ **Research and Development Overheads**

These are the costs of seeking new ideas, materials, methods of production and improved products and the development and design of such ideas so that they can be applied to formal production.

With this new cost classification, the Cost Card can be revised as follows:

Direct material cost	xxx	
Direct labour cost	xxx	
Direct expenses	<u>xxx</u>	
Prime cost	xxx	
Indirect production material cost	xxx	
Indirect production labour cost	xxx	
Indirect production expenses	<u>xxx</u>	
Production overheads	<u>xxx</u>	
Production cost	xxx	
Selling overheads	xxx	
Distribution overheads	xxx	
Administrative overheads	<u>xxx</u>	<u>xxx</u>
Total cost		xxx
Profit margin		<u>xxx</u>
Selling price		<u>xxx</u>

d. ***Classification According To Behaviour***

Costs may be classified according to the way the cost behaves in relation to activity level. In this regard, costs may be classified as:

- i. Fixed cost
- ii. Variable cost
- iii. Semi-fixed, semi-variable or mixed cost
- iv. Stepped fixed cost

i. **Fixed Cost**

These are costs that do not vary with changes in activity levels. They usually change with the passage of time. For example, rent and rates, the managing director's salary, etc. They are sometimes referred to as period costs.

ii. **Variable Cost**

These are costs which vary in direct proportion with changes in activity

levels. For example, the cost of raw materials, direct wages and direct expenses such as royalties.

iii. **Semi-fixed/semi-variable or mixed cost**

These are costs which contain both fixed and variable elements, that is, for a given range of level, the cost may remain constant and beyond the relevant ranges, costs may then vary in direct proportion with changes in activity level. For example, the cost of utilities such as electricity, water and telephone.

iv. **Stepped fixed cost**

These are costs which are fixed for a given range of activity level but which change discretely for ranges of activity levels beyond the given ranges.

e. ***Classification as Product Costs or Period Costs***

i. **Product Costs**

These are the costs that are identified with goods produced or purchased for resale. These usually are the production or manufacturing costs. They are the costs used for the valuation of stocks and work in progress.

Examples of product costs are:

- Cost of raw materials
- Production wages
- Production overheads such as electricity, depreciation of plant, rent of factory premises, etc.

ii. **Expired Product Cost**

These are the portion of product cost which relate to products that have already realised revenues and do not have future revenue generating potential.

iii. **Unexpired Product Costs**

These are the costs of resources acquired which are expected to contribute to future revenue. They are recorded in the balance sheet, e.g. stock of materials not yet sold. When the stocks are sold and revenue realised, the cost is then expired cost and recorded in the profit and loss account.

iv. **Period Costs**

These are the costs incurred and charged against profit for a period, and not included in cost for stock valuation purposes. These usually are non-manufacturing costs.

Examples are selling and distribution overheads and administrative overheads.

Period costs are charged in full to the profit and loss account for the period.

They are not included for stock valuation purposes.

Product costs can be analysed as expired costs or unexpired costs.

f. **Classification According To Controllable and Uncontrollable Costs/Revenue**

These are costs/revenues that are reasonably amenable to regulation by a given responsibility centre manager. In other words, they are costs/revenue whose incidence are influenced by the actions or inactions of a given responsibility centre manager.

All costs/revenues are controllable at some level of management. However, lower down the hierarchical structure of management, some costs/revenues are not controllable. In preparing control reports, it is very necessary to have cost/revenue classified as controllable and non-controllable.

g. ***Classification of Costs as Relevant and Irrelevant Costs***

i. **Relevant Costs/Revenue**

These are those future costs and revenues that can be altered by a given decision.

ii. **Irrelevant Costs/Revenues**

These are those costs/revenues that will not be affected by a given decision. Irrespective of what decision is taken, the cost will not alter.

Examples of Relevant Costs include:

Future costs

Opportunity costs

Avoidable costs

Incremental costs, etc.

Examples of Irrelevant Costs include:

Past costs

Sunk costs

Unavoidable costs

Fixed costs except for incremental fixed costs

h. **Other Classifications of Cost**

i. **Avoidable Costs**

These are costs that may be saved by the adoption of a given alternative option.

ii. **Non-Avoidable Costs**

These are costs that cannot be saved or eliminated by the adoption of a given alternative line of action.

iii. **Normal Costs**

These are costs planned for and expected at given levels of activity under specified conditions. For example, normal scrap, loss of materials, cost of expected idle time, etc.

iv. **Abnormal Costs**

These are costs not planned for and therefore not expected to be incurred at a given level of activity under conditions in which that level of activity is normally achieved, e.g. cost of excessive scrap and abnormal idle time pay, etc.

v. **Sunk Costs**

These are the costs of resources already acquired. They are costs created by decisions made in the past and cannot be altered by decisions to be made in the future. For example the written down value of plant previously acquired.

vi. **Opportunity Costs**

These are the values of benefits forgone or sacrificed in favour of alternative courses of action.

vii. **Incremental Costs/Revenue**

They are the additional costs or revenues that arise from the production or sale of a group of additional units. These are sometimes termed differential costs.

viii. **Marginal Costs/Revenues**

These are the additional cost or revenue that arises from the production of one additional unit of output or service.

ix. **Future cost**

These are costs estimated and are reasonably expected to be incurred in the future.

- x. **Replacement Costs**
These are the estimated costs at which an identical item can be acquired or produced.
- xi. **Conversion costs**
These are the cost of transforming raw materials into finished goods or the cost of converting raw materials from one stage of production cycle to the next. It is the total cost of production less cost of bought-in materials.
- xii. **Attributable Costs**
These are costs that could be avoided on average if a product or a function is discontinued entirely.
- xiii. **Policy Costs**
These are costs additional to normal requirement incurred in accordance with the policy of an undertaking. They are also termed discretionary costs.
- xiv. **Development Costs**
These are costs of research into improving the production of goods and services.
- xv. **Pre-Production Costs**
These are the part of development costs relating to making trial production run preliminary to formal production
- xvi. **Committed Costs**
These are costs that are expected to be incurred and for which resources have been ear-marked or allocated as a result of a contractual agreement or an earlier decision to have the cost incurred.
- xvii. **Value Added**
This is the increase in market value of a product as a result of changing the form, location, etc. of that product. It is the total market value of the product less cost of bought in materials and services.
- xviii. **Pre-Determined Costs**
These are costs estimated and computed in advance of production on the basis of specifications of all the factors affecting cost.
- xix **Standard Costs**
These are costs estimated and expected to be incurred per unit of activity under efficient production conditions.

xx. **Budgeted costs**

These are costs estimated and planned for a given activity level, function or segment of the organisation within a specified time horizon.

xxi. **Actual costs**

These are the costs actually incurred in the production process. Actual costs are not estimates but are historical or past costs.

2.1.2 **Cost Objectives and Possible Cost Classification**

Depending upon the cost objective that is intended to be achieved, cost could be classified as has already been outlined. Three cost objectives can be identified together with the classifications to suit such cost objectives.

a. **Cost Objective**

Cost for stock valuation

Possible methods of cost classifications

Period cost and product costs

Elements of cost

Manufacturing, selling, distribution and administration costs, etc.

b. **Cost for Planning and Decision Making**

Possible methods of cost classifications

Cost behaviour fixed/variable, etc.

Relevant and irrelevant costs

Avoidable and unavoidable costs

Sunk costs

Opportunity costs

Incremental, differential and marginal costs

2.1.3 **Cost Behaviour**

In this section, you will learn about the different behavioural patterns of cost. When you complete this section, you should be able to:

- ✓ explain the problems associated with the conventional methods of cost classification
- ✓ explain the different cost patterns
- ✓ explain the factors that influence cost behaviour.

2.1.4 **Problems Associated With the Conventional Classification of Cost According To Behaviour**

- a. The overall simplistic assumption of cost linearity for variable cost per unit is not practical. In addition to the possibility that variable cost may be linear, it is also possible that they may be curvi-linear or non-linear. The behaviour of cost should be established by analysis of the cost in question and not by some overall simplistic assumption.
- b. Fixed cost can change as activity levels change. Some cost could be classified as fixed or variable in different organisations e.g. depreciation cost. It is better to sub-divide fixed cost into four categories:
 - i. Time related fixed cost e.g. rent and rate
 - ii. Volume related fixed costs-these are the same as step cost e.g. cost of plant.
 - iii. Policy related fixed cost e.g. advertising cost, research and development cost. These types of fixed cost are known as programmed fixed cost.
 - iv. Joint fixed cost.

- ✓ The classification of cost as variable and fixed and may not hold for certain items of cost.

Some cost items contain variable and fixed elements. There are methods that could be applied to separate fixed and variable costs.

- Statistical methods
- Non statistical methods (judgment)

- ✓ Costs do not necessarily behave in regular patterns. For example a variable cost may be linear between 90% - 115% of normal activity level and thereafter have a curvilinear function.

- ✓ Variable costs are assumed to vary with activity levels but there are multiple causes of this variation.

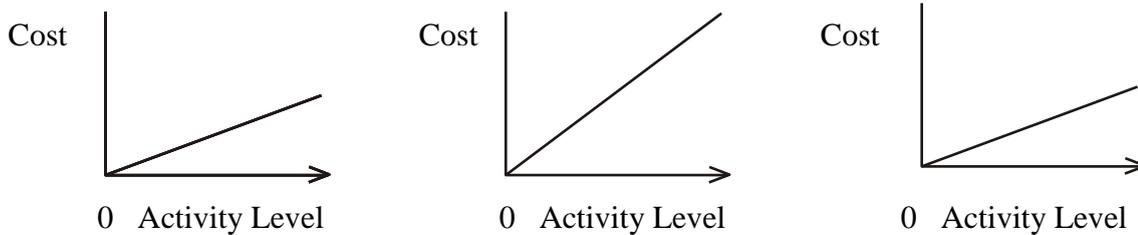
Different variable costs react to different activity measures e.g. Direct wages may vary with the number of direct workers engaged, distribution costs may vary with the deliveries made, etc. The simplistic assumption that all variable costs vary with the same measure of activity level is misleading.

In summary, the conventional classification of fixed and variable costs being defined

in relation to one factor, that of production volume is simplistic and is, at best, only a crude approximation of reality.

2.1.5 Typical Cost Patterns

a. *Variable cost patterns linear*



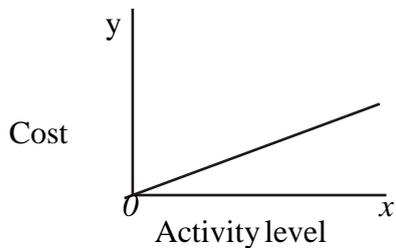
Examples of costs that behave in this linear pattern:

direct materials cost

royalties per unit of production

power usage (without the fixed element)

A perfectly linear variable cost over all activity levels is extremely unlikely. More realistically, a cost may be linear only over the relevant range of activity levels.



$y =$ Total Cost

$x =$ Activity Level

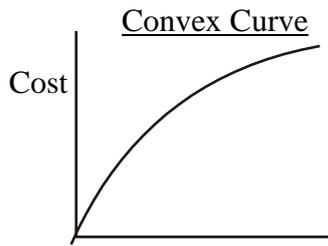
$b =$ Variable cost per unit

The cost function for a linear variable cost is:

$$Y = b x \text{ (where } b \text{ is the slope of the curve i.e. variable cost per unit.)}$$

b. **Variable Cost patterns - Curvi-linear**

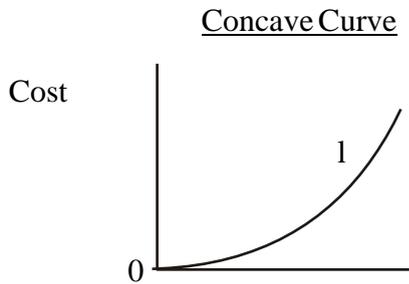
These are cost patterns where the costs do not vary in direct proportion with activity level. e.g.



0
variable cost curve
Activity level

Implications

An extra unit of activity causes less than proportionate increase in cost. i.e. Economies of scale operate



A
c
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Implications

variable cost curve

Activity Level

The above functions are termed "parabolic". Mathematically, the function of a parabola is given as:

$$Y = bx + Cx^2 + \dots + Px^n$$

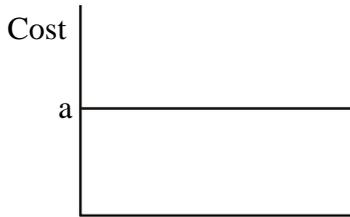
Where b,c,... and p are constants and x is the

activity
level and
y is
variable
cost

An extra unit of activity causes more than proportionate increase in cost. i.e. diminishing returns operate

c. **Other Cost Patterns**

i) **Fixed Cost Patterns**

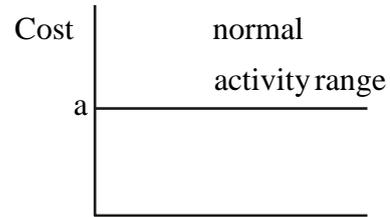


Activity level

e.g. rates, rent, time based depreciation, salaries, etc.

Mathematically, fixed cost function is given as $y = a$

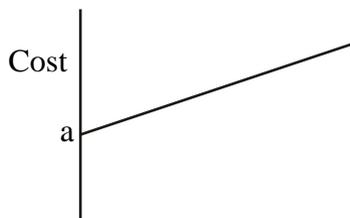
ii)



Activity level

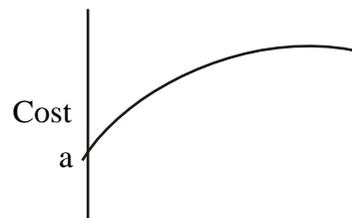
d. **Semi variable cost patterns**

i) **linear semi variable cost**



Activity level

ii) **curvi linear semi variable cost**



Activity levels

Examples include:

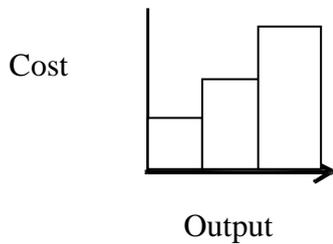
- Cost of electricity
- Telephone charges
- Computer bureau costs
- Some direct wage schemes with a piece work and a guaranteed minimum payment system

Mathematically, a semi variable function is given as:

Linear $y = a + bx$

curvi- linear $y = a + bx + cx^2 + \dots + Px^n$

(e) Stepped Costs



Examples

- Supervisory salaries, bought in materials when there are discounts.

f. **Factors Influencing Cost Behaviour**

- i. Activity level -
 - Sales volume
 - Production volume
 - Hours of work
 - Number of invoices processed, etc.
- ii. Time- the passage of time
- iii. Non-volume factors
 - a) Technologies
 - b) Methods of production
 - c) Levels of efficiency
 - d) Price levels

2.1.6 **Analysis of the Effect of Changing Activity Levels on Costs**

The concept of “levels of activity” may be addressed by some other alternative terms depending on the nature of business concerned. Typical terms include throughput, output, volume and capacity.

Unit costs do not remain the same over different activity levels, a great deal of care is required in monitoring the behaviour of costs at each level of activity, because it forms the basis upon which costs are classified into fixed and variable.

It is instructive to note that fixed cost only remains fixed up to a certain level of activity and thereafter changes. For example, factory rent is fixed up to the level of the maximum capacity of that particular factory; any output beyond that may necessitate the acquisition of an additional factory, hence more costs.

Even for variable costs, some may change at some activity levels. For example, unit material costs may drop at high volumes due to quantity discounts. The accounting technician should therefore recognize that fact and make appropriate changes if his/her cost information is to remain reliable.

2.2 CODIFICATION

2.2.1 Cost Coding System

Cost Classification of controlling cost is not complete until codes are applied to classified cost items for simplicity purpose. The terminology defines code as 'a brief, accurate reference designed to assist classification of items by facilitating entry, collation and analysis'.

2.2.2 Characteristics of a Good Designed Coding System

A good coding system designed must be:

1. Simple for the organisation to operate
2. Flexible in nature
3. Easy to remember
4. Each item should be with a fixed coding length i.e 00000 is having a coding length of spc (6) digits
5. Concise in nature

2.2.3 Methods of Codification

The three popular methods of codifying classified items are:

- a. **Mnemonic Method:** This method applies symbols to classified items such as:
FAU applied to Factory Unit,
ADM applied to Administration
DMA applied to Direct Material
DLA applied to Direct Labour
- b. **Decimal Method:** This method applies whole number to a master group and decimal to primary and secondary group in each of the master group i.e
 1. Direct Materials
 2. Direct Labour
 3. Direct Expenses
 4. Factory Overheads

- 4.1 Indirect material in the factory
- 4.2 Consumable stores etc
- 5. Indirect Labour
 - 5.1 Factory Labour
 - 5.2 Factory Cleaners etc

c. **Numerical Method:** This method applies fixed digits to classified item i.e if an item such as wood is having varies dimensions of width and thickness. If the same wood type is either iroko wood and mahogany wood, then the code designed for different types of woods such as iroko wood and mahogany wood, with each type having dimensions involving length, width and thickness should possess a fixed length. Supposing eight digits of 00000000 is designed. Then it can be shown as under:

d.

Type of wood	Length	Width	Thickness
0	000	00	00

Equals 0 0 0 0 00 0 0 (Eight digits)

The code for Irokowood with dimensions of 12 feet length; 2 inches width; and 1 foot thickness after the design could be:

Iroko wood 12 feet by 2 inches by 1 inch

Code 1 1 4 4 0 4 0 4

Note that the names and dimensions of the wood will be kept secret. Only code 1 1 4 4 0 4 0 4 will be disclosed.

Supposing mahogany of the same dimensions of 12 feet length; 2 inches, width and 1 inch thickness. Then, the code may be: Code 2 1 4 4 0 4 0 4

Note that codes are not only applicable to materials' type but could equally be designed for material cost, labour cost, and overhead.

2.3 Cost Centre and Cost Unit

2.3.1 Cost Centre:

This is defined in the terminology as 'production or service location, function, activity or item of equipment for which costs are accumulated'.

Therefore a cost centre can be described as a location, a person, an item of equipment or a group of these in relation to which costs are ascertained and further related to cost units. For example, the factory, canteen, maintenance section, the foreman, managing director, the plant, the pool of computers, etc. Cost centres are broadly classified into:

1. Production cost centres
2. Service cost centres

The manager in any cost centre is accountable for the outcome achieved in his domain. This means that each centre is evaluated in terms of performance achieved.

2.3.2 Cost Unit:

The CIMA terminology defines cost unit as 'unit of product or service in relation to which costs are ascertained.

So, a cost unit is a quantitative unit of a product or service in relation to which costs are ascertained. For example, tonnes of cocoa, bags of maize, bags of rice, barrels of beer or cartons of minerals, kilowatt hours, passenger per mile, ton per mile, etc.

Some of the selected popular cost units are provided below:

Nature of Industry	Cost Unit
Brewing	Barrel
Coal Mining	Tunnel/ton
Electricity	Kilowatt hour (kw/hr)
Oil	Barrel/Tonne, Litre
Education	Courses, Enrolled Student
Paper	Ream
Hospitals	Patient day
Telephone	Calls made, number of extension

2.3.3 Profit Centre

This is a centre which not only incurs cost but also generates income.

2.4 CHAPTER SUMMARY

Chapter one has been discussed in four sections. Section one focused on the introduction to cost accounting, essentially explaining the preliminary issues in accounting such as the objectives, merits and limitations of cost accounting.

Section two explained the nature and scope of cost accounting, discussing in outline the various elements of cost, the methods of costing such as job costing, batch costing, contract costing, etc. The section also explained the relationship between cost accounting and management accounting on one hand and financial accounting on the other hand.

Sections three and four concentrated on cost classification and cost behaviour. These sections explained in detail the various ways in which cost may be classified and how cost usually behaves.

In conclusion, this chapter has given you a firm foundation of the various concepts, and principles in cost accounting to enable you easily understand the chapters ahead.

MULTIPLE-CHOICE AND SHORT ANSWER QUESTIONS

1. Cost accounting involves
 - A. Drawing up balance sheet
 - B. Writing-off of costs
 - C. Ascertaining of cost
 - D. Preparation of statement of value added
 - E. Annual audit of financial statements

2. Cost accounting is an integral part of
 - A. Financial accounting
 - B. Forensic accounting
 - C. Treasury accounting
 - D. Historical accounting
 - E. Management accounting

3. One of the following is **NOT** an objective of cost accounting
 - A. To provide information to aid control
 - B. To ascertain cost and facilitate pricing
 - C. To provide information for decision making
 - D. To investigate fraud
 - E. To assist in planning

4. Material costs do **NOT** include cost of
 - A. Fixed assets
 - B. Raw materials
 - C. Work in progress
 - D. Packing materials
 - E. Cleaning materials

5. Which one of the following is a direct expense?
 - A. Director's salary
 - B. Cost of hiring a special equipment for a particular production order
 - C. Advertising expenses
 - D. Electricity expenses
 - E.

Insurance premiums

6. Classifying costs by elements includes materials, labour and
7. The addition of all direct costs is known as
8. Cost which are fixed for a given range of activity level but which change discretely for ranges of activity levels beyond the given ranges are called
9. Costs which may be saved by the adoption of a given alternative option are known as
10. Costs which vary in direct proportion with changes in activity levels are called

SOLUTIONS TO MULTIPLE CHOICE AND SHORT ANSWER QUESTIONS

1. A
2. E
3. D
4. A
5. B
6. Expenses
7. Prime costs
8. Stepped fixed costs
9. Avoidable costs
10. Variable costs

EXAMINATION TYPE QUESTIONS

1. You have been appointed to the newly created position of a Cost Accountant with a small manufacturing company. You have now installed a costing system and the Managing Director has asked you to inform him of the kind of information the system should provide.
You are required to write a report to the Managing Director setting out SIX principal items of information obtainable from the costing system.

(16 marks)

2. “The installation of a costing system is a major move in a business”
You are required to discuss the problems of installing such a system. **(8 Marks)**

3. Outline the possible problems which may be encountered as a result of the introduction of a system of cost control into an organization **(10 Marks)**

4. Enumerate the differences, if any, between financial and cost accounting **(8 Marks)**

5. The Managing Director of a manufacturing concern once said “since the main object of our firm is to know the annual profit, there is no need retaining the cost accounting staff; let us pay them off and retain only the financial accounting staff in order to reduce the administrative costs”.

Required

Write a report to the Managing Director to convince him to retain the cost accounting staff. **(10marks)**

6. Describe **THREE** different methods of cost classification and explain the utility of each method. **(11 marks)**
CACALevel I Costing, June 1989

7. Cost classifications used in costing include:
 - (i) Period costs
 - (ii) Product costs
 - (iii) Variable costs
 - (iv) Opportunity costs

Required:

Explain each of these classifications, with examples of the types of cost that may be included. **(17 marks)**

CACALevel I Costing, June 1987

- 8 “Cost may be classified in a variety of ways according to their nature and the information needs of management.” Explain and discuss this statement, illustrating with examples of the classifications required for different purposes. **(22 Marks)**

ICSA Management Accounting, December 1984

9. An existing cost system lacks the essential aspects of cost control. List the main matters to be

introduced to make good the system's deficiencies.

10. Company HIMCO produces different products through automation. The company incurs large amount of overheads in the factory on power alone, that is semi-variable in nature.

The details of Power Costs for six (6) months ending September 2016 are provided as follow;

Months	Machine Hours	Power Cost
2016	Hours	₦
April	50,000	400,000
May	60,000	460,000
June	40,000	340,000
July	45,000	370,000
August	70,000	520,000
September	75,000	550,000

Required:

- a.
- ai. Differentiate between fixed cost and variable cost
 - aii. Summarise the meaning of semi-variable cost
- b. Segregate the semi-variable costs into total fixed cost and unit variable cost
- c. Estimate power cost for October if the firm plan to use 88 machine hours

CHAPTER THREE

ELEMENT OF COST: MATERIALS

CHAPTER CONTENTS

- a. Definition and basic classifications
- b. Procedure and documentation of:
- c. Purchasing Control
- d. Stores Planning Operation: Re-ordering procedures and Economic Order Quantity(EOQ)
- e. Inventory valuation using FIFO,LIFO, Weighted Average, Standard Cost and Replacement Cost
- f. Storage Control: Bin cards and store ledgers, ABC analysis Techniques, Physical and Continuous stocktaking
- g. Just-In-Time (JIT) production and purchasing

3.0 Objectives

After studying this chapter, you should be able to:

- a. explain the stores function and the factors that facilitate effective stock control
- b. explain the procedures and documentation involved in the procurement process;
- c. explain some principles of good storage system;
- d. explain the methods of pricing issues and stocks;
- e. compute and explain the stock control levels; and
- f. record stores information in stock control records.

3.1 INTRODUCTION

Material cost is a significant portion of total costs for many businesses, especially for manufacturing businesses. To minimize cost, material cost control is vital. This chapter therefore outlines mechanisms for controlling material cost and provides a structure for determining material cost.

3.2 BASIC CLASSIFICATION OF MATERIALS

3.2.1 What are materials?

Other names given to materials include:

Stocks, stores, merchandise, inventory, etc. Stock has been defined as: “all the tangible material assets of an organization other than its fixed assets.” Stock therefore comprises of the following:

- a. raw materials;
- b. work-in-progress;
- c. finished goods;
- d. merchandise ready for sale;
- e. any parts or materials to be incorporated into a finished product (component parts);
- f. consumables such as - stationery, oil, grease, fuel, gas;
- g. jigs, fixtures and special tooling;
- h. by-product, scrap;
- i. works supplies; and
- j. packaging

3.2.2 Significance of Stocks

Stocks form a significant amount of the assets of organizations. For example on average, two thirds of a manufacturing business' working capital will usually be in stock. Retailers and wholesalers will often have close to nine-tenth or 90% of their working capital in stock.

The value of the assets of a business and the quality of service offered to customers by the business is heavily and severely affected by the effective management of stocks. The importance of quality of service to customers needs no emphasis.

The manner in which stores are managed can either define success or failure for the business.

There is no organization which can exist without the use of some items of stores or material. This includes non-profit making organizations as well. Thus every organization will need to use some items of stores. This need is even crucial for profit making businesses whose operations may include the following:

- i. manufacturing of some goods for sale;
 - cement manufacturing;
 - the breweries; and
 - food processing industries which include;
 - Cocoa processing;

- cassava processing;
 - canned food processing; and
 - canned meat processing, etc.
 - restaurants;
 - garment industry;
 - construction industry;
 - agricultural activities, and
 - printing industry
- ii. the purchase and sale of goods.
- This involves commercial activities like:
- supermarkets
 - retail shops
 - distribution outlets
 - bookshops, etc.
- iii. the provision of services;
- transportation
 - education and training
 - medicare
 - personal service
 - hair dressing / barbering
 - dress making and tailoring
 - repairs and maintenance services, etc.

For most businesses, the cost of stores and materials account for over 60% of total cost. The efficient management of the stores function is therefore very critical to minimizing cost and maximizing profits for the organization.

Even for non-profit oriented organizations, available resources must be judiciously applied, hence a requirement of efficient management of the stores function.

3.3 THE STORE FUNCTIONS AND ACTIVITIES

3.3.1 Purchasing:

- a. Identifying and defining need for items of stores and supplies;
- b. Identifying and evaluating available suppliers of these items;
- c. Negotiating with selected suppliers; and
- d. Making contracts and placing orders for the needed items to be supplied

3.3.2 Operating the Store:

- a. Receiving and accepting (rejecting) the items ordered
- b. Holding or keeping the items until they are used
- c. Issuing the items out for use

3.3.3 Stock Control

- a. Recording stock;
- b. Checking stock;
- c. Planning replenishment of stock;
- d. Valuation of stock

3.3.4 Summarized Overview of Stores Functions

- a. the purchasing function:
 - i. Requisition for stock;
 - ii. Supplier analysis and selection;
 - negotiation with suppliers; and
 - placing orders.

- b. operating the store:
 - i. receipt of orders; and
 - ii. materials handling, comprising;
 - holding stocks
 - issuing stock for use

- c. stock control
 - i. Stock records;
 - ii. Stock audits; and
 - iii. Re-ordering of stocks.

It is worth noting that the stores function is a complete process. Many people take part in the process at various levels of the management hierarchy and in several functional departments.

3.4 **Factors That Facilitate Effective Materials Cost Control**

To control material cost to desirable levels, an enabling environment must be created. The following factors are essential elements of an effective material control system:

- a. A budget of material usage and purchases;
- b. The handling of purchases by competent and qualified personnel. In this regard, a central purchasing system may be preferred;
- c. Availability of sufficient and effective storage facilities;
- d. A system to clearly classify materials either as direct or indirect with unique codes and a consistent assignment of cost to cost units or cost centres as may be appropriate;
- e. The documentation, accounting systems and controls at each stage should be well designed and effective. In this regard, the use of standard forms is recommended;
- f. An efficient and well organized stock taking and a reconciliation of stock taking results with stock records;
- g. An effective co-ordination among all departments involved in materials handling e.g. buying, receiving, storage and usage; and
- h. Internal audits.

3.5 **Procurement of Materials and Documentation**

3.5.1 **Responsibilities of Purchasing or Procurement Unit include:**

- a. To purchase all materials and stores not internally produced which involves the following tasks:
 - i. Supplier selection;

- ii. preparation of purchase orders / contracts;
 - iii. monitor suppliers' performance; and
 - iv. renegotiate or terminate purchase orders/contacts when conditions change.
- b. Provide information to and participate in management planning sessions on subjects related to purchases of materials;
 - c. Review purchase specifications and assist operating departments in the selection of required materials;
 - d. Protect the organization from unnecessary commitments resulting from inappropriate contracts with suppliers; and
 - e. Dispose of all obsolete materials, equipment, or scraps that are no longer required for the organization's operations.

Items of stores may either be bought for stock or are bought just-in-time to meet manufacturing schedules.

3.5.2 **Methods of Purchasing include:**

- a. verbal contracts of purchase e.g. purchases at auction sales;
- b. standard purchase order forms;
- c. simplified order forms (similar to a purchase requisition);
 - cash purchases, etc.;
 - spot contracts for immediate delivery;
 - future contracts for delivery at a stipulated future date;
 - blanket orders/period contracts; and
 - call-off orders.

3.5.3 **Settlement Methods include**

- a. cash with order;
- b. part-payment when the contract is made;
- c. stage payment during the course of the contract; and
- d. payment upon complete delivery, etc.

The choice of settlement method depends on the nature of store item, the type of market, etc.

3.5.4 Summary of the Stages of the Purchasing Function

Stage	Forms used:
Originating	a) requisition; b) buy list; c) schedule requisition; and d) travelling requisition
Supplier selection	a) enquiry; b) Request For Information (RFI) c) Request For Quotation (RFQ) and d) Tender.
Ordering	a) purchase order; b) period contract /blanket order; c) call off order; d) standing order; and e) scheduled order.
Completing	a) advice note; b) packing note; c) Goods Received Note (GRN) d) Goods Inspection Report; e) invoice; and f) statement.

a. **Originating purchases**

Depending upon the nature of the system and the item needed, the person or officer requiring the item writes out a purchase requisition for it. The purchase requisition will have to be authorized by a designated officer before it is acted on. The purchase requisition authorizes the expenditure.

In respect of items which are purchased into stock, as the items get used up, they may need to be replenished through the issue of purchase requisitions.

The process in selecting suppliers is as follows:

- i. Make a short list of possible suppliers by gathering information about suppliers of the particular item from sources such as;
 - trade magazines;
 - calls by company representatives;
 - i. catalogues;
 - ii. membership of professional associations;
 - iii. a directory of suppliers;
 - iv. print and electronic media adverts;
 - from a long list of suppliers, scale the list down by requesting for information through;
 - v. Request For Information;
 - vi. Prequalification questionnaire; and
 - vii. Tender forms
 - Prepare a short list of suppliers
 - Make a request for quotations from the short list
- ii. Evaluate suppliers' quotations or tenders. Factors to consider in the evaluation price analysis and cost analysis which include:
 - specification and design standard;
 - delivery terms / reliability;
 - durability and maintenance cost i.e. quality of supplies;
 - improvement in productivity;
 - capability, i.e. ability to meet volume requirements;
 - set-up costs;
 - tooling charges;
 - transport cost;
 - payment arrangements/ terms; and
 - discount offers, etc.
- iii. Select and negotiate terms with the supplier;
- iv. Negotiations must be aimed at a mutually satisfactory agreement. All aspects of the purchase contract which are not standard should be negotiated. The

negotiations should also aim at a win-win relationship between the organization and the suppliers.

v. Ordering:

The purchase order is often used for ordering. The use of a standard purchase order is not only to meet a legal requirement but also to satisfy organizational requirements. To ensure that all orders are properly authorized and are made against authorized requisitions.

The order is an offer to buy on the terms stipulated by the organization. When the supplier agrees to supply then there is a contract.

Various methods of ordering exist among which are:

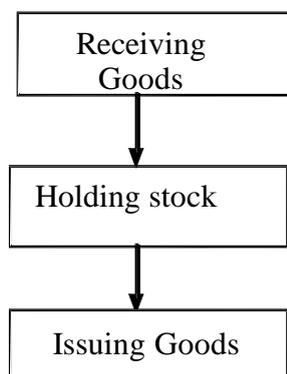
- period contracts;
- blanket orders;
- schedule orders; and
- standing orders.

vi. Completing the order

The purchasing is concluded when the items ordered are received into store. There is a need to control delivery. This implies making sure that, suppliers will meet delivery schedules.

3.6 RECEIPT AND STORAGE OF MATERIALS

3.6.1 Store operations include:



3.6.2 **Factors that Influence the Design of Procedures for Operating the Store:**

- a. Volume of materials handled;
- b. Frequency of transactions;
- c. Range and variety of stock items;
- d. Kind of demand on the store;
- e. Type of store;
- f. Stock control system;
- g. Materials handling system;
- h. Bulkiness and weight of goods; and
- i. Value of the goods.

3.6.3 **Receiving Goods**

When goods are received, they are checked for quantity and description against the Delivery Note, Advise Note and Purchase Order. If they are satisfactory a Goods Received Note is made. If the goods are damaged, defective or they are not of the prescribed description, they should if possible, be returned by the vehicle which brought them. Failing that, they are stored at a separate location clearly labelled until they are returned. Both the carrier and supplier should be notified immediately. Rejected goods should be covered by the Inspection Report and a Debit Note.

3.6.4 **Holding Stock**

After acceptance, the goods should then be moved into their proper location in the stores or to the department which requires them.

There are different methods used for locating goods in the store. The three methods are:

- a. Fixed location - every regular stock item has a fixed address or stock location. This is expensive in terms of store space. Accessing stock is easy;
- b. Random location - any item can be stored anywhere. Here location records are essential. This makes better use of space; and
- c. Zoned location - a hybrid of fixed and random locations.

Allocate groups of goods to particular zones. Location within a zone may either be fixed or random.

3.6.5 **Some Principles of Storage include:**

- a. frequently used items should be nearest to the issue point;
- b. complementary stocks should be stored together;
- c. keep things which are similar to each other near each other;
- d. store things in issue batches where possible; and
- e. isolate dangerous stocks like:
 - i. Inflammables
 - ii. explosives such as oil and gas;
- f. change location when demand changes; and in loading racks;
 - i. put light bulky goods near the top;
 - ii. put small things from waist to shoulder height;
 - iii. put heavy things in big compartments low down; and
 - iv. very heavy things are best on the floor not on the rack.

3.6.6 **Issuing Goods**

The organization should design a procedure for issuing stores. A specimen routine will be:

- a. The foreman of the unit that requires the materials writes a requisition, inserts job number, date and signs;
- b. The section's labourer takes requisitions to stores issue counter;
- c. Store man collects the requisition and issues out specified stock, labourer takes them to section;
- d. The completed requisition is passed to store clerks who adjust stock records to show new balance after issue and copy price from stock record to requisition; and
- e. The priced requisition is then passed to the cost clerks.

3.6.7 **Store Location and Layout**

Stores should be located as close as possible to the point of use of materials in order to reduce material handling charges.

This may be difficult to implement where the same material is used at more than one location within a factory or where special storage conditions are required. Where possible, specialised stores should be located close to the point of use.

3.6.8 Factors that Facilitate Effective Materials Cost Control

To ensure efficient storage, the following factors need consideration:

- a. Provide speedy receipt and issue of materials. Some factors relevant in this regard include:-
 - locating the store close to the point of entry of materials;
 - locating store close to user departments;
 - locating fast moving stock close to issue point;
 - having separate receipt and issue points to reduce possible congestion; and
 - separate issue points for different groups of materials.
- b. Ensure easy location of materials;
- c. Facilitate easy identification through proper classification and coding;
- d. Keep adequate records of quantities held e.g. Bin cards, Tally cards, and Store ledger cards;
- e. Adequate security measures to safeguard materials. Materials should be adequately stored in such a way that they are appropriately protected against:-
 - fire,
 - rust,
 - theft,
 - Deterioration; and
 - effects of weather.
- f. Ensure efficient use of storage space. In this regard, the most appropriate method of storage should be used for the materials concerned e.g. shelves, bins, etc.

The appropriate type of store should be used. There are two types of store namely: centralised and decentralised stores.

i. **Centralised Stores**

Materials are kept in one central warehouse and issued from that point only.

Advantages of Centralised Stores

- a. reduces storage space;
- b. less number of staff required;
- c. reduced administrative work and costs;

- d. easier stock control;
- e. lower risks of duplication of items; and
- f. economy of staff and concentration of experts in one department.

Disadvantages of Centralised Stores

- a. increased transportation costs;
 - b. increased handling charges, breakages, etc.;
 - c. increased risk of loss by fire; and
 - d. likely delays in issue to distant usage points.
- e. Decentralised Stores
 - f. Materials are held and issued by stores in each user department.

Advantages of Decentralised Stores

- a) lower transport costs;
- b) lower handling charges and breakages;
- c) lower risk of loss due to fire; and
- d) less delays at delivery to usage points.

Disadvantages of Decentralised Stores

- a. duplication of cost;
- b. more number of staff required;
- c. cumbersome stock taking;
- d. more administrative work and cost; and
- e. inability to use experts in all sub-stores.

The layout of stores should ensure the following:

- a. Ease of access for the movement of materials in and out of stores;
- b. The issue of perishable materials on a FIFO basis;
- c. The segregation of toxic or dangerous materials in a separate location; and
- d. Security of materials by restriction of access to authorized personnel only.

3.7 PRICING OF ISSUES AND VALUATION OF STOCK

3.7.1 Introduction

When materials are needed from stores, the prospective user prepares a materials requisition to request for the materials.

When the materials are issued out they should be priced. The problem usually is the price to use. This is because materials in stock may have been purchased at varying prices from time to time. There are several methods that could be used to price issues.

The objectives of material pricing are:

- a) To charge to production on a consistent and realistic basis, the cost of materials used; and
- b) To provide a satisfactory basis of valuing stock at the end of the period.

3.7.2 Methods of Pricing Issues and Valuing Stocks

There are several methods. Examples are:

- a. First In First Out (FIFO);
- b. Last In First Out (LIFO);
- c. Simple Average method;
- d. Weighted Average method;
- e. Standard Price;
- f. Replacement Price;
- g. Specific Identification; and
- h. Retail Method.

3.7.3 FIFO

This method uses the price of the first batch of materials received for all issues until all units in the first batch have been issued, after which the price of the next batch received becomes the issue price.

Stocks are thus valued using the prices of the last batches of materials received.

Merits

- a. It reflects the normal movement of materials in store issuing materials in order of receipt;

- b. Stock is valued using recent prices;
- c. The method is simple and easily understood; and
- d. It uses actual prices.

Demerits

- a. The comparison of the cost of one job with another is difficult because different issue prices are often used. The cost of a job depends on when materials are requisitioned from stores;
- b. The issue price may not reflect current economic values;
- c. Stocks with low turnover will tend to be priced at old prices when they are eventually issued. These prices could well be unrealistic; and
- d. In times of inflation, product cost may be low whilst replacement cost is high.
Thus profit may be overstated.

3.7.4 LIFO

This method uses the price of the last batch of materials received for all issues until all units from this batch have been issued and then the price of the previous batch is used. Note that if a new delivery is received before the first batch is fully issued, the new issue price at once becomes the last in price and is used to price issues until either the batch is exhausted or a new delivery is received.

Stocks are valued using the prices of materials delivered first.

Advantages

- a. The issue price is near to current economic value;
- b. It is fairly simple to operate when materials are slow moving;
- c. It uses actual prices; and
- d. During a period of rising prices, stock values are conservative.

Disadvantages

- a. It is not realistic as it is contrary to normal issue procedures;
- b. The frequency of calculations causes much clerical work;
- c. Stock values may significantly be understated; and

- d. It can become complicated with a fast moving stock since not all of one receipt may be exhausted before a differently priced replacement order arrives.

3.7.5 **The Simple Average Method**

Under this method, the issue price is the co-efficient of the different prices of all the materials in store and the number of material items in that total.

The assumption is that materials issued out of stock at any time are drawn from a mixed group in the store without any deliberate attempt to identify materials or stocks as being from the earliest or the latest batch.

Advantages

- a. It is simple to operate; and
- b. It evens out effects of any price fluctuations.

Disadvantages

- i. It does not use actual prices;
- ii. Where prices fluctuate, stock values may be misleading; and
- iii. It gives very false issue and valuation figures.

3.7.6 **Weighted Average Price Method**

This method averages prices after weighting by their quantities. With each receipt of materials, the weighted average price is re-calculated and subsequent issues are priced at the calculated weighted average price until a further receipt of goods necessitates the average price to be re-calculated.

Advantages

- a. It smoothens out fluctuations in issue prices; and
- b. The comparison of different jobs is easier because it assumes that values of identical items are all equal.

Disadvantages

- i. Calculations have to be made to approximately four decimal places to achieve a fair degree of accuracy; and
- ii. The issue price may not reflect current economic values.

3.7.7 **Standard Price**

Standard price is a predetermined estimate of the price or cost of a material item under specified conditions.

Advantages

- a. It is easier to operate as there is no variation in the issue prices over long periods;
- b. The efficiency of purchasing is checked as actual prices are compared with standard prices; and
- c. It eliminates price fluctuations from costs enabling satisfactory manufacturing cost comparisons to be made.

Disadvantages

- i. It requires careful initial determination;
- ii. Issues may not be valued at current economic values; and
- iii. It disregards price trends.

3.7.8 **Replacement Price**

This method uses current replacement Costs/Price to value all issues

Advantages

- a. Issues are at current prices;
- b. It is easier to operate; and
- c. Stock values are at current prices.

Disadvantages

- i. The issue price is not at cost, so where there is a long interval between each receipt of material, estimates have to be made; and
- ii. There is often difficulty and much work involved in ascertaining current market prices.

3.7.9 **Specific Identification**

Items issued are priced at the actual prices at which they were actually bought by specifically identifying the materials to their actual prices. Thus closing stock is also valued at the specific prices they were bought.

3.8 STOCK CONTROL LEVELS

Introduction

The level of stock held will depend upon a number of variables which will each have cost implications. Management must make decisions about the control of stock levels with a view to minimizing the cost to the business whilst achieving maximum efficiency in the availability of materials to fulfil planned usage requirements.

The following stock levels need to be considered:

- a. Minimum stock level;
- b. Maximum stock level;
- c. Re-order stock level;
- d. Re-order stock quantity or Economic Order Quantity; and
- e. Average stock level.

Illustration 3.1

The following data relates to Good Works Company Ltd with respect to material AY4

- i. 12,000 units of the material will be used every day for a 360 days year.
- ii. It will cost 50,000 cedis to place each order
- iii. The cost of one unit of AY4 is 12,000 cedis and it will cost 10% of this amount to hold each unit of AY4 in store
- iv. Daily usage of material AY4 will not exceed 12,500 units and will not be less than 11,500 units
- v. The most reliable supplier takes a maximum period of 4 days to deliver but the shortest delivery period could be 2 days.

NOTE: We shall use this activity for illustrative purposes

3.8.1 Re-Order Level of Stock

This is the level at which an order will be placed for additional supplies of material so that delivery will be made before the business runs out of stock. The factors that influence the re-order stock level are:

- a. rate of consumption
- b. delivery period - reliability of supplier

Mathematically, it is computed as:

Re-order stock level = Maximum consumption x Maximum delivery period

Using the data in the illustrative example:

Re-order level (ROL)

$$\begin{aligned} &= \text{maximum usage} \times \text{maximum delivery period} \\ &= 12,500 \times 4 \text{ days} \\ &= 50,000 \text{ units} \end{aligned}$$

3.8.2 Minimum Stock Level

This is the lowest level at which stock may be allowed to fall. It is not prudent to allow stock to fall below the minimum stock level:

The following factors determine the minimum stock level:

- a) The rate of consumption;
- b) The delivery period normally allowed; and
- c) The re-order level of materials.

Mathematically, the minimum stock level may be calculated as:

$$\text{Minimum stock level} = \text{Re-order} - (\text{average consumption} \times \text{average delivery period})$$

Using the illustrative example;

Minimum stock level:

$$\begin{aligned} &= \text{Re Order Level} - (\text{average usage} \times \text{average lead time}) \\ &= 50,000 \text{ units} (12,000 \times 3) \\ &= 50,000 - 36,000 \\ &= 14,000 \text{ units} \end{aligned}$$

3.8.3 Maximum Stock Level

This is the largest possible quantity of stock that may be in store at any given time. It is not prudent to maintain a quantity of stock above this level.

The following factors determine the maximum stock level:

- a. The storage space available;
- b. The nature of stock such as its perishability and seasonality. In other words, the risk of deterioration;
- c. The cost of storing above normal stocks;

- d. The rate of consumption;
- e. The re-order quantity;
- f. The delivery period; and
- g. The re-order level.

Mathematically, it is computed as

$$\text{Maximum stock level} = \text{Re-order level} + \text{Re-order quantity} - \left[\begin{array}{cc} \text{minimum x} & \text{minimum} \\ \text{consumption} & \text{delivery period} \end{array} \right]$$

Using the data from illustrative example;

$$\begin{aligned} \text{Maximum stock level} &= \text{ROL} + \text{ROQ} - (\text{minimum usage} \times \text{minimum lead time}) \\ &= 50,000 + 18,974 - (11,500 \times 2) \\ &= 68,974 - 23,000 \\ &= 45,974 \text{ units} \end{aligned}$$

Note: Check the computation of the Re order Quantity from 2.8.4 below.

3.8.4 Re-Order Quantity

This is the optimum quantity that should be ordered each time an order is being placed. It is often referred to as the economic order quantity. It is set in such a way as to optimise material costs.

The cost of material stock is made up as follows:

- a. Costs of holding or carrying stocks:
 - i. forgone interest on capital invested in stock;
 - ii. storage charges e.g. rent, lighting and cooling, refrigeration, air conditioning, etc.; and
 - iii. stores administration cost
 - staff salaries
 - equipment maintenance and handling charges
 - iv. Handling costs e.g. cost of packing and unpacking stocks;

- v. Stock taking costs or perpetual inventory costs;
 - vi. Insurance, security, etc.;
 - vii. Deterioration and obsolescence; and
 - viii. Pilferage, damages, etc.
- b. Cost of obtaining stocks or ordering costs:
- i. Administrative costs associated with purchasing, accounting and receiving goods;
 - ii. Transport costs e.g. carriage inwards;
 - iii. Set-up and tooling costs of production runs for internally manufactured goods; and
 - iv. The purchase price of the stocks.
- c. Stock out costs:
- i. Lost contribution due to lost sales arising from stock out;
 - ii. Loss of future sales because customers will go elsewhere;
 - iii. Loss of customer goodwill;
 - iv. Cost of production stoppages e.g. idle time pay, not using plant optimally;
 - v. Labour frustrations over stoppages; and
 - vi. Extra costs of urgent replenishment purchases.

$$\text{Economic Order Quantity (EOQ)} = \sqrt{\frac{2DC_o}{C_c}}$$

Where:

D = Annual demand

Co = Cost of order

Cc = Carrying cost per unit

From the illustrative example above;

$$\text{Economic Order Quantity (EOQ)} = \sqrt{\frac{2DC_o}{C_c}}$$

Where:

D = annual demand = 12,000 x 360 = 4,320,000

Co = Cost of order = 50,000

Cc = Carrying cost per unit = 1,200

$$\begin{aligned} \text{EOQ} &= \sqrt{\frac{2(4,320,000)(50,000)}{1,200}} \\ &= 18,974 \text{ units} \end{aligned}$$

3.8.5 Average Stock Level

This is the midway between the minimum stock level and the maximum stock level.

Mathematically, it is computed as:

$$\text{Average stock Level} = \frac{\text{minimum stock level} + \text{maximum stock level}}{2}$$

Using the data in the illustration 2.1:

$$\begin{aligned} \text{Average stock level} &= \frac{\text{maximum stock level} + \text{minimum stock level}}{2} \\ &= \frac{45,974 + 14,000}{2} \\ &= 29,987 \text{ units} \end{aligned}$$

Illustration 3.2

Using the information provided below, calculate the maximum, minimum, re-order and average stock levels for Boateng Ltd.

Boateng Ltd. manufactures a special product for the domestic market. Records available at the stores department indicated the following:

Maximum usage	-	1,200 units per week
Minimum usage	-	500 units per week
Re-order quantity	-	1,500 units per week
Delivery period	-	between 2 to 4 weeks

8 marks
ICAG, May 2000

Solution to Q2

$$\begin{aligned}\text{ROL} &= \text{Max usage} \times \text{max lead time} \\ &= 1,200 \times 4 \\ &= 4,800 \text{ units}\end{aligned}$$

Minimum Stock level = Reorder level (average usage of average lead time)

$$\begin{aligned}&= 4,800 \left[\left(\frac{1200 + 500}{2} \right) \times \left(\frac{2 + 4}{2} \right) \right] \\ &= 4800 - (850 \times 3) \\ &= 4800 - 2550 \\ &= \underline{\underline{2250 \text{ units}}}\end{aligned}$$

Maximum Stock level = reorder level + reorder qty - min usage x min lead time

$$\begin{aligned}&= [4,800 + 1,500] - [500 \times 2] \\ &= 6,300 - 1,000 \\ &= 5,300 \text{ units}\end{aligned}$$

$$\begin{aligned}\text{Average stock} &= \frac{\text{max stock} + \text{min stock}}{2} \\ &= 5,300 + 2,250 \div 2 \\ &= 3,775 \text{ units}\end{aligned}$$

3.9 Stock Control Records and Procedures

3.9.1 The Need for Stock Control Records

A comprehensive stock control record system is necessary in order that:

- a. Materials can be recorded on receipt in relation to both quantity and price;
- b. Issue of material for production can be recorded so that the residual balance of stock both in quantity and monetary terms can be calculated;
- c. Checks can be implemented on a regular or random basis to minimize losses due to pilferage or damages in stocks;
- d. Records can be examined to highlight slow moving stocks which may deteriorate or become obsolete;
- e. New stocks can be ordered when the re-order level is reached;
- f. Materials costs are charged to the appropriate cost centres when materials are issued from store;

- g. Returns to store and to suppliers can be properly recorded; and
- h. The valuation of stock for balance sheet preparation and profit measurements purposes can be accurately implemented.

3.9.2 Stock Control Records

The following are examples of stock control records,

- a. The Bin Card;
- b. The Stock Tally Card; and
- c. The Stock Ledger Card.

i. Bin Card

This is a document which assists the store keeper in the recording of receipts and issues of materials and the control of stock. The specific format of the bin card will depend on the record system which is in use.

Below is a specimen of a bin card. Fig 2.1

Bin Card XYZ LIMITED

Description :		Bin No. :
Code :		Max Stock Level:
Re-order Quantity:		Min Stock Level:
Stores Ledger Folio:		Re-order Level:
Level :		

Date	Order		Allocated		Stock Balance	
	Qty	Received	Qty	Issued		

Illustration 3.3

The following transactions occurred in respect of Material JD42 during the four months ending 31 July.

Month	April	May	June	July
Allocated units	1,000	1,500	1,300	3,200
Receipts in units	600	900	1,800	1,500
Issued units	500	800	1,400	1,200

The following information is also available:

- a. Balances as at 1st April were as follows:
 - Balance on Order 1,000 units
 - Stock on hand 500 units
 - Balance on Allocation 700 units
 - Free balance 800 units

- b. Orders are placed in lots of 1,000 units when the free balance falls to 600 units or below. You are required to present the above data in a Bin Card.

Solution

FIG. 3.1 BIN CARD

Date	Order			Allocated			Free balance			stock		
	Qty	Recei	Bal	Qty	Issued	Bal	Order	Alloc	Bal	Recei	issued	Bal
April 1	-	-	1,000	-	-	700	-	-	800	-	-	500
April	-	600	1400	1000	500	1200	1400	1200	1000	600	500	600
May	2000	900	2500	1500	800	1,900	2500	1900	1600	900	800	700
June	1000	1800	1,700	1,300	1,400	1,800	1,700	1,800	1,500	1,800	1,400	1,100
July	3000	1,500	3,200	3,200	1,200	3,800	3,200	3,800	900	1,500	1,200	1,400

Note

1. stock balance = balance + received - issued
2. allocated balance = balance b/d + quantity allocated - quantity issued
3. order quantity is determined so as to ensure that free balance does not fall to or below 600 units. It is in multiples of 1,000 units
4. order balance = balance b/d + quantity ordered - quantity received
5. free balance = balance b/d + order balance - allocated balance
6. free balance b/d = stock balance + order balance - allocated balance
7. it is assumed that all materials issued were first allocated before actually being issued

2. Stock Tally Card: This is another type of stocks record form. It is often used for stock items involving small values. Below is a sample of a Tally Card.

Fig 3.2

STORE TALLY CARD

XYZ LIMITED

Description:	Max. Stock level :
Code :	Min Stock level :
	Re-order Stock level:
	Economic order qty:

Date	Receipt	Issued	Balance	Signature

3. Store Ledger Card

The stores ledger card shows similar information as that contained in a bin card or a tally card and additionally records the unit price and total value of all stock received and issued.

Below is a specimen of a store ledger card

Fig 3.3

Store Ledger Card

XYZ LIMITED

Description:

Max. Stock level :

Code :

Min Stock level :

Re-order Stock level:

Re-order quantity :

Date	Receipts			Issued			Balance		
	Qty	Unit Price	Value	Qty	Unit Price	Value	Qty	Unit Price	Value

Illustration 3.4

Mr. Kofi Abebrese decided on 1 July, to invest his insurance compensation of 4,000,000 cedis in a retail business to buy and sell second hand shovels. The following transactions took place from that month to December.

Purchases

Sales

Date	Quantity	Cost	Date	Quantity	Value
July 5	200	720,000	Aug 2	500	2,500,000
Aug 1	400	1,520,000			
Sept 3	600	2,400,000			
Oct 4	400	1,400,000	Oct 12	600	2,700,000
Dec 7	500	1,400,000	Dec 12	400	1,500,000

Required

- (a) Calculate the cost of shovels issued during the period and the cost of shovels on hand on 31/12 using the following methods of pricing
- i. FIFO (3 Marks)
 - ii. LIFO (3 Marks)
 - iii. Weighted average (calculation to 2 decimal places) (4 Marks)
- (b) Calculate and discuss the effect, each of the pricing methods will have on the reported profit of the business (3 Marks)
- (c) Examine critically the performance of the business during the period (2 Marks)
- (Total 15 Marks)**

Solutions

Table 3.2 STORES LEDGER CARD- FIFO

Date	Receipts			Issued			balance		
	Quantity	Unit Price ¢	Value ¢	Quantity	Unit Price ¢	Value ¢	Quantity	Unit Price ¢	Value ¢
July 5	200	3,600	720,000				200	3,600	720,000
August 1	400	3,800	1,520,000				600		2,240,000
August 2				200	3,600	720,000			
				<u>300</u>	3,800	1,140,000			
				500			100		380,000
Sept 3	600	4,000	2,400,000				700		2,780,000
Oct 4	400	3,500	1,400,000				1,100		4,180,000

Oct 12				100	3,800	380,000			
				<u>500</u>	4,000	<u>2,000,000</u>			
				<u>600</u>		<u>2,380,000</u>	500		1,800,000
Dec 7	500	2,800	1,400,000				1,000		3,200,000
Dec 12				100	4,000	400,000			
				<u>300</u>	3,500	<u>1,050,000</u>			
				<u>400</u>		<u>1,450,000</u>	600		1,750,000

(i) Stores ledger card (FIFO)

Closing stock

October 4	100 units @ 3,500	=	350,000
December 7	<u>500</u> units @ 2,800	=	<u>1,400,000</u>
	600	=	1,750,000

Cost of sales:

	units	cost
August 2	500	1,860,000
October 12	600	2,380,000
December 12	<u>400</u>	<u>1,450,000</u>
	<u>1,500</u>	<u>5,690,000</u>

Therefore the cost of the 1,500 shovels sold using the FIFO method is ₦5,690,000 and the value of the remaining 600 shovels is ₦1,750,000.

Table 3.3 : STORES LEDGER CARD (LIFO)

Date	Receipts			Issued			Balance		
	Quantity	Unit Price ₦	Value ₦	Quantity	Unit Price ₦	Value ₦	Quantity	Unit Price ₦	Value ₦
July 5	200	3,600	720,000				200	3600	720,000
August 1	400	3,800	1,520,000				600		2,240,000
August 2				400	3,800	1,520,000			
				<u>100</u>	3,600	<u>360,000</u>			
				<u>500</u>		<u>1,880,000</u>	100		360,000
Sept 3	600	4,000	2,400,000				700		2,760,000
Oct 4	400	3,500	1,400,000				1,100		4,160,000
Oct 12				400	3,500	1,400,000			
				<u>200</u>	4,000	<u>800,000</u>			
				<u>600</u>		<u>2,200,000</u>	500		1,960,000
Dec 7	500	2,800	1,400,000				1,000		3,360,000
Dec 12				400	2,800	1,120,000	600		2,240,000

Closing stock

	Units	unit cost ¢	value ¢
July 5	100	3,600	360,000
September 3	400	4,000	1,600,000
December 7	<u>100</u>	2,800	<u>280,000</u>
	600		<u>2,240,000</u>

Cost of sales

Date of sales	unit sold ¢	cost of units sold ¢
August 2	500	1,880,000
October 12	600	2,200,000
December 12	<u>400</u>	<u>1,120,000</u>
	<u>1,500</u>	<u>5,200,000</u>

Table 3.4 STORES LEDGER CARD- WEIGHTED AVERAGE

Date	Receipts			Issued			Balance		
	Quantity	Unit Price ¢	Value ¢	Quantity	Unit Price ¢	Value ¢	Quantity	Unit Price ¢	Value ¢

July 5	200	3,600	720,000				200	3,600	720,000
August 1	400	3,800	1,520,000				600	3,733	2,240,000
August 2				500	3,733	1,866,500	100	3,735	373,500
Sept 3	600	4,000	2,400,000				700	3,962	2,773,500
Oct 4	400	3,500	1,400,000				1,100	3,794	4,173,500
Oct 12				600	3,794	2,762,000	500	3,794	1,897,100
Dec 7	500	2,800	1,400,000				1,000	3,297	3,297,100
Dec 12				400	3,297	1,318,800	600	3,297	1,978,300

Therefore the cost of 1,500 shovels sold using the LIFO method is ₦5,200,000 and the value of the remaining stock of 600 units is ₦ 2,240,000.

(iii) Stores ledger card (Weighted Average)

Closing stock

600 units @ 3,297 = 1,978,300

Cost of sales:

Date of sales	units sold	cost of sales ₦
2/8	500	1,866,500
12/10	600	2,276,400
12/12	<u>400</u>	<u>1,318,800</u>
	<u>1,500</u>	<u>5,461,700</u>

b)

Sales revenue

Date of sales	sales revenue ₦
2/8	2,500,000
12/10	2,700,000
12/12	<u>1,520,000</u>
	<u>6,720,000</u>

Profit statement

	FIFO method ₦	LIFO method ₦	Weighted average method ₦
Sales	6,720,000	6,720,000	6,720,000
Less cost of sales	<u>5,690,000</u>	<u>5,200,000</u>	<u>5,461,700</u>
Gross profit	<u>1,030,000</u>	<u>1,520,000</u>	<u>1,258,300</u>

From the gross profit figures above, it can be seen that the profit from the LIFO is the smallest. The weighted average method profit falls between the FIFO and LIFO gross profits. This position is because the cost of shovels have tended to decline. In a situation where the cost of materials experiences an upward trend, FIFO will always produce the greatest profit and LIFO the smallest profit.

- c) The company has been able to make some margin on its costs. The sales price of the company is however on a downward trend from $\text{¢}5,000$ per unit to $\text{¢}3,800$ per unit for the last sales in December. Its cost has also experienced decline.

The company is operating in an industry faced with falling prices. This could imply a depression for the industry.

Illustration 3.5

Edwuma Pa Ye Manufacturing Company Ltd is reorganizing its costing system. A materials consultant has recommended that the company adopts one pricing method to cost the issues of materials to production or specific jobs. He recommended that the choice should be either the FIFO or LIFO method. Based on the consultant's recommendation, Edwuma PaYe has requested that you assist its newly employed cost accountant to prepare cost statements for its Job 2499. The following data for material 'A' used for the job in May 2011 have been provided.

Date	Particulars	Kilos	Cost ¢
2 nd Mav	Balance	40,000	12,000,000
5 th Mav	Receipts	10,000	400 per kilo
12 th Mav	Receipts	24,000	500 per kilo
16 th Mav	Issues	48,000	
19 th Mav	Receipts	34,000	450 per kilo
26 th May	Issues	40,000	

Required:

- (a) i Using FIFO and LIFO methods of pricing, cost the materials issued to job 2499 as well as the materials on hand on 26th may, 2011.

(7 Marks)

- ii Using the two methods, work out the price to be charged for Job 2499 based on the following additional information:

Direct labour for the job is $\text{¢}10,000,000$

Overhead is absorbed at 110% of materials.

It is company policy to make a profit margin of 10% on all jobs.

(6 Marks)

- (b) Edwuma Pa Ye Manufacturing Company Ltd further sought the materials consultant's advice on inventory management for production and the commitment of funds for such a purpose.

The consultant recommended two policy strategies:

- i. that the company should ensure that sufficient amount of materials is available to reduce any subsequent shortage risk and subsequent interruptions in production
- ii. that working capital should as much as possible not be locked up in excess materials.

The company has decided to implement the above recommendations and had provided the following data on materials B based on its order schedule and production capacity for the year.

- i) 400 Kg of materials B will be used every week for 50 weeks
- ii) It will cost ₦30,000 to make an order
- iii) While each cost of the material will cost ₦1200 and it will cost the company an additional 33 1/3% of that cost every year to carry a kilo of the material
- iv) While the consumption of material will not exceed 600 kilos in a week, it will not fall below 400 kilos. Usually, it takes between 1 to 3 weeks for suppliers to deliver orders that are made.

Required:

The company has requested you to compute:

- i) the economic quantity that ought to be ordered
- ii) the level at which the company should put in a new order
- iii) the maximum level that material B should carry
- iv) the minimum level that material B should carry (5 marks)

(Total marks: 18)

ICAG, NOV. 1997 (adapted)

Solutions

Table 3.5 STORES LEDGER CARD (FIFO)

Date	Receipts			Issued			Balance		
	Quantity	Unit Price ¢	Value ¢	Quantity	Unit Price ¢	Value ¢	Quantity	Unit Price ¢	Value ¢
May 2							40,000	300	12,000,000
May 5	10,000	400	4,000,000				50,000		16,000,000
May 12	24,000	500	12,000,000				74,000		28,000,000
May 16				40,000	300	12,000,000			
				<u>8,000</u>	400	<u>3,200,000</u>			
				<u>48,000</u>		<u>15,200,000</u>			12,800,000
May 19	34,000	450	15,300,000				26,000		28,100,000
May 26				2,000	400	800,000	60,000		
				24,000	500	12,000,000			
				<u>14,000</u>	450	<u>6,300,000</u>			
				<u>40,000</u>		<u>19,100,000</u>		450	9,000,000
							20,000		

Cost of issues for production:

Date	Quantity Issued	Cost ¢
May 5	48,000	15,200,000
May 26	40,000	19,100,000
	88,000	434,300,000

Valuation of Closing Stock:

Date	Quantity Outstanding	Price per Unit ¢	Value ¢
May 19	20,000	450	9,000,000

Table 3.6 : STORES LEDGER CARD (LIFO)

Date	Receipts			Issued			Balance		
	Quantity	Unit Price ¢	Value ¢	Quantity	Unit Price ¢	Value ¢	Quantity	Unit Price ¢	Value ¢
May 2							40,000	300	12,000,000
May 5	10,000	400	4,000,000				50,000		16,000,000
May 12	24,000	500	12,000,000				74,000		28,000,000
May 16				24,000	500	12,000,000			
				10,000	400	4,000,000			
				<u>14,000</u>	300	<u>4,200,000</u>			
				<u>48,000</u>		<u>20,200,000</u>	26,000	300	7,800,000
May 19	34,000	450	15,300,000				60,000		23,100,000
May 26				34,000	450	15,300,000			
				<u>6,000</u>	300	<u>1,800,000</u>			
				<u>40,000</u>		<u>17,100,000</u>	20,000	300	6,000,000

Cost of issues for production:

Date of issue	Unit issued	Cost of issues ¢
May 16	48,000	20,200,000
May 26	<u>40,000</u>	<u>17,100,000</u>
	<u>88,000</u>	<u>37,300,000</u>

Valuation of closing stock

May 2 20,000 @ ¢300 = ¢6,000,000

(ii) JOB COST CARD FOR JOB 2499

	FIFO	LIFO
	¢	¢
Direct materials cost	34,300,000	37,300,000
Direct labour cost	10,000,000	10,000,000
Overheads cost		
(110% of direct materials)	<u>37,730,000</u>	<u>41,030,000</u>
Total cost	82,030,000	88,030,000
Profit margin		
(10% of total cost)	<u>8,203,000</u>	<u>8,833,000</u>
Price of job	<u>90,000,000</u>	<u>97,163,000</u>

(b) Economic Order Quantity (EOQ)

$$\sqrt{\frac{2DC_o}{C_c}}$$

Where:

D = annual demand

Co = Cost of order

Cc = Carrying cost per unit

$$\begin{aligned} \text{i) } \text{EOQ} &= \sqrt{\frac{2(20,000)(30,000)}{400}} \\ &= 1,732, \text{kg} \end{aligned}$$

$$\begin{aligned} \text{ii) } \text{Re Order Level} &= \text{maximum usage} \times \text{maximum lead time} \\ &= 600 \times 3 \\ &= 18,000 \text{kg} \end{aligned}$$

$$\begin{aligned} \text{iii) } \text{Maximum stock level} &= \text{ROL} + \text{EOQ} \text{ (minimum usage} \times \text{minimum lead time)} \\ &= (1,800 + 1,732) (400 \times 1) \\ &= 3,132 \text{ kg} \end{aligned}$$

$$\begin{aligned} \text{iv) } \text{Minimum stock level} &= \text{ROL} - (\text{average usage} \times \text{average lead time}) \\ &= 1,800 - \left(\frac{600 + 400}{2} \right) \times 3 + 1 \end{aligned}$$

$$2 \quad \left[\frac{1}{2} \right]$$

$$\begin{aligned} &= 1,800 - (500 \times 2) \\ &= 800 \text{ kg} \end{aligned}$$

3.10 **PERPETUAL INVENTORY SYSTEM**

This is a system of stock control where records such as the bin card, tally card, stores ledger account, etc. are kept as a perpetual record of receipts and issues of materials. Thus the system keeps a perpetual record of all stock transactions updated on a continuous basis. The main objective of such a system is to know the stock level at any particular time, facilitate regular checking of stock level and to prevent the need for stores closure for stock taking. The records from the perpetual inventory system should be reconciled with the result of stock count.

3.11 **INVENTORY TAKING**

This is the physical counting of materials in the store. Stocks of raw materials, work-in-progress and finished goods are usually subject to a stock take.

There are two basic types of inventory taking methods:

- a. Annual / Periodic Stock taking; and
- b. Continuous Stock taking

3.11.1 **PERIODIC STOCK TAKING**

This is a method of counting stock where the items are counted at the end of a given period usually, annually or semi-annually.

Merits

- a. it is less expensive to conduct a stock count once in the whole year; and
- b. the inconvenience of regular or frequent stock count is avoided.

Demerits

- i. It may require a disruption of operational activities at the end of the year when the stock take is to take place;

- ii. The size of the work may justify the use of a large team; some members of the team may not be familiar with the particular stock items. This may lead to inaccuracies in the stock count;
- iii. Discrepancies which are the result of an on-going problem and which should have been noted at an earlier date may be revealed; and
- iv. The deferment of the stock taking to the end of the year may increase theft and pilferage.

3.11.2 **Continuous Inventory Taking**

This is a method of inventory taking where stock items are counted at frequent intervals on a random rotational basis and the results of the counts reconciled with the perpetual inventory records.

Merits

- a. It is a deterrent to pilferage and theft;
- b. The closure of stores for an annual stock count is avoided;
- c. There is ready availability of reliable stock balances, throughout the year;
- d. Discrepancies are discovered and remedied more promptly;
- e. The stores system is kept constantly under review; and
- f. It enhances effective stock control.

Demerits

- i. It is expensive to operate a continuous stock taking system.

3.11.3 **Effective Inventory Procedures**

In order to have a successful stock taking, the following should be considered

- a) Stock items should be arranged so as to avoid omissions and double counting;
- b) Counting should be done by pairs of two persons, one person counting and the other recording;
- c) The stock take should be well organized to avoid or minimize production disruptions;
- d) The counting of stock should be done whilst production is in progress; and

- e) The final stock sheet should be checked against the store records and discrepancies immediately investigated.

3.11.4 Causes of Stock Discrepancies

- a) Incomplete entries caused by non-completion of original documents;
- b) Casting errors on stock records;
- c) Over or under issues due to carelessness of the issuing officer;
- d) Recording materials in the wrong stock record;
- e) Movement of stock without proper documentation;
- f) Pilferage;
- g) Loss due to breakage, evaporation, etc.;
- h) Inaccuracies in the stock count; and
- i) Omissions.
- j) Double counting, etc.

3.12 CHAPTER SUMMARY

Chapter two covers materials cost determination and control and has been treated under six sections.

- a) Section one explains what constitutes materials, the functions of stores and the factors that facilitate effective materials cost control;
- b) Section two concentrates on materials procurement process in organizations. This section explains the responsibilities of the procurement unit, the methods of purchasing and the various stages of the purchasing function;
- c) Section three focuses on the receipts and storage of materials. Issues discussed in this section include: the stores operation process; the factors that influence the design of procedures for operating the stock; principles of good storage and issuing, and factors that facilitate effective materials cost control;
- d) Section four discusses the various methods of costing issue of stocks for production

and closing stocks. Some of the methods discussed include; FIFO, LIFO, Weighted Average, Pricing etc.

- e) Sections five and six explain the procedure for controlling stock. This involves establishing stock control levels such as re-order stock level, maximum stock level, minimum stock level and re-order quantities of stock so that stock cost will be minimized;
- f) Some records are kept in Bin Cards, Tally Cards or Store Ledger Cards to ensure that the control levels established are maintained. To facilitate effective stock control, it is necessary to undertake stock counts. All of these issues have been discussed in section six.

In conclusion, material cost is usually a significant proportion of the total cost of operations of business organizations. To maximize profitability, effective ways must be adopted to control material cost to the minimum.

MULTIPLE-CHOICE AND SHORT ANSWER QUESTIONS

1. Materials include the following EXCEPT
 - A. Finished goods
 - B. Work in progress
 - C. Consumable goods
 - D. Fixed assets
 - E. Raw materials
2. The work of the storekeeper does NOT include
 - A. Receiving stock items
 - B. Issuing stock items
 - C. Custody of stock items
 - D. Recording of stock items
 - E. Selling of stock items

3. Purchase orders are issued by
 - A. Quality Control Manager
 - B. Procurement Manager
 - C. Stores Manager
 - D. Cost Accountant
 - E. Production Manager

4. When ordered materials are received, they are brought into stores via
 - A. Materials Requisition
 - B. Local Purchase Order
 - C. Goods Received Note
 - D. Tenders
 - E. Materials Issue Note

5. Under the First In First Out method, store issues are priced using the prices of
 - A. The last batches received into store
 - B. The first batches received into store
 - C. The middle batches received into store
 - D. The average of the first and last batches received into store
 - E. The next batch to be received into store

SHORTANSWER QUESTIONS (SAQ)

6. The stock valuation method that assumes that stocks are issued in reverse order of receipts is called
7. The level of stock below which quantities are not expected to fall in the store is called?
8. The optimum quantity of stock that should be ordered from suppliers at any one time is known as
9. The name of the document which the storekeeper uses in recording the receipt and issue of materials is called?

10. The system whereby bits of store items are counted at frequent intervals so that by year end all items would have been counted at least once is known as.....

SOLUTION

1. D
2. E
3. B
4. C
5. A
6. Last In First Out (LIFO)
7. Minimum stock level
8. Economic Order Quantity
9. Bin Card
10. Continuous Stocktaking

EXAMINATION TYPE QUESTIONS

- 3.1(a) One of the board members of Dunu Manufacturing Company wants to know the purchasing procedure that the company adopts to procure its raw materials. As a Cost Accountant, outline the main purchasing procedures.

(14 Marks)

- b. What are the costs associated with the following:
- i. excessive stock holding?
 - ii. stock out?

(6 Marks)

(Total 20 Marks)

ICAG, May 2001

- 3.2(a) Briefly explain the following, bringing out clearly, the formulae of calculation where appropriate
- i. Free stock balance
 - ii. Minimum stock balance
 - iii. Maximum stock balance
 - iv. Re-order level
 - v. Average stock level
 - vi. Re-order quantity/economic order quantity
 - vii. Lead time

(12 Marks)

- (b) Use the following information to calculate the maximum, minimum, re-order and average stock levels for Boateng Ltd.

Boateng Ltd manufactures a special product for the domestic market. Records available at the stores department indicated the following:

Maximum usage	-	1,200 units per week
Minimum usage	-	500 units per week
Re-order quantity	-	1,500 units per week
Delivery period	-	between 2 to 4 weeks

(8 Marks)

ICAG, May 2000

- 3.3(a) Distinguish between perpetual inventory system and continuous stock taking.

(5 Marks)

ICAG NOV. 1999

- 3.4 State and explain **TWO** merits of each of the following methods of pricing issues of materials from stores to production and service cost centres

- (a) Weighted Average Method
- (b) Standard Price Method
- (c) LIFO Method
- (d) Replacement Price Method
- (e) FIFO Method

(20 Marks)

ICAG JAN. 1995

3.5 The level of stock held is controlled to enable a company operate on an economic level.

(a) Explain briefly the following stock levels, giving the formulae of computation as appropriate:

- i) minimum stock level
- ii) maximum stock level
- iii) re-order stock level
- iv) average stock level

(12 Marks)

(b) You are required to compute

- i) re-order stock level
- ii) minimum stock level
- iii) maximum stock level
- iv) average stock level

Using the following data:

minimum usage 250 per week

maximum usage 250 per week

re-order quantity 30 unit

delivery is between 4 to 6 weeks

(8 Marks)

(Total 20 Marks)

ICAG January 1994

3.6 Ebeyeye Co Ltd stocks a number of basic raw materials to meet its production lines. The following are the forecast consumptions in respect of one of the raw materials for the year 1993.

Month	Consumption	Month	Consumption
January	10,000	July	15,000
February	10,000	August	15,000
March	14,000	September	11,000
April	14,000	October	11,000
May	15,000	November	10,000
June	15,000	December	10,000

Delivery period from suppliers

Minimum 2 months

Maximum 4 months

Required :

- (a) State the main objectives of stock control. **(4 Marks)**
- (b) Give reasons why the average stock level ought to be maintained at the optimum level, that is, the level most favourable to a company that stocks a wide range of materials.

(6 Marks)

- (c) Calculate Ebeyeye Co Ltd's estimated average stock level for the year from the information provided. **(10 Marks)**

(Total20Marks)

ICAG January 1993

3.7 In manufacturing its products, a company uses three raw materials, A, B, and C in respect of which the following applies

Raw Material	Usage unit of product	Price per kilo	Delivery period in months		Re-order level kilos	Mini- mum level kilos
			Min	Max		
Kilo			Min	Max	kilos	kilos
A	16	10	1	3	6750	-
B	4	30	3	5	4500	1300
C	6	15	2	4	-	1800

Monthly production varies from 175 to 225 units averaging 200 units

Re-order quantities are as follows

Material	kilos
A	10,000
B	5,000
C	10,000

Required

- (a) Explain:
- i) Minimum stock level (2 Marks)
 - ii) Maximum stock level (2 Marks)
 - iii) Re-order level (2 Marks)
- (b) Calculate the quantities of the following:
- i) Minimum stock of material A (2 Marks)
 - ii) Maximum stock of material B (2 Marks)
 - iii) Re-order level of material C (2 Marks)
 - iv) Average stock level of material A (2 Marks)
- (c) Material B could be the increase in 10,000 kilos lots at €29 per kilo:
- i) What would be the increase in the value of the average stock of B?
(4 Marks)
 - ii) What would be the saving in raw material cost for one unit of product B?
 - iii) What would be the annual saving on material costs as a percentage of the average increase in investments in stocks?
(4 Marks)

(Total 24 Marks)

ICAG January 1989

Describe the essential requirements of an effective material stock control system.

(17 Marks)

CACA Level I Costing June 1985

CHAPTER FOUR

ELEMENT OF COST: LABOUR

CHAPTER CONTENTS

- a. Job evaluation, merit rating, work study, methods study and work measurement
- b. Time-keeping and Time-Booking Functions
- c. Treatments of overtime and idle time in labour costing
- d. Basic methods of remuneration
- e. General features of incentive schemes including computation of individual incentive scheme
- f. Labour Cost Accounting
- g. Labour Turnover

4.0 Objectives:

After studying this chapter, reader should be able to:

- a. explain labour as a factor of production;
- b. explain what constitutes recruitment cost;
- c. explain the methods of labour timing and assessment;
- d. compute labour cost using the various methods of remuneration;
- e. distinguish between direct labour cost and indirect labour cost;
- f. compute overtime premium and explain the various treatments of overtime premium;
- g. explain group incentive schemes; and
- h. prepare payroll of employees for organisation.

4.1 INTRODUCTION

Labour is the second element of cost after materials. Labour cost represents the remuneration for employees' effort in the production process. Controlling labour cost involves complex procedures since it involves human beings and controlling human behaviour is complex. This chapter will explain the process for determining and controlling labour cost.

4.2 LABOUR ADMINISTRATION AND DOCUMENTATION

4.2.1 Labour as a Factor of Production.

Factors of production are resources or inputs that are used to facilitate the production of goods and services. Labour is the effort of employees required to transform raw material into

finished goods and services. Labour takes the form of employee knowledge, efforts, expertise and experience. Without these skills, production cannot take place. Labour encompasses all categories of the workforce of an organisation spanning from top management down through the hierarchy of responsibility to the grassroots workforce.

From the perspective of cost accounting, labour cost determination and control is very important because it has huge cost implications for the organization. Labour cost consists of: recruitment cost, cost of training and staff development, wages and salaries, employee bonuses, overtime premium, group incentives, etc. If these costs are not properly controlled, total cost may not be minimized.

4.2.2 **Labour Recruitment Process**

Labour recruitment refers to the process of engaging employees in the organization for their services.

Depending on the policy of the organisation, the mode of recruitment is determined either internally or externally. The following steps are usually undertaken:

- A job analysis is done to determine the role, responsibilities and person specification required.
- Internally- an advert is placed on company notice board and a search conducted.
- Externally, consideration is given to various search options like labour office, newspapers, outsourcing, job fairs, executive searches and so on.
- Applicants respond to companies' invitation and the company proceeds to shortlist potential applicants.

Selection Process

- Interviews are conducted- whether structured or unstructured.

A structured interview should have an agreed format with questions ordered to evaluate applicants.

- The right candidate is selected using pre-determined criteria.

4.2.3 **Labour Induction and Placement**

This is a programme carried out to ensure that new employees are as soon as possible integrated into the culture of the organisation by becoming familiar with the values and norms of the organisation. Employees are then placed according to their experiences,

qualifications and competencies. Training may thereafter be provided to ensure enhanced performance.

Training may involve a consideration of the following:

- Training needs analysis
- Assess training budget.
- Prioritize what is most critical.
- Define skills, knowledge abilities and objectives desired after the training.
- Consider the training method.
- Evaluate the training

Labour recruitment costs as well as other labour cost therefore include the following:

- Advertising cost
- Interviewing expenses
- Training expenses
- Cost of inducting new employ
- Wages and salaries of employees
- Overtime premiums
- Employee bonuses
- Retirement payments, etc.

4.2.4 **Labour Timing and Assessment.**

After employees have been engaged and they begin to work, there is the need to time them as they work so as to assess their performance and also to make it possible to cost the work that they do.

Various organisations use different methods to time their employees. Examples of methods used include the use of the following:

- Attendance Register
- Clock Cards
- Attendance Boards
- Job Sheets and Job Books, etc.

The above records will then be used as evidence of:

- The number of hours worked by employees
- The time spent by each employee on any Job

- The number of hours during which each employee was idle, etc.
- These will then form the basis for computing the wages of employees.

4.2.5 **Labour Behaviour and Control**

Labour is about human beings and so, it is relatively difficult to control human behaviour. However, it is important that steps are taken by the organisation to control human behaviour. Some of the mechanisms for labour control are:

- Time keeping- employees are required to record the time they reported for work and the time he/she departed from the work place. The employee is also required to record the time spent on each job or work that he/she does.
- Monitoring and supervision- employees are monitored and supervised by senior officers who observe the work attitude of the employee.
- Evaluation- the work of the employee is evaluated by his peers, clients and by management. This motivates staff to exhibit positive work attitude.
- Reward schemes- rewarding effective employees through bonuses and incentives drives employees to work hard.

4.2.6 **Job Evaluation**

This is a technique which seeks to show the relative worth of each job so as to rank it against other jobs and ultimately establish the appropriate weight of remuneration to attach to the job. Job evaluation analyses the content of each job using yardsticks such as degree of responsibility, decisions involved, training and experience required, working conditions etc., awarding points for each yardstick.

4.2.7 **Merit Rating**

Whilst job evaluation assesses the worth of the job, merit rating measures the jobholder's performance so as to determine whether the employee should be promoted, demoted or given a special award. It also uses its own yardsticks on the performance and attributes of the employee like accuracy, initiative, level of responsiveness, willingness, etc. Most

industries employ rating techniques at the end of each year in order to determine the progress of each employee within the salary structure.

4.2.8 **Work Study**

This is a system of increasing or maximizing the productivity of an operating unit by reorganizing the work of that unit. Work study is sub-divided into two major methods namely methods study and work measurement.

a. **Method study**

This is the recording and critical examination of existing methods of doing work and comparing same with proposed methods with a view to coming up with easier methods which would be more effective and cheaper on the long run.

b. **Work measurement**

As the name suggests, work measurement seeks to measure the time required for a qualified worker to complete a specific assignment at a specified level of performance.

4.3 **LABOUR COST COMPUTATION**

There are two basic methods of remunerating labour; time based remuneration and output based remuneration.

4.3.1 **Time Rate Methods of Remuneration**

The amount earned by the employee is based on the number of hours spent at his place of work and not on the quantity of work produced. The gross wage is calculated as Hours Worked \times Rate per hour. However, when overtime is worked, the payment to the employee will also include premium on the overtime hours.

Example:

Hours worked =	50hours
Rate per Hour =	¢2,000
Gross wage =	¢2,000 x 50hours
	= <u>¢100,000</u>

Advantages of Time rate methods of remuneration are:

1. It is simple to operate and easy to understand
2. The quality of work produced tends to be higher since the worker is not in a rush to complete a job in order to maximize his earnings.

Disadvantages of Time rate methods of remuneration are:

1. There is no financial incentive to produce more than a minimum amount. In fact, there is often an incentive to produce as little as possible so that the worker can increase his wage.
2. To monitor and check idleness, the employer will be obliged to incur supervision cost.
3. The method is often unfair because lazy workers and hard working staff are paid the same rates.

4.3.2 Piece Rate Method or Payment by Result Method of Remuneration

Under this method, the amount earned by the employee is based on the number of units produced. Piece rates can be examined under three headings, namely:

Straight Piece Rate

Differential Piece Rate

Piece Rate with guaranteed time Rate

- a. **Straight Piece Rate:** Under straight piece rates the payment to the employee is computed thus: No. of units produced \times Rate per unit.

The worker receives a fixed rate for each unit produced which does not depend on the time taken to produce it. Earnings therefore depend on the volume of the worker's output.

Example 1

Number of units produced	= 1,000 units
Rate per Unit	= ₱16,000
Gross wage	= 1,000units \times 16,000
	= <u>₱16,000,000</u>

Example 2

Normal rate / hour	₱1,600
--------------------	--------

Standard time allowed 10 units per hour

During an 8 hour day, 'B' completes 90 units and 'S' 60 units. Calculate the earnings of each employee.

			<u>B</u>	<u>S</u>
Rate per hour =	1,600	units produced	90	60
Units per hour =	10 units	rate per unit	¢160	¢160
Rate per units =	$\frac{1600}{10}$	Gross wage	<u>¢14,400</u>	<u>¢9,600</u>
	= ¢160			

The remuneration fluctuates in direct proportion to the units produced by each employee. If time rates were used, both employees would receive (8 hours × ¢1,600) = ¢12,800

Advantages

1. Effort is rewarded and in consequence, the employee is given the incentive to produce more
2. Employees are self-motivated; hence, less supervision is required.
3. The employer benefits from a reduction in the overhead cost per unit of production.

Disadvantages

1. There is a danger that quality will be sacrificed and in order to avoid such a situation, the employer would spend more on inspection and quality control
 2. Piece workers, after earning certain remuneration during a week, might be satisfied and slacken their pace, arrive late or absent themselves. Plant is therefore left idle and capacity is under-utilised.
 3. A considerable degree of time is involved in setting standard times and as these are subject to the agreement of trade union representatives, further time is often spent in detailed negotiation before piece rates are established.
 4. If an error is made and piece rates are set too high, it is difficult subsequently to reduce them. This could prove to be extremely costly.
- b. **Piece Rate with Guaranteed Day Rate:** It is a system adopted to compensate employees on account of low production, leading to earnings under piece rate being below the normal day rate remuneration. If an employee's earnings according to the

piece work are less than the normal Day Rate, he is paid the day rate instead of the Piece Rate.

Example:

Rate per hour	¢15,000
Cost per unit	¢16,000
Units produced	8,000units

Calculate the piece rate with Guaranteed Day rate of remuneration assuming that 8,800 hours were used to produce all the units.

Piece Rate Earnings = Units produced x Rate per unit

$$8,000 \text{ units} \times \text{¢}15,000$$

$$\text{¢}120,000,000$$

Time Rate Earnings = Hours worked x Rate per hour

$$8,800 \text{ hours} \times \text{¢}15,000$$

$$\text{¢}132,000,000$$

- c. Since the guaranteed hourly rate is higher than the piece rate, the employee is paid the hourly wages of ¢132,000,000

4.3.3 Differential Piece Rate: Under this scheme the piece work rate changes at different levels of efficiency or production.

Example:

¢10,000 per unit when production is below 7 units per hour

¢15,000 per unit, when production is 7-10 units per hour.

¢20,000 per unit when production is above 10 units per hour, etc.

The objective of this is to provide a strong incentive to reach the maximum rate of production.

4.3.4 Premium Bonus Schemes

Bonus schemes are intended to reward employees for their efficiency in saving cost for the organisation through the saving of time. These are therefore schemes for sharing extra profits with employees. Conceptually, bonus can only be awarded where there has been

cost savings or improved performance that leads the organisation to exceed its profit target. To be able to compute bonuses, we must first appreciate the following concepts:

Time allowed: This refers to the expected time to be spent in doing some piece of Editorial work e.g. if time set for one unit is 5 hours, then 100 units shall be 500 hours. Time allowed may therefore not be the same as the hours worked.

Time taken: This the number of hours actually used in performing a piece of work.

Time saved: It is the difference between time allowed and hours worked, when time allowed is greater than hours worked.

Premium bonus: This is paid when time has been saved; the magnitude of the bonus therefore depends upon the time saved.

Types of Premium Bonus Schemes:

- a. Individual Incentive Schemes
- b. Group Incentive Schemes

4.3.4.1 Individual Incentive Schemes

These are bonus schemes that reward individual employees for their efficiencies.

These include the following:

- (i) Halsey Bonus Scheme
- (ii) Halsey-Weir Bonus Scheme
- (iii) Rowan Bonus Scheme

Halsey Scheme:

According to this scheme, the time saved should be apportioned equally between the employer and the employee.

$$\text{Bonus} = \frac{1}{2} \times (\text{Time Saved}) \times \text{Day Rate}$$

$$\text{Note: Time allowed} - \text{Time Taken} = \text{Time Saved}$$

Halsey-Weir Scheme:

Under this scheme the proportion is 2:1 in favour of the employer. Thus the employee gets only a third of time saved at the rate per hour.

$$\text{Bonus} = \frac{1}{3} (\text{Time Saved}) \times \text{Day rate}$$

Rowan Scheme: Under this system, the bonus awarded to the employee is the proportion between time taken and Time allowed of the Time saved.

$$\text{Bonus Awarded to Employee} = \frac{(\text{Time Saved})}{\text{Time Allowed}} \times \text{Hours Worked} \times \text{Day Rate}$$

$$\text{Total Remuneration} = (\text{Time Taken} \times \text{Day Rate}) + \text{Bonus Awarded to Employee}$$

It therefore follows that if the employee saves more time, he gets a greater bonus.

Example

Time allowed	=	12 hrs.
Day rate	=	¢18,000
Time taken by A	=	6 hrs
Time taken by B	=	9 hrs

Required:

Calculate the Bonus to be awarded to both employees

Solution

Bonus to be awarded under Rowan Bonus Scheme:

Employee A

Time allowed =	12hrs	Bonus =	$\left(\frac{\text{Time Saved}}{\text{Time Allowed}} \right) \times \text{Time Taken} \times \text{Day rate}$
Time Taken =	<u>6hrs</u>		
Time Saved	<u>6hrs</u>		
			$= \left(\frac{6\text{hrs}}{12\text{hrs}} \right) \times 6 \times \text{¢}18,000$
			<u><u>= ¢54,000</u></u>

Employee B

$$\begin{aligned}
 \text{Time allowed} &= 12\text{hrs} & \text{Bonus} &= \left(\frac{\text{Time Saved}}{\text{Time Allowed}} \right) \times \text{Time Taken} \times \text{Day rate} \\
 \text{Time Taken} &= \underline{9\text{hrs}} & &= \left(\frac{12-9}{12} \right) \times 9 \times \text{¢}18,000 \\
 \text{Time Saved} &= 3 \text{ hrs} & &= \left(\frac{3}{12} \right) \times 9 \times \text{¢}18,000 \\
 & & &= \underline{\text{¢}40,500}
 \end{aligned}$$

Many business organisations determine their bonuses through negotiation with employee groups. The factors that influence the size of the bonus include the following:

- Time saved by employees
- Cost saved by employees
- Improved productivity
- The amount of super profits made by the business organisation
- The achievements of other budgetary targets, etc.
- Market demand for the product

4.3.4.2 Advantages and Disadvantages of Individual Incentive Schemes

Advantages of Individual Incentives Schemes

- Individual employees are motivated to be more efficient and productive
- It may generate competitive spirit among employees
- Employees morale is raised since individual effort is rewarded
- Ultimately, both the employee and the business organisation obtain enhanced benefits

Disadvantages of Individual Incentives Schemes

- Employees may compromise on quality in an effort to increase their bonus earnings
- Excessive competition can bring about unhealthy rivalry
- The determination of standard performance levels for the purpose of determining efficiency levels can conflict in the organisation
- It is relatively more difficult and expensive to operate an individual incentive scheme compared to a group incentive schemes.

4.4 Overtime Remuneration Schemes

Overtime is the time spent beyond the normal working hours or days. Overtime wage rates are expressed as time plus a fraction or in multiples of time, e.g.

- (i) Time and one half
- (ii) Time and one third

- (iii) Double time
 - (iv) Time and one fifth, etc.
- a. **Meaning of Time:** Time refers to the basic rate e.g. if the normal rate of pay is ₹500 an hour, then the time is ₹500.
- Meaning of Additional Rate The additional rate is called the overtime premium and whatever it is the amount involved is arrived at by multiplying the description by the basic rate e.g. The overtime rate is time and one half, the basic rate is ₹500. The premium shall be ₹250 = $\frac{1}{2} \times ₹500$.
- b. **Overtime Premium:** It is the portion of the overtime pay over and above the basic rate of pay. Basically, overtime premium is treated as indirect wages. The only time it is treated as direct wages is when the overtime is worked according to the customer's request to complete his order within a specified period.

4.5 Idle Time Or Waiting Time

Idle time or waiting time is defined in the CIMA terminology as “the period of time for which a workstation is available for production but is not utilised due to shortage of tooling, material and operators”. From the definition, idle time is the time lost for which there is no production. In most cases, employees received payments for the lost production created because of idle time.

Idle time can be classified into:

1. Normal idle time; and
2. Abnormal idle time

Normal idle time is uncontrollable while abnormal idle time is controllable. Therefore, Management should ensure that all facilities are in good condition and materials readily available for production.

Operation costs associated with normal idle time are charged to work in progress, for which customers are to bear the burden. Ordinary, costs associated with abnormal idle time are to be written off to profit and loss account or income statement, but some organisations treat them as part of indirect costs incurred

Illustration 4.2

Jobs are issued to operative X to make 189 units and to operative Y to make 204 units for which a time allowance of 20 standard minutes and 15 standard minutes per unit respectively is credited. For every hour saved, bonus is paid at 50% of the basic rate which is ₹200 per hour for both employees.

The basic working week is 42 hours. Hours in excess are paid at time and half. X completes his units in 45 hours and Y his in 39 hours (but works a full week). Because of defective material, 6 of X's units and 4 of Y's units are subsequently scrapped although all units produced are paid for.

You are required to calculate for each of X and Y:

- (a) the amount of bonus payable
- (b) the total gross wage payable.
- (c) the wages cost per good unit made.

(a) Solution

	X	Y
(i) Time allowed	$\underline{20} \times 189$	$\underline{15} \times 204$
	60	60
	= 63 hrs.	= 51 hrs.
Time Taken	45 hours	39 hours
Time Saved	18 hours	12 hours
a) Bonus ($\frac{1}{2} \times$ Time saved \times Day rate)	$\frac{1}{2} \times 18 \times \text{¢}200$	$\frac{1}{2} \times 12 \times \text{¢}200$
	= <u>¢1800</u>	= <u>¢1200</u>

	X	Y (b)
Basic wages (42 hrs. \times ¢200)	¢8,400	¢8,400
Over time (3 hrs. \times 1.5 \times ¢200)	900	Nil
Bonus	<u>1,800</u>	<u>1,200</u>
	<u>11,100</u>	<u>9,600</u>

(c)

Good units made (189-6)	183 units	(204-4)		200 units
Gross wage	11,100			¢9,600
Less non-productive pay	<u>-</u>	(3 x 200)		<u>600</u>
	11,100			9000

Wages cost/good unit	<u>11,100</u>	<u>9,600</u>
	183	200
	= <u>¢60.66</u>	<u>¢48</u>

Illustration 4.3

Kokonsekyi Ltd. presents the following information which relates to a week's work of 3 of its employees

Employee	<u>Mumu</u>	<u>Opi</u>	<u>Adam</u>
Work issued (units)	400	600	120
Time Allowed (hrs. per unit)	0.2	0.1	0.4
Output Rejected (units)	60	90	40

The basic working week is 40 hours; the first 6 hours overtime are paid time plus $\frac{1}{2}$ and the next

10 hours at time plus $\frac{3}{4}$. Hours worked by Mumu, Opi and Adam were 52, 45 and 40 respectively. Adam spent 8 hours on indirect work. These hours being included in the 40 hours worked by him. The three employees' basic hourly rates of pay were as follows: Mumu ¢30, Opi ¢40 and Adam ¢25.

Bonus is paid at $\frac{1}{2}$ of the basic rate for all time saved. The high rate of rejection was considered abnormal due to faulty materials and it was agreed to credit all output for bonus purposes.

Required:

You are required to present in a tabular form for each employee:

- (a) number of bonus hours worked 3 marks
- (b) basic wages including overtime 4 marks
- (c) amount of bonus earned 4 marks
- (d) gross wages 3 marks
- (e) direct wages cost per unit accepted when overtime is worked:
 - (i) regularly throughout the year as company policy due to labour shortages and
 - (ii) specifically at the customer's request to expedite delivery.

Summary of answers

	Mumu	Opi	Adam
(a) Bonus hours	<u>28hours</u>	<u>15hours</u>	<u>16hours</u>
(b) Basic wages	¢1,650	¢1,900	¢1,135
(c) Bonus earnings	<u>420</u> 2,070	<u>300</u>	<u>200</u> 1,335
(d) Gross wages		<u>2,200</u>	<u>1,135</u> (e)
Direct wages per unit	_____		
(i) Regular overtime	4.59	3.53	10
(ii) Requested overtime	5.25	3.75	10

Illustration 4.4

A Company's basic wage rate is ¢0.45 per hour and its overtime rates are:

Evenings - 1¹/₃
Weekends - double time

During the previous year the following hours were worked:

Normal time	440,000	clock hours
Time plus 1/3	40,000	clock hours
Double time	20,000	clock hours

The following times have been worked on the stated jobs

	Job X	Job Y	Job Z Clock
	Clock Hours	Clock Hours	Clock Hours
Normal Time	6,000	10,000	8,000
Evening overtime	600	1200	2100
Weekend overtime	200	100	600

You are required to calculate the labour cost chargeable to each job in each of the following circumstances:

- (a) Where overtime is worked regularly throughout the year as company policy due to labour shortage.
- (b) Where Overtime is worked specifically at the customer's request to expedite delivery.

Solution:

	<u>Job X</u>	<u>Job Y</u>	<u>Job Z</u>
(a) Hours worked	6,800 hrs.	11,300 hrs.	10,700
× Hourly Rate(¢)	× 0.45 = <u>¢3,060</u>	× 0.45 = <u>¢5,085</u>	× 0.45 = <u>¢4,815</u>
 (b)	 6,800 hrs. × ¢0.45 = 3,060	 11,300 hrs. × ¢0.45 = 5,085	 10,700 × ¢0.45 = 4,815
 Overtime premium:			
Evening overtime ($\frac{1}{3}$)	(600 × $\frac{1}{3}$ × 0.45) 90	(1200 × $\frac{1}{3}$ × 0.45) 180	(400 × $\frac{1}{3}$ × 0.45) 315
Week-end overtime (1)	(200 × 0.45 × 1) 90	(100 × 1 × 0.45) 45	(60 × 1 × 0.45) 270
	<u>¢3,240</u>	<u>¢5,310</u>	<u>¢5,400</u>

4.6 Group Incentive Schemes

These are bonuses awarded to a team of employees rather than individual employees. The incentives are enjoyed by every member of the team based on an agreed formula of sharing.

4.6.1 Advantages and Disadvantages of Group Incentive Schemes

Advantages of Group Incentive Schemes

- It enhances team spirit among employees and organizational cohesiveness
- Quality of output is not unduly compromised
- Compared to individual incentive schemes, it is relatively easy and less expensive to administer
- It avoids unhealthy competitive rivalry among employees

Disadvantages of Group Incentive Schemes

- Lazy team members are rewarded as hard working group members.
- This does not provide motivation for individual hard work.

4.7 Direct and Indirect Cost of Labour

As already discussed, labour cost is either direct or indirect. The direct labour cost is the labour cost incurred on employees who are engaged in directly transforming the raw materials into finished goods. It must be noted that, it is only the basic wages paid to direct workers that constitute direct labour cost. Policy related cost incurred on direct workers is not direct labour but rather indirect labour. Examples of these policy related costs include:-

- Workmen compensation premium paid to insurance companies
- Employer's social security fund contribution
- Bonuses paid to employees
- Overtime premium paid to employees where the overtime is worked regularly as company policy, etc.

Wages cost incurred on indirect workers is indirect wages.

Illustration 4.5

Mame Coins employs on her farm 120 workers as direct labour and 15 workers as indirect labour. The farm remunerates its labour as follows:

- a. Direct labour is paid regularly on the basis of units of output at the rate of ¢12,250 per unit
- b. Indirect labour is paid regularly on the basis of hours worked at the rate of ¢14,000 per hour
- c. Overtime premium is paid to all factory workers on the hours worked at the following rates
 - i. ¢26,000 per hour for direct labour
 - ii. ¢28,000 per hour for indirect labour
- d. The firm makes deductions and contributions to the social security scheme. The employer and employee contribute 10% and 5% respectively of gross pay
- e. Each worker contributes dues to the local workers union at the following rates:
 - i. ¢50,000 per direct labour month
 - ii. ¢80,000 per indirect labour per monthThe union dues are deducted at source
- f. The firm in addition operates a workmen's compensation insurance scheme with SIC for all factory workers. The monthly premium is ¢7,500,000.00 approximately divisible between

direct and indirect labour in the ratio of 4:1

g. PAYE TAX is appropriately 8% of monthly Gross Income

During the month of June 1999, the farm produced 30,000 units of products during regular working time of 8 hours a day for 22 days a month. The farm worked overtime of 6 hours a day for 4 days during the month and produced 3,200 more units of products.

;You are required to determine:

- i. the cost to Mame Coins of farm labour for the month of June 1999 distinguishing between direct and indirect labour costs
- ii. the total net wages paid to the workers for June 1999 (20 marks)

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Solution

Analysis of Wages

	Direct Workers	Indirect Workers
No of units produced in normal time	30,000 units	-
Overtime production	3,200 units	-
Total units produced	33,200 units	-
Hours worked regular time	120 x 176 hrs. = 21,120 hrs.	15 x 176 hrs. = 2,640 hrs.
Overtime hours	24hrs x 120 = 2880hrs.	24 hrs. x 15 = 360 hrs.
Wage rate	¢12,250/unit	¢14,000/hrs.
Overtime rate		¢28,000/hrs.
Overtime pay	2,880 hrs. @ ¢26,000 = ¢74,880,000	360 hrs. @ ¢28,000 = ¢10,080,000
Overtime piece rate	<u>¢74,880,000</u> 3,200	
Overtime premium	= ¢23,400	¢14,000

Solution

	Direct Wages ¢'000	Indirect Wages ¢'000	Total Basic wages ¢'000
Direct worker 3320 units @ 12,250	406,700	-	406,700
Indirect worker 3000 hrs. @ 14,000	<u>-</u>	<u>42,000</u>	<u>42,000</u>
Basic wages	406,700	42,000	448,700
Overtime premium			
Direct workers (3200 x 11,150)	35,680	-	35,680
Indirect workers (360 hrs. x 14,000)		5,040	5,040
Premium for workman compensation	6,000	1,500	7,500
Employer SSF 10% of basic wages			
Direct worker	40,670	-	40,670
Indirect workers	<u> </u>	<u>4,200</u>	<u>4,200</u>
Total labour cost	<u>489,050</u>	<u>52,740</u>	<u>541,790</u>

DIRECT WORKERS INDIRECT WORKERS PAYROLL

	¢	¢
Basic wages	406,700	42,000
SSF contribution 5%	<u>20,335</u>	<u>2,100</u>
	386,365	39,900
Other allowances:		
Overtime premium	<u>35,680</u>	<u>5,040</u>
Taxable pay	422,045	44,940
PAYE 8%	(33,763.6)	(3,595.2)
Local union	<u>(6,000)</u>	<u>(1,200)</u>
Net wages	382,281.4	40,144.8
Net wage per employee	<u>382,218.4</u>	<u>40,144.8</u>
	120	15
	= <u>3185.68</u>	<u>2676.32</u>

4.8 Labour Cost Minimization Techniques

Some of the techniques include the following:

- Effective labour monitoring and control
- Reduce labour turnover
- Eliminate or reduce labour related fraud

4.9 Labour Turnover

a. Meaning

This is a term which signifies percentage change in labour force during a given period. It can be measured by using the following formula:

$$\frac{\text{Number of employees leaving during a period}}{\text{Average number of employees for the same period}} \times 100$$

The percentage calculated is referred to as the labour turnover ratio (or rate)

The details below relate to the month of March.

Total number of employees at the beginning of month 201

Number of employees who started during the month 3

Number of employees leaving during the month 5

Calculate the labour turnover rate

$$\begin{aligned} \text{Labour turnover rate} &= \frac{\text{Number of employees leaving during period}}{\text{Average number of employees}} \times 100 \\ &= \frac{5}{\frac{1}{2}(201 + 199)} \times 100 \\ &= \frac{5}{200} \times 100 \\ &= 2.50\% \end{aligned}$$

Note: Average number of employees

$$= \frac{1}{2} \left\{ \begin{array}{l} \text{Number of employees} \\ \text{at beginning of period} \end{array} \right\} + \left\{ \begin{array}{l} \text{Number of employees} \\ \text{at end of period} \end{array} \right\}$$

To obtain the maximum benefit from the calculation, the rate of labour turnover should be compared with rate for previous periods and if available, the rate for other businesses in the area and in the industry as a whole. If the number of leavers is high relative to the total

number of employees, a high ratio will emerge. An increase in the number of employees leaving or a reduction in the total workforce will cause an increase in the rate compared with previous periods. The effect of a high rate is reflected in loss of output, lowering of morale and higher cost. Loss of output occurs because of:

- (a) The gap between the person leaving and his replacement;
- (b) The length of time taken to train a new employee to the level of efficiency of the previous employee;
- (c) The reduced effort given by an employee during the days or weeks immediately prior to the date of departure.

Note that two other methods of computing labour turnover are:

Flux Method:
$$\frac{\text{number of workers joining the organisation} + \text{number of workers leaving during the period}}{\text{Average number employed during the same period}}$$

Separation Method:
$$\frac{\text{Number of workers replaced during a given period}}{\text{Average number employed during the same given period}}$$

b. **Cost of Labour Turnover**

In addition to the increase in the cost per unit from reduced production and low morale, the following costs are likely to be higher when the rate of labour turnover is on the increase:

- (i) Advertising for personnel and interviewing expenses
- (ii) Re-imburement of removal and settling in expenses removal of furniture to new house and subsistence allowance between date of commencement and date of moving.
- (iii) Training, including the new employee's wages during the training period, the wages and salaries of instructors, materials used in the training process.
- (iv) Scrap and defective work during initial stages
- (v) Machine break-down
- (vi) Pension scheme administration, etc.

c. **Causes of Labour Turnover**

Although Labour turnover cannot be eliminated completely, the problem can be tackled by an understanding of the events and circumstances by which it is caused. Why do people leave? The following are some of the possible reasons:

- (i) Dissatisfaction with the job, wages, hours of work or working conditions;
- (ii) Discontent due to the relationship with the employee's supervisors and or colleagues;
- (iii) Lack of promotion opportunities;
- (iv) Personal matters e.g. ill health, marriage, pregnancy, moving to a new area.

- (v) Sometimes employees are discharged due to redundancy, incompetence, lateness, absenteeism and for disciplinary reasons.

d. **Reduction in the Labour Turnover Rate**

In order to reduce the rate of labour turnover, the following should be considered:

- (i) Regular statistics should be provided analysing labour turnover by cause and indicating whether the cause was avoidable or unavoidable and whether the person left voluntarily or was dismissed; we should however note that there are some dangers in such an analysis because employees who leave do not always give the true reasons for leaving.
- (ii) Seek ways in which the selection of applicants can be improved in order to prevent situations arising where employees are discontented or unsuitable.
- (iii) Ensure that the labour requirements are properly planned in order to avoid redundancy
- (iv) Consider the introduction of high wages plan or some other form of incentives.
- (v) See to it that the working environment is congenial.
- (vi) Consider whether the transfer of a dissatisfied employee to another department will remove the cause of the dissatisfaction.
- (vii) Hold annual medical check-ups in order to prevent ill-health at a later date.
- (viii) Consider whether the fringe benefits are competitive, e.g. pension scheme, subsidized meals, sports and social facilities.
- (ix) Develop better human relationship between management and workers
As it is important for an organisation to keep its skilled and experienced employees, a target labour turnover rate could be set with the personnel manager being responsible if the rate is higher than target.

e. **Internal Check and Payroll Fraud**

There is ample scope for perpetration of fraud at some stage during the preparation and payment of wages. For this reason, it is essential that some form of controls exist to prevent fraud or to detect it in its early stages. The dangers to be avoided are:

- The payment of wages to employees who do not exist – (ghost workers),
- The payment to an employee of an amount which is more than he is entitled to receive.

Precautions to reduce payroll fraud

1. Segregating the work so that the payroll procedures are not the responsibility of only one or two persons e.g. the clerk who prepared the wage sheet should not also make-up or distribute the wage packets.
2. Adopting adequate authorization procedures:
 - Piece work tickets should be signed by an inspector and the employee's foreman;
 - only overtime properly authorized should be paid;
 - changes in wage rates and salaries should only be processed if the personnel manager completes and signs the appropriate forms.
3. Proper Supervision: The distribution of the pay envelopes must be supervised by a senior official and preferably by one who can identify the recipients.
4. Instituting suitable procedures, e.g. a procedure should be laid down for dealing with unclaimed wages.
5. Creating a programme for internal checks. As part of the programme, the personnel officer might periodically check the payroll to ensure that payments are not being made to fictitious employees.

If the organisation is sufficiently large, the internal audit department could be very much involved in the creating and working of the internal check programme.

4.10 PAYROLL PREPARATION AND ACCOUNTING

4.10.1 Types of Payroll for Labour

The payroll is the process of determining the net wage earnings of each employee in the organisation. The payroll could either be computerized or done manually. With the manual payroll, the earnings of each employee are computed by human effort without the use of the computer. The computerized payroll uses computer software and inputs the basic variables for each employee such as:

- a. hours worked
- b. overtime hours
- c. units produced
- d. wage rate per unit or hour
- e. statutory deductions
- f. voluntary deductions, etc.

into the computer and the software processes the data to arrive at the net earnings of each employee as well as the total amount of various deductions.

4.10.2 Labour Payroll Preparation

In preparing the payroll, the following procedure is followed:

- a. Determine the basic wages of each employee. This is done by multiplying the hours worked or units produced by the agreed wage rate
- b. Add all other allowances to the basic wages to obtain the gross wages
- c. Calculate the various deductions to be made. These are of two types: statutory and voluntary deductions. The statutory deductions are required to be deducted by law and so the amount of deduction is determined by the law. These deductions include the following:
 - Social Security contributions
 - Employee Personal Income Tax (P.A.Y.E.)
 - National Health Insurance, etc.

Examples of voluntary deductions include:

- Trade Union contributions
- Provident fund contribution
- Employee welfare contribution, etc.

When the total deductions are taken from the gross wages, then we obtain the net wages of each employee.

Illustration 4.6

Clay products limited manufactures and sells a variety of clay products. Management of the company is proposing to introduce an incentive scheme into its factory but is undecided on what kind of scheme to introduce.

Below is an extract of payroll information with respect to four of the company's employees for July 2005

Name of employee	Michael	Gerald	Cynthia	William
Actual hours worked	152 hours	144 hours	160 hours	136 hours
Wage rate per hour ¢	45,000	30,000	37,500	54,000
Output produced - units				
Product A	168	480	-	480
Product B	288	304	-	1,080
Product C	368	-	200	-

The standard time per unit of each product is

Product	Minutes Allowed
A	6
B	9
C	15

Each minute earned is valued at ¢750 for piecework calculations

Required:

- a. Calculate the earnings of each employee using the following methods:
 - i. guaranteed hourly rates (basic pay)
 - ii. piecework, but earnings guaranteed at 75% of basic pay
 - iii. premium bonus in which the employee receives (2/3) two thirds of time saved in addition to hourly pay. **(14 marks)**

- b. State three (3) advantages and three (3) disadvantages of individual incentive schemes **(6 Marks)**

ICAG NOV. 2005

Solution

Payroll of Clay Products Ltd

i. guaranteed hourly rates method

Name of Employee	Hrs. Worked	Wage Rate per Hour ¢	Basic Wage ¢ '000
Michael	152 hrs.	45,000	6,840
Gerald	144 hrs.	30,000	4,320
Cynthia	160 hrs.	37,500	6,000
William	136 hrs.	54,000	<u>7,344</u>
			<u>24,504</u>

ii. piece work method

Rates per unit of output produced

Produced	A	B	C
a. minutes allowed	6	9	15
b. value of a minute ¢	750	750	750

Rate per unit

(a) x (b)	=	¢4,500	¢6,750	¢11,250
		Product A	product B	Product C

i. rate per unit	¢4,500	¢6,750	¢11,250
------------------	--------	--------	---------

ii. units produced (in units)

Michael	168	288	368
Gerald	480	304	-
Cynthia	-	-	200
William	480	1,080	-

Wages computation

Michael			¢
Product A	168 @ 4500	=	756,000
Product B	288 @ 6750	=	1,944,000
Product C	368 @ 11250	=	<u>4,140,000</u>
			<u>6,840,000</u>
<u>Gerald</u>			
Product A	480 @ 4500	=	2,160,000
Product B	304 @ 6750	=	<u>2,052,000</u>
			<u>4,212,000</u>

Since 75% of his basic pay which is ₦3,240,000 is less than the piece rate wage he will be entitled to the piece rate wage at 4,212,000.

Cynthia

Product C 200 @ ₦11,250 = ₦2,250,000

75% of her basic hourly wages is ₦4,500,000

Therefore, she will be entitled to ₦4,500,000 and not ₦2,250,000

<u>William</u>	₦	=	₦
Product A	480 @ 4,500	=	2,160,000
Product B	1,080 @ 6,750	=	<u>7,290,000</u>
			<u>9,450,000</u>

iii. Bonus premiums

<u>Time allowed for actual production</u>	<u>Time taken</u>	<u>Time saved</u>	<u>Bonus premium</u>
---	-------------------	-------------------	----------------------

Michael

A 6 x 168 x 1/60 = 16.8 hrs.

B 9 x 288 x 1/60 = 43.2 hrs.

C 15 x 368 x 1/60 = 92.0 hrs.

<u>152 hrs.</u>	152 hrs.	Nil	None
-----------------	----------	-----	------

Therefore his wages = ₦ 6,840,000

Gerald

A 6 x 480 x 1/10 = 48 hrs.

B 9 x 304 x 1/10 = 45.6 hrs.

C - -

Total	<u>93.6 hrs.</u>	144 hrs.	Nil	None
-------	------------------	----------	-----	------

Therefore wages = ₦4,320,000

Cynthia

Product C 15 x 200 x 1/40

= 50 hrs.	160 hrs	Nil	None
-----------	---------	-----	------

Therefore wages = ₦ 6,000,000

William

A 6 x 480 x 1/60 = 48 hrs.

B 9 x 1080 x 1/0 = 112 hrs.

Total 210 hrs. 136 hrs. 74hrs

Therefore William will be entitled to bonus premium.

¢

His hourly basic pay = 7,344,000

Bonus premium

2/3 of 74 hrs. @ 54,000 = 2,664,000

10,008,000

4.10.3 The Differences between Labour Cost Accounting and Payroll Accounting

Labour cost accounting relates to the determination of the cost of labour chargeable to various jobs, customers, clients and overhead accounts. Under labour cost accounting, the objective is to ascertain the labour cost that can be charged to products and services. In this regard, the following are considered as Labour cost:

- Wages and salaries of employees
- Insurance for workmen compensation
- Employee bonuses
- Employee share schemes, etc.

Payroll accounting relates to the process of computing the amount of earnings of employees as well as the various payments made for and on the behalf of employees. Examples of payment on behalf of employees include the following:

- Employer's Social Security Contribution for employee
- Employee Social Security Contributions
- Personal Income Tax of employees
- Welfare deductions for employees, etc.

Under payroll accounting, labour cost such as workmen compensation, employee insurance, etc. are not considered. It is only amounts payable to or on behalf of employees that are considered.

4.11 CHAPTER SUMMARY

In this chapter, we have discussed labour cost determination and control under three sections. Section one dealt with the preliminary issues of labour; including: labour as a factor of production; labour recruitment, induction and placement; labour behaviour and control.

Section two focused on the computation of labour cost, explaining the two main methods of labour remuneration; time based methods and piece rate methods. The concept of overtime was also explained as well as the treatment of overtime premium when overtime is regularly worked and when overtime is requested by a customer. Bonuses and incentives were also discussed. We explained the difference between group incentive schemes and individual incentive schemes as well as the merits and demerits of each of these. Section two concluded with a discussion on labour cost minimization techniques. To minimize labour cost, labour turnover rates should be reduced, payroll fraud eliminated and employees effectively monitored and supervised.

The last section of this chapter covered payroll preparation and administration. Here we explained manual payrolls and computerized payrolls and illustrated how the payroll is prepared. We also explained the difference between labour cost accounting and payroll cost accounting.

In conclusion, labour cost is an important element of cost and forms a significant part of the total cost of most organisations, especially service organisations. Its accurate determination and effective control is therefore critical to the success of organisations.

MULTIPLE-CHOICE AND SHORT ANSWER QUESTIONS

1. Under labour incentive schemes, bonus is paid
 - A. Every December
 - B. Each time the company received a large order
 - C. To very good employees
 - D. Anytime there is surplus money in the treasury
 - E. Over and above the basic pay to reward extra time worked or time saved
2. Overtime is
 - A. Work done over a period of time

- B. Time spent in calling over production figures
 - C. Time spent by the employee working beyond the normal working hours
 - D. Time spent by the employee in the changing room
 - E. Time wasted when the production machines are idle
3. PAYE is an acronym for
- A. Pay As You Engage
 - B. Pay According to your Expectation
 - C. Pay All Your Employees
 - D. Payment At Year End
 - E. Pay As You Earn
4. Ghost workers are
- A. Former employees who are now dead
 - B. Employees who were involved in accident whilst working
 - C. Employees always on sick leave
 - D. Workers who do not exist but in whose names salaries are being paid
 - E. Those who work in the cemetery
5. Gross wages are calculated by adding
- A. All allowances to basic wages
 - B. All deductions to basic wages
 - C. Pension deduction to PAYE
 - D. Bonuses and allowances together
 - E. Twelve months' wages together
6. Time allowed minus time taken equals.....
7. Labour costs incurred on employees engaged in directly transforming the raw materials into finished goods is referred to as
8. The extent at which employees leave an organization is known as
9. The product of hours worked and wage rate per hour is
10. The card issued in the name of each employee which is inserted into an electronic recording machine to capture time spent at work by the employee is called.....

SOLUTION

1. E
2. C
3. E
4. D
5. A
6. Time saved
7. Direct Labour Costs
8. Labour Turnover
9. Basic Wage
10. Clock Card

EXAMINATION TYPE QUESTIONS

4.1 Cee ltd is a waste collection company engaged in the collection of household refuse in the Gonor District. The District is divided into three areas made up of a total of 1,000 households. Each area enjoys 2 days of refuse collection during the 6-day working week of 48 hours. During April 2000, the company employed 2 drivers and 4 labourers, further grouped into 2 Gangs, Gang A and Gang B. A gang is made up of 1 driver and 2 labourers. A driver is paid $\text{¢}2,500$ per hour and a labourer $\text{¢}3,125$ per hour.

A group bonus scheme is in operation which requires that hours in excess of the normal working hours is shared equally among members of a gang and paid at a rate of $\text{¢}10,000$ per driver and $\text{¢}12,000$ per labourer.

During the month of April 2000, gang A worked 219 hours and gang B worked 228 hours.

Required:

- (a) Calculate the total cost of providing this service in the district for the month of April 2003. **(8 Marks)**
- (b) Calculate the net pay due to the workers for the month of April 2003. **(8 Marks)**
- (c) The company charges the households at cost plus 20%. How much should Cee ltd charge each household for the month of April 2003? **(4 Marks)**

Assume

Assume

1. An income tax rate of 10% of total earnings
2. Statutory SSF deductions of 12% for employer and 5% for employee
3. 4 weeks in the month of April

(Total 20 Marks)

ICAG NOV., 2003

4.2

An item passes through 5 successive hand operations in sequence as follows:

Operation	<u>Time per Article (minutes)</u>	<u>Grade of Employee</u>	<u>Wage rate Per hour</u> ¢
1	12	A	50p
2	20	B	55p
3	30	C	60p
4	10	D	70p
5	15	E	80p

A 36- hour week is worked and a production target of 720 dozen items has been set. You are required to calculate:

- a. the number of workers required;
- b. the weekly cost of each operation;
- c. the total labour cost per week.

4.3. Kofi, Yaw and Kwesi are three craft men employed by Handcraft Ltd. on the carving of two models of traditional sculptures for the local market known as “SS 77' and 'SS 88”. Each craft man completes 8 'SS 77’ sculptures and 10 'SS 88' sculptures per week. Production is then inspected for defective work. The company's remuneration scheme provides for employees to work a 40-hour week for which Kofi is paid ₵48 per hour, Yaw ₵54 per hour and Kwesi ₵60 per hour. Time worked in excess of 40 hours in any week is paid for as follows:

The first 4 hours - Time and a third
 Additional hours - Time and a half

In addition, a bonus of 25% of time saved is paid on work completed during the week. The bonus hourly rate for all workers is ₵50. No bonus payment is made on defective work. The time allowance in hours per completed sculpture passing inspection is as follows:

	Craft man		
	Kofi	Yaw	Kwesi
'SS 77' model	5	4	3
'SS 88' model	3	5	2

The following facts relate to week No. 34

- (a) Hours worked: Kofi 44; Yaw 46; Kwesi 40.
- (b) Hours worked during week No. 33 on uncompleted sculpture brought forward to week No. 34:
 Kofi 8; Yaw 7; and Kwesi 5.
- (c) Hours worked on uncompleted sculptures carried forward to week No. 35:
 Kofi 7; Yaw 8 and Kwesi 3

(d) Defective work:

	Kofi	Yaw	Kwesi
'SS 77' Sculptures	1	2	-
'SS 88' sculptures	-	1	1

You are required to calculate the total wages earned by each craft man for week No. 34 showing separately:

- (i) The standard hours allowed excluding time for defective work;
- (ii) Bonus hours and bonus payable
- (iii) Overtime payable
- (iv) Basic wage payable

(20 Marks)

ICAG Jan., 1989

4.4 End times Co. Ltd manufactures two different types of product, namely miaweni and yirewoho. Below is a summary of the payroll data of the company's production department for the month of March 2006

	Direct workers	Indirect workers
Hours worked;		
Ordinary time	3600 hrs.	800 hrs.
Overtime	650 hrs.	80 hrs.
Wage rate per hour	¢15000	¢20000

The company pays overtime at a time and half. Overtime is generally worked to meet budgeted production targets.

Analysis of the time used by the direct workers on the two products reveal the following:

Miaweni	2,400 hours
Yirewoho	1,150 hours
Idle time	700 hours

Required -

- a. Prepare the following accounts:
- i. wages control account
 - ii. work-in progress control account
 - iii. production overhead control account
- (12 Marks)**
- b. Explain the term labour turnover cost and state **FOUR** examples of such cost
- (3 Marks)**
- c. Outline **FIVE** causes of labour turnover
- (5 Marks)**
(Total 20 Marks)

How can the Cost Accountant help to control labour cost in an organisation and what are some of the problems to be faced in labour cost control?

(15 Marks)

ACCA Costing

- 4.6** Explain the differences between labour cost control and labour cost reduction and outline five practical ways of achieving labour cost control as well as labour cost reduction.
- (20 Marks)**
- 4.7** What is the difference between individual incentive scheme and group incentive scheme? Outline **THREE** advantages and **THREE** disadvantages for each of the **TWO** types of incentive schemes.
- (20 Marks)**
- 4.8** (a) Explain the differences between labour cost accounting and payroll accounting
- (6 Marks)**
- (b) List examples of labour turnover cost
- (7 Marks)**
- (c) Explain seven (7) ways of avoiding or reducing labour turnover.
- (7 Marks)**
(Total 20 Marks)

- 4.9 a. Write formulae for remuneration payable using: (i) Time rate system; and (ii) Payment by result
- b. PUCT provides you with the extracted details of its employees labour records as under:

Data

• Name of employee	Sanity	Moses
• Units produced	90	80
• Standard time allowed (in minutes per units produced)	30	30
• Actual time worked in hours	35	40
• Rate per hour	₦200	₦250
• Rate per unit	₦66.7	₦68

Required:

1. Determine the remuneration payment using (i) Time rate system; (ii) Payment by result; and (iii) Bonus Scheme is based on the product of time saved and hourly rate.
2. Which of the two employee is efficient.

CHAPTER FIVE

ELEMENT OF COST: OVERHEADS

CHAPTER CONTENTS

- a. Definition, classifications and analysis
- b. Allocation and apportionment
- c. Absorption - bases and calculation of overhead absorption rates
- d. Treatment of under- and over-absorption of overhead
- e. Activity Based Costing

5.0 Objectives:

After studying this chapter, readers should be able to:

- a. define overheads and identify the various ways of classifying overheads
- b. distinguish between overheads allocation, overheads apportionment and overheads absorption
- c. use the overheads analysis sheet to allocate and apportion overheads to cost centres
- d. calculate overheads absorption rates using six methods
- e. explain why predetermined overheads absorption rates are often used
- f. explain the reasons for the preference of departmental overhead absorption rates to blanket or company-wide overhead absorption rates
- g. calculate and explain the alternative treatments of overhead under-absorbed and overheads over-absorbed
- h. make accounting entries with respect to overheads

5.1 INTRODUCTION

Overheads are the aggregate of indirect materials, indirect labour and indirect expenses. Overheads are a very important issue in cost accounting because of a number of reasons, namely:

- i. it is made up of a number of cost elements; materials; labour and expenses therefore, its determination and control is complex and more challenging.

In many organizations, the overheads component of total cost is often significant and therefore requires careful analysis, monitoring and control to minimize total cost and thus maximize profitability.

5.2 DEFINITION AND CLASSIFICATION OF OVERHEADS

Overhead cost consists of indirect material cost, indirect labour cost and indirect expenses.

Examples include:

- a. Cost of cleaning materials
- b. Cost of stationery
- c. Cost of consumable materials
- d. Supervision cost
- e. Bonus payable to employees
- f. Salaries of indirect workers
- g. Lighting and heating
- h. Rent and rates
- i. Insurance premium
- j. Depreciation of fixed assets.

The objective of overhead cost determination is to:

- a. enable overhead cost to be absorbed by products and
- b. provide useful information for management decision making and cost control decisions

5.3 TYPES AND CLASSIFICATION OF OVERHEADS

Overheads can be classified variously as follows:

- a. production overheads
- b. administrative overheads
- c. marketing, selling and distribution overheads
- d. research and development overheads

Let us explain each of them.

a. **Production Overheads**

These are the indirect costs of manufacturing a cost unit. It comprises of indirect materials consumed in the factory, indirect factory wages and other indirect expenses incurred in connection with production.

b. **Administrative Overheads**

These are the costs of formulating policy, directing and controlling operations not related directly to production, selling, distribution or research and development.

c. **Marketing, Selling and Distribution Overheads**

These are marketing costs incurred in securing orders, publicising and presenting to customers the products of the undertaking in suitably attractive forms at acceptable prices and delivery of the goods to customers. It also includes the costs of after sales services or processes.

d. **Research and Development Overheads**

These are the costs of seeking new ideas, materials, methods of production and improved products and the development and design of such ideas so that they can be applied to formal production.

Overheads can be analysed as consisting of:

- i. Indirect materials cost
- ii. Indirect labour cost and
- iii. Indirect expenses.

Overheads can also be analysed either as

- Fixed overheads or
- Variable overheads

These forms of analysis have already been discussed in chapter one under the classification of overheads.

In order to charge overhead cost to products and services, a system of overhead allocation, overhead apportionment and overhead absorption is adopted. This is because;

overheads by their nature cannot be assigned to any specific cost unit. Overheads must first be assigned to cost centres before they can be absorbed by products.

5.3.1 Overhead Allocation and Apportionment Methods

a. Overhead Allocation

This is the assignment of overheads to cost centres directly without sharing. Overhead cost that is specifically incurred in respect of a particular cost centre is wholly assigned to that cost centre; this is referred to as overheads allocation.

b. Overhead Apportionment

This is the sharing of overhead cost incurred in respect of a number of cost centres to the centres involved using a fair and equitable basis of apportionment. There are some overhead costs that are incurred for a number of cost centres and at times even for the whole organization. Such overheads cannot be allocated but must be apportioned. The basis of apportionment should be fair and equitable. Examples of bases of apportionment commonly used are:

- i. Space occupied by cost centre
- ii. Number of employees
- iii. Value of plant
- iv. Number of materials requisitioned
- v. Kilowatt hours of energy used
- vi. Horse power energy used, etc.

Where the cost centres involved are production and service cost centres, then the overheads relating to the service cost centres must be re-apportioned to the production cost centre.

One of the following methods can be used for the re-apportionment of service cost centre overheads to production cost centres where service cost centres serve one another. That is where there is reciprocal service.

Illustration 5.1

Apple Ltd. makes wooden crates which are sold to brewers and soft drinks bottling companies. The production work involves three production departments, Sawing, Assembling and Finishing. There are also two service departments, Maintenance and Materials Handling.

During the year ended 31st December 1991, 40,000 crates were made:

	Sawing ¢	Assembly ¢	Finishing ¢
Costs incurred:			
Materials issued	800,000	600,000	100,000
Direct Wages	300,000	150,000	250,000
Overheads	120,000	80,000	30,000

Materials handling wages totalled ¢21,000

Maintenance wages totalled ¢45,000

Consumable stores totalled ¢15,000 (maintenance)

The departments' benefits from the service departments are as follows:

	Sawing %	Assembly %	Finishing %	Materials Handling %
Maintenance	30	40	20	10
Materials Handling	50	20	30	

Required:

- (a) Prepare a Statement showing the overheads allotted to each production department
(6 Marks)
- (b) Calculate the unit cost of a wooden crate.
(9 Marks)

(Total 15 Marks)

ICAG JULY 1993

SOLUTION
OVERHEAD ANALYSIS SHEET

	SAWING	ASSEMBLY	FINISHING	MAINTENANCE	MATERIALS HANDLING
	¢	¢	¢	¢	¢
Overheads	120,000	80,000	30,000	45,000	21,000
Consumables				15,000	
	120,000	80,000	30,000	60,000	21,000
Apportion					
Maintenance	18,000	24,000	12,000	(60,000)	6,000
Material					
Handling	<u>13,500</u>	<u>5,400</u>	<u>8,100</u>	<u>-</u>	<u>(27,000)</u>
	<u>151,500</u>	<u>109,400</u>	<u>50,100</u>	<u>NIL</u>	<u>NIL</u>

	SAWING	ASSEMBLY	FINISHING	TOTAL	COST PER UNIT
Material Cost	800,000	600,000	100,000	1,500,000	37.5
	¢	¢	¢	¢	¢
Direct wages	300,000	150,000	250,000	700,000	17.5
Overheads (a)	<u>151,500</u>	<u>109,400</u>	<u>50,100</u>	<u>311,000</u>	<u>7.78</u>
	<u>1,251,500</u>	<u>859,400</u>	<u>400,100</u>	<u>2,511,000</u>	<u>62.78</u>

Unit cost per crate = ¢62.78

5.3.2 The Concept of Overhead Absorption

This is the process of assigning overhead costs to products or services produced. Overheads are absorbed into products by first calculating the overhead absorption rate and then

applying the calculated overhead absorption rate to determine the overhead absorbed by each cost unit.

5.3.3 **Methods of overheads analysis.**

The ascertainment of overhead cost per cost unit involves a more complex procedure than the ascertainment of direct expenses. This is because overhead cost consists of indirect material, indirect labour and indirect expenses.

First of all, the overhead is not only one type of cost, and secondly, overheads cost cannot be attributed directly to a cost unit.

To determine the overhead cost per unit of any product or service therefore, the following process is followed:

- a. The organization is divided into cost centres which represent areas of the business, items of equipment or persons with respect to which cost can be gathered and related to cost unit. There are two types of such cost centres
 - i. production cost centres
 - i. service cost centres
- b. Allocate to the various cost centres, the cost incurred for each of them that can be wholly assigned to the cost centre without sharing or apportionment.
- c. Those overhead costs that are incurred for more than one cost centre, should be apportioned among the beneficiary cost centres. The apportionment should be done using a fair, equitable and reasonable basis of apportionment. Some bases that can be used include:

Basis	Type of overhead
i. Floor space or area occupied	Rent Rates Heating and lighting Insurance of buildings, etc.
ii. Kilowatt hours	Electricity Power, etc.
iii. Value of Plant and Machinery	Depreciation of Plant & Machinery Insurance of plant Plant maintenance, etc.
iv. Number of employees	Canteen expenses Supervisors' wages Personnel dept expenses
v. Number of requisitions	Stores expenses Indirect material expenses, etc.

At this stage, the overhead cost for each cost centre can be determined

- d. Re-apportion the overhead cost of the service cost centres to the production cost centres. The reason for this re-apportionment is that cost units are not produced in the service cost centres and so it will not be possible for the cost units to absorb the overhead costs of the service cost centres unless and until such have been reappropriated to the production cost Centres.

When re-apportioning service cost centre overheads it is important to observe whether or not the service cost centres serve each other. That is, whether or not they provide reciprocal services. If they don't provide reciprocal services, then the following procedure should be followed:

- i. First re-apportion the service cost centre that serves other service cost centres, beginning with the service cost centre that serves the largest number of cost centres.

- ii. Repeat the first process until all service cost centres overheads have been re-apportioned to production cost centres. Note that under these circumstances once a service cost centre's overheads have been re-apportioned, that centre does not receive any re-apportioned overheads.

Where the service cost centres provide reciprocal services, it means one service cost centre serves another and receives services from that other. In such a situation the following methods can be used for the re-apportionment:

- i. elimination method
- ii. continuous allotment method
- iii. Simultaneous equation method

Illustration 5.2

Lamina Manufacturing Company has four production departments and three service departments. Indirect labour and other indirect costs for a typical month have been allocated as shown below:

Lamina Manufacturing Company

	Production Department			Service Department			
	Grinding	Blending	Firing	Polishing	Personnel	Adminis- tration	Mainten- ance
	₺000	₺000	₺000	₺000	₺000	₺000	₺000
Indirect labour	4,600	3,300	5,400	2,900	700	1,800	800
Other Indirect Costs	1,400	1,200	2,800	1,600	500	300	1,200

The service departments' costs are allocated as follows:

	Grinding	Blending	Firing	Polishing	Adminis- tration	Maintenance
Personnel (%)	15	25	30	20	5	5
Administration (%)	10	30	40	15	-	5
Maintenance (%)	15	30	40	5	10	-

In the Grinding and Firing Departments, an overhead rate per machine hour is used; whereas in the Blending and Polishing Departments, an overhead rate per direct labour hour is used.

Machine hours are budgeted as 620 in the Grinding Department and 520 in the Firing Department. Direct labour hours are budgeted as 1,050 in the Blending Department and 450 in the Polishing Department.

Required:

- (a) Determine the total overheads for each of the production cost centres.
- (b) Calculate the overhead recovery rates for each of the production departments

Note: We shall use this example to illustrate each of the methods.

For the purpose of computing the overhead absorption rates, we shall use the production cost centre overheads determined through the elimination method.

5.3.4 Elimination method:

In this method, once a service cost centre's overheads have been re-apportioned, that service cost centre is eliminated from further apportionments

Using the above illustrative example, we will have the solution below.

OVERHEADS ANALYSIS SHEET (ELIMINATION METHOD)

Overheads	BASIS	Production cost centres				Service cost centres		
		Grinding ¢000	Blending ¢000	Firing ¢000	Polish- ing ¢000	Personnel ¢000	Admini- stration ¢000	Mainte- nance ¢000
Indirect labour	Allocated	4600	3300	5400	2900	700	1800	800
Other indirect Cost	Allocated	1400	1200	2800	1600	500	300	1200
Total		6000	4500	8200	4500	1200	2100	2000
re- apportionment of service cost: Personnel	15:25:30: 20:5:5 15:30:40:	180	300	360	240	(1200)	60	60
Maintenance	5:10	309	618	824	103	-	206	(2060)
Administration	10:30:40: 15	249	747	996	374	-	(2366)	-
Overheads production cost centres		<u>6,738</u>	<u>6,165</u>	<u>10,380</u>	<u>5,217</u>	<u>nil</u>	<u>nil</u>	<u>nil</u>

Please observe the following points:

Overheads	Basis	Production cost centres			Service cost centres			
		Grinding	Blending	Firing	Polish- ing	Personnel	Admini- stration	Mainte- nance

- i. the service cost centre that does not receive any service is first re-apportioned
- ii. the next service cost centre to be re-apportioned is the service cost centre that receives the least portion of service from other service cost centres
- iii. once a service cost centre's overheads have been re-apportioned, that cost centre does not receive any further re-apportionment
- iv. this process is continued until all service cost centre overheads have been re-apportioned to production cost centres

5.3.5 Continuous allotment:

Each of the service cost centre overheads will be continuously re-allocated until the amount to be re-apportioned becomes insignificant, then re-apportionment is ignored.

Again, if we use the illustrative example we will have the solution below.

Overhead Analysis Sheet

Please observe the following points:

Indirect labour	Allocation	₺000	₺000	₺000	₺000	₺000	₺000	₺000
Other indirect	cost	4600	3300	5400	2900	700	1800	800
total	allocation	1400	1200	2800	1600	500	300	1200
Re-apportionment		6000	4500	8200	4500	1200	2 100	2000
of service cost:								
personnel								
Maintenance	15:25:30: 20:5:5	180	300	360	240	(1200)	60	60
Administration	15:30:40: 5:10	309	618	824	103	-	206	(2060)
Maintenance	10:30:40: 15:5	237	710	947	354	-	(2366)	118
Administration	15:30:40: 5:10	18	35	47	6	-	12	(118)
Overheads of production cost centres	10:30:40: 15	1	4	5	2	-	(12)	-
		<u>6,745</u>	<u>6,167</u>	<u>10,383</u>	<u>5,205</u>	Nil	Nil	Nil

The service cost centres that serve each other are continuously re-apportioned to each other until the figure becomes so small that we will ignore the fact of the reciprocal service

5.3.6 Simultaneous Equations:

This method uses equations. The amount to be charged to each service cost centre is considered an unknown variable and worked for using the concept of simultaneous equations. If we use the above illustrative example, we will have the solution below.

SOLUTION

Under this method, the total allotment of overheads to a particular service cost centre is the overheads allocated direct to that cost centre plus the amount of overheads allotted to it from other service cost centres.

Using the illustrative example let us denote the service cost centres as follows:

P = total personnel department overheads

A = total administrative departments overhead

M = total maintenance department overheads

Now, P = 1200

$$A = 2100 + 0.05p + 0.10m$$

But we know P to be 1,200

$$\text{Thus } A = 2100 + 0.05(1200) + 0.10m$$

$$A = 2160 + 0.10m \quad -$$

$$(1) M = 2000 + 0.05p + 0.05 A$$

$$= 2000 + 0.05(1200) + 0.05 A$$

$$M = 2060 + 0.05 A \quad -$$

(2) By re-arrangement, equation 2 will be:

$$M - 0.05A = 2060$$

$$-0.05A = 2060 - M$$

$$A = \frac{2060}{-0.05} - \frac{1 M}{-0.05}$$

$$A = -41,200 + 20M$$

(3) Deduct equation (1) from (3)

$$A = -41,200 + 20M -$$

$$A = 2160 + 0.10M$$

$$0 = -43,360 + 19.90M$$

$$-19.90M = -43,360$$

$$M = \frac{-43,360}{-19.90}$$

$$= 2179$$

Substitute M = 2179 into - (1)

$$A = 2160 + 0.10(2179) = 2378$$

Therefore

$$P = 1200$$

$$M = 2179$$

$$A = 2378$$

Indirect labour	Allocated	₺000 4,600	₺000 3,300	₺000 5,400	₺000 2,900	₺000 700	₺000 1,800	₺000 800
Other indirect cost	Allocated	1,400	1,200	2,800	1,600	500	300	1,200
Total		6,000	4,500	8,200	4,500	1,200	2,100	2,000
Overheads re-apportionment:								
Personnel	15:25:30:2 0:5	180	300	360	240	(1,200)	60	60
Administration	15:25:30:2 0:5:5	238	713	951	357	-	(2,378)	119
Maintenance	10:30:40:1 5:5	327	654	872	108	-	218	(2,179)
Production cost Centre overheads		<u>6,745</u>	<u>6,167</u>	<u>10,383</u>	<u>5,205</u>	Nil	Nil	Nil

At the end of all of these stages, the total overheads cost for each production cost centre would have been determined. The next stage then is to absorb the overheads to cost units using any of the methods of overheads absorption methods.

5.3.7 Overheads Absorption Methods

a. The Concept of Overhead Absorption.

This is the process of assigning overhead costs to products or services produced. Overheads are absorbed into products by following the process below:

- i. Calculate the overhead absorption rates
- ii. Apply the calculated overhead absorption rate to determine the overhead absorbed

b. Methods of Overhead Absorption.

Generally, overhead absorption rate (OAR) is computed as

$$\text{OAR} = \frac{\text{Budgeted overheads}}{\text{Budgeted activity level}}$$

There are different factors that could possibly be used as activity level. These include the following:

- i. direct labour hours
- ii. machine hours
- iii. units of production
- iv. direct material cost
- v. direct labour cost
- vi. prime cost, etc.

i. Direct labour hours

This method assumes that direct labour hours are the most significant factor that influences the amount of overhead incurred in the production of products and services. Direct labour hours are therefore used as basis for the absorption.

$$\begin{aligned} \text{OAR} &= \frac{\text{budgeted overhead}}{\text{Budgeted direct labour hours}} \\ &= \text{OAR per direct labour hour} \end{aligned}$$

This method is suitable where the production technology is labour intensive and wage rates are stable.

From our illustrative example, we were told that overheads from the Blending and Polishing departments are absorbed using Direct Labour Hours.

Overheads for these two departments are:

Blending Department = ₪6,165,000

Polishing Department = ₦5,217,000 and the budgeted direct labour hours for these two departments are 1050 hours and 450 hours respectively.

The Overhead Absorption Rates will be computed as follows:

	BLENDING	POLISHING
Budgeted Overheads	₦ <u>6,165,000</u>	₦ <u>5,217,000</u>
Budgeted Direct Labour Hours	1,050 hours	450hours
Therefore O.A.R.	₦5.87 Per DLH	₦11.5 Per DLH

Where DLH is Direct Labour Hour.

ii. Machine hours

Where the production process is highly mechanized and is not labour intensive, the use of labour hours may be inappropriate. Under such circumstances, machine hours may be preferred as activity base for overhead absorption.

$$\begin{aligned} \text{OAR} &= \frac{\text{Budgeted overheads}}{\text{Budgeted machine hours}} \\ &= \text{OAR per machine hour.} \end{aligned}$$

From our illustrative example, we were told that overheads from the Grinding and Firing departments are absorbed using Machine Hours.

Overheads for these two departments are:

Grinding Department = ₦6,738,000

Firing Department = ₦10,380,000 and the budgeted machine hours for these two departments are 620 hours and 520 hours respectively.

The Overhead Absorption Rates will thus be computed as follows:

	GRINDING	FIRING
Budgeted Overheads	₦ <u>6,738,000</u>	₦ <u>10,380,000</u>
Budgeted Machine Hours	620 hours	520 hours
Therefore O.A.R.	₦10.87 per MH	₦19.96 per MH

Where MH is Machine Hour.

iii. Units of production

Where the production process turns out uniform products in mass quantities, units of production could be used as basis for overheads absorption. Where the units are not uniform however, it will be inappropriate to use units of production as a basis for overhead absorption.

$$\begin{aligned} \text{OAR} &= \frac{\text{Budgeted overheads}}{\text{Budgeted production units}} \\ &= \text{OAR per unit of output} \end{aligned}$$

produced iv. Direct material cost percentage

Overheads are absorbed as a percentage of direct materials cost.

This method is used when there are stable and uniform materials prices. Where materials price are not uniform, this method will not yield good results

$$\begin{aligned} \text{OAR} &= \frac{\text{Budgeted overheads}}{\text{Budgeted direct materials cost}} \times 100 \\ &= \text{OAR as a percentage of direct material cost} \end{aligned}$$

v. Direct labour cost percentage

Overheads are absorbed as a percentage of direct labour cost. Where intensive labour technology is used and wage rates are stable and uniform, this method may be used

$$\begin{aligned} \text{OAR} &= \frac{\text{Budgeted overheads}}{\text{Budgeted direct labour cost}} \times 100 \\ &= \text{OAR as a percentage of direct labour cost} \end{aligned}$$

vi Prime cost percentage

Prime cost as we have already explained is the aggregate of direct materials cost, direct labour cost and direct expenses. Overheads can therefore be absorbed as a percentage of prime cost. Where there is relative stability of rates and prices, this method could be used.

$$\begin{aligned} \text{OAR} &= \frac{\text{Budgeted overheads}}{\text{Budgeted prime cost}} \times 100 \\ &= \text{OAR as a percentage of prime cost} \end{aligned}$$

5.4 Calculation of Overhead Absorption Rates

We shall use the illustrative example below to demonstrate further, how overhead absorption rates are calculated and absorbed.

Illustration 5.3

- (a) Distinguish between Overhead Absorption and Overhead Apportionment

(6 Marks)

- (b) Enyo Manufacturing Company Ltd. produces three products - Frytol, Brilliant and Pepsodent. The cost estimates of each of the products are given below:

	<u>Frytol</u>	<u>Brilliant</u>	<u>Pepsodent</u>
Direct Materials	¢ 720	¢ 1,280	¢ 1,800
Direct Labour:			
Production Dept. at ¢60/hr.	2 hrs.	1.5 hrs.	2 hrs.
Finishing Dept. at ¢40/hr.	2 hrs.	2.5 hrs.	1 hr.
Variable Overheads	¢80	¢30	¢40

Fixed overhead cost for the following year is estimated at ¢6 million and planned production is:

Frytol	10,000 units
Brilliant	20,000 units
Pepsodent	40,000 units

The directors are considering alternative methods of absorbing fixed overheads into product costs and you have been asked, as the Cost Accountant, to calculate the rates to be applied for the following alternatives:

i, Direct Labour Costs (7 Marks)

ii, Percentage of Total Variable Cost (7 Marks)

(20 Marks)

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SOLUTION

Please refer to sections 5.2.1 a and b for the answer to (a)

(b)

	Production department	Finishing department
Direct labour hour budgeted		
Frytol	2 x 10,000 = 20,000 hrs.	2 x 10,000 = 20,000 hrs.
Brilliant	1.5 x 20,000 = 50,000 hrs.	2.5 x 20,000 = 50,000 hrs.
Pepsodent	2 x 40,000 = <u>80,000 hrs.</u>	1 x 40,000 = <u>40,000 hrs.</u>
	150,000hrs	110,000hrs

Budgeted wage rate per hour	¢60	¢ 40
Budgeted direct labour cost	150,000hrs @ 60 = <u>¢9,000,000</u>	110,000hrs@40 = <u>¢4,400,000</u>
Total direct labour cost	=9,000,000 + 4,400,000	= ¢13,400,000

Budgeted material cost:	¢
Frytol	720 x 10,000 = 7,200,000
Brilliant	1,280 x 20,000 = 25,600,000
Pepsodent	1,800 x 40,000 = <u>72,000,000</u>
	104,800,000
Budgeted labour cost	13,400,000

Budgeted variable overhead	
Frytol	80 x 10,000 = 800,000
Brilliant	30 x 20,000 = 600,000
Pepsodent	40 x 40,000 = 1,600,000
Budgeted total variable cost	<u>121,200,000</u>

Overheads Absorption Rate (OAR)	=	<u>Budgeted overhead</u> Budgeted activity level
---------------------------------	---	---

$$\begin{aligned}
 \text{(i) O.A.R. (Direct Labour cost percentage)} &= \frac{\text{Budgeted Overheads}}{\text{Budgeted Direct Labour cost}} \\
 &= \frac{\text{¢600,000}}{13,400,000} \times 100 \\
 &= 4.48\% \text{ of direct labour cost} \\
 \text{(ii) O.A.R. (Variable cost percentage)} &= \frac{\text{Budgeted Overheads}}{\text{Budgeted Variable cost}} \\
 &= \frac{\text{¢6,000,000}}{121,200,000} \times 100 \\
 &= 5\% \text{ of total variable cost.}
 \end{aligned}$$

5.5 Why Predetermined Rates Are Used

- a. Actual overheads are not known until after the end of a given period. If budgets are not used product cost cannot be quickly determined. The alternative will be to calculate the overhead recovery rate as frequently as possible. This could however be cumbersome and inconvenient.
- b. Actual overheads are substantially influenced by the general price level and actual activity levels are subject to wide fluctuations. The combined effect of these two is large fluctuations in the absorption rates if based on actual overhead cost and actual activity level. To reduce the effects of such fluctuations on overhead recovery, it is considered better to use budgeted overheads and budgeted activity for overhead absorption since these reflect standards.

5.6 Blanket Overhead Absorption Rates Versus Cost Centre Overhead Absorption Rates.

Overhead recovery rates are usually calculated for each production cost centre. Where an overhead recovery rate is in respect of the whole factory it is termed a blanket overhead recovery rate or factory wide overhead recovery rate.

Blanket overhead recovery rates are not very appropriate because of the following reasons:

- a. The factory consists of different production cost centres and products may consume cost centre overheads in different proportions.
- b. Different activity bases drive cost for different products in different proportions.

5.7 Determination and Treatment of Overheads Over Absorbed or Overheads Under Absorbed.

The overhead cost absorbed to a cost unit is computed as:

Overhead absorption rate x actual quantity of activity base.

Having regard to the way overheads is absorbed, it is unlikely for the actual overhead incurred to be the same as the overheads absorbed. This thus creates a situation of over absorbed overheads or under absorbed overheads.

Treatment of under or over absorption of overheads.

- a. Adjust the under or over recovery to cost units produced during the period.
 - This may not be worthwhile and such historical information is of no use to management
- b. Carry the under or over recovery to future accounting periods
 - This results in a distortion of performance figures.
- c. Treat the under or over recovery as a period cost by writing it off in the Profit and Loss account.
 - This is the most preferred treatment.

The treatment of overheads could be done using

- a. Absorption costing system where both fixed and variable overheads are considered and charged to products.
- b. Marginal costing system where only variable overheads is considered and absorbed into products and fixed overheads treated as a period cost and charged to Profit & Loss account.

Illustration 5.4

- (a) The use of pre-determined rates for overhead absorption may lead to under-absorption or over-absorption of overheads.

You are required to discuss any three methods for disposing of overhead discrepancy.

(5 Marks)

- (b) Agape Co. Ltd. operates two production departments (machining and assembling) and one service department (which is responsible for maintenance). The data below was extracted from the books of the company on 31st July, 1998.

Hours Spent	Machining	Assembling	Maintenance
Direct labour hours		600	
Machine hours	300		
<u>Expenses</u>	¢000	¢000	¢000
Indirect labour	200	250	120
Indirect materials	420	450	500
Machine handling	-	-	80
Housekeeping	50	70	100
Air Conditioning	30	30	50
Rent and rates	160	120	150
Supervision	240	180	200

Expenses of the maintenance centre are subsequently re-apportioned to the two production centres in proportion to the total expenses incurred by those departments during the month. Predetermined overhead rates were established as follows:

	<u>Machining</u>	<u>Assembling</u>
	¢000	¢000
Budgeted Monthly overhead	2,000	1,200
Planned machine hours	500	-
Planned direct labour hours	-	400

You are required to:

- calculate the overhead absorption rates which were in operation during July;
- prepare a statement showing the actual overhead borne by the production department for July;
- state the extent to which overhead was under- absorbed or over-absorbed by the production departments during the month of July.

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SOLUTION

Please for the answer to (a) of this illustrative example, refer to section 3.6.

(b)

$$\text{Overheads Absorption Rate (OAR)} = \frac{\text{Budgeted overhead}}{\text{Budgeted activity level}}$$

		Machinery	Assembly
Budgeted overheads	¢	2,000,000	1,200,000
Budgeted machine hours		500,000	
Budgeted direct labour		-	400,000
OAR	¢	<u>2,000,000</u>	¢ <u>1,200,000</u>
		500,000	400,000

Overheads analysis sheet ¢4 per machine hour ¢3 per direct labour hour

Overhead	Basis	Production cost centre		Service cost Centre
		Machinery	Assembly	Maintenance
Indirect labour	Allocated	200	250	120
Indirect Material	Allocated	420	450	500
Material handling	Allocated	-	-	80
House keeping	Allocated	50	70	100
Air conditioning s	Allocated	30	30	50
Rent & Rate	Allocated	160	120	150
Supervision	Allocated	<u>240</u>	<u>180</u>	<u>200</u>
Maintenance	1,100:1,100	1100	1100	1200
		600	600	(1200)
		<u>1700</u>	<u>1700</u>	<u>Nil</u>

Overheads absorbed = OAR x actual activity

	Machining	Assembly
OAR	¢4 per machine hour	¢3 per direct labour hour
Actual machine hours	300,000 hrs.	
Actual direct hours		600,000 hrs.
Overheads Absorbed	4 x 300,000 <u>1,200,000</u>	3 x 600,000 <u>1,800,000</u>
Overheads absorbed	1,200,000	1,800,000
Overheads incurred	<u>1,700,000</u>	<u>1,700,000</u>
Overheads under absorbed	<u>500,000</u>	-
Overheads over absorbed		<u>100,000</u>

5.8 Activity-Based Costing

In a conventional costing of indirect cost, overhead is absorbed to different products through a single base such as units of production, labour hours etc. This method of overhead absorption is suitable for a small or medium firm that is not having complex operational activities.

However, in a large firm that is highly automated, a single base is not suitable for recovery overheads simply because different activities are associated with incurring indirect costs. In such a complex automated firm, activity-based costing is used for absorbing overhead to products.

Definition:

Activity-Based Costing is a costing approach that focuses on how costs of resources utilised are traced to activities that causes them to incur and then to absorb overhead to products or services based on the activities utilisation.

Thus, ABC identifies factors that cause or drive costs and termed those factors as **cost driver**.

Cost Driver is defines as “any factor that causes a change in the cost of an activity (CIMA).

Examples of Cost Drivers are:

- Number of materials handling or issued
- Number of machine set-up
- Number of machine hours
- Number of inspector orders

5.8.1 Stages in ABC

Two stages are involved in how overheads are absorbed into products through ABC. They

include:

1. **Stage One:** Grouping of overheads into pool in accordance with identifying activities that drive them
2. **Stage Two:** Determination of how much overhead should be charged

The first stage involves identification of cost driver that allows cost to be incurred. The steps required in this first stage include:

- i. Step 1: Identify and classify activities;
- ii Step 2: Selection of cost driver bases such as number of machine set-up etc;
Step 3: Assigning of cost to each activity or cost pools; and
Step 4: Ascertainment of activity cost per cost driver base. The formula is:

$$\text{Cost Driver Rate} = \frac{\text{Activity cost for each cost pool}}{\text{Quantity of cost driver available}}$$

Stage Two: This stage computes amount of overheads to be recovered i.e assuming 100 units of product Lare to be manufactured. If total overhead is determined as:

Machine set up:	20 set up x ₦40	=	800
Materials handling:	10 issues- 10 x ₦20	=	<u>200</u>
Total			<u>1,000</u>

Overhead rate per unit of output of product L
 = ₦1,000 ÷ 100 = ₦100

Illustration 5.5

MMT manufactures two products. The company provides you with the following details relating to 2015 financial year

1. Units Produced:
 Product AB - 150,000 units
 Product CD - 200,000 units

2. Cost drivers identified

Activity	Activity Cost Pool	
	₦	
Machine set up	300,000	60 set up
Materials issued	200,000	90 requisition
Quality control	100,000	40 inspection

3. Cost drivers identified

Activity	PRODUCT	
	AB	CD
Machine set up	10	10
Materials issued	20	10
Quality control	10	5

Determine overhead absorption rate through activity based costing

Illustration 5.6

MMT manufactures two products. The company provides you with the following details relating to 2015 financial year

1. Units Produced:

Product AB - 150,000 units

Product CD - 200,000 units

2. Cost drivers identified

Activity	Activity Cost Pool	₹
Machine set up	300,000	60 set up
Materials issued	200,000	90 requisition
Quality control	100,000	40 inspection

3. Cost drivers identified

Activity	PRODUCT	
	AB	CD
Machine set up	10	10
Materials issued	20	10
Quality control	10	5

Determine overhead absorption rate through activity based costing

SOLUTION

Unit cost of each cost driver:

Activity cost for each pool

Total quantity per pool

Machine set up:	₹300,000 ÷ 60	=	₹5,000 per set up
Material issued:	₹200,000 ÷ 80	=	₹2,500 per issue
Quality Control	₹100,000 ÷ 40	=	₹2,500 per inspection

Amount of cost driver to charge to each product:

	PRODUCT	
	AB	CD
	₹	₹
Machine set up	5,000 x 10 = 50,000	5,000 x 10 = 50,000
Materials issued	2,500 x 20 = 50,000	2,500 x 20 = 25,000
Quality control	2,500 x 10 = <u>25,000</u>	2,500 x 5 = <u>12,500</u>
	<u>125,000</u>	<u>87,500</u>

Total amount of Overhead charged:

	₹
Product AB	125,000
Product CD	<u>87,500</u>
	<u>212,500</u>

5.9 CHAPTER SUMMARY

In this chapter, we have discussed accounting for overheads in three sections. The first section addressed the introductory issues in overheads; explaining the meaning of overheads, the classification of overheads and the treatment of overheads.

The second section discussed the processes of overhead allocation, overhead apportionment and overhead absorption.

The final section of the chapter explained the concept of overhead absorption; explaining six methods that could be used to absorb overheads, the reasons for the preference of pre-determined overhead absorption rates to actual overhead absorption rates and the treatment of overheads under absorbed or overheads over absorbed.

Overheads are a very important concept in cost accounting and it is very important that you thoroughly understand it because you encounter overheads concepts in subsequent topics as you progress.

MULTIPLE-CHOICE AND SHORT ANSWER QUESTIONS

1. Overheads are the aggregates of
 - A. Indirect materials, indirect labour and indirect expenses
 - B. Expenses incurred over the normal expense heads
 - C. Expenses incurred by the owners of the business
 - D. All uncontrollable expenses
 - E. All unauthorized expenses

2. Distinguish between overhead allocation and overhead apportionment
 - A. Allocation is used in government whilst apportionment is used in the private sector
 - B. Allocation is assigned direct to cost centres whilst apportionment is shared to a number of cost centres
 - C. Allocation is made scientifically whilst apportionment is done arbitrarily
 - D. Allocation benefits only managers whilst apportionment benefits junior staff
 - E. Both terms mean the same thing

3. What is the usual basis of apportioning factory rent?
 - A. Number of employees
 - B. Number of machines
 - C. Floor space occupied
 - D. Kilowatt of energy used
 - E. Number of pillars

4. What distinguishes a profit centre from a cost centre?
 - A. Direct Cost
 - B. Indirect Cost
 - C. Profit
 - D. Loss
 - E. Revenue

5. What does OAR stand for in overheads accounting?
 - A. Organisational Accounting Returns
 - B. Overheads Accounting Rate
 - C. Overheads Accounting Returns
 - D. Overheads Absorption Rate
 - E. Organisational Absorption Rate

6. Where the actual overheads for a period exceeds the predetermined overheads, we have a case of

7. A system of continuously reallocating each service cost centre overhead until the amounts become insignificant is known as

8. Overheads covering cost of securing orders, publicizing and presenting to customers the products of a company in proper forms at acceptable prices and delivery of the goods to customers are generally known as

9. Where the production process is highly mechanized making the use of labour hours inappropriate for overhead absorption, what alternative basis may be used?

10. Which is the best way to treat over- and under-absorbed overheads for a period?

SOLUTION

1. A
2. B
3. C
4. E
5. D
6. under-absorption
7. continuous allotment
8. marketing, selling and distribution overheads
9. machine hour
10. Write off to Profit & Loss Account

EXAMINATION TYPE QUESTIONS

5.1

The following information is available for a firm producing and selling a single product:

Budgeted costs (at normal activity):	€000
Direct material and labour	264,000
Variable production overhead	48,000
Fixed production overhead	144,000
Variable selling and administration overhead	24,000
Fixed selling and administration overhead	96,000

The overhead absorption rates are based upon normal activity of 240,000 units per period. During the period just ended 260,000 units of product were produced and 230,000 units were sold at €3,000 per unit. At the beginning of the period 40,000 units were in stock. These were valued at the budgeted costs shown above. Actual costs incurred were as per the budget.

Required:

- Calculate the fixed production overhead absorbed during the period and the extent of any over or under absorption. For both of these calculations you should use absorption costing.
- Calculate profits for the period using absorption costing and marginal costing respectively.
- Reconcile the profit figures which you calculated in (ii) above.
- State the situations in which the profit figures calculated under both absorption costing and marginal costing would be the same.

(20 Marks)

ICAG MAY 2000

5.2

Atta Kwesi Manufacturing Company has three departments X, Y and Z. The company uses a single production overheads rate for overhead absorption purposes, the rate expressed as a percentage of direct wages.

A change in policy in favour of departmental absorption rates has been contemplated on the grounds that these rates can be more precise.

The following information relates to the factory's budgeted and actual costs:

Budgeted:

	Direct Wages €000	Direct Labour hrs. '000	Machine Hrs '000	Production Overheads '000
Dept. X	250	100	400	1,200
Dept. Y	1,000	500	100	300
Dept. Z	<u>250</u>	<u>250</u>	-	<u>750</u>
Total	<u>1,500</u>	<u>850</u>	<u>500</u>	<u>2,250</u>

Actual				
	Direct Wages €000	Direct Labour hrs. '000	Machine Hrs '000	Production Overheads '000
Dept. X	309	120	450	1,300
Dept. Y	800	450	140	280
Dept. Z	<u>300</u>	<u>300</u>	-	-
	<u>1,400</u>	<u>870</u>	<u>590</u>	<u>2,380</u>

A Job No. FX18 has been completed currently and the actual information on this job is as follows:

	Direct Materials	Direct Wages	Direct Labour hrs.	Machine Hrs.
Dept X	1,200	1,000	200	400
Dept Y	600	600	400	100
Dept. Z	100	100	100	-

The pricing policy of the company is to make a gross mark-up of 331/3 on completion of jobs, which is expected to cover other business expenses plus net profit.

Required:

- Determine the overhead absorption rate which has been in use.
- Determine the production overhead to be absorbed by Job FX18 using the absorption rate determined in (a) above and determine the price of Job FX 18.
- Considering the new policy, determine the relevant overhead absorption rates, on a departmental basis, that can ensure precise cost computations of jobs. Give your reasons for each rate chosen.
- With the new rates in (c) above, determine the new departmental overheads and the

subsequent total production overheads to be absorbed by Job FX 18 as well as the price of Job FX 18 with this new information.

(25 Marks)

ICAG MAY 1997

Q.1

5.3

A manufacturing company that produces in batches is preparing a budget for the next financial period. There are two production departments - Moulding and Finishing. The following information for the coming year has been compiled:

	Moulding	Finishing
	(¢'000)	(¢'000)
Direct Materials	640,000	120,000
Direct Labour	(56,000 hours) 224,000	(14000 hours) 44,800
Overhead (apportioned)	313,600	62,720
Total	¢ 1,177,600	¢227,520

The following forecast has been made:

- (i) In the Moulding Dept. 90% of the labour time will be spent in actual production, and 10% of the time will be used for adjusting machines before actual production operation.
In the Finishing Dept. 80% of the labour time will be for actual production and 20% for preparing machines for actual operation.
- (ii) 2,000 batches of work will be produced. The work passes through the two stages of production - Moulding and Finishing before reaching completion.
There are two ways by which labour employed in preparing machines could be treated:
 - (i) as part of direct labour cost, or

(ii) as an addition to the overhead apportioned to each department.

Required:

Calculate for each Department:

- (a) Overhead absorption rates on a percentage of prime cost bases, assuming labour spent in preparing machines as part of:
- (i) direct labour cost
 - (ii) overhead cost

Note: The prime cost percentage should be calculated to the nearest whole number

(12 marks)

(b) The total production cost of each of the following three batches:

Batch No.	<u>Direct Labour hours</u>		<u>Direct Materials</u>		<u>Price of Materials</u>
	Moulding	Finishing	<u>(Kilograms)</u>		<u>per kilo</u>
C061	35	22	Moulding	Finishing	¢ 800
			250	101	
L024	38	29	411	139	¢ 690
M115	19	12	89	26	¢ 1,100

Your calculation should be based on the overhead rates calculated in (a) above:

- (i) with preparation of machines time as direct labour cost,
- (ii) with preparation of machines time as overhead cost

(12Marks)

(Total 24 Marks)

ICAG JAN 1996

5.4

Larson Co. Ltd., a jobbing engineering firm, has in its single factory three production departments (moulding, assembly and finishing) supported by two service departments boiler and maintenance. The Company's production costs for the past month are:

	¢	¢
Prime Cost		
Direct Materials	360,000	
Direct Wages	300,000	660,000
Indirect Materials	<u> </u>	
Dept. moulding	11,240	
Dept. assembly	17,890	
Dept. finishing	6,390	
Dept. boiler	11,000	
Dept. maintenance	5,000	51,520
Supervision and indirect wages:	<u> </u>	
Dept. moulding	13,000	
Dept. assembly	16,800	
Dept. finishing	13,600	
Dept. boiler	12,420	
Dept. maintenance	<u>10,380</u>	6,200
General production overheads:		
Factory rent and rates	25,200	
Insurance - machinery	9,900	
- building	7,700	
Depreciation - machinery	18,000	
- building	7,280	
Administrative Costs of wages dept.	16,800	84,880
Total Factory Cost	<u> </u>	<u>882,600</u>

Further information is available

	Moulding	Assembly	Finishing	Boiler	Maintenance
Area (Sq. metre)	600	400	200	100	100
Direct labour (hours)	15,000	10,000	-	-	
Direct labour cost (¢)	45,000	30,000	25,000	-	
Machine hours	20,000	30,000	40,000	-	
Net book value of plant (¢)	30,000	60,000	90,000	120,000	nil
Number of employees	75	75	50	15	25
Machine maintenance hrs.	156	312	468	104	

The factory manager estimates that 10% of total maintenance costs relates to the boiler and the balance to the three production departments (the maintenance department uses none of the power produced by the boiler).

The most important factor in determining the requirement for maintenance is total machine hours, all machines used in the factory can be taken to be of approximately equal value.

The company sets its selling prices on the following basis:

- (1) Cost of production, plus
- (2) 25% (uplift to cover normal administrative and selling cost; plus
- (3) A profit margin of 10% of the final selling price.

It is the policy of the Company to absorb overhead into production on the basis of Direct Labour Hours.

Two jobs X and Y are currently being priced. Details are:

	Job X		Job Y	
Direct materials		¢483.00		¢361.00
(a) Direct labour:	(10 hrs.)	¢ 30.00	(15 hrs.)	¢ 45.00
Dept. Moulding	(20 hrs.)	¢ 40.00	(2hrs.)	¢ 4.00
Dept. assembly	(8 hrs.)	¢ 20.00	(12 hrs.)	¢ 30.00
Dept. finishing				
(b) Machine hours:				
Dept. moulding	(5hrs.)		(8 hrs.)	
Dept. assembly	(7 hrs.)		(1 hr.)	
Dept. finishing	(1 hr.)		(5 hrs.)	

You are required to:

- (a) Calculate overhead absorption rates for the three production departments:

(20 Marks)

- (b) Calculate the prices to be charged for jobs X and Y.

(8 Marks)

Answer to 2 decimal places

(Total 28 Marks)

1CAG JAN. 1988

5.5

- (a) Explain why predetermined overhead absorption rates are preferred to overhead absorption rates calculated from factual information after the end of a financial period.
- (b) The production overhead absorption rates of factories X and Y are calculated using similar methods. However, the rate used by X is lower than that used by factory Y. Both factories produce the same type of product. You are required to discuss whether, or not, this can be taken to be a sign that factory X is more efficient than factory Y.

(20 Marks)

CIMA Cost Accounting 1

Nov. 1979

5.6

- (a) Explain the differences that exist between the following terms as used in cost accounting:
- (i) Allocation of overheads
 - (ii) Apportionment of overheads
 - (iii) Absorption of overheads

(12 Marks)

- (b) Explain the reasons for overhead under absorbed and overhead over absorbed.

(8 Marks)

(Total 20 Marks)

5.7

- (a) Specify and explain the factors to be considered in determining whether to utilize a single factory wide recovery rate for all production overheads or a separate rate for each cost centre, production or service department.

(12 Marks)

- (b) Describe **THREE** methods of determining overhead recovery rates and specify the circumstances under which each method is superior to the other methods mention

(8 Marks)

(Total 20 Marks)

CACA Management Accounting June 1981

- (a) Outline the procedures and information required in order to determine a set of predetermined production overhead absorption rates for a company manufacturing a range of different products in a factory containing a number of production departments and several service departments.
- 5.8 (b) Critically examine the purpose of calculating overhead absorption rates.

(20 Marks)
ACCA Costing

5.9 OVERHEAD ABSORPTION RATE

- a. Distinguish between Blanket rate and Cost Centre (multiple) rate, used for absorbing overheads
- b. The following data were provided by XYZ Ltd:
- | | |
|-----------------------|----------|
| Budgeted labour hours | 8,500 |
| Budgeted Overheads | ₹148,750 |
| Actual labour hours | 7,928 |
| Actual overheads | ₹146,200 |

Required:

- i. What is the labour hour overhead absorption rate?
- ii. What is the amount of overhead under/over absorbed if any?
- iii. Produce overhead control account for the transaction above
- iv. Give the major reason for the under/over absorption of overhead in (ii) above

(12½ Marks)

CHAPTER SIX

INTERLOCKING AND INTEGRATED ACCOUNTS

CHAPTER CONTENTS

- a. Book keeping entries and ledger for interlocking systems
- b. Reconciliation of financial and cost accounting profits
- c. Integrated Accounts - Bookkeeping entries and ledgers

6.0 Objectives:

After studying this chapter, readers should be able to:

- a. enter cost accounting transactions in the appropriate books of account;
- b. apply double entry principles in cost accounting;
- c. differentiate between "interlocking accounts" and "integrated accounts";
- d. reconcile financial accounting and cost accounting profit; and
- e. design accounts code in a summarized and suitable form for effective management of assets.

6.1 Introduction

Book keeping is the process of identifying, recording, and summarizing transactions in the appropriate books of accounts. The balances in the accounts, to be obtained at the end of an accounting period, are to be extracted to the trial balance, which is just list of balances of both debit and credit. The system of book keeping is not restricted to Financial Accounting; it is applicable to Cost Accounting too. Both financial and cost accounting data are to be properly kept and processed to develop and produce the required information for decision making in the future.

The size of a business normally determines the complexity of the cost records. Small businesses keep simple records not linked to the financial accounts, while larger businesses maintain a full set of cost accounts which provides the details behind the totals shown in the financial accounts. In some firms, the cost accounts will be kept independent of the

financial accounts and periodic reconciliation will be necessary. In other firms, the cost accounts form part of the formal accounting system and no reconciliation is necessary. The latter method is more satisfactory because it avoids duplication of effort and reconciliation problems. However, both methods are in use and will be explained in this chapter.

This chapter focuses attention on the double entry aspect of cost accounting and the reconciliation needed between cost accounts and financial accounts when the two are maintained separately. The reconciliation is required where a firm adopts interlocking system. When integral system is maintained, both financial and cost accounting systems are combined to generate single profit.

6.2 INTERLOCKING ACCOUNTING SYSTEM AND COST LEDGER

This accounting system uses separate cost accounts which periodically are reconciled with the financial accounts.

The cost accountant must use a great deal of the information which is also available to the financial accounts, e.g. purchase day book, expenses daybook, payroll, main journal, sales daybook, etc.

The structure of the cost accounts will be formed according to the complexity of the business and will often include accounts for: cost elements, cost centres (production, marketing and general administration), job cost (production, repairs, capital) and stock (i.e. raw materials, components or spare parts, finished goods). The interlocking of the two systems is carried out by the use of control accounts in each set of accounts, i.e.

- a. cost ledger control account in the financial ledger
- b. financial ledger control account in the cost ledger.

6.3 **The Cost Ledger:** The cost ledger is the principal ledger in the cost book-keeping system when the system is separated from the financial accounts. Generally, the cost ledger will contain:

- (a) Control accounts for stores, work-in-progress, finished goods and overhead. Each control account will be supported by a subsidiary ledger to provide the necessary details for accounting control and preparation of information.

- (b) Accounts for wages, sales, cost of sales, together with any other account needed in the cost book-keeping system, e.g. Notional charges, Suspense accounts.
- (a) A Cost Ledger Contra Account. This account is needed to maintain the double-entry principle within the cost ledger and contains postings which affect accounts outside the costing system, e.g. Debtors, Creditors or Cash Accounts of Real and Personal accounting transactions. This ledger is also referred to as :
 - i. General Ledger Adjustment Account; and
 - ii. Cost Ledger Control Account

The focal point of the cost accounting system is the work-in-progress ledger. In a specific order business, the ledger will contain a separate account for each job and will be debited with the cost of material used, wages allocated and production overhead absorbed. The cost of completed jobs is transferred to Finished Goods Ledger. When the job is delivered to the customer, cost of sales will be debited with the Job Cost and Sales credited with the selling price. Thus, a (costing) profit and loss statement can be prepared and analysed by job. The balances on the control accounts represent the cost value of stores, work-in-progress and finished goods.

6.4 Summary of Relevant Cost Accounting entries under interlocking system up to WIP Control Account.

1. For Raw Material Incurred
Debit Raw Material Control A/c Or Stores Ledger Control Account
Credit Cost Ledger Control Account/General Ledger Adjustment Account/
Cost Ledger Control Account
2. For Materials returned to Suppliers
Debit Cost Ledger Control Account or General Ledger Adjustment Account
Credit Raw Materials Control Account or Stores Ledger Control Account
3. For Material Issued
Debit Work-in-Progress Control Account, WIP (Direct)
Debit Production Overhead Control Account, POCA (Indirect
Material issued to factory)
Credit Raw Materials Control Account
4. For Wages Incurred
Debit Wages Control Account, WCA
Credit Cost Ledger Control Account

5. For Wages Allocated
Debit Work-in-Progress Control A/C (Direct)
Debit Production Overhead Control A/c (Indirect to factory)
Credit Cost Ledger Control Account

6. For Production Overhead Absorbed
Debit WIP Control Account
Credit Production Overhead Control Account

Note: Adjustment entry is made for under or over absorption of overhead

7. For Output Achieved:
Debit Finished Goods Accounts
Credit Work-in-Progress Control Account

Illustration 6.1

Below are incomplete accounts in the cost ledger of a manufacturing business for a period in which final accounts are to be prepared:

Raw materials Control Account/ Store Ledger Control A/C		
	₦	₦
Bal. b/f	8,000	Work-in-progress 90,000
Cost ledger Contra	110,000	(i)
	118,000	

Work-in-Progress Control Account		
	₦	₦
Bal. b/f	7,000	(iv)
Raw materials control	90,000	
(ii)		
(iii)		
(vi)		

(iii)

Finished Goods Control Account

	₦		₦
Bal. b/f	30,000	(v)	
(iv)			

Production Overhead Control Account

	₦		₦
Cost Ledger Control	117,000	(ii)	
		(vi)	

Production Wage Control Account

₦		₦
(i)		(iii)
(vi)		
Cost Ledger contra	46,000	

Marketing & Admin Control Account

₦		₦
Cost Ledger contra	50,000	(vii)

Cost of Sales

₦		₦
(v)		
(vii)		

Sales

P. & L. Acct	300,000	(viii)
--------------	---------	--------

Cost Ledger Contra

N		N
(viii)	(ix)	
	(Bal. B/f):	
	Raw materials control	110,000
	Production OH control	46,000
	Prod. wages control	117,000
	Marketing & Admin. OH	50,000

You are given the following additional information:

(a) The closing stock balances are:

	N
Raw materials control	18,000
Work-in-Progress control	68,000
Finished Goods control	45,000

(b) The ratio of direct wages incurred to indirect wages is 11:2

(c) Marketing and administration overhead is absorbed by jobs on the basis of 25% of cost of goods sold.

(d) Production overhead is absorbed on the basis of N3.50 per direct labour hour. During the period total direct labour hours worked is 22,000.

Required

- (a) Identify the transactions indicated by the accounting entries numbered (i) to (viii)
- (b) Complete the cost accounts for the period
- (c) Compute the cost accounting profit for the period
- (d) Prepare a trial balance as at the end of the period

(Adapted from ACCA).

6.1 Solution

(a) The transactions indicated by the accounting entries (i - viii) are as follows;

- (i) Issue of indirect materials to production
- (ii) Direct wages allocated
- (iii) Production overhead absorbed
- (iv) Finished goods produced during the period transferred from WIPCA
- (v) Cost of goods sold during the period
- (vi) Indirect wages allocated
- (vii) Marketing and administration overhead absorbed
- (viii) Value of sales during the period.

Workings

- (a) The total production wages incurred = N117,000, and the ratio of direct wages to indirect wages is 11:2.

Therefore:

$$\text{Direct wages (ii)} = \frac{11}{13} \times 117,000 = \underline{\text{N}99,000}$$

$$\text{Indirect wages (vi)} = \frac{2}{13} \times 117,000 = \underline{\text{N}18,000}$$

- (b) Production overhead absorbed (iii) = $22,000 \times \text{N}3.50 = \underline{\text{N}77,000}$

- (c) Indirect materials issued to production (i)

	N	N
Total raw materials available		118,000
Less: Direct materials issued	90,000	
Closing stock of Raw materials	<u>18,000</u>	<u>108,000</u>
		<u>10,000</u>

The values of other missing figures can be determined the same way as indirect materials issued to production as follows:

- (d) Value of finished goods produced during the period (iv) =
 $\text{N}(7,000 + 90,000 + 99,000 + 77,000 - 68,000) = \underline{\text{N}205,000}$

- (e) Cost of goods sold (v)
 $= \text{N}(30,000 + 205,000 - 45,000) = \underline{\text{N}190,000}$

- (f) Marketing & Administration overhead absorbed (vii)
= 25% of cost of goods sold
= 25% of N190,000
= N47,500

- (g) Value of opening balance of cost ledger contra account (ix) = Net sum of all the opening balances; i.e.

	Dr		Cr
	N		N
Raw materials control	8,000		
WIP control	7,000		
Finished goods control	<u>30,000</u>	Cost Ledger Contra	<u>45,000</u>
	<u>45,000</u>		<u>45,000</u>

- b. Completion of the accounts:

Raw Materials Control Account

	N		N
Bal. b/f	8,000	Work-in-progress	90,000
Cost Ledger Contra	110,000	Production OH(i)	10,000
		Bal. c/d	<u>18,000</u>
	<u>118,000</u>		<u>118,000</u>
Bal. b/d	18,000		

Work-in-Progress Account

	N		N
Bal. b/f	7,000	Finished goods (iv)	205,000
Raw materials control	90,000		
Wages control (ii)	99,000	Bal. c/d	68,000
Production OH control (iii)	<u>77,000</u>		
	<u>273,000</u>		<u>273,000</u>
Bal. b/d	68,000		

Finished Goods Control Account

₦		₦	
Bal. b/f	30,000	Cost of sales(v)	190,000
W.I.P. control (vi)	205,000	Balance c/d	45,000
	<u> </u>		<u> </u>
	<u>235,000</u>		<u>235,000</u>
Bal. b/d	45,000		

Production Overhead Control Account

₦		₦	
Raw materials control	10,000	W.I.P. Control	77,000
Wages control	18,000		
Cost Ledger Contra	46,000		
Profit & Loss (Over absorbed overhead)	<u>3,000</u>		
	<u>77,000</u>		<u>77,000</u>

Production Wages Control Account

₦		₦	
Cost Ledger control	117,000	W.I.P. Control	99,000
	<u> </u>	Production Wages (a)	18,000
	<u>117,000</u>		<u>117,000</u>

Marketing & Admin. Overhead Account

₦		₦	
Cost Ledger contra	50,000	Cost of sales (vii)	47,500
Profit and Loss	<u> </u>	(under absorbed OH)	<u>2,500</u>
	<u>50,000</u>		<u>50,000</u>

Cost of Sales Account

	N		N
Finished goods control	190,000	Profit & Loss	237,500
Marketing & Admin. OH(vi)	<u>47,500</u>		
	<u>237,500</u>		<u>237,500</u>

Sales Account

	N		N
Profit & Loss	<u>300,000</u>	Cost Ledger contra(viii)	<u>300,000</u>

c.

Profit and Loss Account

	N		N
Cost of Sales	237,500	Sales	300,000
Marketing & Admin. OH	2,500	Production OH control	3,000
Net Profit (transferred to cost ledger contra)	<u>63,000</u>		
	<u>303,000</u>		<u>303,000</u>

Cost Ledger Contra Account

	N		N
Sales	300,000	Balance b/f	45,000
Balance c/d	131,000	Raw materials control	110,000
		Production OH control	46,000
		Production wages control	117,000
Profit and Loss	<u>63,000</u>	Marketing & Admin. OH	50,000
	<u>431,000</u>		<u>431,000</u>
		Balance b/d	131,000

d.

Trial Balance as at the end of the Period

	Dr	Cr
	₦	₦
Raw materials control	18,000	
Work-in-Progress control	68,000	
Finished goods control	45,000	
Cost Ledger contra	_____	<u>131,000</u>
	<u>131,000</u>	<u>131,000</u>

NB: The term 'control' account implies that a subsidiary ledger is kept. Entries to control accounts represent summary postings.

6.5 RECONCILIATION OF COSTING AND FINANCIAL ACCOUNTING PROFITS

The profit disclosed by the Costing Profit and Loss Account may differ from that shown in the financial Profit and Loss Account where interlocking system is adopted and it is necessary to reconcile them. The difference may be due to the following reasons:

6.5.1 Appropriations of Profit not Dealt With in the Cost Accounts

- (a) Corporate tax
- (b) Transfers to general reserve or any other fund of accumulated profits, e.g. dividend equalization reserve.
- (c) Charitable donations, where no direct benefit is derived therefrom by the company's employees.
- (d) Dividends paid on the share capital of the company
- (e) Additional provisions for depreciation of buildings, plants, etc., and for bad debts.
- (f) Amounts written off on goodwill, preliminary expenses, underwriting commission, debenture discounts, expenses of capital issues, etc.
- (g) Appropriations to sinking funds for the purpose of providing for the repayment of loans or debentures.

6.5.2 Financial Matters that are Outside the Scope of Cost Accounts

- (a) Interest received on bank deposits and investments.
- (b) Rents receivable. If, however, rents are received from a portion of the business premises which has been sublet, the profit on rental only should be excluded from the cost records. The proportion which represents recovery of rent paid will be deducted from total rent to ascertain the net cost of the premises to be included in the cost records.
- (c) Profits or losses on sales of investments, buildings and other fixed assets; capital expenditure charged specifically to revenue.
- (d) Interest on bank loans, mortgages, debentures and other borrowed money, if interest on capital is ignored in the cost records.
- (e) Damages payable according to law.
- (f) Penalties payable for late completion of contracts.
- (g) Losses due to scrapping of machinery before the date estimated when depreciation and obsolescence were provided for.

6.5.3 Items Whose Costing Treatment Differ from that Adopted in the Financial Accounts

- (a) Under and over recoveries of overhead due to deliberate omission from the cost accounts, e.g. selling costs, or to approximation in the basis of recovery or to fluctuations in output.
- (b) Differences in the valuation of stocks and work-in-progress. Stocks are frequently valued in the cost accounts at a figure which includes an appropriate allotment of overhead, which from the point of view of ascertaining the profit on manufacture, is perfectly justifiable. It may be thought prudent when preparing the financial accounts to value stocks at prime costs only.
- (c) Depreciation in the cost accounts may in certain circumstances be charged on the basis of production units or hours, while in the financial accounts it is usually provided for in the form of a charge for the period, irrespective of the actual level of production output.
- (d) Abnormal losses in production and storage, and abnormal idle time. In the financial accounts these losses will be "merged" in the appropriate accounts, i.e. the figure of sales will be exclusive of finished products wasted, and the debits for materials and wages will be inclusive of any abnormal losses of material or time. In the cost

accounts such as abnormal losses may be ignored as outside the scope of manufacturing costs.

The reconciliation of financial accounts and cost accounts is carried out using a memorandum reconciliation account in order to show why the respective profit figures of the two accounts are different.

Illustration 6.2

NUASA Limited has separate financial and cost accounting systems. Extracts from both sets of accounts for the year ended 31 December 2011 were as follows:

(a) **Financial Accounts**

	<u>Opening Stock</u>	<u>Closing Stock</u>
	N	N
Stock valuations:		
Raw materials	34,000	36,000
Work-in-progress	7,000	5,000
Finished goods	16,000	20,500
		N
Debt interest		5,000
Interest received		750
Discounts allowed		2,000
Discounts received		1,000
Net Profit (before taxation)		17,500

(b) **Cost Accounts**

	<u>Opening Stock</u>	<u>Closing Stock</u>
	N	N
Stock valuations:		
Raw materials	33,000	34,500
Work-in-progress	8,000	7,000
Finished goods	17,000	20,500

Required:

Reconcile the profit as reported in the financial accounts with the cost accounts, and calculate the cost accounting profit for the *period*.

Solution 6.2**Memorandum Reconciliation Account**

	₦	₦		₦	₦
Profit as per financial a/cs		17,500	* Profit as per cost a/cs		21,750
Debenture interest	5,000		<u>Items not credited:</u>		
Discount allowed	2,000		Discount received	1,000	
Raw material opening	1,000		Interest received	750	
W.I.P. - closing	<u>2,000</u>	10,000	Raw mat. Closing	1,500	
			W.I.P. closing	1,000	
			Finished Goods:		
			- Opening	1,000	
			- Closing	<u>500</u>	<u>5,750</u>
		<u>27,500</u>			<u>27,500</u>

- The sum of ₦21,750 stands for the difference between the two sides of the account as well as the Cost Accounting profit.

6.6 INTEGRATED ACCOUNTING SYSTEM

In this accounting system, the concept of separate Profit and Loss Accounts for financial and cost purposes is discarded in favour of a unified set of accounts which serves both financial and management purposes. Such a system of accounting is referred to as "integrated" or "integral" system. The terminology (CIMA) defines integrated accounts as "set of accounting records that integrates both financial and cost accounts using a common input and data for all accounting purposes." The system is designed on the following principles:

- The degree of integration must be determined. Some undertakings find it satisfactory merely to integrate up to the stage of prime cost, leaving overhead allotment to be dealt with in memorandum form only.

- (b) Dependent upon the degree of integration decided upon, the normal classification of expenditure by nature is discarded. In some systems a single control account is opened to which all expenditure and revenue which is the subject of costing treatment is posted. Such a control account operates in the same way as a debtors control account, i.e. it contains a summary of transactions posted to the cost ledger in detail. It is, however, more usual for separate control accounts to be opened in the formal records in the same way as control accounts were opened within the cost ledger for stores, Work-in-Progress, Overhead, etc., under a separate accounting system.
- (c) Full details of items posted to the control accounts are supplied to the cost department at conventional intervals, accompanied by prelists or registers of amounts to ensure completeness.
- (d) The information is then dealt with by the cost department in accordance with the system of costing in force and with the following objectives in mind:
 - (i) To provide the necessary costing data.
 - (ii) To form the basis for journal entries so that the control accounts can be cleared to suitable revenue accounts, culminating in a profit and loss account.
- (d) The amount of detail which is recorded in the ledger itself depends upon circumstances, but is usually kept to a minimum, with full information regarding each department or process being contained in subsidiary ledgers (based of course upon exactly the same data). Postings to subsidiary ledgers are sometimes referred to as third entries to emphasize that they are not part of the double entry of the accounting system.

Application of the above principles will facilitate preparation of operating statements in the form required from data which are subject to routine accounting control. The conventional analysis of expenditure required for statutory purposes and for external reporting can be accommodated by modifying the classification procedures within the subsidiary ledgers.

The integrated accounting system saves administrative effort since only one set of accounts is kept, instead of two separate systems of cost and financial accounting. In this regard the possible confusion arising from having two sets of accounts is eliminated.

The main problem with regards to the integrated accounting system is that one set of accounts is expected to fulfil two different purposes, which are:

- (i) Stewardship of the business and external reporting
- (ii) Provision of internal management information.

At times these different purposes may conflict. For example, the valuation of stocks will conform to the requirement of International Accounting Standards, whereas the cost accountant might have preferred to value closing stocks at say, marginal cost or replacement cost.

Entries for Integrated System

1. For Materials Purchased
Debit Raw Materials/Stores Ledger Control A/c
Credit Bank/Creditors for Materials
2. For Materials returned to Suppliers
Debit Creditors for Materials
Credit Raw Materials Control Account
3. For Materials Issued:
Debit Work-in-Progress Control Account (Direct)
Debit Production Overhead Control Account (Indirect Factory)
Credit Raw Materials Control Account
4. For Wages Incurred
Debit Wages Control Account, WCA
Credit Wages Payable Account
5. For Wages Allocated
Debit Work-In-Progress Control Account
Credit Production Overhead Control Account
Credit Wages Control Account
6. For Production Overhead Incurred
Debit Production Overhead Control Account, POCA
Credit Bank/Creditors for Overheads
7. For Absorption of Overhead
Debit WIP Control Account
Credit Production Overhead Control Account
Note: Adjust for under/over absorption
8. For Output Achieved
 - a. Finished Goods Account
 - b. Credit Work-In-Progress Account

Illustration 6.3

Gwammaja Limited manufactures a range of products which are sold through a network of wholesalers and dealers. A set of integrated accounts is kept, and for the year 2011 the following information is relevant:

- (a) Production overhead is absorbed into the cost of products on the basis of a budgeted rate of 80% of direct labour cost.
- (b) Finished stocks are valued at factory cost.

(c)	31 March 2011 ₤	30 April 2011 ₤
Raw materials stock	8,600	7,580
Work-in-Progress	2,800	2,375
Finished goods stock	5,250	6,045
Debtors for goods sold	4,600	5,570
Creditors for raw materials	3,800	4,710
Fixed assets at net book value	3,000	3,000

(d) Bank transactions for the month of April 2011 were as follows:

	N
Bank balance at 31st March	750
Receipts from debtors	13,780
Payments made:	
Direct labour	3,200
Creditors for raw materials	4,480
Production overhead	2,700
Administration overhead	350
Selling & Distribution overhead	1,150

Required:

- (a) Use the information above to write up the following control accounts:
- (i) Raw materials stock
 - (ii) Work-in-Progress
 - (iii) Finished Goods
 - (iv) Production Overhead
- (b) Prepare the following statements:
- (i) A Profit and Loss Account for the month of April, 2011
 - (ii) A balance sheet as at 30th April, 2011

Solution 6.3

(a) (i) **Raw Materials Stock**

	N		N
Opening balance	8,600	Work-in-progress	6,410
Creditors (W1)	5,390	(balancing figure)	
		Balance c/d	<u>7,580</u>
	<u>13,990</u>		<u>13,990</u>
Balance b/d	7,580		

(ii) Work in Progress			
N		N	
Opening balance	2,800	Finished goods	
Raw materials stock	6,410	(balancing figure)	12,595
Direct wages	3,200		
Production OH (W2)	<u>2,560</u>	Balance c/d	<u>2,375</u>
	<u>14,970</u>		<u>14,970</u>
Balance b/d	2,375		

(iii) Finished Goods			
N		N	
Opening Bal.	5,250	P. & L. A/c (cost of sales)	
W-I-P	12,595	(balancing figure)	11,800
		Balance c/d	6,045
	<u>17,845</u>		<u>17,845</u>

(iv) Production Overhead			
N		N	
Cash	2,700	Work-in-progress	2,560
		Profit & Loss account	
		(under-absorbed)	<u>140</u>
	<u>2,700</u>		<u>2,700</u>

(b) (i) **Profit and Loss Account for the month of April, 2011**

	N	N
Sales (W3)		14,750
Production cost of sales		<u>11,800</u>
Gross Profit		2,950
Less: Administration Overhead	350	
Sales & Distribution overhead	1,150	
Under-absorbed production overhead	<u>140</u>	<u>1,640</u>
Profit		<u>1,310</u>

(ii) **Balance Sheet as at 30th April, 2011**

	N	N
Fixed assets (net book value)		3,000
Current assets:		
Raw materials	7,580	
Work-in-progress	2,375	
Finished goods	6,045	
Debtors	5,570	
Cash (W4)	<u>2,650</u>	
	24,220	
Less: Current Liabilities	<u>4,710</u>	
		<u>19,510</u>
		<u>22,510</u>
Long-term capital N 21,200 (balancing figure) + 1,310)		21,200
Profit		1,310

Workings

(1) **Creditors for Raw materials**

	N		N
Cash	4,480	Opening balances	3,800
Bal. c/f	4,710	Raw materials purchases (balancing figure)	<u>5,390</u>
	<u>9,190</u>		<u>9,190</u>

(2)	Direct labour	(80% of Dir. Labour)	N3,200
	Production overhead absorbed (80%)		N2,560

(3) **Debtors**

	N		N
Opening balance	4,600	Cash	13,780
Sales (bal. figure)	<u>14,750</u>	Balance c/f	<u>5,570</u>
	<u>19,350</u>		<u>19,350</u>

(4)

		Cash	
	₦		₦
Opening bal.	750	Creditors for raw materials	4,480
Debtors	13,780	Direct labour	3,200
		Production overhead	2,700
		Admin. Overhead	350
		Sales & Distribution OH	1,150
		Balance c/d	<u>2,650</u>
	<u>14,530</u>		<u>14,530</u>

6.7 ACCOUNTS CLASSIFICATION AND CODES

In an organization of any size, cost and financial data will be so numerous that details are to be summarized under suitable headings before the data could be processed and assimilated by management for various decision making. For example, many types of indirect materials would be used in the factory and in reporting consumption. Typical headings under which data are summarized might be:

- a. Cleaning materials
- b. Lubrication
- c. Fuel
- d. Protective clothing
- e. Stationery
- f. Small tools
- g. Packing material
- h. Food stuffs
- i. Replacement parts
- j. Miscellaneous

By using such groups the number of accounts can be reduced and the groups can be used for budgeting purposes, etc. In order to assemble data under these headings, it is vital to use code numbers or letters and to prepare an accounts manual which contains, among other things, a list of all current codes with explanatory notes on their use. A good manual will be one which

is comprehensive, unambiguous and well indexed, so that invoices, requisitions, time-sheets, etc., can be coded quickly and accurately.

The code structure adopted can be prepared in several ways but it is important that it follows a logical sequence, i.e. all common items are together, that it is flexible enough to accommodate additions and that it is arranged in a way that aids memory. If the system is so complex that a code in excess of 6 digits must be used, then it is preferable to adopt a composite code suitably structured like 024-824-03. A simple accounts code showing some of the fixed asset accounts likely to be encountered is given below:

0000 - 0099	Land
0100 - 0299	Buildings
0300 - 0399	Machine tools
0400 - 0499	Containers and tanks
0500 - 0599	Vehicles
0600 - 0699	Handling equipment
0700 - 0799	Heating plant
0800 - 0899	Tools and pattern
0900 - 0999	Miscellaneous fixed assets, patents and goodwill

The same coding system may be followed when designing accounts code for current assets, liabilities, cost centre, expenditure and miscellaneous accounts.

6.8 **COMPUTER ASSISTED COSTING TECHNIQUES**

In today's dynamic business environment, it is doubtful if the cost accountant can be effective without the use of computer techniques. Aside from the volume of transactions and the speed of processing required, there is the need for systems that simplify decisions by offering a wide range of options for the user.

First among the computer assisted costing techniques are transaction processing systems. These are systems designed to handle large volumes of monotonous transactions from various points and coordinated by a central server which processes and harmonizes such mass of data. Usually, such systems have set functions and their formats cannot be easily amended without the intervention of data processing experts such as system analysts and programmers.

Secondly, some systems are designed to support decision making. They are generally very user-friendly and interactive, offering a variety of tools the user can employ to perform his tasks more effectively unlike the mass data processing systems.

Decision Support Systems have the advantages of:

- a. Guiding the manager through a process of using available data to quickly arrive at useful decisions. They provide the support but still leave the manager to take the decisions because they do not offer pre-determined solutions.
- b. Interaction which enhances effective problem solving through wide options provided.
- c. Not having a structured solution; the manager must determine the direction of decisions to be reached; only the system guides him towards possible solution and their implications.

Examples of Decision Support Systems

- i. Spreadsheets
- ii. Forecasting
- iii. Regression Analysis
- iv. Non-linear and Linear Programming
- v. Modelling and simulation
- vi. Statistical Analysis
- Vii. Financial modelling
- viii. Sensitivity and Risk Analysis
- ix. Activity Cost Management

All the above systems come with application packages which are flexible and cheap to use (does not require the employment of specialist system analysts who are expensive to maintain) and can be readily customized to suit the user's requirements. This flexibility includes transactions types, data layouts, reports formats and frequency. Most packages are

designed to deal with a single specific application, but by far the most versatile and widely applied package is the electronic spreadsheet. To today's cost accountants, the most useful electronic spreadsheet is the Microsoft excel. The spreadsheet is capable of storing both alphabetical and numeric data which are amenable to easy manipulations through simple commands. They are arranged in a grid of columns and rows. With the data safely entered in the cells, a change in a simple command is automatically effected in the mass of data throughout the worksheets that are linked together. Spreadsheets can be used for monthly expenditure reports, cash budgets, standard cost records and profitability reports amongst others.

The data in Microsoft Excel is also capable of being exported into packages like PowerPoint and others with capabilities for pictorial presentation, thus enhancing the use of computer systems in decision making.

6.9 CHAPTER SUMMARY

In this chapter, efforts have been made to explain the double-entry aspects of cost accounting, and the reconciliation of the cost accounts with financial accounts. It has been made clear that cost accounts and financial accounts might be reconciled through the use of "interlocking accounts" or "integrated accounts". We have also shown how the two different accounts are reconciled with the use of memorandum reconciliation account. Finally we have described how accounts code should be used to summarize cost and financial data before data could be processed and assimilated by the management for relevant decisions.

It is clear from this chapter that double entry system of book keeping is not restricted to financial accounting. The system is also very applicable to cost accounting and management accounting. It all depends on the type of organization and its commitment to proper record keeping, transparency and accountability.

MULTIPLE-CHOICE AND SHORT ANSWER QUESTIONS

1. An interlocking accounting system has
 - A. Various ledgers relating to one another
 - B. A separate set of financial ledgers and separate set of costing ledgers

- C. Accounting entries locked up in the ledger
 - D. Different ledger for direct expenses and indirect expenses
 - E. A single set of ledger serving dual purpose
2. A trial balance is
- A. The set of accounting records presented at court cases
 - B. An account prepared to determine a company's profitability
 - C. List of account balances both debit and credit sides balance
 - D. The balance of the cost ledger control account
 - E. A statement of balances on bank accounts
3. What is a notional charge?
- A. A charge on the assets of the company
 - B. A government charge to be paid by the company
 - C. Charges introduced to reduce tax liability
 - D. Charges which though not payable are meant to reflect the normal costs of running the business
 - E. Expected income which may be recognized in the accounts
4. In reconciliation of profits disclosed by interlocking accounts, what are purely financial matters?
- A. Items involving cash transactions
 - B. Balance sheet items
 - C. Matters relating to the banks
 - D. Salaries and wages paid to casual workers
 - E. Financial matters outside the scope of production
5. What is a control account?
- A. An account in the main ledger summarizing the subsidiary ledger accounts
 - B. The account maintained by the Financial Controller
 - C. An account maintained by the Cost Controller
 - D. A separate account for monitoring factory performance
 - E. A secret account for monitoring factory performance

6. A system where a set of accounts is kept for both financial and costing transactions is known as
7. In the accounts manual, processing of large mass of data under different accounts heads are made possible through the use of
8. Raw materials issued to production but yet to reach the finished stage at period end is to be found in which account?
9. The conflict between the profit figures arrived at under the financial account and cost account ledger is settled by way of a

SOLUTIONS TO MULTIPLE CHOICE AND SHORT ANSWER QUESTIONS

1. B
2. C
3. D
4. E
5. A
6. Integrated Accounting Systems
7. Accounts codes
8. Work in progress account
9. Memorandum Reconciliation Statement

EXAMINATION TYPE QUESTIONS

1. What do you understand by the term "Integrated Accounting and what advantages does it offer compared to separate systems of cost accounting and financial accounting?
2. The growth in the volume of data handled together with technological advances in data processing equipment continues to emphasize the need for a satisfactory system of codification of accounts. In determining such a code, what principles should be observed?

3. You have been appointed as adviser to a trade association of toy manufacturers and are asked to prepare a report on implementing uniform costing systems.

List **TWO** aspects of overhead costing to be examined and explain how uniformity may be achieved in respect of each.

4. The following trial balance results from entries in the cost ledger of a jobbing manufacturer:

	<u>Dr</u>	<u>Cr</u>
	N	N
(a) Cost Ledger Contra Account		11,590
(b) Stores Ledger Account	3,790	
(c) Work-in-Progress Account	5,430	
(d) Finished Goods Account	2,350	
(e) Factory Overhead Account	50	
(f) Administration cost Account		<u>30</u>
	<u>11,620</u>	<u>11,620</u>

Explain what each balance represents and the transactions out of which it has arisen.

5. The following Trial Balance was extracted from the books of Easy Going Limited on 1 January, 2010:

	N	N
Raw materials	18,000	
Work-in-progress	27,000	
Finished goods	9,000	
General ledger control a/c	<u> </u>	<u>54,000</u>
	<u>54,000</u>	<u>54,000</u>

The company keeps a separate cost accounting records. Transactions for January 2010 are given below:

	N
Raw materials purchased	59,000
Direct wages	40,000
Indirect wages	7,200
Administration salaries	6,800

Selling and Distribution expenses	4,400
Administration expenses	7,500
Production expenses	4,000
Stores issued: -	
Production	33,100
Factory maintenance	2,070
Administration	1,000
Production overhead absorbed	14,000
Production overhead absorbed	
by finished goods	15,000
Selling and distribution Overhead	
absorbed by sales	11,000
Factory cost of finished goods	78,000
Cost of finished goods sold	80,000
Sales	120,000

You are required to record the transactions for the month and prepare a Costing Profit and Loss Account and a Trial Balance as at the end of the month. (ICAN, May 1995 Adopted)

6. Explain how the results shown by the Cost Accounts and those shown by the Financial Accounts may be reconciled.
- (b) According to the Cost Accounts of Gwammaja PLC, profit for the year was ₦48,390. The Financial Accounts disclosed the following position:

Manufacturing Account

	N		N
Raw materials opening stock	1,900	Transfer to finished stock account	111,400
Purchases (less returns)	<u>54,900</u>		
	56,800		
Less: Closing stock	<u>1,800</u>		
	55,000		
Direct labour	35,500		
Factory overhead	<u>21,400</u>		
	111,900		
Work-in-progress:			
Opening	8,400		
Closing	<u>8,900</u>		
	<u>500</u>		
	<u>111,400</u>		<u>111,400</u>

Finished Stock Account

	N		N
Opening stock	11,600	Cost of Sales transf.	
Transfer from manuf. a/c	111,400	to trading A/c	110,700
		Closing Stock	<u>12,300</u>
	<u>123,000</u>		<u>123,000</u>

Trading Account

	N		N
Factory cost of sales transferred from stock a/c	110,700	Sales	184,500
Gross profit c/d	<u>73,800</u>		
	<u>184,500</u>		<u>184,500</u>

Profit and Loss Account

	N		N
Administration expenses	15,600	Gross profit b/d	73,800
Distribution expenses	10,182	Discount received	1,806
Discounts allowed	1,511	Bank interest revd	37
Debenture interest	850	Dividend received	300
Fines	500		
Losses of a non-trading nature	350		
Net Profit	<u>46,950</u>		
	<u>76,943</u>		<u>75,943</u>

Stock valuations in the Cost Accounts were as follows:

	<u>Opening Balance</u>		<u>Closing Balance</u>
	N		N
Raw materials	1,969		1,850
Work-in-progress	8,280		8,730
Finished Stock	11,396		12,810

Depreciation amounting to N6,146 was charged in the cost accounts, whereas Factory Overhead in the Financial Accounts included N5,873 for this expense. The profit shown in the Cost Accounts has been arrived at before charging notional rent of N1,500.

You are required to present a logical statement to reconcile the two profit figures.

- 7 Indabawa Limited, a company engaged in the manufacture of specialised marine engines, operates an historic job cost accounting system which is not integrated with the financial accounts. At the beginning of May 2010, the opening balances in the cost ledger were:

	N
Stores Ledger Control Account	85,400
Work-in-progress Control Account	167,350
Finished Goods Control Account	49,250
Cost Ledger Control Account	302,000

During the month the following transactions took place:

	₦
Materials: Purchases	42,700
Issues - to production	63,400
- to general maintenance	1,450
- to construction of manufacturing equipment	7,650
Factory wages: Total gross wages paid	124,000

₦125,000 of the above gross wages were incurred on the construction of manufacturing equipment ₦35,750 were indirect wages and the balances were direct.

Production overheads:

Actual amount incurred, excluding items shown above, was ₦152,350; ₦30,000 was absorbed by the manufacturing equipment under construction and under-absorbed overheads written off at the end of the month amounted to ₦7,550.

Royalty Payments:

One of the engines produced is manufactured under licence.

₦2,150 is the amount which will be paid to the inventor for the month's production of that particular engine.

Selling overheads:	₦22,000
Sales	₦410,000

The company's gross profit margin is 25% on factory cost.

At the end of May, stocks of Work-in-Progress had increased by ₦12,000. The manufacturing equipment under construction was completed within the month and transferred out of the cost ledger at the end of the month.

Required:

Prepare the relevant control accounts, costing profit and loss account, and any other accounts you consider necessary to record the above transactions in the cost ledger for May 2010. (A C C A , Costing adapted)

6.8 Chiroki and Ibro Nig. Ltd. maintained separate cost and financial accounts, and the costing profit for 2010 differed to that revealed in the financial accounts, which was shown as ₦50,000.

i. The following information is available:

	<u>Cost</u> <u>Accounts</u> ₦	<u>Financial</u> <u>Accounts</u> ₦
Opening Stock of Raw materials	5,000	5,500
Closing stock of raw materials	4,000	5,300
Opening stock of finished goods	12,000	15,000
Closing stock of finished goods	14,000	16,000

(ii) Dividend of ₦1,000 was received by the company.

(iii) A machine with Net Book Value of ₦10,000 was sold during the year for ₦8,000.

(iv) The company charged 10% interest on its opening capital employed of ₦80,000 to its process costs.

Required:

(i) Determine the profit figure which was shown in the cost accounts.

(ii) Explain what advantages a business might obtain from the integration of cost and financial accounting data. (AAT Cost Accounting & Budgeting)

INTEGRAL

6.9 You are provided with the extracted operational data of Tamsat Limited:

Opening Trial Balance as at 1st January, 2017

	N
Debit: Work-in-Progress	25,000
Store Ledger Control A/c	10,000
Finished Goods Control A/c	20,000
Fixed Assets (Non-Current Assets)	80,000
Credit: Creditors for Material	30,000
Prov. For depreciation on F.A	10,000

Transactions for the period ended 31st January, 2017

	N	N
Materials purchased		60,000
Normal loss on materials		3,000
Direct materials issued		50,000
Indirect materials issued to factory		6,000
Wages allocated as indirect to factory	35,000	
Wages allocated as indirect to factory	10,000	
Total Wages Incurred		45,000
Production overhead incurred		12,000
Production overhead absorbed		24,000
Output for the period		100,000

Required:

- a. Produce the following ledgers, using integrated account: (i) Stores Ledger (ii) Wages Control Account (iii) Production Overhead Control Account (iv) Work-in-progress control account; and (v) finished goods account.
- b. Prepare the closing trial balance

(12½ Marks)

INTERLOCKING

6.10 The trial balance of Wusu on 31st March, 2016 is provided below:

	N	N
Stores Ledger Control Account	20,000	
Work-in-Progress Control Account	30,000	
Finished goods control Account	10,000	
Cost ledger contra or general ledger adjustment account		60,000
	<u>60,000</u>	<u>60,000</u>

The extracted details for April 2016 transactions are:

	₦	₦
Purchase of Stores		70,000
Returned to suppliers		15,000
Normal loss in stores		1,000
Direct materials issues to production		50,000
Stores issued to maintenance		5,000
Stores: Wages allocated	25,000	
Indirect factory wages	<u>8,000</u>	
		33,000
Production Overhead incurred		9,000
Production Overhead recovered		22,000
Output for the period		120,000

Required:

- a. Prepare the following ledgers:
 - i. Cost ledger contra Account
 - ii. Store/raw materials ledger control account
 - iii. Wages control account
 - iv. Production overhead control account
 - v. Work-in-Progress Control Account
 - vi. Finished Goods Account
 - vii. Closing Trial Balance at 30th Aril 2016

(12½ Marks)

RECONCILIATION

- 6.11 a. Dambat Limited is a medium size firm that has been in existence since the last five years. The firm uses interlocking system in its Cost Accounting Department. It has always been observing that profit disclosed, in the costing department differs from profit disclosed in the financial reports generated in the Financial Account Department.

Required:

- a.
 - i. Why is profit disclosed in cost accounting department differs from those of financial accounting department.
 - ii. List four (4) items that are recorded in the financial books but not in the cost accounting books.
 - iii. List two (2) items that are considered in the cost accounting books only.

b. Given below relates to the extracted data in both financial and costing books:

Financial Books:

	₹
Opening inventory on raw materials	6,000
Closing inventory on raw materials	7,000

Costing Books:

Opening inventory on raw materials	5,000
Closing inventory on raw materials	12,000

Other details:

Interest received on investment	2,000
Profit on sale of fixed asset (non-current asset)	1,000
Profit disclosed in financial books	77,000
Profit disclosed in costing books	80,000

Required to reconcile different in profit disclosed in both books, commencing from profit disclosed as per cost accounting books.

CHAPTER SEVEN

COSTING METHODS: SPECIFIC ORDER COSTING METHODS

CHAPTER CONTENTS

- a. Introduction
- b. Specific Order Costing methods:
 - i. Job,
 - ii. Batch, and
 - iii. Contract costing

7.0 Objectives:

After studying this chapter, readers should be able to:

- a. appreciate what order costing is all about and its difference with process costing.
- b. understand various methods of absorbing general overhead expenses by jobs, batches, contracts, services or products.
- c. appreciate the important features of batch, service and contract costing.
- d. understand how to account for the value of a product, service, batch or contract.
- e. understand how to account for the total cost of an order, for effective pricing decision purpose.

7.1 INTRODUCTION

7.2 Specific Order Costing Methods

7.2.1 The Concept of Order Costing

This is a situation where expenses are linked to the cost of products or services ordered from the supplier. The ordering expenses are to be fully accounted for in the course of costing the product or service. Examples of ordering items are job, contract, or batch. Thus, job costing, contract costing and batch costing are specific order costing methods.

Order costing is a technique used by organizations which produce specific jobs, batches, contracts or orders that can be identified throughout the various stages of production. A job cost system, therefore, enables an organization to determine the total cost incurred in the course of performing a job. The system is normally used by organizations that are involved in construction (bridge, road, etc.), building (of houses, offices, etc.), machine tool manufacturing, printing (of books, journals, newsletters, etc.), and general engineering where each product is produced to the satisfaction of the customer.

Order costing is also widely used for costing of batches of similar articles such as shoes, bags, shirts, etc. Order costing is a basic costing procedure which may be used in conjunction with other costing techniques.

The main purpose of order is to determine the profit or loss realized on each order. This means that total cost per order has to be estimated as accurately as possible for a good price to be charged on the order, if the organization is to make reasonable profit. Order costing assists organizations (in the private or public sectors) to distinguish between profitable orders and unprofitable orders and to make comparison with past estimates in order to assess productivity and profitability levels. The technique is also used as a basis of pricing government's contracts and other contracts, where "cost plus" basis (that is at a price based on an agreed cost plus agreed target profit) of pricing is in use.

7.2.2 Job Order Costing Procedure

Costing a job, batches of product, or contract, involves aggregation of all the cost elements necessary for the final product. For factory working process, adequate production control records must be maintained. Each job must be given an order number which must be cited or identified at all stages of production.

Where an order for a very large quantity of output is placed, it should be divided into separate batches so that job costing can be made without waiting for the completion of the whole work. The batches are then to be numbered along the line of the number given to the large quantity order. For example, where the order number is 30, the separate batches of the job could be 30.1, 30.2, 30.3, etc. for distinction purpose.

Each order is to be put into production control records and a job cost sheet or job Ledger Account prepared. On this account will be recorded the cost of material used, the wages paid to labour and the machine time taken. The departmental general overhead cost is to be apportioned for absorption by each of the jobs, batches or contracts performed by the department.

7.2.3 Overhead Cost Absorption Methods in Job Costing

In costing a job, the total of the direct material cost, direct wages, and direct expense of the job must be taken. Overhead is then applied as a percentage of direct material cost, percentage of wages, percentage of prime cost, rate per unit or rate per hour as required. The direct materials, wages and expenses, and the absorbed overhead are totalled to give the production cost of the job. Each job must absorb, in addition to production overhead, part of the administration, selling and distribution overheads, unless they are regarded as direct charges to the Profit and Loss Account of the period. The addition of selling, administrative and distribution overhead costs to production cost gives the total cost of the job.

The final effect in accounting for overhead is to charge overhead costs to cost units. The charging of overheads of a production cost centre to all the units passing through the centre is termed Absorption.

In order to absorb overhead, it is necessary to develop a basis upon which overhead costs can be charged to cost unit. In general, the following arbitrary bases, which have been discussed earlier (in chapter 4), are used:

1. Percentage Rate on Direct Labour Cost, Direct material Cost and Prime Cost.
2. Cost unit Rate
3. Time Rate: Machine Hour Rate and Direct Labour Hour Rate.

We shall illustrate some of these bases of overhead absorption, as follows:

- (a) **Percentage Rate on Direct Wages:** This basis (method) is about the overhead rate determinable by dividing the total overhead cost attributable to a cost centre by the total direct wages incurred and expressing the same as a percentage.

$$\text{Overhead Rate} = \frac{\text{Total overhead charges}}{\text{Total Direct Labour Cost}} \times 100$$

This method is suitable where the overhead cost is lower than the direct wages; where wages are major portion of total costs; where similar types of labour and rates of pay are employed; and where relatively little machines are in use.

Illustration 7.1

Star Modern Shoemakers Company Limited, Wambai, Kano, found that their production costs for the 2000 accounting year had been as follows:

Direct wages	₦8,000,000
Direct material cost	₦5,000,000
Direct expenses	₦1,500,000
Production overhead cost	₦2,400,000
Total shoe manufactured	160,000 units
Machine time used	10,000 hours
Direct Labour time used	40,000 hours

500 pairs of shoes were produced during the first two weeks of the year as a single job, which had a direct wages cost of ₦8,000, direct material cost of ₦5,000 and direct expenses of ₦1,500. The company apportions fixed overhead cost using the percentage rate on direct wages and charges administrative expenses and selling expenses at the rate of 15% and 10% respectively, of production cost.

Required: Determine the following:

- (a) Production cost
- (b) Total cost
- (c) Cost per pairs of shoe

Solution

Star Modern Shoemakers Company Ltd, Wambai, Kano

Computation of Production Cost & Total Cost

	₦
Direct wages	8,000
Direct material cost	5,000
Direct expenses	<u>1,500</u>
Prime cost	14,500
Production Overhead	<u>2,400</u>
Production Cost	16,900 (a)
Admin. expenses	2,535
Selling expenses	<u>1,690</u>
Total Cost	<u><u>21,125</u></u> (b)

(c) Cost per pair of shoes = $21,125 / 500 = \underline{\underline{N42.25}}$

Workings

1. % Rate on Direct wages = $\frac{N2,400,000}{N8,000,000} \times 100 = 30\%$
2. Production Overhead cost on the job = 30% of 8,000 = N2,400
3. Administrative expenses = 15% of 16,900 = N2335
4. Selling expenses = 10% of 16,900 = N1690

(b) Percentage Rate on Direct Material Cost

This is determinable by dividing the total overhead cost by the total direct material cost and expressing the figure in percentage.

$$\text{Overhead Rate} = \frac{\text{Total Overhead Charges}}{\text{Total Direct Material cost}} \times 100$$

Illustration 7.2

Assume that the Shoe Manufacturing Company in illustration 6.1 apports fixed overhead cost using the percentage rate on direct material cost, and all other figures remain the same, determine i - iii.

Workings:

1. % Rate on Direct Material Cost = $\frac{N2,400,000}{N3,000,000} \times 100 = 80\%$
2. Production Overhead on the job = 80% of N5,000 = N4,000
3. Administrative expenses = 15% of N18,500 = N2,775
4. Selling expenses = 10% of 18,500 = N1,850

Computation of Production Cost & Total Cost

	N
Direct wages	8,000
Direct material cost	5,000
Direct expenses	<u>1,500</u>
Prime cost	14,500
Production overhead	<u>4,000</u>

Production Cost	18,500 (i)
Administrative expenses	2,775
Selling expenses	<u>1,850</u>
Total Costs	<u>23,125</u> (ii)

(iii) Cost per pair of Shoes = $\text{N}23,125 \div 500 = \text{N}46.25$

The percentage rate on direct material cost method is more appropriate where direct material cost forms a major part of total cost for a job, contract or batch and where overhead cost tends to relate to direct material cost. The method is also equitable where only one type of product is produced and, therefore, the material cost charged to each cost unit is identical.

Note:

A Job Card is opened for each job, contract or batch that is undertaken by the company. The format of a job card varies from one organization to the other but essentially it should contain certain information as contained in a typical job.

It should be appreciated that the Job Cost Card is supplementary to the cost book-keeping system, that is, it exists independently of the cost ledger system, for up to date control of costs. This is why in most jobbing concerns, such as a Motor Garage, the job card is kept in the shop floor while costs (expenses) are recorded in the Cost Ledger via the normal source documents like Material Requisition Note, Wages Analysis Journals and Expenses Analysis Books.

7.2.4 Batch Costing

Batch Costing arises where a customer orders a quantity of identical products at the same time. The job consists of a number of units of similar products covered by a single job number: for example, a batch of 1000 copies of a book printed by a printer. The batch cost must be divided by the total quantity to give a cost per unit.

Peculiar features of Batch Costing System:

- (a) **Set-Up Costs:** This is the cost of setting up production facilities, for example, the Engineering time, Factory consumables to set up moulds, etc.
- (b) **Unit Cost:** Average cost per unit will tend to decrease as the batch size increases due to some fixed costs (such as set up costs mentioned above) which will remain the same irrespective of the batch size.

(c) **Batches of Dissimilar Products:** Sometimes batches of different products are brought together because a common operation can be performed on them so as to save set-up time on the machine. The common cost of this Joint Operation becomes a problem to apportion. However, it should be realized that common costs should be apportioned on equitable basis.

Illustration 7.3

Ayingba Press Limited was asked to quote for supplying 5,000 and 25,000 booklets. The company normally expects a profit of 10% on sales. Costs were recognized as follows:

Paper and other materials, (per 1,000 copies)	₦ 30.00
Wages (per 1,000 copies)	20.00
Layout cost	500.00
Fixed overhead	200.00
Variable overhead= 12% of wages	

Draft a cost computation, showing minimum selling prices that might be quoted per 1,000 copies each of the supplies.

Although this question is asking for the selling price to quote, we shall also use it to demonstrate how cost per batch and how cost per unit is obtained in addition to solving the simple arithmetical exercise of calculating selling price.

Solution

Calculation of Batch Cost

As earlier on mentioned, this is just the accumulation of all the expenses incurred in producing the batch of similar products; in this case, the booklets:

	1000 Copies ₦	5000 copies ₦	25000 copies ₦
Setup Cost or Lay-out Cost	500	500	500
Material Paper	30	150	750
Labour Wages	20	100	500
Overhead Fixed Overhead	200	200	200
Variable Overhead	<u>2.4</u>	<u>12</u>	<u>60</u>
Total Cost	752.40	962	2,010
Profit Margin	<u>83.60</u>	<u>107</u>	<u>223</u>
Selling Price	<u>836</u>	<u>1069</u>	<u>2,233</u>

It should be noted that Total Cost was obtained by simply aggregating the expenses, set-up cost, and material, labour and overhead cost. If cost per unit is desired, it will be obtained by simply averaging the total cost per batch over the units that made up the batch size. At 5000 units, total cost was ₦962: cost per unit, therefore, will be ₦962/5000, i.e. 19.24 kobo. At 25000 copies, total was ₦2,010; cost per copy therefore is 8.04 kobo. This proves a common saying that unit cost decreases as the batch size increases. Selling price per copy will also be calculated in the same way.

7.3 Contract Costing and Accounting

Contract Costing is a form of order costing. Perhaps the following features would explain how contract costing differs from job order costing. The peculiar features of contract costing system are:

- (a) The jobs are usually of long term duration, often more than one accounting period.
- (b) The contracts are often carried out in the contractee's premises, that is, site-based.
- (c) There may be sub-contractors where there are some special jobs to be done such as plumbing and electrical installation.
- (d) There is often an architect engaged by the contractee who supervises the work and

issues a valuation certificate upon which payment would be made to the contractor. This is otherwise known as work certified or architect's valuation.

It should be appreciated by the reader that the problem with contract costing is not the ascertainment of cost. Cost is ascertained by simply aggregating all the expenses relating to each contract. A contract account is opened for each contract wherein the expenses will be recorded as they are incurred.

The major problem with contract costing is the calculation of profit (if any) that can be taken on an on-going contract which has reached an advanced stage, but has not been completed. This major problem (accounting for profit on uncompleted contracts) should, therefore, be given proper attention.

Contracts can be classified into three (3) different categories, according to their stages of completion, as follows:

- (a) Contracts at the early stage.
- (b) Contracts that have reached an advanced stage but for which cost to complete cannot be reasonably estimated.
- (c) Contracts that are nearing completion, that is, have reached an advanced stage and for which cost is somehow complete and can be reasonably estimated.

For any of these types of contract, the accountant is advised to first open the contract account and debit thereto all relevant expenses and apportionments. This will give the up-to-date cost of the contract, and then move to the next stage of considering whether profit can be taken at the given stage of the contract. It is at this stage that the three classifications given above become important.

A Notional profit is usually first obtained before a calculation of profit is taken. The procedure for calculating Notional Profit and profit to be taken is discussed according to the stage of the contract.

(a) **Contract at the Early Stage**

Where the contract has just been started and not in any way nearing completion, the expenses debited to the contract account will simply be carried forward as cost of the contract or the cost of the Work-In-Progress, just in the same manner as Job Costing.

(b) **Fairly Advanced Stage**

At this stage of a contract's life, profit may be recognized on the efforts on the contract to date, although clear estimate of the cost to completion may not be available. The profit taken is usually limited by the excess of the architect's value of work certified over the contractor's

cost to date (notional profit) adjusted for the cash actually received. This approach accords with the prudence concept.

Where a contract is at this stage, the profit recognized is usually computed as follows: Step 1: Calculate the Notional Profit as follows:

Value of work certified	XX
Less: Cost of work certified	<u>(X)</u>
Notional Profit	<u>XX</u>

It should be noted that cost of work certified might not be the same with the cost to date as cost may be incurred on work which, for one reason or the other, the architect is yet to certify.

Step 2: Calculate the Profit taken as follows:

$$\frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash received}}{\text{Value of work certified}}$$

Readers should note that the proportion of notional profit to be taken will be as determined by the contract paper or, in the case of students, by the examiner.

(c) **Nearing Completion Stage**

At this point, reliable estimates could be made on the cost of completed contract, thus the total contract cost is in sight. Profits are taken on the contracts at this stage, using a fairly different basis compared to those discussed above. Here the profit taken is with reference to the estimated total profit of the contract over its life, while adjusting for whatever profit that has been recognized previously.

The calculation of profit taken follows these steps:

Step 1: **Calculate the Estimated Total Profit (ETP).**

₦		
Total Contract Price		XX
Less: Contract Cost:		
Cost to date	x	
Cost to complete	<u>x</u>	
Estimated total cost		<u>(X)</u>
Estimated total profit		<u>XX</u>

Step 2: **Calculate Profit Realised to Date.**

This is the lower of:

- (i) $\frac{\text{Value of work certified}}{\text{Estimated Total Cost (ETC)}} \times \text{ETP}$

and

$$(ii) \frac{\text{Cost to date}}{\text{Estimated total cost}} \times \text{ETP}$$

Step 3: Profit taken in Current Period

	N
Profit realized to date	X
Profit recognized in prior periods	<u>(X)</u>
Profit taken in current period	<u><u>XX</u></u>

Where it is expected that the contract as a whole will result in a loss for the contractor, the loss must be written off to the maximum possible extent immediately. If the contract is unprofitable, it shouldn't have been accepted in the first place. The foreseeable loss should be written off in the period in which it is recognized, in line with the prudence principle.

Final Step

The final step is to provide the value at which a contract should be reflected in the balance sheet. This should not pose a big problem as what is required is to deduct payments received from the contractee from the value of the asset created so far by the contract. This is the amount to which the contractor remains entitled and is to be shown as contract value receivable in the balance sheet.

The calculation is to be done as follows:

	N
Total Cost incurred to date	X
Profit taken/realised on contract	<u>X</u>
Total value of the contract	X
Less cash received from contractee	<u>(X)</u>
Contract value for balance sheet	<u><u>X</u></u>

7.4 CHAPTER SUMMARY

In this chapter, you have acquired the knowledge of job costing, batch costing, service costing and contract costing, which were discussed under specific order and non-specific order costing methods. It has been made clear that job costing is quite different from

process costing. Efforts have been made to simplify some of the methods of absorbing general overhead expense for the determination of total cost of an order for the supply of a product or service, which may come in the form of a job, a batch or a contract. These methods are basically classified into three: (i) Percentage rate on direct cost (material, labour or prime cost); (ii) Cost per unit rate and (iii) Time rate (machine hour or direct labour hour rate). The outlines and steps for job, batch, service and contract costings were all presented and discussed.

It is hoped that readers would be able to show clear understanding of the following, anywhere, anytime:

- Meaning of order costing.
- Differences between job order costing and process costing.
- Different methods of absorbing overhead costs by jobs.
- Job Costing procedure as guide to effective pricing decision.
- Batch costing principles and process.
- Service costing, including costing of professional services.
- Steps to be followed in contract costing and accounting.

MULTIPLE-CHOICE AND SHORT ANSWER QUESTIONS

1. Distinguish between a Job Card and a Job Cost Card
 - A. Job card is kept for employees whilst Job Cost Card is kept for assets
 - B. Job card is kept on the shop floor whilst Job Cost Card in the cost office
 - C. Job card is for engineering jobs whilst Job Cost Card is for financial jobs
 - D. Job card is for jobs whilst Job Cost Card is for batches
 - E. Job card is given to the customer whilst Job Cost Card is kept by the company
2. What are set-up costs?
 - A. Cost of buying equipment sets
 - B. Cost of constructing the factory
 - C. Cost of setting up production facilities for a particular job or production
 - D. Cost of laying ambush for dishonest employees
 - E. Cost of assembling factory operatives in readiness for production
3. What is mark-up?
 - A. A percentage of total costs added as profit to determine the selling price
 - B. The distinctive mark on packages to avoid mix-up

- C. The total selling price of an order
 - D. The total cost of executing a Job
 - E. The amount of bonus to be given to those who worked on an order
4. What is Notional profit on contracts?
- A. The total profit of the contractor for the years
 - B. The amount of profit to be paid to the nation's coffers
 - C. The profit on the mobilization fee received on a contract
 - D. The amount of profit brought forward from previous years
 - E. The portion of profit to be recognized on an on-going contract at year end
5. "Value of work certified" in contract means.....
- A. Value of materials used in the contract
 - B. Total cost of executing a contract
 - C. Total progress payments received on a contract
 - D. The aggregate total value of architect's certificates issued so far
 - E. Total value of items sub-contracted on the main contract
6. How is a job identified among other jobs being carried out simultaneously in the accounts?
7. What document gives the value of contract completed on a progressive basis?
8. Large jobs usually of long-term duration, usually extending beyond the company's financial year-end, and carried out on the customer's premises are known as
9. Where a company decided to recognize total provisional profit on a contract almost fully completed at its year end, what is the name given to the amount added to cost to date to arrive at estimated total cost?
10. An amount, usually a small percentage of the total contract sum, withheld by the contractee, for almost a year after the end of a contract as insurance against possible faults discovered later is known as.....

SOLUTION

- 1. B
- 2. C
- 3. A
- 4. E
- 5. D
- 6. Job Number or Order Number

7. Architect's certificate
8. Contracts
9. Cost to completion
10. Retention money or fee

EXAMINATION TYPE QUESTIONS

1. Discuss the concept of Job Order Costing as clearly as possible.
2. Briefly explain any TWO methods of absorbing overhead costs by jobs.
3. Write short notes on each of the following:
 - (i) Overhead absorption
 - (ii) Cost Plus basis of pricing
 - (iii) Transport service costing
 - (iv) Batch costing
4. Mr. Hankaka, a shoe manufacturer, found that his production costs for an accounting period had been as follows:

Direct wages		₦800,000
Direct materials		₦300,000
Direct expenses		₦100,000
Prime cost		₦1,200,000
Production overhead		₦240,000
Factory Cost		₦1,440,00
Total shoes manufactured	=	160,000 units
Total machine hours used	=	10,000 hours
Total Direct labour hours used	=	40,000 hours

A job performed had a direct wages cost of ₦800, direct material cost of ₦500 and direct expenses of ₦150.

Required:

- (a) Find the total cost of the job, using:
 - (i) Direct Wages percentage rate
 - (ii) Direct material percentage rate.
 - (b) If the job was that of producing 120 units of shoes, what would be the total cost?
5. Hantsi Limited operates a factory consisting of two departments: Assembly and Galvanizing. All products pass through the 2 departments. The following information in respect of the two departments was given:

	<u>Assembly</u>	<u>Galvanizing</u>
Materials	N40,000	N12,000
Direct wages	N20,000	N36,000
Production OH	N16,000	N24,000
Direct labour hours	38,000	24,000
Machine hours	66,000	38,000

One of the jobs completed in the factory was No. 707 and the following data relate to the job.

	<u>Assembly</u>	<u>Galvanizing</u>
Materials	N 400	N80
Direct wages	N300	N150
Direct labour hours	800	300
Machine hours	700	800

Required:

- (a) Use 3 different methods by which production overheads could be recovered and prepare the job cost card in respect of Job No. 707, using 50% of production overheads to recover administrative overheads and 25% of production overheads to recover selling and distribution overheads.
- (b) Show the total proceeds on the job if target profits is put at 45% of total cost.

6. Shahada Ltd operates a factory consisting of two (2) departments: Washing and Cleaning. All activities pass through the two (2) departments:

	<u>Washing</u>	<u>Cleaning</u>
Materials	N60,000	N25,000
Direct wages	N30,000	N40,000
Production OH	N20,000	N32,000
Direct labour hours	40,000	25,000
Machine hours	50,000	43,000

One of the jobs completed in the factory was Job No. 807 and the following data relate to the Job:

	<u>Washing</u>	<u>Cleaning</u>
Materials	N500	N120
Direct wages	N450	N200
Direct labour hours	900	450
Machine hours	200	150

Required: Prepare Job Cost Card in respect of Job No. 807 using:

- (i) Direct material percentage rate; and
 - (ii) Direct labour hour rate of recovering production. You are to use 30% of Production Overhead of the Job to recover administrative overhead and 35% of the production overhead to recover selling and distribution overhead. (BUK, 1993).
8. The following figures have been extracted from the books of Raysoap Manufacturing Company. All jobs pass through the company's two departments:

	<u>Working</u> <u>Department</u>	<u>Finishing</u> <u>Department</u>
Materials used	N6,000	N500
Direct Labour cost	N3,000	N1,500
Factory overheads	N1,800	N1,200
Direct labour hours	12,000	5,000
Machine hours	10,000	2,000

The following information relates to Job S.10.

	<u>Working</u> <u>Department</u>	<u>Finishing</u> <u>Department</u>
Materials used	N20	N10
Direct Labour	N65	N25
Direct Labour hours	265 (hrs.)	70 (hrs.)
Machine hours	255 (hrs.)	25 (hrs.)

You are required:

- (a) To use **FOUR** methods of absorbing factory overhead to show overhead absorbed in each department.
- (b) To prepare statements showing the different cost results for Job S.10 under any two of the methods mentioned above (HUK Poly, 1997).
- 8. Discuss the procedures involved in normal service costing.
- 9. Discuss the necessary features of a good batch costing system.
- 10. Write an article suitable for publication in an Accounting Students Journal/ Newsletter on the topic: **PECULIARITIES OF CONTRACT COSTING AND ACCOUNTING**

CHAPTER EIGHT

COUNTINUOUS OPERATION COSTING:

PROCESS COSTING AND JOINT PRODUCTS COSTING

CHAPTER CONTENTS

- a. Continuous Operation costing:
 - i. Process costing including determination of work-in –process, equivalent units, Treatment of Losses, Gains and Accounting for Scrap
 - ii. Accounting treatment of By-Products and Joints Products
 - iii. Output costing

- b. Non-specific order costing Methods - service costing.

8.0 OBJECTIVES:

After studying this chapter, the reader should be able to:

- a. explain the meaning and importance of Process Costing;
- b. explain the areas where Process Costing is applied;
- c. determine 'equivalent units' and its meaning;
- d. treat process losses and wastages;
- e. describe the valuation process in Process Costing;
- f. determine completed product cost;
- g. explain joint costs and joint-products;
- h. understand various methods of apportioning joint costs to joint-products;
- i. explain the accounting treatment of by-products; and
- j. determine total costs of producing joint products.

8.1 INTRODUCTION TO CONTINUOUS OPERATION COSTING

Continuous operation costing is another method of costing. Unlike specific order costing that is applicable where work is undertaken to customer's specification, continuous operation costing is applicable in the industries where there are repetitive operations. In the manufacturing industries, continuous operation is applicable in (a) process costing and (b) output or operation costing. In organisations that render services, continuous operation costing is termed as operating or service costing.

8.1.1 PRINCIPLES OF PROCESS COSTING

Process Costing is a method used in a situation where production follows a series of sequential processes. The method is used to ascertain the cost of a product or service at each stage of production, manufacture or process.

It is generally applied in particular industries where continuous mass production is possible. Because of the continuous nature of the process and the uniformity of the output, it is not possible or necessary to identify a particular unit of output with a time of manufacture. In process costing, the cost of any particular unit must be taken as the average cost of manufacture over a period. This can be complicated by the necessity to apportion costs between completed output and unfinished production at the end of the period.

Wastage must also be accounted for. In this costing system, it is the average cost incurred that concerns management, as managerial pricing decisions would be taken on that basis.

In this section of the chapter, we shall learn about the application areas of process costing, the treatment of losses and wastages, the concept of equivalent units and the determination process of cost of completed products.

8.1.2 Application Areas of Process Costing

Process costing is used in a variety of industries, including food processing, paper milling, chemical and drug manufacturing, oil refining, soap making, textiles, box-making, paint and ink manufacturing, brewery, flour milling, bottling and canning, biscuits products, meat products, sugar making, etc. It is probably the most widely used cost accounting system everywhere in the world.

Although, details will vary from one business concern to another, there are common features in most process costing systems that should be taken note of. These are:

- (a) Expenditure for each cost centre is collected and, at the end of the accounting period, the cost of the completed units are then transferred into a stock account or to a further process cost centre.
- (b) Accurate records are required of units produced and part-produced as well as the cost incurred by the cost centres.

- (c) The cost unit chosen should be relevant to the organisation.
- (d) The cost of the output of one process is the raw material input cost of the next process stage. The cost incurred in a process cost centre could include, therefore, costs transferred from a previous process plus the raw materials, labour and overhead costs relevant to the cost centre.
- (e) Wastage due to scrap, chemical reaction or evaporation is unavoidable. The operation or manufacturing should, however, be in such a way that wastage can be reduced to the barest minimum.

Either the main product or by-product of the production process may require further processing before reaching a marketable state.

8.1.3 .Distinction between Process and Order Costing

Order costing and process costing are two extreme systems of product costing. The distinction between the two centres mainly on how product costing is accomplished. Unlike process costing, which deals with broad averages and great masses of like units, the essential feature of order costing is the attempt to apply costs to specific jobs, batches or contracts, which may consist of either a single physical unit or a few like units.

The most important point is that product costing is an averaging process. The unit cost used for products is the result of taking some accumulated cost that has been allocated to production departments and dividing it by some level of production (activity). The basic distinction between order costing and process costing is the size of the denominator. For order costing, the denominator is small (for example, one bridge constructed or one hundred copies of a book, etc.).For process costing, the denominator is large (for example, thousands of litres of kerosene, thousands of bags of cement, etc.).

As indicated earlier, order costing is used in industries like construction, printing, furniture-making, aircraft, machinery, shoe-making, etc., where tailor-made or unique goods are produced. Process costing, as we would learn in chapter 7, is mostly found in such industries as chemicals, oil, textile, plastic, paints, flour milling, canneries, rubber, food processing, glass-making, mining, cement, meat processing, etc., where there is mass

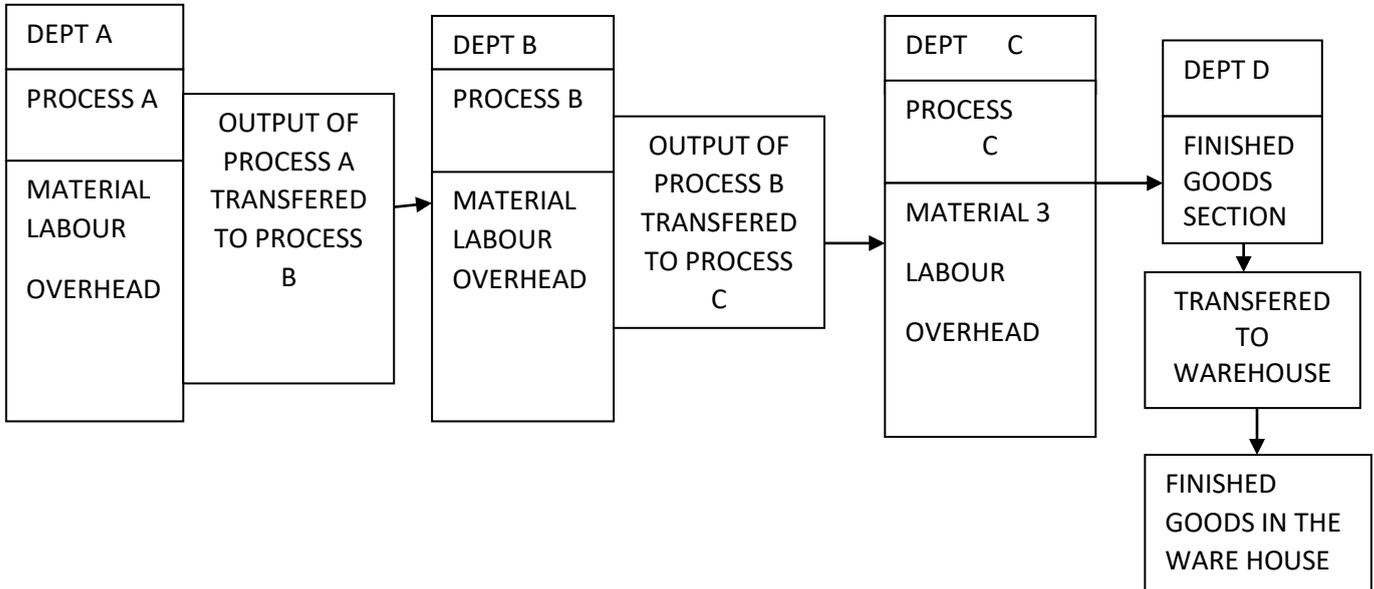
production of like units which usually pass in continuous fashion, through a series of uniform production steps called processes.

8.1.4 Production Stages in Process Costing

It is noticed from the definition of process costing that production follows a series of sequential processes and that the output of one process automatically becomes an input of intermediate product for the next process stage.

Generally, intermediate product is further processed with adding further material and incurring labour and overhead until another output is obtained. This process is continuous until when the finished goods are obtained in the finished section and transferred to the warehouse. At each process, unit cost is arrived at, by dividing the total cost of the output achieved by the total units turned out. This stage by stage is indicated in Fig. 7.1

Fig. 8.1: Production Stages in Process Costing



8.1.5 Treatment of Process Losses and Wastages

In many industries, the amount of the process output will be less than the amount of the materials input. Such shortages are known as process losses or wastages, which may arise due to a variety of factors such as evaporation, scrap, shrinkage, unavoidable handling, breakages, etc.

If the losses are in accordance with normal practice they are known as normal process losses. But where losses are above expectation, they are known as abnormal losses, and as such they should be charged to an appropriate account pending investigation.

Normal process wastages are unavoidable losses arising from the nature of the production process and, so, it is logical and equitable that the cost of such losses is included as part of the cost of good production. This is because the attainment of good units necessitates normal wastages. Since the wastage arises under efficient operating condition, it can be estimated with some degree of accuracy.

Abnormal process wastages are those above the level deemed normal in the production process. Abnormal wastage cannot be predicted and may be due to special circumstances such as plant breakdown, inefficient working, or unexpected defects in materials. Abnormal wastage is the difference between actual spoilage in the period and the normal (estimated) wastage. Abnormal gain is where the actual wastage is less than the normal wastage.

The cost of abnormal wastage is to be charged to the profit and loss account unlike the cost of normal wastage which is to be part of the good products' total cost. Process account is to be credited as abnormal loss account is debited. The abnormal loss account is then to be closed to the profit and loss account.

Abnormal gain realized is to be credited to the abnormal gain account as process account is debited. The abnormal gain account is to be closed to the credit of profit and loss account.

Illustration 8.1: Accounting for Process Wastages

TMR produces 100 units from the input of 120 units from material that cost is ₦27,000 and conversion cost of ₦13,000. Normal process wastage was determined in advance as 5% of input. The output is to be sold at ₦150 per kg. Wastages is valued as ₦50=00 per kg.

Required to determine:

- c. Cost per unit of the expected output,
- d. Production cost of the output achieved,
- e. Cost of abnormal loss or abnormal gain obtained.

Solution 8.1

	Units produced	Cost
	(kg)	₦
Input : Material	120	27,000
Conversion		<u>13,000</u>
		40,000
Less Normal wastage (5%)	<u>6</u>	<u>300</u>
Expected output	114	<u>39,700</u>
Output	<u>100</u>	
Abnormal Loss	14	

- a. Cost per kg of Expected output = $\frac{\text{₦}39,700}{114} = \underline{\underline{\text{₦}348.246}}$
- b. Production cost of the output achieved: 100 units x ₦348.246
= ~~₦~~34,824.6
- c. Cost of abnormal loss: 14 units x ₦348.246 = ~~₦~~4875.44

Illustration 8.2

Using the information given in illustration 8.1, prepare Process account
And abnormal loss account.

Solution 8.2

Process Account

	Kg	Value		Kg	Value
		₦			₦
Material	120	27,000	Good production	100	34,825
Conversion		13,000	Normal wastage	6	300
	<u> </u>	<u> </u>	Abnormal wastage	<u>114</u>	<u>4,875</u>
	<u>100</u>	<u>40,000</u>		<u>120</u>	<u>40,000</u>

Abnormal wastage Account

	N		N
Process A/c	<u>4,875</u>	Profit & Loss	<u>4875</u>

Illustration 8.3: On product flowing

A product passes through three distinct processes (A, B, and C) to completion. During the period 15 May, 1,000 litres were produced. The following information was obtained:

	Process A	Process B	Process C
	N	N	N
Materials cost	40,000	15,000	5,000
Labour cost	20,000	25,000	15,000
Direct OH expenses	5,000	3,000	3,000

Indirect overhead expenses for the period were N30,000 apportioned to the processes on the basis of wages. There was no work-in-process at the beginning or end of the period.

Required: Calculate the cost of output to be transferred to finished goods stock and the cost per litre.

Solution 8.3

Process A					
Details	Cost/litre	Total	Details	Cost/litre	Total
	₦	₦			₦
Materials	40	40,000	Transferred-in to		
Labour	20	20,000	Process B	75	75,000
Dir. Exps.	5	5,000			
Indir. Exps.	<u>10</u>	<u>10,000</u>			
	<u>75</u>	<u>75,000</u>		<u>75</u>	<u>75,000</u>

Process B					
Details	Cost/litre	Total	Details	Cost/litre	Total
	₦	₦		₦	₦
Process A	75	75,000	Transferred-in to		
Material	15	15,000	Process C	130.50	130,500
Labour	25	25,000			
Dir. Exps.	3	3,000			
Indir. Exps.	<u>12.5</u>	<u>12,500</u>			
	<u> </u>	<u> </u>			

130.50 130,500

130.50 130,500

Details	Process C		Details	Cost/litre ₦	Total ₦
	Cost/litre ₦	Total ₦			
Process B	130.50	130,500			
Materials	5.00	5,000	Output to finished		
Labour	15.00	15,000	goods stock	161.00	161,000
Dir. Exps.	3.00	3,000			
dir. Exps.	<u>7.50</u>	<u>7,500</u>			
	<u>161.00</u>	<u>161,000</u>		<u>161.00</u>	<u>161,000</u>

Note:

1. Indirect expenses were apportioned as follows:
 Process A = $\frac{20,000}{60,000} \times 30,000 = \text{₦}10,000$

Process B = $\frac{25,000}{60,000} \times 30,000 = \text{₦}12,500$

Process C = $\frac{15,000}{60,000} \times 30,000 = \text{₦}7,500$

- The cost per litre of the process product is ₦161 and, so, the selling price must be higher than that amount if the business is to make any positive profit.
- Indirect expenses include all expenses that cannot be directly traced to the productive process and, so, they include general administrative, selling and distributive cost.

8.1.6 Determination of Equivalent Units

At the end of a given period, in the course of the production process, it is virtually certain that some items will only be partly completed (work-in-process). Some of the cost for the period, therefore, is attributable to these partly completed units as well as to those that are fully completed. In order to spread the costs equitably over part-finished and fully completed units, the concept of 'equivalent units' is used.

For the calculation of costs, the number of equivalent units is the number of equivalent fully completed units which the partly completed units represent. For example, in a given period, production was 3,000 completed units, and 1,600 partly completed were deemed to be 60% complete.

$$\begin{aligned}
 \text{Total equivalent production} &= \text{completed units plus equivalent units produced in WIP} \\
 &= 3,000 + (60\% \text{ of } 1600) \\
 &= 3,000 + 960 \\
 &= \underline{3960} \text{ units}
 \end{aligned}$$

The total costs for the period would be spread over the total equivalent production as follows:

$$\text{Cost per unit} = \frac{\text{Total Costs}}{\text{Total equivalent production (units)}}$$

In calculating equivalent units, it is more desirable to consider the percentage completion of each of the cost elements: material, labour and overhead. Here each cost element must be treated separately and then the costs per unit of each element are added to give the cost of a complete unit.

Illustration 8.4: Equivalent Units Determination

The production and cost data of Elsemco Shoemakers for the month of January, 1999 were as follows:

	₦
Materials	422,400
Labour	395,600
Overhead	<u>225,000</u>
Total cost	<u>1,043,000</u>

Production was 8,000 fully completed units and 2,000 partly completed. The percentage completion of the 2,000 units' work-in-process was:

Material	80%	
Labour	60%	226
Overhead	50%	

Required: Find the value of completed production and the value of work-in-progress.

Solution 8.4

Cost Elements	Equiv. Units in WIP	Fully compl. Units	Total prod.	Total Cost	Cost/unit
	₦			₦	
Material	80% of 2000 = 1600	8000	9600	422,400	44
Labour	60% of 2000 = 1200	8000	9200	395,600	43
Overhead	50% of 2000 = 1000	8000	9000	<u>225,000</u>	<u>25</u>
				<u>1,043,000</u>	<u>112</u>

Value of completed units = ₦112 x 8,000 = ₦896,000

Value of WIP = TC - Value of completed units
 = 1,043,000 - 896,000 = ₦147,000

To check the value of WIP, the cost per each cost element is to be multiplied by the number of equivalent units of production in WIP related to each cost element.

Element	No. of equiv. units in WIP	Cost/unit	Value of WIP
	₦		₦
Material	1,600	44	70,400
Labour	1,200	43	51,600
Overhead	1,000	25	<u>25,000</u>
			<u>147,000</u>

Process Account

Element	Unit	Total	Element	Unit	Total Cost
	Cost				
	₦	₦		₦	₦
Material	10,000	422,400			
Labour		395,600	Goods transferred		
Overhead		225,000	to next stage	8,000	896,000
			WIP c/d	<u>2,000</u>	<u>147,000</u>
	<u>10,000</u>	<u>1,043,000</u>		<u>10,000</u>	<u>1,043,000</u>
WIP b/d	2,000	147,000			

It is important to remind the reader that the output of one process level forms the input material to the next process level. The full cost of the completed units transferred forms the input material cost of the subsequent process, and by its nature must be 100% complete. Material introduced is an extra material required by the process and should always be shown separately.

If there are partly completed units at the end of one period, there will be opening WIP at the beginning of the next period. The values of the cost elements of the brought forward WIP are normally known and they are to be added to the costs incurred during the period.

8.1.7 Valuation Process and Cost of Production Report

A number of stages are passed through in the valuation necessary in process costing for cost statement. First, the physical flow of the units of production must be calculated having regards to the total number of units to be accounted for, regardless of the degree of completion.

Secondly, the equivalent units involved in the physical flow are to be calculated. In this respect, it is often necessary to divide the flow into its material cost element and conversion cost element as the degree of completion may well vary between them.

Thirdly, having already established the physical units to be accounted for by means of the first two stages, the total equivalent units and the current equivalent units involved are to be calculated. These are to be accounted for in respect of the cost elements (transferred-in cost, material cost and conversion cost).

Fourthly, the unit costs are to be calculated, paying regards to the stock valuation method assumed (FIFO, WAP, LIFO, etc.). Fifthly and finally, the total cost of the transferred-out products and work-in-process are to be calculated, ensuring that all costs are accounted for.

The cost of production report is to show the number of units of output to be accounted for, the total equivalent units of completed output, the cost statement showing the impact of all the cost elements and the cost of completed units as well as that of the work-in-process at the end of the reporting period.

In the illustration that follows, two methods of stock valuation, FIFO and WAP,

would be used and two processes of production are assumed.

Illustration 8.5: Cost of Production Report

Within the production department of Savannah Sugar Company Limited, there are two processes which produce the finished product. Raw materials are introduced initially at the commencement of Process 1 and further raw materials are added at the end of process 2. Conversion costs accrue uniformly throughout both processes. The flow of the product is continuous; the completed output of process 1 passes immediately into process 2 and the completed output of process 2 passes immediately into the finished goods warehouse.

The following information is available for the month of June:

Process 1

Opening WIP units				35,000
Materials				₦210,000
Conversion	(2/5 complete)			₦52,500
Completion of units in June				168,000 units
Units commenced in June				140,000 units
Closing WIP				
(1/2 complete as to conversion)				7,000 units
Material introduced	in		June	₦770,000
Conversion cost added	in		June	₦630,000

Process 2

Opening WIP units	42,000
-------------------	--------

Material from Process 1	N343,000
Conversion (2/3 complete)	N392,000
Completion of Units in June units	154,000
Units commenced in June (3/8 complete as to conversion)	- Closing WIP: 56,000 units

Material introduced in June	N462,000
Conversion costs added in June	N2,205,000

Required:

Prepare the cost of production report of Savannah Sugar Company Limited for the Month of June, using each of the WAP and FIFO methods, and showing clearly the cost of finished products and WIP at the end of the period.

Solution 8.5

Tutorial Note: The units to be accounted for, total equivalent units and current equivalent units are to be determined before going to the cost statement, using each of the two stock valuation methods. The heading of the report should be well expressed.

Cost of Production Report of Savannah Sugar Company Limited for the Month of June, using

Weighted Average Price (WAP) Method

Process 1

Physical flow of units of material:
Units

WIP(beginning)	35,000
Material introduced	<u>140,000</u>
Total units to be accounted for	<u>175,000</u>

<u>Units Accounted for:</u>	<u>Equivalent Units</u>		<u>Conversion</u>
	<u>Material</u>		
Units completed & transferred out:	168,000	168,000	168,000
WIP(ending):	<u>7,000</u>	7,000(100%)	3,500 (1/2 of 7,000)
Total units accounted for	<u>175,000</u>	<u> </u>	<u> </u>
Total equivalent units (TEU)		175,000	171,500
Less WIP(beginning)		<u>35,000</u>	<u>14,000</u>
Current Equivalent units (CEU)		<u>140,000</u>	<u>157,500</u>

Note:

1. Conversion WIP ending = $\frac{1}{2} \times 7,000 = 3,500$ units
2. Conversion WIP beginning = $\frac{2}{5} \times 35,000 = 14,000$ units

Cost Statement

<u>Cost Element</u>	<u>Cost of WIP</u>	<u>Current Cost</u>	<u>TC</u>	<u>TEU</u>	<u>Cost/unit</u>
		(beginning)			
	₦	₦	₦	₦	₦
Material	210,000	770,000	980,000	175,000	5.60
Conversion	<u>52,500</u>	<u>630,000</u>	<u>682,500</u>	<u>171,500</u>	<u>3.98</u>
	<u>262,500</u>	1,400,000	<u>1,662,500</u>		<u>9.58</u>

Cost of Units completed and transferred out = $168,000 \times \text{₦}9.58 = \text{₦}1,609,440$

Cost of WIP(Ending)

Material:	$7,000 \times 1 \times \text{₦}5.6$	=	$\text{₦}39,200$
Conversion:	$7,000 \times \frac{1}{2} \times \text{₦}3.98$	=	<u>$\text{₦}13,930$</u>
			<u>$\text{₦}53,130$</u>

Another way (which is easier) of determining the cost of WIP ending is to find the difference between total cost and cost of the completed units.

$$\begin{aligned}
 \text{Cost of WIP(end)} &= \text{TC} - \text{Cost of completed units} \\
 &= \text{₦}1,662,500 - \text{₦}1,609,440 \\
 &= \text{₦}53,060
 \end{aligned}$$

Note: The difference of $\text{₦}70$ is due to the approximation made to two decimal places.

Cost of Production Report Using First-In-First-Out (FIFO) Method

Process 1

	<u>Current costs:</u>	<u>C.E. Units</u>	<u>Units cost</u>
Material	₦770,000	140,000	₦5.50
Conversion	630,000	157,500	4.00

Cost of Closing WIP:

Material: $7,000 \times 1 \times ₦5.5$ = ₦38,500

Conversion: $7,000 \times \frac{1}{2} \times ₦4.0$ = 14,000

52,500

Units completed and transferred out = 168,000 units

Cost of the completed units = TC - cost of closing WIP

= ₦1,662,500 - ₦52,500

= ₦1,610,000

Process 2, using WAP method

Physical flow of units of material:

WIP (beginning)	42,000
Units transferred in	<u>168,000</u>
Units to be accounted for	<u>210,000</u>

<u>Units Accounted for:</u>	<u>Transferred Material</u>	<u>Equivalent Units</u>	<u>Conversion</u>
	154,000	154,000	154,000
WIP (ending):	<u>56,000</u>	56,000	0
Total units accounted for	210,000		
Total equivalent units		210,000	154,000
Less WIP (beginning)		<u>42,000</u>	0
Current Equivalent units (CEU)		<u>168,000</u>	<u>147,000</u>

Cost Statement

<u>Cost Element</u>	<u>Cost of WIP (beginning)</u>	<u>Current Cost</u>	<u>TC</u>	<u>TEU</u>	<u>Cost/unit</u>
	₦	₦	₦	₦	₦
Transferred in	343,000	1,609,440	1,952,440	210,000	9.2973
Material	0	462,000	462,000	154,000	3.0000
Conversion	<u>392,000</u>	<u>2,205,000</u>	<u>2,597,000</u>	<u>175,000</u>	<u>14.8400</u>
	<u>735,000</u>	<u>4,276,440</u>	<u>5,011,440</u>	TC/unit	= <u>27.1373</u>

Cost of complete units = ₦154,000 x ₦27.1373 = ₦4,179,144.20

Cost of WIP (Ending)

Transferred-in	56,000 x 1 x ₦9.2973	=	₦520648.80
Material:	56,000 x 0 x ₦3	=	₦0
Conversion:	56,000 x 3/8 x ₦14.84	=	<u>311640.00</u>
			<u>₦832,288.80</u>

Another Way:

Cost of Ending WIP = TC - Cost of completed units	
=	5,011,440 - 4,179,144.20
=	₦832,295.80

Note that the difference of ₦7 is due to the approximation made to four decimal places.

Process 2: Using FIFO Method

<u>Current Costs:</u>	<u>Current Equiv. Units</u>	<u>Unit Cost</u>
		₦
Transferred in ₦1,609,440	168,000	9.58
Material 462,000	154,000	3.00
Conversion 2,205,000	147,000	<u>15.00</u>
	TC/C.E.U.	<u>₦27.58</u>

Cost of Closing WIP:

Transferred in:	56,000 x 1 x 9.58	=	₦536,480
Material:	56,000 x 0 x ₦3	=	₦0
Conversion	56,000 x 3/8 x 15	=	<u>₦315,000</u>
			<u>₦851,480</u>

Units completed and transferred-out = 154,000 units

Cost of completed units = TC - Cost of ending WIP

$$= 5,011,440 - 851,480$$

$$= \underline{\underline{N4,159,960}}$$

FIFO: An Improved Method

	N
Opening WIP to be out first =	735,000
Completion of opening WIP:	
Material: 42,000 x N3 =	126,000
Conversion: 42,000 x 1/3 x 15 =	210,000
Cost of units started & completed in June:	
154,000 - 42,000 = 112,000 x N27.58 =	<u>3,088,960</u>
	<u><u>4,159,960</u></u>

8.2 Joint Products and By-Products

8.2.1 The Concept of Joint Products

The process costing principles discussed in Paragraph 7.1 are shown to be all about determining the cost of processing some inputs that yield the same types of products. At the end of the processing activities, only one type of product would result from the processed raw material.

However, it is not always that we have only one type of product from a processing operation. It is possible for a single raw material to yield two or more products simultaneously when processed. Such products are known as Joint Products. For example, when crude oil (a single raw material) is processed or refined, petrol, kerosene, gas, etc., could be obtained from it.

The cost of processing a production input (raw material) that would amount to joint products is known as Joint Cost. The joint cost is to be restricted to the split-off point (point after which each joint product would be incurring separate processing cost). Joint cost is not to be traced to any particular product but rather to all the joint products as a group. There are many ways of apportioning joint cost to joint products for financial accounting purposes. These would be discussed later.

In practice, it is normal to identify one product out of the joint products as the main or principal product and the rest to be treated as joint products or even by-products. In the example above, it is clear that petrol is the main product to be identified as crude oil is processed. Pairs of shoes could be main products as leather is processed, while bags, wallets, etc., could be seen as joint or by-products.

One way of differentiating between by-product and joint product is to consider their cost of production or sales value. A product that costs 10% to 15% of the main product cost should be treated as a by-product. Any product that costs 15% to 40% of the main product cost is a joint product. Any product that costs above 40% of the identified main product cost should also be treated as a main product.

As a result of changes in price, therefore, a by-product can become a joint-product or even a main product and vice versa.

8.2.2 Accounting Treatment of By- Products

A by-product is a secondary product arising as a result of a processing activity aimed at producing a certain main product. The market value of a by-product less the processing cost after the split off point is usually negligible, compared to the total market value of all the joint products or the market value of the main product.

The usual treatment of by-product is to deduct its Net Realizable Value (NRV) from the total Joint Cost (JC) and then divide the net joint cost among the joint or main products. The NRV of the by-product is the difference between its market value and its separate processing cost.

Illustration 8.6: Treatment of by- products

Wambai Shoemakers have a process that yields two main products: A and B and a by-product C at a total cost of ₦3,000,000. There are 1,000 units of C requiring no further processing and each can be sold at ₦60 with negligible market cost. The two main products take equal share of joint cost.

Required: What should be the share of Product A from the Joint Cost?

Solution 8.6

The total market value of Product C = $100 \times \text{N}60 = \text{N}60,000$. This is the NRV, since its market cost is negligible.

$$\text{Net Joint Cost} = \text{N}3,000,000 - \text{N}60,000 = \text{N}2,940,000$$

$$\text{Share of Product A} = \frac{\text{N}2,940,000}{2} = \underline{\underline{\text{N}1,470,000}}$$

Note: It can be concluded that in deducting the NRV of by-product C from the Joint Cost, we are in effect, assigning to the by-product, a joint cost which is equal to its NRV.

8.2.3 Methods of Apportionment of Joint Cost

There are three popular methods of sharing joint cost to the joint (or main) products. These are the Physical Units Bases, Sales Value (at the point of separation) and Net Realization Basis. These methods are briefly discussed below:

(a) Physical Units Basis

Under this method, the joint cost is shared among the joint products on the basis of the quantities of physical units, provided all the products are measured by a common unit of measurement, such as kilograms or litres. The problem with this method is that consideration is not given to price and, so, it does not consider the value of the products. Usually, the value of products is the most important factor to be considered.

Illustration 8.7

Anadariya Company Ltd., Tiga has a processing system that produces three products: K, S and T with 5,000 kg, 3,000 kg and 2,000 kg, respectively, in a year. The total cost incurred up to the split-off point in the year 2000 was $\text{N}1,000,000$. Use the physical units basis to share the joint cost among the three products. Calculate also their unit cost.

Solution 8.7

1. The Ratio:

$$K = \frac{5,000}{10,000} \times 100 = 50\%$$

$$S = \frac{3,000}{10,000} \times 100 = 30\%$$

$$T = \frac{2,000}{10,000} \times 100 = 20\%$$

Share of joint cost:

$$K = 50\% \text{ of } \text{N}1,000,000 = \text{N}500,000$$

$$S = 30\% \text{ of } \text{N}1,000,000 = \text{N}300,000$$

$$T = 20\% \text{ of } \text{N}1,000,000 = \text{N}200,000$$

2. Unit Cost based on the share of joint cost:

$$K = \frac{\text{N}500,000}{5,000} = \text{N}100/\text{unit}$$

$$S = \frac{\text{N}300,000}{3,000} = \text{N}100/\text{unit}$$

$$T = \frac{\text{N}200,000}{2,000} = \text{N}100/\text{unit}$$

(b) **Sales Value (at the Point of Separation)**

Under this method, the joint cost is shared among the joint products on the basis of their sales value before further processing. At the split off point, market value can be estimated per unit of each of the joint products. It is the ratios of the sales value of the joint products that are to be used as basis of apportioning the joint cost.

The problems with this method are two-fold: One, a product may have zero value at the point of separation but significant value with little processing cost after the split-off point. Secondly, a product may have high selling price at the split-off point and hence high sales value but may involve large selling and distribution cost (advert, carriage, etc.).

Illustration 8.8

Assuming that Anadariya Company Ltd has estimated the following selling prices for its three products at the point of separation:

$$K = \text{N}400/\text{unit}$$

$$S = \text{N}440/\text{unit}$$

$$T = \text{N}340/\text{unit}$$

Use the Sales Value method to apportion the joint cost and determine the unit cost of each of the three products.

Solution 8.8

1.

Product	Unit	SP/Unit	Sales Value	Ratio	Share of JC
	₦	₦	₦		₦
K	5000	400	2,000,000	50%	500,000
S	3000	440	1,320,000	33%	330,000
T	2000	340	<u>680,000</u>	17%	<u>170,000</u>
			<u>4,000,000</u>		<u>1,000,000</u>

2. Unit cost based on the share of joint cost:

$$\begin{aligned} K &= \frac{\text{₦}500,000}{5000} = \text{₦}100/\text{Unit} \\ S &= \frac{\text{₦}330,000}{3000} = \text{₦}110/\text{Unit} \\ T &= \frac{\text{₦}170,000}{2000} = \text{₦}85/\text{Unit} \end{aligned}$$

(c) Net Realizable Value Basis

This method is used only when further processing is necessary or when high marketing and distribution costs are involved. Net realization is sales value less the incremental cost of further processing after the split-off point and any other cost necessary for the selling or distribution of the product.

Illustration 8.9

Assuming that the sales values in illustration 7.9 are market prices after further processing and that separate processing and marketing costs are as follows:

$$\begin{aligned} K &= \text{₦}200,000 \\ S &= \text{₦}300,000 \\ T &= \text{₦}160,000 \end{aligned}$$

Determine the share of the joint cost to the three (3) products. Show also the unit cost of each of the three products.

Solution 8.9

1.

Product	Units	SP/Unit	Sales Value	SPC	NRV	Share of JC
	₦		₦	₦	₦	₦
K	5000	400	2,000,000	200,000	1,800,000	538,922
S	3000	440	1,320,000	300,000	1,020,000	305,389
T	<u>2000</u>	340	<u>680,000</u>	160,000	<u>520,000</u>	<u>155,689</u>
Total	<u>10,000</u>		<u>4,000,000</u>		<u>3,340,000</u>	<u>1,000,000</u>

Note:

- Net Realizable Value (NRV) = Sales Value Less separate processing costs (SPC)
- The total of the NRV of all the joint products is obtained and the joint cost is shared in proportion to the NRV of each product.
- This method is the 'best' as it considers the quantity (units) produced of all the joint products, their sales values and their further processing costs.

2. Unit cost based on the share of joint cost:

$$\begin{aligned} \text{K} &= \frac{\text{₦}538,922}{5,000} = \text{₦}108/\text{unit} \\ \text{S} &= \frac{\text{₦}305,389}{3,000} = \text{₦}102/\text{unit} \\ \text{T} &= \frac{\text{₦}155,689}{2,000} = \text{₦}78/\text{unit} \end{aligned}$$

8.2.4 Total Cost Determination Using NRV Method

Total Cost of a joint product is given by its share of joint cost plus its further processing and marketing cost. To arrive at a product's total cost per unit, its total cost is to be divided by the units produced.

Using illustration 7.10, total cost per unit could be determined for each of the three products as follows:

$$\begin{aligned}
 K &= \frac{\text{N}538,922 + \text{N}200,000}{5,000} = \frac{\text{N}738,922}{5,000} = \text{N}147.78 \\
 S &= \frac{\text{N}305,389 + \text{N}300,000}{3,000} = \frac{\text{N}605,389}{3,000} = \text{N}201.80 \\
 T &= \frac{\text{N}155,689 + \text{N}160,000}{2,000} = \frac{\text{N}315,689}{2,000} = \text{N}157.84
 \end{aligned}$$

If there are closing inventory of Product K (900 units), S (500 units) and T (400 units), the value of closing stock for reflection in the balance sheet could be determined as follows:

		N
K	=	900 x N147.78 = 133,002
S	=	500 x N201.80 = 100,900
T	=	400 x N157.84 = <u>63,136</u>
		<u>297,038</u>

Note:

It should be understood that profit is always the difference between total revenue (sales value) and total cost. That economics principle is very much applicable in joint-product costing.

8.3 Non Specific Order Costing Methods

8.3.1 Service Costing

This is the application of costing principles to the costing of service operations as opposed to the manufacture of goods. Hotels, transport, airlines, and school businesses are examples of areas of application. It may also be applied to a service cost centre in a manufacturing concern. It may be decided to treat the haulage department of a manufacturing and trading concern as a service cost centre after determining whether it is worthwhile to run the delivery of goods to customer internally or to sub-contract it to Haulage Company. To take such a decision, information is required on how much it costs to run it in-house.

The principles of cost ascertainment remain the same in that all expenses incurred in the process of providing services that are appropriately classified and aggregated and then averaged over the total number of units of that service to obtain cost per unit.

The manner in which costs are classified would vary from one industry to the other. The following formats for a transport and canteen businesses are illustrated:

Format of a Cost Statement for a Transport Business

Fixed or Standing Charges:

Motor Insurance	X
Motor Licence	X
Driver's Remuneration	X
General Administration	<u>X</u>
	<u>X</u>

Running Costs

Fuel	X
Servicing	X
Lubricants	X
Repairs and Maintenance	<u>X</u>
	<u>X</u>
Total Cost	<u>XX</u>

Fixed or Standing Charges represent those expenses which are incurred irrespective of the distance covered.

	ACTUAL	CANTEEN COST	BUDGET	
Wages and Salaries	X	X	X	X
Supervisor				
Cooks				
Counter helpers				
Provisions				
Meat				
Fish and Poultry				
Vegetable and Fruit				
Eggs				
Coffee				
Miscellaneous				
Maintenance				
Crockery and Glassware				
Insurance				
Table line				
Rent				
Steer				
Deduct Income from				
Sales				
Company Subsidy				

(a) Cost Unit in Service Industry

The major problem with service costing is the determination of the cost unit to use in measuring the output of the service. For example, for a transport business, service could be measured in terms of kilometers travelled or the weight of goods carried, or combination of both.

Other cost-units in the service industry are as follows:

Service	Cost units
Hotel	Occupied room-day
Restaurant	Meal served
College	Fulltime equivalent student
Electricity	Kilowatt-hour
Hospital	Patient-day
Transport	Miles travelled

(b) Costing of Professional Services

In most professional offices such as those of Architects, Accountants, Tax Practitioners and Medical Doctors, where services are rendered and classified as belonging to the service industry, it may be appropriate to apply service costing principles. This is because the services rendered by professional offices usually differ from one client to another as opposed to the service organizations that render standardized services. In such a case, job costing method is used in the costing of such professional services.

8.4 CHAPTER SUMMARY

This chapter has introduced the reader to the meaning of Process Costing, its application areas, and how it can be put to use for proper accountability. The characteristics of Process Costing, how products flow in the course of processing, the equivalent units of production to be transferred to the next stage of production, accounting for wastages/losses and the valuation process for cost of production report have all been discussed. Process costing, which is arguably the most widely used costing in the world, has been given the coverage it deserves, hoping that readers would find the contents of the chapter so simple that process costing would be 'counted in' as one of their simplest accounting topics.

Detailed discussion was also made on joint and by-product costing, where three different methods of apportioning joint cost to joint-products were explained. These methods are the

Physical units' basis, Sales Value basis and the Net Realizable Value basis. By-product and its accounting treatment have also been discussed in the chapter.

MULTIPLE-CHOICE AND SHORT ANSWER QUESTIONS

1. In process costing, what does "Abnormal Loss" mean?
 - A. Stock stolen during production
 - B. Stock items given out as gifts before full production
 - C. The greater of the present production's loss over the previous production
 - D. The greater of actual process loss over what is deemed to be normal in the industry
 - E. Losses in production due to abnormal behaviour of workers

2. Joint products is the name given to two or more
 - A. main products arising from the same process
 - B. dissimilar products manufactured from the same factory
 - C. complementary products that must be sold together
 - D. raw materials mixed together to manufacture a single item
 - E. products which work alike but are from different manufacturers

3. What is scrap?
 - A. Metal residue of a production process
 - B. Residues of little or no value obtained during production
 - C. Failed production items
 - D. Cleaning materials
 - E. Packaging materials

4. Explain "Net Realisable Value" in joint product costing
 - A. Sales value less cost of further processing before the point of separation
 - B. Market value of each of the joint products
 - C. Sales value less cost of further processing, selling and distribution after the split-off point
 - D. Sales value less cost of production up to the point of separation
 - E. Sales value less commission

5. Which of these statements is correct as far as process costing is concerned?
 - A. Each process' output can be sold without further processing

- B. Only the materials introduced in process 1 is sufficient for the whole production
 - C. Each manufacturing process has normal gain
 - D. Process costing is not significantly different from contract accounting
 - E. The output of one process forms the input of another process
6. In process costing, partly completed units are calculated to represent fully completed units based on the percentage of completion. Such representation is known as
 7. Where actual process wastage is less than what is regarded as normal in the industry, the difference is called.....
 8. A product of lesser value incidentally produced during the manufacture of another product is known as
 9. The point during the production process where two or more joint products assume their individual identities is called
 10. Where is the total credit on Abnormal Gains Account transferred to at the end of the accounting period?

SOLUTION

1. D
2. A
3. B
4. C
5. E
6. Equivalent units
7. Abnormal Gain
8. By-product
9. Split-off-point or separation point
10. Profit & Loss Account

EXAMINATION TYPE QUESTIONS

- 1 “Process Costing is a cost accounting system used to determine cost of production in a series of sequential processes”. Discuss this comment, giving diagrammatical example(s).
2. Briefly discuss the characteristics of a good process costing system.
3. Write short notes on each of the following terms:
 - (a) Product flow

Required:

Using the weighted average pricing method, draw up a cost of production report showing the cost of completed units, abnormal spoilage and the cost of the inventory (WIP) at 31 December, 2008. Also, show the relevant computations in detail. Spoilage is detected at the end of operations.

7. BCB Company has the following data for the month of October:

	<u>Department</u>	
	A	B
Beginning Inventory in process	2,000 units	2,000 units
Transferred in cost	-	N4,600
Cost of materials added last month	N2,000 (100%)	N3,200 (80%)
Conversion costs added last month	N900 (60%)	N800 (40%)
Units put in process this month	30,000	29,000
Cost of materials added this month	N30,968	N56,580
Conversion costs added this month	N41,800	N29,803
Units completed and transferred	29,000	30,000
Ending inventory in process:	3,000 units	1,000 units
Material content	90%	50%
Conversion costs	50%	30%

Required:

- a. Using weighted average costing method, prepare a production report for the month of October for each department. Show the cost of the ending work-in-process as well as the cost of goods completed and transferred.
 - b. Using the FIFO costing method, repeat the requirements of (a) above
8. Differentiate clearly between joint-product, by-product and main-product in a joint costing system.
 9. (a) Discuss, briefly, the three methods of apportioning joint cost to joint-products.
(b) Explain how do a profit or loss on a joint-product is arrived at?
 10. (a) Briefly describe the Accounting Treatment of By-product.

(b) A Process has 2 products A and B with a joint cost of ₦900. After the split-off point, Product A has 1,000 units with a selling price of ₦2 per unit and a separate processing cost of ₦600. Product B has 500 units with a selling price of ₦1 per unit and a separate processing cost of ₦100.

Required: Calculate the total cost of each product using:

- a) Physical unit basis
- b) Net Realization method

11. A firm manufactures two products X and Y from the same material. In Department I, the material is split into X and Y. X requires no further processing while Y must be processed further in Department 2. The following costs pertain to the month of November.

<i>Dept.</i>	<i>Direct mat.</i>	<i>Direct labour</i>	<i>Factory OH</i>	<i>Total</i>
	₦	₦	₦	₦
1	60,000	15,000	10,000	85,000
2	-	<u>3,000</u>	<u>12,000</u>	<u>15,000</u>
	<u>60,000</u>	<u>18,000</u>	<u>22,000</u>	<u>100,000</u>

Product	Kilograms <i>sold</i>	Kilograms <i>produced</i>	Sales for <i>the period</i>
X	30,000	45,000	₦60,000
Y	20,000	20,000	₦95,000

There were no finished goods at the beginning of the month.

Required:

Using net realization method to apportion the joint cost, calculate the total cost of Producing X and also Y during the month.

Assume that selling price of X will remain constant in the immediate future.

12. A firm operates a process which produces four refined products A, B, C and D. The joint costs of operating the process in the month of December were:

	₦
Raw materials	15,000
Labour	4,800
Overhead	<u>1,200</u>
Total	<u>21,000</u>

Output for the period was:

- A 14,000kg
- B 12,000 kg
- C 8,000 kg
- D 2,000 kg

Work-in-process at the beginning and end = zero. Also equal to zero was finished output at the beginning of the month. Finished output at the end of the period:

- A 600 kg
- B 400 kg
- C 1,600 kg
- D 100 kg

The price received per kilogram of refined product during the period was:

- A ₦0.20
- B ₦0.45
- C ₦0.60
- D ₦1.00

The price is expected to be maintained in the near future.

Required:

Calculate the cost of the ending finished units using as your basis of calculation:

- (a) Physical units
- (b) Sales value

13. JAY Chemicals Ltd manufactures a range of industrial chemicals. Basic materials are put through an initial process which produces the ingredients for three products X, Y, Z. The ingredients for each product then undergo separate further processing to form the finished products:

The following is the budget for year:

Joint Cost apportioned: ₦

	Total	X	Y	Z
Sales (kilos)		6,000	6,000	6,000
Sales value	₦540,000	₦180,000	₦240,000	₦120,000
Materials	120,000	40,000	60,000	20,000
Labour	80,000	30,000	40,000	10,000
Overheads	<u>100,000</u>	<u>30,000</u>	<u>50,000</u>	<u>20,000</u>
	<u>₦300,000</u>	<u>₦100,000</u>	<u>₦150,000</u>	<u>₦50,000</u>

Separate further:

Processing cost (₦)

Material	10,000	20,000	10,000
Labour	10,000	10,000	10,000
Overhead	20,000	20,000	20,000
Total	40,000	50,000	40,000
Profit/Loss	40,000	40,000	30,000

The overhead costs are fixed, except for the separate processing where the variable portion is estimated at ₦6,000 for X, ₦12,000 for Y and ₦3,000 for Z.

The company has the capacity to increase its production by 25% of the present level without incurring additional fixed costs, and market research has shown that to sell more than the budgeted quantities in the present market, the price would have to be reduced to the following levels:

X ₦28; Y ₦35; and Z ₦18

Although the products are jointly produced, sales of the products are independent of each other, thus an increase in the quantity sold of a product would not affect the sales of the other products.

A customer from a neighbouring country has offered to purchase the following quantities:

X	1,500 kilos	@ ₦27 per kilo
Y	500 kilos	@ ₦37 per kilo
Z	1,000 kilos	@ ₦18 per kilo

Based on the budget for the next year, direct labour will be working at full capacity. To meet the order, direct labour force will have to work overtime to be paid at five and half. Evaluate whether the company should accept the order. (ICAN Foundation, May 1997)

14. Okoro Ltd is attempting to decide sales price for two products 'wids' and 'leads'. The products are both made by the same work force and in the same department. ₦30,000 direct labour hours are budgeted for the year. The budgeted fixed costs are ₦30,000, and it is expected that the department will operate at full capacity. Variable costs per units are as follows:

	Wids	Leads
Materials	4	4
Labour (2 hours)	2	9
Expenses (1 machine hr.)	<u>6</u> (3 hrs.)	<u>2</u>
	<u>12</u>	<u>15</u>

Expected sales demand is estimated roughly to be 7,500 'wids' and 5,000 'leads'.

What would the unit sales prices be to give a profit of 20% on full cost if overheads are absorbed:

On a direct labour hour basis?

On a machine hour basis? (ICAN, PEI November)

SIMPLE PROCESS

15

- Summarise what you understand by abnormal loss and as well show how it is treated in Process Costing.
- Given below relates to the data for **Process I** during the month of January 2017 as extracted from the books of MMM Ltd.

2nd Jan, 2017: Input 40,000 units
 Opening WIP Nil Value

Process Costs: ₦
 Material 1,140,000

Labour	633,600
Overhead	528,000

31 st Jan, 2017:	Units
Output	32,000
Closing WIP	8,000

Degree of completion of Clowing WIP:

Materials	75%
Labour	40%
Overhead	40%

Determine:

- i. Equivalent Production Units
- ii. Cost per unit of equivalent production
- iii. Statement of evaluation
- iv. Process I Account

(12½ Marks)

16 Tamco Limited manufactures TACO product. The product passes through two distinct Processes before it is turned out as a finished product. Extracted details are provided below:

i. Input Details:

Items	L ₦	M ₦	Total ₦
Direct materials	400,000	158,000	558,000
Direct wages	200,000	80,000	280,000
Production overhead	110,000	90,000	200,000

20,000 units @₦3 were introduced to Process L. The output of Process L passes to process M where finished goods are obtained. The finished goods are then forwarded to the warehouse.

ii. Output, normal loss details and total scrap realised in each process

	Actual Output Unit	% of normal loss on input Unit	Total scrap to realised ₦
Process L	18,900	5%	10,000
Process M	18,000	5%	6,700

Required to prepare:

- a. Process accounts; and
- b. Process losses and process gain account

(12½ Marks)

CHAPTER NINE

COSTING TECHNIQUES - MARGINAL COSTING

CHAPTER CONTENTS

Decision making:

- a. Use of Marginal Costing and Absorption Costing Techniques in the preparation of Income Statements.
- b. Concept of Relevant Cost
- c. Short Term decisions: Make or buy, products mix, special order pricing, shut down problems with simple illustration, etc.

9.0 OBJECTIVES:

After studying this chapter, readers should be able to:

- a. Explain the concepts and differences between marginal and absorption costing;
- b. Explain the equation, advantages and limitations of marginal costing;
- c. Discuss the importance of contribution margin in managerial decision making;
- d. Use marginal costing as a technique for short-term tactical planning and decision-making; and
- e. Make decisions on whether to make or buy a component, accept or reject an order, among others.

9.1 Marginal Costing Versus Absorption Costing

9.1.1 Introduction

In taking short term, medium term or long term decisions, management of organisations in both the public and private sectors of the economy must adopt some tools that would aid better decision making for the achievement of organizational goals. In Accounting, there are many tools to be used in guiding effective decision making by management. Two of the most popular decision making techniques are marginal costing and absorption costing.

The two techniques are expected to be appropriately used in short term tactical managerial decision making exercise that would amount to efficient management of resources for the production of income, profit and wealth. The decision to be taken would normally be about the future, which is full of risks and uncertainties. This calls for a lot of care and attention when using either of the two techniques.

This section of the chapter explains the concepts of marginal costing and absorption costing; the differences between marginal and absorption costing; and the environments for the application of marginal and absorption costing.

9.1.2 The Concepts of Marginal Costing and Absorption Costing

Marginal costing has been described by different names in different continents. The term 'Marginal costing' is common in the United Kingdom (UK) and other countries of the European continent, while the expression 'Direct Costing' or 'Variable Costing' is preferred in the United States (US). The technique has generated strong views both for and against, with the result that it has become a subject of lively raging controversy during recent times.

'Marginal Cost', is derived from the word 'margin', which is a well-known concept in economic theories. Thus, quite in tune with the economic connotation of the term, it is described in simple words as the cost which arises from the production of additional increments of output and it does not arise if the additional increments are not produced. This shows that marginal cost is the cost of additional unit of product or service produced in any production process.

From this point of view, marginal costs will be synonymous with variable costs, i.e. prime costs and variable overheads in the short run, but in a way, would also include fixed costs in planning production activities over a long period of time involving an increase in the productive capacity of the business. Thus, marginal costs are related to change in output under a particular circumstance of a case. Marginal costing therefore is about costing an additional product or service on its merit without relating it to the general cost being incurred by the producer in the course of the production process.

Marginal costing is not a system of costing in the sense in which other systems of costing, like process or job costing are, but it has been designed simply as an approach to the presentation of accounting information meaningful to management from the viewpoint of adjudging the profitability of an enterprise by carefully studying the impact of the entire range of costs according to their respective nature.

The concept of marginal costing is a formal recognition of ideas underlying flexible budgets, break-even analysis and/or Cost-Volume-Profit relationships. It is an application of these

relationships which involves a change in the conventional treatment of fixed overheads in relation to income determination.

The concept of marginal costing is based on the important distinction between product costs and period costs, the former being related to the volume of output and the latter to the period of time rather than the volume of production. Marginal costing regards as products costs, only those manufacturing costs which have a tendency to vary directly with the volume of output. This is in complete contrast to the conventional system of costing under which all manufacturing costs - fixed as well as variable are treated as product costs.

Absorption costing, on the other hand, is the technique of costing that is used in preparing income statements to ascertain the result of operations of private and public sector organisations. The term absorption is about absorbing the general overhead (fixed) costs being shared to all the units of goods or services produced to ascertain total cost of production per unit rather than total variable (marginal) cost per unit.

Absorption costing, therefore, is about costing a product or service with due regards to all the cost elements involved in the production process and, so, appropriate apportionment is to be made for indirect costs to be incorporated into the total cost for each unit of goods or services produced.

9.1.3 Major Differences between Marginal Costing and Absorption Costing

Marginal costing, as explained above, is a technique of costing that considers fixed costs as a period cost and, so, irrelevant when taking decision on the total cost of a product to be compared against its benefit for the determination of its profitability/ viability. It is conceptually about variable or direct costing. Absorption costing, on the other hand, is about appreciating all cost elements as essential for production and sales and, so, all of them are to be captured when determining total cost at all levels of production up to sales.

As the two techniques are used in preparing income statements, some important differences could be noticed when the income statements are compared. The most fundamental difference is in the treatment of fixed overhead production cost. While absorption costing accepts the overhead cost as part of the cost of goods sold, marginal costing treats it as a period cost which must be incurred.

must be incurred whether or not there is production and, so, it is not to be part of the cost to be aggregated for a product or service.

The second difference is in the determination of cost of closing stock, where absorption costing recognizes total cost per unit to be multiplied by the closing units to get the value of closing stock while marginal costing recognizes only the total variable cost per unit for that purpose as all fixed costs (production, administrative and selling) must have been covered by contribution margin.

The third difference is in the initial profit shown under each of the two techniques. While absorption costing income statement first shows gross profit before net profit and so on, marginal costing income statement first shows contribution margin, which is the difference between sales and total variable costs. This shows that unless where all the units produced are sold, the two income statements would not amount to the same level of profit at the initial stage.

Absorption costing is used in preparing income statements at the end of an accounting period by all the three forms of businesses (sole proprietorship, partnership and company) in an economy and various governmental establishments. The method is, therefore, better used to aid decision on performance evaluation in respect of result of operations at the end of an accounting period. Marginal costing technique is only relevant for short term tactical managerial decision making, focusing the future happenings of businesses. The areas of application of marginal costing would be discussed in this chapter.

Students would learn more about the differences and the environments for application in the subsequent section and subsections of the chapter.

9.1.4 Basic Equation, Advantages and Limitations of Marginal Costing

(a) Basic Equation of Marginal Costing

The technique of marginal costing hinges on the contribution made by a product towards fixed costs and profit of the undertaking.

Contribution can be looked at from two angles - either as the total of fixed costs and profit or as the difference between sales and variable costs.

For the sake of convenience, contribution can be stated by way of equation as:

Sales - variable costs = Contribution.

This is sometimes shortened as:

$$S - V = C$$

It is also true that: Contribution - Fixed Cost = Profit

$$\text{i.e. } C - FC = P$$

The formula has been so framed that, if some of the above four factors are known, the remaining one can be easily found out. From this point of view, the equation is of fundamental importance.

Moreover, its significance also lies in the fact that a formula for calculating sales at break-even point has been derived from the basic equation and the formula is:

$$\text{Sales at break-even point} = \frac{\text{Fixed Cost} \times \text{Sales}}{\text{Sales} - \text{Variable costs}}$$

(b) Advantages of Marginal Costing

- I. **Constant in nature:** Marginal costs remain the same per unit of output irrespective of the volume of production;
- ii. **Facilitating cost control:** The clear-cut division of costs into their fixed and variable components paves the way for a better cost control through flexible budgeting which is based on this important distinction;
- iii. **Simplicity of overhead treatment:** Marginal costing does away with the need for allocation, apportionment and absorption of fixed overheads thereby removing an important source of accounting complications by way of under-absorbed or over-absorbed overheads;

- iv. ***Basis for pricing and tendering:*** Marginal costing furnishes a better and more logical basis for the fixation of sales prices as well as in tendering for contracts when business is at a low ebb;
- v. ***Aid to Profit planning:*** The technique of marginal costing enables data to be presented to management in a manner as to show cost-volume profit relationships; and
- vi. ***Realistic valuation:*** Elimination of fixed overheads from the cost of production means that finished goods and work-in-progress are valued at their marginal cost and, therefore, the valuation is more realistic and uniform as compared to the one when they are valued at their total cost.

(c) **Limitations of Marginal Costing**

- i. ***Difficulty in analysis:*** Considerable difficulty is always experienced in analysing overheads into their fixed and variable components;
- ii. ***Lop-sided Emphasis:*** Marginal costing has a tendency to attach more importance to the selling function which has the effect of relegating the production function to a comparatively unimportant position. However, the efficiency of a business is to be judged by taking together its selling as well as production functions into account;
- iii. ***Difficulty in application:*** The technique of marginal costing cannot be adequately applied in the case of industries in which, according to the nature of business, large stocks have to be kept in the form of work-in-progress;
- iv. ***Limited Scope:*** As marginal costing distinguishes between the treatment of fixed and variable components of costs, it is difficult to adopt the technique in capital-intensive industries where fixed costs are very large; and
- v. ***Inappropriate basis for pricing:*** Selling price cannot reasonably be fixed on the basis of contribution alone.

In the light of these advantages and disadvantages, marginal costing may be considered to be a very useful technique from the point of view of management but it must be applied with a full awareness of its limitations as well as of the circumstances in which it can be fruitfully used.

9.2 PREPARATION OF INCOME STATEMENTS

9.2.1 Income Determination: Under Absorption and Marginal Costing

According to traditional costing system, fixed costs of production are assigned to products to be subsequently released by way of expenses as part of cost of goods sold or are carried forward as part of the cost of inventory. Such an approach to the treatment of fixed costs has brought into attention various methods of allocation of overheads to different departments on an equitable basis and their proper apportionment to units produced. However, the various methods devised fail to give precise results and sometimes even lead to absurd situations.

Marginal costing removes all the difficulties involved in the allocation, apportionment and recovery of fixed costs; it is able to accomplish this by excluding fixed costs from product costs and by covering them off entirely using contribution margin. Consequently, when the volume of output differs from the volume of sales, the net income reported under marginal costing will differ from the net profit reported under absorption costing.

Illustration 9.1: (Comparative Income Statements)

Green-Green Limited furnishes the following details for the year ended 31 December 1992 for preparing the income statement of the year:

Sales	1,000 units @ ₦10 per unit
Manufacturing costs	₦2,200
Variable manufacturing cost	1,100 units @ ₦6 per unit
Inventory at close	100 units
Fixed selling & admin. Expenses	₦500
Variable selling & admin expenses	₦400

Solution 9.1

Green-Green Limited

Income Statement for the year ended 31st December, 1992

(a) Under Absorption Costing

	N	N
Sales 1,000 unit @ N10 each		10,000
Less: Cost of sales:		
Variable manufacturing cost:		
1,100 units @ N6 each	6,600	
Fixed manufacturing costs	<u>2,200</u>	
	8,800	
Les: Inventory at close:		
100 units @ N8 each	<u>800</u>	<u>8,000</u>
Gross Margin or profit		2,000
Less: Total selling & admin. exps.		<u>900</u>
Net Income		<u>1,100</u>

Workings:

The Cost of inventory at close, as well as cost of each unit of inventory at close, has been calculated as follows:

Units manufactured	1,100	
Units of inventory at close	100	
Ratio of closing inventory to total production	$= \frac{100}{1,100} =$	$\frac{1}{11}$

$$\text{Cost of Inventory at close} = \frac{1}{11} \times \text{N}8,800 = \text{N}800$$

Thus, the cost of each unit of inventory at close

$$= \frac{\text{N}800}{100 \text{ units}} = \text{N}8 \text{ per unit}$$

(b) **Under Marginal Costing**

	N	N
Sales: 1,000 units @ N10 each		10,000
Less: variable cost of sales:		
Variable manufacturing cost		
1,100 units @ N6 each	6,600	
Less: Inventory at close:		
100 units @ N6 each	<u>600</u>	<u>6,000</u>
Variable Gross Margin		4,000
Less: Variable selling & Admin. exps.		<u>400</u>
Operating contribution margin		3,600
Less: Fixed Costs:		
Fixed manufacturing costs	2,200	
Fixed selling & admin. exps.	<u>500</u>	<u>2,700</u>
Net Income		900

Workings

The cost of inventory at close, as well as the cost of each unit of inventory at close, has been calculated as follows:

Ratio of closing inventory to total production

$$= \frac{100}{1,100} = \frac{1}{11}$$

$$\text{Cost of Inventory at close} = \frac{1}{11} \times \text{N}6,600 = \text{N}600$$

Thus, the cost of each unit of inventory at close

$$= \frac{\text{N}600}{100 \text{ units}} = \text{N}6 \text{ per unit}$$

Note:

The difference of N200 in the net income calculated under the two methods is due to the difference between the costs of closing inventory which, under absorption costing, is N800 and, under marginal costing, is N600. This is the result of holding back N200 out of the total

fixed manufacturing cost of ₦2,200 as cost of inventory under absorption costing, whereas ₦200 is released immediately as period charge under marginal costing.

A perusal of the absorption costing statement and marginal costing statement shows that the former gives more information than the latter. Although, this might be correct, the information furnished by the absorption costing statement cannot be as useful as the one given by marginal costing because the conventional costing statement rarely classifies costs into fixed and variable components.

9.2.2 Role of Contribution

Contribution is of vital importance for the system of marginal costing. The rationale of contribution lies in the fact that, where a business manufactures more than one product, the profit realized on individual products cannot be possibly calculated due to the problem of apportionment of fixed costs to different products which is done away with under marginal costing. Therefore, some methods are required for the treatment of fixed costs and marginal costing and answer to the challenge is 'contribution'.

Contribution is the difference between sales and the variable cost of sales and is, therefore, sometimes referred to as a 'gross margin'. It is visualized as some sort of a 'fund' or 'pool' out of which all fixed costs, irrespective of their nature, are to be met and to which each product has to contribute its share. The difference between contribution and fixed costs is either profit or loss as the case may be.

The concept of contribution is useful in the fixation of selling prices, determination of break-even point, selection of product mix for profit maximization, make or buy decisions, acceptance or rejection of special orders and ascertainment of the profitability of products, departments, etc.

Illustration 9.2: Contribution Margin

The following information has been gathered from the accounts of Prudent Engineering Limited, organized on departmental basis:

	Departments		
	<u>X</u>	<u>Y</u>	<u>Z</u>
	N	N	N
Variable costs	90,000	100,000	150,000
Fixed costs:			
(apportioned on the basis of sales)	<u>20,000</u>	<u>30,000</u>	<u>50,000</u>
Total Costs	110,000	130,000	200,000
Sales	<u>100,000</u>	<u>150,000</u>	<u>250,000</u>
Profit (Loss)	<u>(10,000)</u>	<u>20,000</u>	<u>50,000</u>

With the object of doing away with the 'X' department incurring a loss, the management asks for your opinion on:

- a. The closure of Department X on the basis of the above information.
- b. The comparative profitability of different departments if specific fixed costs are ascertained to be N5,000 for Department X, N55,000 for Department Y and N30,000 for Department 'Z' the remaining N10,000 being general fixed costs.

Required:

Prepare appropriate statements so as to help management in arriving at a decision on the above points. Also give your comments, explaining the position presented in the statements.

Solution 9.2

- i. **All Fixed Costs regarded as general fixed costs:**

	Marginal Cost Statement			
	Departments			
	<u>X</u>	<u>Y</u>	<u>Z</u>	Total
	N	N	N	N
Sales	100,000	150,000	250,000	500,000
Less: Var. Cost	<u>90,000</u>	<u>100,000</u>	<u>150,000</u>	<u>340,000</u>
Contribution Mar.	<u>10,000</u>	<u>50,000</u>	<u>100,000</u>	160,000
Less: Fixed Costs				<u>100,000</u>
Profit				<u>60,000</u>

Comment

The loss of ₦10,000 shown by Department X has been due to the arbitrary basis of the apportionment of fixed overheads to different departments.

The fact has been underlined by the marginal cost statement which does not attempt to allocate fixed costs to the various departments with the result that, in the event of the closure of Department X, the total contribution as well as profit would be reduced by ₦10,000. Therefore, the company would not stand to gain anything by closing Department X; rather, it would lose under such an eventuality.

ii. On the basis of specific fixed costs

Statement of Comparative Profitability

Departments

	<u>X</u>	<u>Y</u>	<u>Z</u>	<u>Total</u>
	₦	₦	₦	₦
Sales	100,000	150,000	250,000	500,000
Less: Var. cost	<u>90,000</u>	<u>100,000</u>	<u>150,000</u>	<u>340,000</u>
Contribution	10,000	50,000	100,000	160,000
Less: Specific				
fixed Costs	<u>5,000</u>	<u>55,000</u>	<u>30,000</u>	<u>90,000</u>
Net contribution	<u>5,000</u>	<u>(5,000)</u>	<u>70,000</u>	70,000
Less: General Fixed costs				<u>10,000</u>
Profit				<u>60,000</u>

Comment

Although, the second statement shows the same profit of ₦60,000 as is shown by the first statement, it tells an entirely different story.

From the above statement, it is Department Y which incurs a loss of ₦5,000 instead of Department X. The position has been brought about by the availability of fixed costs specifically assigned to different departments. It also highlights the anomalies created by the apportionment of fixed costs on some arbitrary basis as according to sales in this example.

It is also evident that if Department Y is closed, the total contribution as well as profit would increase by ₦5,000. Advice on these lines would be tendered only if either the working of Department Y cannot be improved so as to show a profit, or at least to break-even, or the price of its products cannot be increased. It is so because, generally, it is better from the point of view of business to offer a wider range of choices to its customers.

The position on the closure of Department Y can be shown as follows:

Statement of Comparative Profitability

Departments

	<u>X</u>	<u>Z</u>	<u>Total</u>
	₦	₦	₦
Sales	100,000	250,000	350,000
Less: Var. Costs	<u>90,000</u>	<u>150,000</u>	<u>240,000</u>
Contribution	10,000	100,000	110,000
Less: Specific			
fixed costs	<u>5,000</u>	<u>30,000</u>	<u>35,000</u>
Net Contribution	5,000	70,000	75,000
Less: Gen. Fixed costs			<u>10,000</u>
Profit			65,00
0			<u> </u>

Thus, profit increases by ₦5,000 on the closure of Department Y, the amount being exactly equal to the loss incurred by that Department.

9.3 Relevant Cost and Relevant Revenue

Environment affected by limiting factors often requires consideration of relevant costs and relevant revenues in taking short term decisions. For instance, decisions involving application of marginal costing such as special order pricing, make or buy decision etc often make use of relevant costing. The CIMA Official Terminology defines Relevant Costs/Relevant Revenues as “Costs and revenues appropriate to a specific management decision. It further expresses that these costs and revenues are represented by future cash flows whose magnitude will vary depending upon the outcome of management decision made. If stock is used, the relevant cost, used in the determination of the profitability of the transaction, would be the cost of replacing the stock, not its original purchasing price

which is a sunk cost.”

The three major characteristics of relevant costs are:

- They are future cost/future revenues
- They are differential costs/revenues that differs between alternative decisions
- This involve cash flows

Thus, to consider a cost or revenue as relevant, it must satisfy the three major characteristics listed above. The implication, which is also contained in the definition above, is that whenever a decision is to be taken involving application of marginal costing, past costs, known as historical costs are sunk cost.

Some of the items of relevant costs include:

- 1. Notional Imputed Costs:** They are costs not considered in financial accounting because they do not involve actual cost spending but useful in decision making. The terminology defines it as “cost used in product evaluation, decision making and performance measurement to reflect the use of resources that have no actual (observable) cost” e.g notional interest for internally generated fund or notional rent for use of space.
- 2. Opportunity Costs:** They are value of benefit forgone in favour in favour of taking alternative course of action. Others are
- 3. Out of Pocket Cost**
- 4. Replacement Cost**
- 5. Differential Costs** that are more than zero value

The Concept of Sunk Costs

These costs are past or historical costs that are not useful in taking economic decisions. The terminology defines suck cost as “cost that has been irreversibly incurred or committed and cannot therefore be considered relevant to a decision”. Sunk cost may also be termed as irrecoverable cost.

A past or historical cost can be considered relevant if only such item has a replacement or market value or can be put into an alternative use; otherwise the value is zero in decision making.

Relevant costs of elements of cost

- 1. Relevant Cost of Material:** Where materials in stores will be used to implement decision, relevant cost is NIL value. However, if materials in stores have replacement or markek value or can be put into an alternative use, then, the values involved are relevant.
- 2. Relevant Cost of Labour:** Fixed salaries of workers are irrelevant, only the associate opportunity cost of fixed salary earner is relevant.

Illustration

A firm received a special order. The order will utilise material worth of ₦10,000 in stores. The material has no market value and cannot be put into an alternative use. The order will require additional material CD to be procured for ₦30,000. Factory workers will be paid a total of ₦50,000.

The order will also make use of an idle plant that has a written down value of ₦200,000. Depreciation is calculated at ₦5,000 per month. The order will take one month to complete.

Required: Determine the minimum price to charge.

Computation of Minimum Price

	₦
Existing Material in Stores	NIL Value
Material CD	30,000
Factory workers 'wages	50,000
Manager's salary	NIL Values
Plant depreciation	<u>NIL Value</u>
Minimum Price	<u>80,000</u>

Bases for Computation:

- Existing materials in stores are sunk cost
- Manager's salary considered as irrelevant/sunk
- Plant depreciation on an idle plant – sunk cost
- Relevant cost includes material CD value and factory workers' wages.

9.4 PRACTICAL APPLICATIONS OF MARGINAL COSTING

9.4.1 Make or Buy Decisions

This type of situation arises when a manufacturer is faced with the decision as to whether to

- (a) Manufacture one of its components in-house or
- (b) Buy such components from an outside supplier.

The decision maker will be interested in the difference between the supplier's quotation and the cost of producing in-house. The cost of in-house production of the components is made up of:

- i. The incremental cost of production; and
- ii. Any opportunity cost that may arise from producing in-house.

The following qualitative factors will also be considered in deciding whether or not to produce in-house:

- The quality of the product that will be bought from outside;
- The reliability of the outside supplier;
- The effect of future market prices;

- Ability of management to cope with the present and future production capacity;
- The possible adverse effects of revealing trade secrets; and
- The possible problems of transport and handling costs.

9.4.2 Decision Criteria

- a. If the outside supplier's quotation is greater than the total variable cost of producing the component in-house, then the component should be manufactured in-house.
- b. If the total variable cost of in-house production is higher than the quotation of the outside supplier, then it will be quite discrete for the management to purchase the component from the supplier.

Illustration 9.3: Make or Buy Decision

Nagarta Nig. PLC is considering an opportunity to subcontract the production of a certain component part of its product to another manufacturer. The subcontractor has offered to produce the part for ₦1.80 per piece. The management accountant makes a study of the savings of cost resulting from subcontracting as follows:

- a. The standard unit cost of material is reduced by 50k
- b. The direct labour cost per unit is reduced by 25k
- c. The reduction in variable overhead is estimated at ₦1.00 per unit

It is believed by the plant superintendent that supervision costs to the extent of ₦2,000 per year can be saved if the job is subcontracted and that the cost of special tools will be reduced by ₦500 per year.

The other relevant cost data in connection with the manufacture of this product are as follows:

Units sold	<u>14,000</u>
	N
Net sales - 14,000 @ N25 each	<u>350,000</u>
Standard cost of goods sold:	
Direct materials	70,000
Direct labour	28,000
Factory overheads	<u>140,000</u>
Total Standard cost of goods sold	<u>238,000</u>
Standard Gross Margin	112,000
Less: Unabsorbed factory overheads	<u>36,000</u>
Actual Gross margin	76,000
Less: Selling and distr. exp.	<u>100,000</u>
Net Loss	24,000
	=====

The break-up of factory overheads into their fixed and variable components at normal capacity level of 20,000 units is as follows:

	<u>Per Unit</u>	<u>Total</u>
	N	N
Variable	4	80,000
Fixed	<u>6</u>	<u>120,000</u>
	10	200,000
	====	=====

The company is working at less than normal capacity which is manufacture of 20,000 units of this product.

You are required to advise the management on whether to subcontract the production of the component or to produce it internally.

Solution 9.3

Solution to this problem may best be presented in form of differential cost analysis as follows:

Effects of Make or Buy Decision:

	Make		Difference	Buy
	₦		₦	₦
Net Sales	<u>350,000</u>		<u>350,000</u>	
Dir. Materials	70,000	(14,000 x ₦0.50), i.e.	-7,000	63,000
Purchased parts		-(14,000 x ₦1.80), i.e.	+25,200	+25,200
Direct labour	28,000	(14,000 x ₦0.25), i.e.	-3,500	24,500
Var. overheads	56,000	(14,000 x ₦1), i.e.	-14,000	42,000
Fixed overheads	<u>120,000</u>	(2,000 + ₦500), i.e.	-2,500	<u>117,500</u>
Total manuf. Cost	274,000		-1,800	272,200
Selling & Admin. Cost	<u>100,000</u>		-	<u>100,000</u>
	<u>374,000</u>		<u>-1,800</u>	<u>372,200</u>
Net Loss	(24,000)		<u>-1,800</u>	<u>(22,200)</u>

It is to be noted that, no change in volume or selling price is assumed so that revenue is not a relevant factor. The benefit lies purely in cost saving which at this level of volume is ₦1,800.

Despite the fact that the company is operating at less than normal capacity, the small monetary advantage offered by this opportunity may not be considered sufficient to offset the ill-effects of laying off more of the labour force due to the non-manufacture of the component. In spite of the impact of non-quantitative factors, the differential cost analysis remains at the core of make or buy decision.

Illustration 9.4 : Further Example on Make or Buy Decision

A.B. Limited makes four components, W, X, Y and Z for which costs in the following year are expected to be:

	W	X	Y	Z
Production (in units)	<u>1,000</u>	<u>2,000</u>	<u>4,000</u>	<u>3,000</u>
Unit marginal costs:	₦	₦	₦	₦
Direct materials	4	5	2	4
Direct labour	8	9	<u>4</u>	<u>6</u>
Variable prod. Overheads	<u>2</u>	<u>3</u>	<u>1</u>	<u>2</u>
	14	17	7	12
COST ACCOUNTING	<u>14</u>	<u>17</u>		

Directly attributable fixed costs per annum and committed fixed costs:

	N
Incurring as a direct consequence of making W	1,000
Incurring as a direct consequence of making X	5,000
Incurring as a direct consequence of making Y	6,000
Incurring as a direct consequence of making Z	8,000
Other fixed costs (committed)	<u>30,000</u>
	<u>50,000</u>

A sub-contractor has offered to supply units of W, X, Y and Z for N12, N21, N10 and N14, respectively.

Should A.B. Limited make or buy the components?

Solution 9.4

- a) The relevant costs are the differential costs between making and buying, and they consist of differences in unit variable costs plus differences in directly attributable fixed costs. Subcontracting will result in some fixed costs savings;

	<u>W</u>	<u>X</u>	<u>Y</u>	<u>Z</u>
	N	N	N	N
Unit var. cost of making	14	17	7	12
Unit var. cost of buying	<u>12</u>	<u>21</u>	<u>10</u>	<u>14</u>
	<u>(2)</u>	<u>4</u>	<u>3</u>	<u>2</u>
Annual requirements				
(units)	1,000	2,000	4,000	3,000
	N	N	N	N
Extra var. cost of buying	(2,000)	8,000	12,000	6,000
(per annum)				
Fixed cost saved by buying	<u>1,000</u>	<u>5,000</u>	<u>6,000</u>	<u>8,000</u>
	<u>(3,000)</u>	<u>3,000</u>	<u>6,000</u>	<u>(2,000)</u>

- b) The company would save N3,000 per annum by subcontracting component W (where the purchase cost would be less than the marginal cost per unit to make internally) and would save N2,000 per annum by subcontracting component Z (because of the saving in fixed costs of N8,000);

- c) In this example, relevant costs are the variable costs of in-house manufacture, the variable costs of sub-contracted units, and the saving in fixed costs;
- d) Other important considerations would be:
 - (a) If components W and Z are sub-contracted, the company will have spare capacity. The question now is how such spare capacity can be profitably used?
 - (b) Would the sub-contractor be reliable with delivery times, and would he supply components of the same quality as those manufactured internally?
 - (c) Does the company wish to be flexible and maintain better control over operations by making everything itself?
 - (d) Whether the estimates of fixed costs savings are reliable?

9.4.3 Acceptance/Rejection of Special Order

This type of situation arises when a company receives an order from a customer at a price lower than its normal selling price. The company, if working below capacity, may be advised to accept the offer after taking into consideration the marginal cost of its production.

Therefore if the answers to the following questions are in the affirmative, the special price quoted by the customers should be accepted:

- (a) Does the price quoted by the special customer cover the marginal cost of production?
- (b) Does the company have excess capacity?

Illustration 9.5: Acceptance or Rejection

Shukura Nigeria Limited manufactures a special product for ladies called 'the slimming stick'. A stick sells for 20k. Current output is 400,000 sticks which represents 80% level of activity. A customer Gyatin Stores Limited, recently placed an order at 13k per slimming stick. The total cost for the period was ₦56,000 of which ₦16,000 were fixed costs. This represents a total cost of 14k per slimming tablet.

Required:

- (a) Based on the above information, advise Shukura Nigeria Limited whether or not to accept the offer.
- (b) What other factors may be taken into consideration in taking such a decision?

Solution 9.5

(a)

(i) Present position	₦
Sales (400,000 units)	80,000
Less: marginal cost (400,000x10k)	<u>40,000</u>
Contribution	40,000
Less: Fixed costs	<u>16,000</u>
Net Profit	<u><u>24,000</u></u>

(ii) If the order from Gyatin Stores is accepted: ~~₦~~

Sales (100,000 x 13k)	13,000
Less: marginal cost (100,000x10k)	<u>10,000</u>
Contribution	<u><u>3,000</u></u>

Recommendation

The Order from Gyatin Stores should be accepted, since it will increase profit by ~~₦~~3,000.

(b) Other factors to consider include:

- i. Will the acceptance of one order at a lower than market price make other customers to ask for price reductions?
- ii. Is the so called special price the most profitable way of utilizing the excess capacity?
- iii. If accepted, will the special order not block the acceptance of offers which may be at true market price? and
- iv. Will fixed cost remain constant?

9.4.4 Marginal Costing and Pricing Decision

The determination of prices of products manufactured or services rendered, by a business is often considered to be a difficult problem generally faced by management of an enterprise. However, the basic problem involved in pricing is the matching of demand and supply.

The marginal costing technique offers a simple as well as clear portrayal of the relationship between specific products costs and the different possible selling prices being considered. This is due to the fact that contribution margin is unaffected by the allocation of indirect costs.

Illustration 9.6: Marginal Costing and Pricing

M & K Industries Limited produces and markets industrial containers and packing cases. Due to competition, the company proposes to reduce its selling price.

If the present level of profit is to be maintained, indicate the number of units to be sold if the proposed reduction in selling prices is 5%, 10% and 15%.

The following information is available:

	N	N
Present sales turnover (30,000 units)		300,000
Variable cost (30,000 units)	180,000	
Fixed cost	<u>70,000</u>	<u>250,000</u>
Net profit		<u>50,000</u>

Solution 9.6

Marginal Cost Statement

	Present Price	price reduction of 5%	Price Reduction of 10%	Price Reduction of 15%
	N	N	N	N
Sales	300,000	285,000	270,000	255,000
Less: variable costs	<u>180,000</u>	<u>180,000</u>	<u>180,000</u>	<u>180,000</u>
Contribution	120,000	105,000	90,000	75,000
Less: Fixed costs	<u>70,000</u>	<u>70,000</u>	<u>70,000</u>	<u>70,000</u>
Net Profit	<u>50,000</u>	<u>35,000</u>	<u>20,000</u>	<u>5,000</u>
Contribution per unit per unit	<u><u>N4.00</u></u>	<u><u>N3.50</u></u>	<u><u>N3.00</u></u>	<u><u>N2.50</u></u>

As profit is to be maintained at the present level of ₦50,000, the contribution has to be ₦120,000 as at present when the total sale proceeds from 30,000 units are ₦300,000.

The number of units required to be sold at different levels of price reduction would be calculated as follows:

Total Contribution Required

Contribution per unit

Therefore:

$$\text{At 5\% Reduction: } \frac{\text{₦120,000}}{\text{₦3.50}} = 34,286 \text{ units approximately}$$

$$\text{At 10\% Reduction: } \frac{\text{₦120,000}}{\text{₦3}} = 40,000 \text{ units}$$

$$\text{At 15\% Reduction: } \frac{\text{₦120,000}}{\text{₦2.50}} = 48,000 \text{ units}$$

Verification:

The result obtained at 10% price reduction can be verified as follows:

	₦
Sales (40,000 x 270,000/30,000)	360,000
Less: variable costs (40,000 x <u>180,000</u>)	
30,000	<u>240,000</u>
Contribution	120,000
Less: Fixed Costs	<u>70,000</u>
Profit	<u>50,000</u>

The other results can also be similarly verified.

9.4.5 Marginal Costing and Profit Planning

Marginal costing, through the calculation of contribution ratio, enables the planning of future operations in such a way as to attain either maximum profit or to maintain a specified level of profit. Thus, it is helpful in profit planning.

Illustration 9.7: Profit Planning

A toy manufacturer earns an average net profit of ₦3 per piece in a selling price of ₦15 by producing and selling 60,000 pieces at 60% of the potential capacity. Composition of his cost of sales is:

Direct materials	₦4.00
Direct wages	₦1.00
Works overhead	₦6.00 (50% fixed)
Sales overhead	₦1.00 (25% varying)

During the current year, he intends to produce the same number but anticipates that:

- (a) his fixed charge will go up by 10%
- (b) rates of direct labour will go up by 20%
- (c) rates of direct material will increase by 5%
- (d) selling price cannot be increased.

Under these circumstances, he obtains an order for a further 20% of his capacity.

What minimum price will you recommend for accepting the order to ensure the manufacturer earns an overall profit of ₦180,500.

Solution 9.7

Marginal costing statement for current year

(prior to acceptance of 20% excess order)

	<u>Per Piece</u>	<u>Total Amount</u>
	₦	₦
Variable costs:		
Direct material	4.20	
Direct labour	1.20	
Var. works overhead	3.00	
Var. sales overhead	<u>0.25</u>	
	8.65	519,000
Sales value	<u>15.00</u>	<u>900,000</u>
Contribution	6.35	<u>381,000</u>

Fixed Costs:

	₦	
Works overhead	180,000	
Add: 10%	<u>18,000</u>	198,000
Sales overhead	45,000	
Add: 10%	<u>4,500</u>	<u>49,500</u>
Profit		<u>133,500</u>

Planned profit = ₦180,500

increased in profit = ₦180,500 - ₦133,500 = ₦47,000

The minimum price for 20,000 toys (order for 20% capacity) can be worked out as thus:

	₦	
Variable cost @ ₦8.65	173,000	
Add: Increase in profit	<u>47,000</u>	
	<u>220,000</u>	
Minimum sales price per unit	= <u>₦220,000</u>	
	20,000 units	
	= ₦11	

9.5 CHAPTER SUMMARY

In this chapter, efforts have been made to differentiate clearly between marginal costing and absorption costing, two techniques that guide decision making based on income statements prepared using them. Greater emphasis has been put on marginal costing, being the technique that is purely for managerial decision making. Its advantages and limitations were highlighted for better appreciation and some of the popular areas of its application for short term tactical managerial decision making were discussed and illustrated.

It is expected that the set objectives of the chapter have been achieved by now and that the reader is in a position to educate beginners on:

- The concepts of marginal and absorption costing;
- The role and importance of contribution margin in managerial decision making;
- The advantages and limitations of marginal costing; and
- The various application areas of marginal costing.

MULTIPLE-CHOICE AND SHORT ANSWER QUESTIONS

1. What is marginal cost?
 - A. Cost incurred when increasing profit margin
 - B. Total cost of manufacture
 - C. Cost of producing an additional unit
 - D. Cost of manufacturing a new product
 - E. Aggregate cost of manufacturing diverse products

2. What are period costs?
 - A. Costs incurred during a stated period of production
 - B. Costs incurred during certain periods of the year
 - C. Costs which serves to enhance profitability
 - D. Costs of maintaining equipment during a period
 - E. Costs incurred during a period irrespective of production volume

3. How does marginal costing differ from absorption costing in stock valuation?
 - A. Marginal costing is only concerned with margins
 - B. Absorption costing uses LIFO
 - C. Absorption costing recognizes slow-moving stocks
 - D. Marginal costing uses total variable costs, writing off fixed assets
 - E. Marginal costing uses FIFO

4. What is contribution?
 - A. Total sales minus total variable costs
 - B. Total sales plus total variable costs
 - C. Total variable costs plus total fixed costs
 - D. Total fixed costs minus profit
 - E. Total sales plus total fixed costs

5. What is limiting factor?
 - A. The extent to which the company may manufacture its products
 - B. The factor of production which is in short supply

- C. The limit to which government may allow the company to manufacture
 - D. The factor of production which is most expensive
 - E. The factor of production which is easily obtainable
6. Under absorption costing, closing stocks include a portion of the period's.....
 7. In most decision making scenarios, marginal costing advises that the relevant cost is the
 8. Under marginal costing, sales minus variable costs equals
 9. What is the major cause of differences in profit figures derived from profitability statements using absorption costing and marginal costing?
 10. Based purely on financial information, a company should manufacture more of the products giving the highest towards the absorption of its fixed assets and ultimately earning profit.

SOLUTION TO MULTIPLE-CHOICE AND SHORT ANSWER QUESTIONS

1. C
2. E
3. D
4. A
5. B
6. Fixed costs
7. Variable cost (marginal cost)
8. Fixed Costs plus profit or Contribution
9. Value of closing stocks/Treatment of fixed costs
10. Contribution

EXAMINATION TYPE QUESTIONS

1. Dala Equipment Limited, manufactures four components, the cost particulars of which are given below:

Elements of cost:	Components			
	A	B	C	D
	₦	₦	₦	₦
Direct material	80	100	100	120
Direct labour	20	25	25	30
Variable overhead	10	12	15	10
Fixed overhead	<u>15</u>	<u>23</u>	<u>20</u>	<u>20</u>
	<u>125</u>	<u>160</u>	<u>160</u>	<u>180</u>
Output per machine hour (units)	4	2	3	3

The key factor is shortage of machine capacity.

You are required to advise management as to whether they should continue to produce all or some of the components (which are used in its main product) or they should buy them from a supplier who has quoted the following prices:

A- ₦115; B - ₦175; C - ₦135; D - ₦185

2. Three different product lines are sold by Indabawa Mills. Product A contributes 20% of its revenue to fixed costs and profits, product B contributes 10% and product C contributes 60%.

The products sell for the following prices:

Product A ₦8 per unit

Product B ₦2 per unit

Product C ₦3 per unit

The company earned a net profit of ₦50,000 before income taxes last year by selling 50,000 units of product A, 150,000 units of product B and 60,000 units of product C.

Muhammed Ibrahim, who is the sales manager believes that the profit picture can be improved by eliminating product B and concentrating the sale effort on products A and C. He sees an opportunity to increase the sales of product A to 70,000 units but admits that product C will probably sell at the same amount next year.

Prepare a projected income statement using Ibrahim's assumption. Do you agree with him? Explain what would cause the profit to increase or decrease as the case might be.

3. The management of Wali and Gwangwazo Ltd, is considering the proposal to discontinue the manufacture of product X out of the list of its products - X, Y and Z. The details of which are given below:

	X	Y	Z
Capacity in actual production	20%	40%	40%
Units manufactured	<u>4,000</u>	<u>10,000</u>	<u>12,000</u>
Costs per unit	₦	₦	₦
Materials	25	20	40
Labour	15	10	20
Fixed overhead	4	4	5
Var. overhead	<u>4</u>	<u>3</u>	<u>5</u>
	48	37	70
Profit/loss per unit	<u>(4)</u>	<u>13</u>	<u>10</u>
	<u><u>52</u></u>	<u><u>50</u></u>	<u><u>80</u></u>

Product X having persistently shown a loss for a number of years due to the saturation of demand and the future prospects of the other two products being bright as a result their having been accepted as components by a newly established machine-building complex in the vicinity, the production capacity realised by the discontinuation of product X is sought to be transferred equally to products Y and Z.

Moreover, the nature of product X has been such that the transfer of production capacity engaged therein to the other two products would bring about an increase of 30% and 50% in the number of units to be manufactured of products Y and Z respectively, than those involved in the capacity transferred to them under the proposal without, of course, involving any change in total fixed costs from those when all the three products were manufactured.

The anticipated increases in the structure of costs and the selling price are as thus:

	<u>Y</u>	<u>Z</u>
Materials	5%	5%
Labour	10%	10%
Selling price	10%	5%

You are required to:

- (a) prepare a statement of projected profitability; and
 - (b) advise management as to whether the proposal may be accepted for implementation.
4. The management of Jigawa Limited is considering next year's production and purchase budgets. One of the components produced by the company which is incorporated into another product before being sold has a budgeted manufacturing cost as follows:

	<u>₦</u>
Direct material	14.00
Direct labour (4 hours at ₦3)	12.00
Var. overhead (4 hours @ ₦2)	8.00
Fixed overhead (4 hours @ ₦5)	<u>20.00</u>
	<u>54.00</u>

Ball Limited has offered to supply the above component at a guaranteed price of ₦50 per unit.

Required:

- (a) Considering cost criterion only, advise management as to whether the above component should be purchased from Ball Limited.
- (b) Explain how your above advice would be affected by the situation shown below:

As a result of government legislation, if Jigawa Limited continues to manufacture this component, the company will incur additional inspection and testing expenses of ₦56,000 per annum, which are not included in the above budgeted manufacturing costs.

- (c) The production director of Jigawa Limited recently said "we must continue to manufacture the component as only one year ago we purchased some special grinding equipment to be used exclusively by this component. The equipment cost ₦100,000, it cannot be resold or used elsewhere and if we cease production of this component, we will have to write off the written down value (book value) which is ₦80,000.

Draft a reply to the production director commenting on his statement.

- 5(a) Koki Limited which manufactures part M - 6 for use in its production cycle has the following costs per unit for production of 25,000 units.

	₦
Direct materials	5
Direct labour	20
Manufacturing overhead	<u>24</u>
	<u>49</u>

It has been established that 66 2/3% of the overhead is fixed. Sahara Limited has offered to sell 25,000 units of part M - 6 to Koki Ltd, for ₦45 per unit. If Koki Ltd., accepts Sahara's offer, some of the facilities presently used to manufacture M - 6 could be rented to a third party at an annual rent of ₦65,000.

Additionally, ₦6 per unit of the fixed overhead costs applied to part M - 6 would be totally eliminated. The managing director of Koki Ltd, has called on you to advise on whether he should accept Sahara's offer.

- (b) State factors other than the relevant costs above which would influence your decision to accept or reject Sahara's offer.
6. Aminu Motors Limited specializes in the manufacture of sport cars making some of the components which are required and buying others. Alparts Limited offers to supply a component currently made by Aminu Motors Ltd. at a price of ₦7. The costs incurred by Aminu Motors in making the part are as follows:

	₦
Variable costs	4
Traceable fixed costs	2
Allocated fixed costs	3
	<u>9</u>

Monthly output is 5,000 units.

Required:

Present information to management on the assumption that the production capacity realised as a result of accepting the order will remain idle.

- 7(a) What benefits are to be gained from marginal costing? Are there any pitfalls in the application of marginal costs? Discuss these matters critically.
- (b) Give a brief account of a practical application of marginal costing which you consider sound from a policy viewpoint.

8. Tapgun Industries Limited manufactures paints in 4-litre cans. The selling price of the product is N280 with standard cost of N180 made up as follows:

Direct materials	N100
Direct labour	N20
Variable overheads	N30
Fixed overhead	N30

In the months of April and May 1999, the company's production and sales reports were as follows:

	<u>April</u>	<u>May</u>
Production (qty)	10,000	10,000
Sales (qty)	8,000	12,000

You are required to:

- (a) Prepare the company's operating statements for the two months using:
- (i) the marginal costing technique; and
 - (ii) the absorption costing technique.
- (b) Comment on the results of the two techniques with particular reference to difference in the stock valuation; and the operating profit. *(ICAN Intermediate, Nov. 1999)*

CHAPTER TEN

COST-VOLUME-PROFIT ANALYSIS

CHAPTER CONTENTS

- a. The concept of Cost-Volume-Profit Analysis, C-V-P Analysis
- b. Break-Even-Point
- c. Margin of Safety
- d. Graphical presentation of C-V-P Analysis

10.0 Objectives

After studying this chapter, readers should be able to:

- explain the meaning and importance of C-V-P Analysis;
- explain the concept of break even analysis and computation of Break-Even-Point; BEP and P/V ratio or contribution margin ratio
- explain the meaning of margin of safety and use formula to determine margin of safety;
- present graphical approach for C-V-P analysis

10.1 Cost-Volume-Profit Analysis

10.1.1 The Concept of Cost-Volume-Profit

Cost-Volume-Profit (CVP) analysis involves the analysis of how total costs, total revenues and total profits are related to sales volume, and is, therefore, concerned with predicting the effects of changes in costs and sales volume on profit. It is an analysis that guides decision making in respect of going into a production process, expanding an existing production level or diversifying into unusual areas of operations.

CVP analysis seeks to find out answers to the following questions:

- a. What would be the cost of production under different circumstances?
- b. What has to be the volume of production?
- c. How many units of each product can be manufactured in order to earn target profit?
- d. What is the difference between the selling price and cost of production?
- e. What are the effects of a percentage increase or decrease in cost on production volume and on profit;

If carefully used, the technique might be helpful in:

- i. budgeting process. The volume of sales required to make a profit and the "safety

- margin" for profits in the budget can be measured;
- ii. pricing decision and sales volume decisions;
 - iii. sales mix decision, i.e. in deciding what proportions of each product should be sold;
 - iv. decisions affecting the cost structure and production capacity of the company.

10.1.2 Importance of Cost-Volume-Profit Relationship

An understanding of the inter-relationship between these three forces, and of the probable effect that any change in sales volume would have on the business, is extremely helpful to management in a broad variety of problems involving planning and control. The relationship between cost, volume and profit makes up the profit structure of an enterprise. It is only through the knowledge and intelligent use of such information that the prediction of the probable effect of any number of contemplated actions is made possible. This makes Cost- Volume-Profit relationship analysis an important tool for budgeting and profit-planning.

The data used in the review of such relationships may come from several sources and may differ considerably in adaptability and usefulness. In companies where a rather complete sales analysis is made and flexible budgets and standard costs are available, the records would provide the necessary information in readily usable form. Costs, in all probability would have been segregated into the fixed and variable elements. In case such sources are not available, the conventional historical records might be utilized. Quite detailed analysis may be necessary to isolate the effects of changes in volume, selling prices and variable cost.

However, if cost control has been weak, the relationship between volume and cost will be difficult to trace and the margin of error will be high. Thus, the accuracy of results would depend greatly on the reliability of the data and the validity of assumptions. Very often, for investment and credit purposes, published financial statements are used as source data in studying the effects of volume on the business.

10.2 The concept of Break-even Analysis

The C-V-P analyses short-term profit planning that establishes relationship among costs, volume and profit. Even though profit determination is important, it is equally necessary to find out production capacity utilisation that enables a firm to break even in order to enable the firm determine the viability of its business. The C-V-P Analysis is broad, while the narrow concept of C-V-P analysis is referred to as Break-even point analysis.

The Break-Even-Point is the level of production activity at which there is neither profit nor loss. At Break-even-point, BEP, total cost incurred for a product equates total revenue realised for selling the product.

Thus at BEP:

Total Cost = Total Revenue

i.e $TC = TR$ or $TR - TC = \text{Zero Profit}$

where $TC = \text{Total Fixed Cost} + \text{Total Variable Cost}$.

After the BEP, fixed cost is no longer incurred. The cost incurred after BEP is limited to variable cost.

10.2.1 Assumptions of Break-even Analysis

Break-even-analysis and Cost-Volume-Profit analysis are based upon certain assumed conditions which are to be rarely found in practice. Some of these basic assumptions are as follows:

- a. The principle of cost variability is valid.
- b. Costs can be resolved into their fixed and variable components.
- c. Total Fixed costs remain constant throughout the relevant range.
- d. Variable costs per unit vary proportionally with volume.
- e. Selling price does not change as volume changes.
- f. There is only one product or, in the case of multiple products, sale mix remains constant.
- g. There will be no change in general price level.
- h. Productivity per worker remains mostly unchanged.
- i. There is synchronization between production and sales, i.e. no inventory
- j. Revenue and costs are being compared with a common activity base e.g, sales value of production or units produced.
- k. The efficiency of plant can be predicted.

A change in any one of the above factors will alter the break-even point so that profits are affected by changes in factors other than volume. Thus, the break-even chart must be interpreted in the light of the limitations of underlying assumptions, especially with respect to price and sale mix factors.

10.2.2 Computation of Break-Even-Point, BEP

BEP can be computed through different mathematical approaches. However, the two

most popular mathematical approaches are: (i) equation technique or (ii) contribution margin technique.

- (i) *The equation technique:* This technique uses the following formula which also expresses the relationship of the items of income statement.

$$\text{Sales at BEP} = \text{Variable Expenses} + \text{Fixed Expenses} + \text{Zero Profit}$$

$$\text{or TR} = \text{TC} + \text{Zero Profit.}$$

This simple equation may be adapted to any break-even or profit estimate situation.

- (ii) *Contribution margin or marginal income technique:* This is obviously based on the concept of marginal costing. Contribution margin is the difference between sales and variable expenses. Where break-even point is desired, sales and expenses are analysed as thus:

$$\text{Unit selling price} - \text{Unit variable expenses} = \text{Unit contribution}$$

$$\text{And, Contribution} - \text{Fixed Cost} = \text{Profit}$$

This unit contribution margin is divided by total fixed expenses to secure the number of units which have to be sold to break-even.

i.e.
$$\frac{\text{Fixed Expenses}}{\text{Contribution per unit}}$$

These two techniques can be illustrated by an example.

Illustration 10.1: Mathematical Approach

Alhaji Gazali plans to sell toy rockets at Kano International Trade Fair. He may purchase these rockets at ₦5 each, with the privilege of returning all unsold rockets. The booth rent at the fair is ₦2,000 payable in advance. The rockets will be sold at ₦9 each.

Determine the number of rockets, which must be sold, to break-even as well as the number of rockets to be sold to yield a 20 per cent operating margin on sales.

(a) **Equation Technique**

$$\text{Sales} = \text{Variable costs} + \text{Fixed Costs} + \text{Profit.}$$

Assuming that A is the number of units to be sold to break-even, the values in the above formula can be substituted as follows:

$$9A = 5A + ₦2,000 + 0$$

$$9A - 5A = ₦2,000$$

$$4A = ₦2,000$$

$$A = \text{N}2,000/4$$

$$A = 500 \text{ units}$$

(b) **Contribution Margin Technique**

Here, BEP is determined as:

$FC \div \text{Contribution per unit}$

From the illustration, $FC = \text{N}2,000$

Unit contribution = Unit sales price – Unit variable cost i.e

Unit contribution = ~~N9~~ – ~~N5~~ = ~~N4~~ per unit

Then, BEP in unit =

$$\frac{\text{Fixed Costs}}{\text{Contribution per unit}}$$

$$= \text{N}2000 \div 4 \text{ or } 500 \text{ units}$$

Determination of production volume or production units that will realise 20% profit margin:

Sales = Variable costs + Fixed costs + Profit

Assuming that X is the number of units to be sold to yield desired profit, the values in the above formula can be substituted as:

$$9X = 5X + \text{N}2,000 + .2(9X)$$

$$9X = 5X + \text{N}2,000 + 1.8X$$

$$9X - 1.8X - 5X = \text{N}2,000$$

$$2.2X = \text{N}2,000$$

$$X = 909.09 \text{ units approx.}$$

$$\text{Or } X = 910 \text{ units.}$$

Other simple formulae that can be used to determine cost-volume-profit relationship are as follows:

i. Break-even point (in N)

$$= \frac{\text{Fixed Cost}}{\text{Contribution Margin Ratio, CMR}}$$

OR C/S Ratio

Note that C/S Ratio is also termed as Profit-Volume Ratio i.e P/V Ratio

Where:

$$C/S \text{ ratio} = \frac{\text{Contribution per unit}}{\text{Sales price per unit}} \times 100$$

ii. Level of sales to result in target profit (in units)

$$= \frac{\text{Fixed Costs} + \text{Target Profit}}{\text{Contribution per unit}}$$

Note: This formula was applied above to solve for production volume required to earn 20% profit margin.

iii. Level of sales to result in target profit (in ₦ or in monetary value)

$$= \frac{\text{Fixed Costs} + \text{Target Profit}}{\text{Contribution per unit}} \times \text{sales price/unit}$$

Or
$$\frac{\text{FC} + \text{Target Profit}}{\text{C/S Ratio or P/V Ratio}}$$

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

$$\text{Target Profit after Tax} = \frac{\text{Fixed costs} + \text{Profit (1- tax rate)}}{\text{Contribution per unit}}$$

Note that the Profit specified in the above equation is termed as Profit before tax

NB: The above formulae are applicable only to single product firm or one with constant mix of sales. In case of a multi-product firm the break-even point is calculated as follows:

$$\text{Break-even point} = \frac{\text{Total Fixed Cost for all the products}}{\text{Weighted C/S Ratio or P/V Ratio}}$$

Where Weighted P/V Ratio =

Total contribution realised for all products ÷ Total sales revenue earned on all the products sold.

10.2.3 Profit-Volume Ratio, P/V Ratio

Profit Volume Ratio, P/V Ratio or Contribution Margin Ratio, CMR establishes the relationship between contribution and sale revenue. It determines the profitability of a product. It can be calculated in different ways below:

$$1. \text{ P/V Ratio} = \frac{\text{Unit Contribution}}{\text{Unit Sales Price}} \quad \text{i.e.} \quad \frac{S - V}{S}$$

$$2. \text{ P/V Ratio} = \frac{\text{Total Contribution}}{\text{Total Sales Revenue}} = \frac{\text{TSR} - \text{TVC}}{\text{TSR}}$$

Where: S indicates unit contribution

V indicates unit variable cost

TSR indicates total sales revenue

TVC indicates total variable cost

$$3. \text{ P/V Ratio} = \frac{\text{FC} + \text{Profit}}{\text{Total Sales}}$$

Illustration 10.2: Another Mathematical presentation

Time Dey Nigeria Limited manufactures and sells a unique product, the selling price of which is ₦20.

The summarized profit and loss statement for last year is as follows:

	₦	₦
Sales		800,000
Direct materials	120,000	
Direct wages	160,000	
Variable production overhead	80,000	
Fixed production overhead	100,000	
Fixed Administration overhead	75,000	
Fixed Selling and Distr. Overhead	<u>60,000</u>	<u>595,000</u>
Net Profit before tax		205,000
Less: provision for taxation (40%)		<u>82,000</u>
Net Profit after tax		<u><u>123,000</u></u>

Required:

- Calculate the break-even point for last year.
- What do you understand by the terms 'profit volume ratio' and 'margin of safety'. Illustrate using last year's result.
- Determine the number of units to sell in the current year to achieve an after-tax profit of ₦150,000
- Calculate the sales value required to achieve a net profit before tax of 15% of total revenue.
- Assuming no change in unit selling price and cost structure, calculate the percentage increase in sales volume required in the current year to produce a profit before tax 20% higher than last year's results.
- Calculate the selling price per unit that the company must charge in the current year to cover a potential increase of 12% in variable production costs this current year and still maintain last year's contribution margin ratio.
- Determine the volume of sales (in ₦) that the company must achieve in the current year to maintain the same net profit of last year, if the selling price remains at ₦20 and variable cost per unit increases by 12%.
- Recalculate last year's result if salesmen commission of 10% is introduced, selling price is

reduced by 13% and volume increases by 30%.

Solution 10.2

i. (a) Break-even point (in ₦)

$$\begin{aligned}\text{B. E point} &= \frac{\text{Fixed Costs}}{\text{Contribution/unit}} \times \text{selling price/unit} \\ &= \frac{\text{₦}235,000}{11} \times \text{₦}20 \\ &= \underline{\underline{\text{₦}427,273}}\end{aligned}$$

$$\text{Note that P/V Ratio} = \frac{\text{Unit or Total Contribution}}{\text{Unit or Total Sales Price}}$$

$$\text{Or } 11 \div 20$$

(b) Break-even point (in units)

$$\begin{aligned}&= \frac{\text{Fixed costs}}{\text{Contribution/unit}} \\ &= \frac{\text{₦ } 235,000}{11} \\ &= \underline{\underline{21,364 \text{ units}}}\end{aligned}$$

Workings:

1. Calculation of fixed costs:

	₦
Production overhead	100,000
Administration overhead	75,000
Selling & Distr. overhead	<u>60,000</u>
	<u>235,000</u>

$$\begin{aligned}2. \text{ Units of Production} &= \frac{\text{₦}800,000}{\text{Unit S.P}} \\ &= \frac{\text{₦}800,000}{20} = 40,000 \text{ units}\end{aligned}$$

$$\begin{aligned}3. \text{ Unit VC} &= \frac{\text{Total VC}}{40,000 \text{ units}} \\ &= \frac{\text{₦}360,000}{40,000 \text{ units}} = \text{₦}9 \text{ per unit}\end{aligned}$$

4. Contribution per unit:

$$\text{Selling price per unit} - \text{Variable cost per unit}$$

$$= \text{₦}20 - \text{₦}9 = \text{₦}11$$

ii. (a) A profit volume (P/V) ratio indicates the relationship between contribution and revenue. It is otherwise referred to as contribution margin ratio (CMR) or contribution sales ratio (CSR).

It is calculated in the following ways:

1. P/V ratio = $[SP - VC] \div SP$
2. P/V ratio = $CM \div SP$
3. P/V ratio = $\frac{TS - TVC}{TS}$
4. P/V ratio = $[\text{Total Contribution}] \div \text{Total sales}$
5. P/V ratio = $[FC + \text{Profit}] \div \text{Total Sales}$

Calculation of P/V ratio:

$$\text{P/V ratio} = \frac{CM}{SP} = \frac{\text{₦}11}{\text{₦}20} = 0.55$$

Interpretation

The P/V ratio of 0.55 means that for every one ₦ sale generated 55 kobo profit be generated.

10.2.4 The Concept of Margin of Safety

Margin of Safety, M/S

Margin of safety is expressed as the amount at which forecast revenue exceeds or falls short of that required to break even (CIMA). It is the difference between the forecast sales at profit level and that of sales at break-even point. It is expressed mathematically as:

$$i. \quad M/S = S_f - S_b \text{ (in monetary value)}$$

Where:

S_f = forecast sales

S_b = sales at Break-even point

$$ii. \quad \text{M/S Ratio:}$$

$$\left\{ \frac{S_f - S_b}{S_f} \right\} \times 100$$

Calculation of Margin of Safety from Illustration 10.2

		₦	Units
Sales	(B)	800,000	40,000
Break-even point		<u>427,273</u>	<u>21,364</u>
Margin of safety	(A)	<u>372,727</u>	<u>18,636</u>

in percentage for **or**

M/S Ratio: (A/B x 100%)	47%	47%
-------------------------	-----	-----

$$M/S = S_f - S_b = \text{N}800,000 - 427.273 = \text{N}372,727$$

The margin of safety of 47% means that our sales must fall by more than 47% before we sustain loss. Level of sales required to achieve a target profit (after tax) of N150,000 (in units). The answer is given by Target profit

$$\begin{aligned}
 &= \frac{\text{Fixed cost} + 150,000 (1 - \text{rate})}{\text{Unit Contribution}} \\
 &= \frac{\text{N}235,000 + 150,000 (1 - 0.4)}{11} \\
 &= \underline{44,091 \text{ units}}
 \end{aligned}$$

iv. Level of sales to result in net profit before tax of 15% of total revenue.

$$Y = \frac{\text{Fixed Cost} + \text{Target profit}}{\text{Contribution margin ratio}}$$

$$Y = \frac{235,000 + 0.15Y}{0.55}$$

$$0.55Y = \text{N}235,000 + 0.15Y$$

$$0.55Y - 0.15Y = \text{N}235,000$$

$$0.40Y = \text{N}235,000$$

$$Y = \frac{\text{N}235,000}{0.4}$$

$$= \text{N}587,500$$

Workings:

Contribution margin ratio is determined as follows:

$$= \frac{\text{Selling price} - \text{Variable cost}}{\text{Selling price}}$$

$$= [20 - 9] \div 20$$

$$\text{or } 11 \div 20 = 0.55$$

Level of sales to result in target profit.

$$= \frac{\text{Fixed costs} + \text{Target profit}}{\text{Contribution per unit}}$$

$$= \frac{\text{N}235,000 + (120\% \text{ of } 205,000)}{11}$$

$$= \frac{\text{N}235,000 + \text{N}246,000}{11}$$

$$= \underline{\underline{43,727 \text{ units}}}$$

Percentage increase:

$$= \frac{43,727 \text{ units} - 40,000 \text{ units}}{40,000 \text{ units}} \times 100\%$$

$$= \underline{\underline{9.32\%}}$$

vi. Contribution margin ratio of last year = Contribution margin ratio of this year

$$0.55 = \frac{\text{Revised SP} - \text{Revised VC per unit}}{\text{Revised SP}}$$

$$0.55 = \frac{\text{RSP} - \text{RVC}}{\text{RSP}}$$

$$0.55 = \frac{\text{RSP} - (9 \times 1.12)}{\text{RSP}}$$

$$0.55 = \frac{\text{RSP} - 10.08}{\text{RSP}}$$

$$0.55 \text{ RSP} = \text{RSP} - 10.08$$

$$\text{RSP} - 0.55 \text{ RSP} = 10.08$$

$$0.45 \text{ RSP} = 10.08$$

$$\text{RSP} = 10.08 \div 0.45$$

$$\text{RSP} = \underline{\underline{\text{N}22.4}}$$

$$\text{Confirmation P/V} = \frac{\text{RSP} - \text{RVC}}{\text{RSP}} = \frac{22.4 - 20.08}{22.4}$$

$$= 12.32 \div 22.4 = 0.55$$

Note:

Variable Production Cost

DM	120,000
DW	160,000
VPO	<u>80,000</u>
Variable Production Cost	<u>360,000</u>
Unit VPC	$360,000 \div 40,000$
	= N 9 per unit

vii. Sales value required to achieve a target profit of ~~N~~205,000

$$= \frac{\text{FC} + \text{TP}}{\text{Contribution/unit}} \times \text{Unit selling price}$$

$$= \frac{\text{N}235,000 + 205,000}{9.92} \times 20$$

$$= \underline{\underline{N887,097}}$$

Workings:

Contribution per unit is determined as follows:

$$\begin{aligned} &= \text{SP} - \text{RVC/U} \\ &= N20 - (N9 \times 1.12) \\ &= N20 - N10.08 = \underline{\underline{N9.9}} \end{aligned}$$

viii. Revised Income Statement

	N	N
Sales ((N20 x 0.87) x (40,000 x 1.30))		904,800
Less: Variable Cost (52,000units x 9)	468,000	
Salesmen comm. (10% of 904,800)	<u>90,480</u>	<u>558,480</u>
Total Contribution		346,320
Less: Fixed Costs		<u>235,000</u>
Net Profit before tax		111,320
Less: 40% tax		<u>44,528</u>
Net Profit after tax		<u>66,792</u>

10.2.5 C.V.P Graphs

In addition to determining break-even value and P/V Value mathematically, some business organisations usually at the same time present C-V-P graphs in order to enable managers appraise the business profitability at a glance.

Thus, it removes the danger accompanying many accounting reports, a danger that the report would get bogged down with unnecessary details in such a way that managers may never come to grip with the heart of the matter.

Generally, C-V-P graphs can be split into different component graphs. However, this study pack only covers two types of C-V-P graphs that include:

- i. Break-Even Point Graph, and
- ii. Profit-Volume, P/V Graph

10.2.5(a) The Break-Even Point Graph

A break-even chart shows the level at which total cost incurred for a product equates total revenue realised. The break-even point is obtained where total cost graph intersects with

the total revenue graph. The costs and revenues are indicated in the Y-axis while output in units is indicated in the X-axis.

The total cost line is obtained from:

Total Fixed Cost + Variable Cost at different production units

While:

The total revenue line is obtained from:

Total revenue at each level of output, which is the product of output multiplied by unit selling price.

10.3 Illustration 10.3: Graphical demonstration

A company makes and sells a single product. The variable cost of production is ₦3 per unit, and the variable cost of selling is ₦1 per unit. Fixed costs total ₦6,000 and the unit selling price is ₦6. The company budgets to make and sell 3,600 units in the next years.

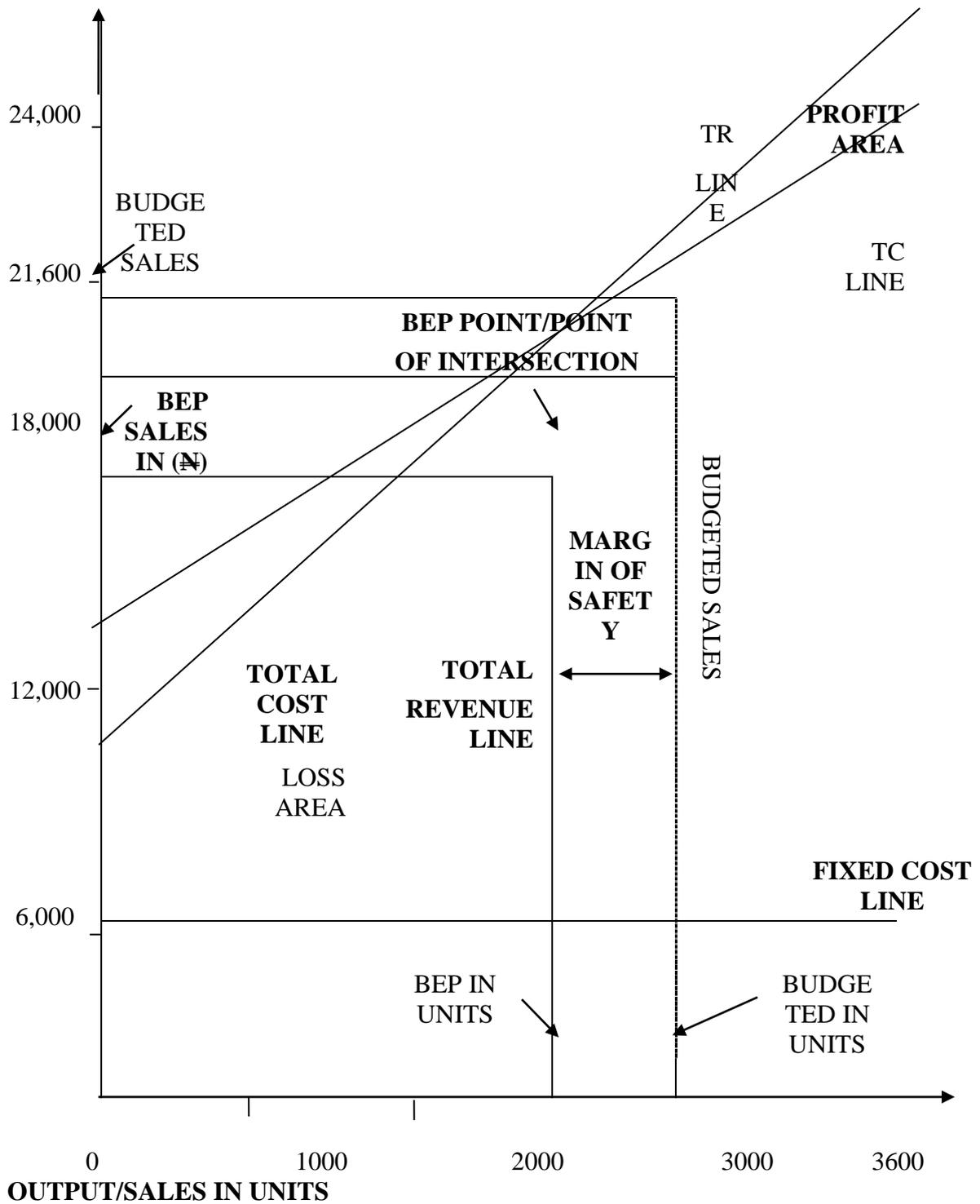
Required: A break-even chart and later to plot (i) Profit-Volume graph, with each graph showing the expected amount of output and sales required to break even, and the safety margin in the budget.

Solution 10.3 (i) Break-Even Chart

The break-even chart shows:

- Fixed cost line of ₦6,000,
- Total costs line, with variable cost added to fixed cost line, and
- Total revenue line

Figure 1: Break Even Chart



Note:

- i. At BEP, TC Line = TR Line = Point of intersection
= 3,000 units sold for ₦18,000
At BEP, Profit = Zero

- ii. M/S from the graph:

Revenue in:

	₦	Units
Budgeted	21,600	3,600
Break-Even Point	18,000	3,000
Margin of Safety	3,600	600

Thus, the sales revenue can be fall by ₦3,600 sales revenue or by 600 units and the firm can still break even with zero profit.

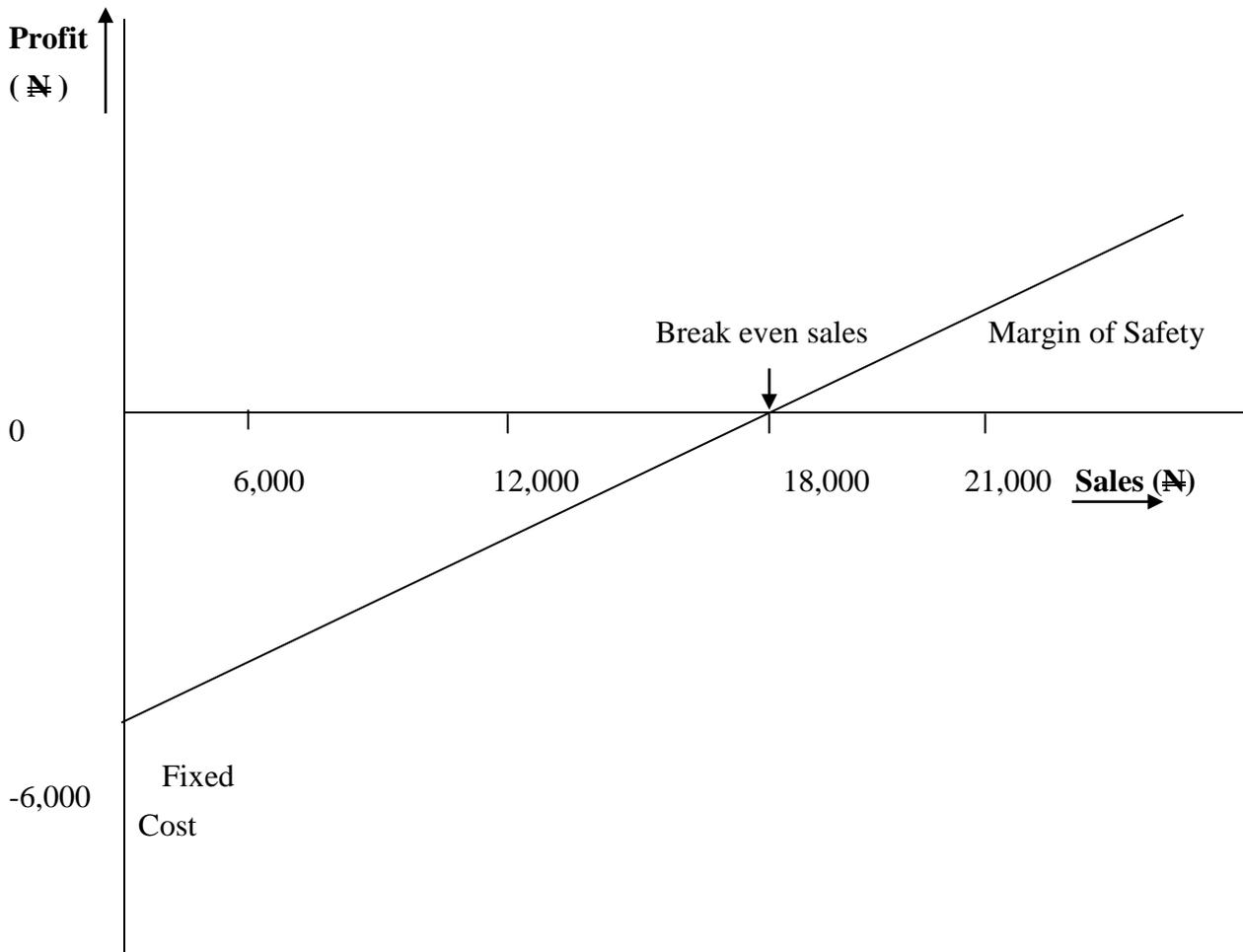
10.2.5(b) The Profit-Volume Chart, P/V Chart

The P/V graph establishes relationship that exists between sales revenue and profit at different level of activities.

In plotting P/V graph:

- i. Determine break even sales in monetary value, having zero profit at x-axis.
- ii. Determine the loss incurred when there is no production and no sales. This is equal to the total fixed cost.
- iii. Join the two points with a straight line.

Figure 10.2: P/V Chart



From the graph:

- i. Break even sales at zero profit = ₦18,000
- ii. Margin of Safety = ₦21,600 – ₦18,000 = ₦3,600 i.e $S_f - S_b$
or 16.67% of budgeted revenue

10.3 CHAPTERSUMMARY

In this chapter efforts have been made to focus on cost-volume profit analysis in decision making. The chapter has also discussed the concept of break-even point, the P/V ratio and margin of safety. At the same time, the chapter illustrated the determination of BEP points, P/V ratio and margin of safety through mathematical formulae, and finally plotted break-even point chart as well as profit-volume chart.

MULTIPLE-CHOICE AND SHORT ANSWER QUESTIONS

1. Which one of these is NOT an assumption of Break-even analysis?
 - A. Fixed costs remain constant
 - B. Variable costs vary proportionally with volume
 - C. There is no synchronization between production and sales
 - D. Costs can be resolved into their fixed and variable components
 - E. Selling price does not change as volume changes
2. What is margin of safety?
 - A. The amount by which actual or budgeted output/sales may fall short of the budget without incurring a loss
 - B. The amount by which budgeted output/sales may fall short of the actuals without incurring a loss
 - C. The point where actual output/sales agree with the budget
 - D. The area immediately preceding the break-even point
 - E. The area where fixed assets are equal to variable costs
3. What happens at the area before the break-even point?
 - A. No profit, no loss
 - B. Marginal profit
 - C. Huge profit
 - D. Loss
 - E. No revenue
4. The point at which total revenues equal total costs is known as
5. The number of units of products to be sold to be able to break-even is given by the formula
6. Break-even point in Naira can be calculated by multiplying the break-even point in units with

SOLUTION

1. C
2. A
3. D
4. Break-even point
5. $\frac{\text{Fixed Costs}}{\text{Contribution Per Unit}}$
6. Unit selling price

-

EXAMINATION TYPE QUESTIONS

- 10.1 An electrical goods manufacturing company made a 10% profit on sales of ₦ 1 million in the last trading year. The composition of its costs was direct labour 25%, direct materials 60% and fixed overhead 15%.

The general manager has drawn your attention to the fact that, although the sales were just below forecast, the profit was very much lower than he had expected.

Your initial investigation shows that the significant difference appears to be caused by the direct labour costs. The company uses the marginal cost accounting principle to price its products. In all price quotations the direct labour was treated as a variable cost directly related to volume of output. However, the review indicates that the direct labour cost showed little change when output decreased for any reason.

You are required to:

- (a) state whether you agree that direct labour costs should be treated as wholly variable with output.
- (b) calculate, using the last year's results, the sales volume at break-even point and the margin of safety when the direct labour costs are treated as:
- wholly variable
 - fixed.

- 10.2 The following figures relate to Prudent Nigeria Ltd which manufactures varied range of products:

<u>Year</u>	<u>Total Sales</u>	<u>Total Costs</u>
	₦	₦
1	39,000	34,800
2	43,000	37,600

Required:

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

- (i) Calculate:
- the fixed cost
 - the profit/volume ratio
 - the break-even point
 - the margin of safety for years 1 and 2

- (ii) How might the profit/volume ratio be improved, apart from increasing prices or reducing cost? 9.3
- (a) Cost-Volume-Profit (C-V-P) analysis is a technique available to management to understand better the inter-relationship of several factors which affect a firm's profit. As with many such techniques, the accountant over simplifies the real world by making certain assumptions. Mention five major assumptions underlying C-V-P analysis
- (b) Yakasai Toys Company's tentative budget for product Q for 2004 is as follows:

		N
Sales (2,500) @ N40		100,000
Manufacturing cost of		
goods sold:		
Direct labour	15,000	
Direct materials	14,000	
Variable factory O.H.	10,000	
Fixed factory O.H.	<u>5,000</u>	
Total manufacturing costs		<u>44,000</u>
Gross Profit		56,000
Selling expenses:		
Variable	6,000	
Fixed	10,000	
Admin. expenses:		
Variable	5,000	
Fixed	<u>10,000</u>	
Total selling & Admin. Exps.		<u>31,000</u>
Operating Income		<u>25,000</u>

Required:

- (i) How many units of product Q would have to be sold to break-even?
- (ii) What would the operating income be if projected sales increased by 30%?

10.3 Universal Cloth Manufacturing Limited has recently rented a new factory and intends to produce a newly developed man-made fibre "Texlon". The company previously had two other large mills. The combined installed capacity of the three mills will enable the company

to provide a wide range of products to its numerous customers.

It has planned to produce "Texlon" in the new mill, first on a single shift and six months later a double shift will be introduced. Three months thereafter a treble shift becomes operational. The production, cost and selling price per unit are as follows:

	Single <u>Shift</u>	Double <u>Shift</u>	Treble <u>Shift</u>
Production/ week (units) up to	1,500	1500-2,500	2501-4,000
Selling price/unit	₦5	₦5	₦5
Variable cost/unit	₦3.00	₦3.20	₦3.50
Fixed cost/week	₦2,000	₦2,520	₦3,030

The managing director has requested for the following information:

- i. The break-even units per week of each shift.
- ii. What is the total unit cost for each shift at break-even and at full capacity?
- iii. What is the profit/loss for each shift at 50 percent of the installed capacity (or increased capacity)?

Single shift	750 units
Double shifts	2,000 units
Treble shifts	3,250 units
- iv. What is the profit per week at full capacity for each of the three shifts and the unit variable and fixed cost?

10.4(a) Explain the term 'break-even point'. Give an example illustrating your answer. Also mention the types of problems which an accountant can expect to solve with the help of such analysis.

(b) Draw a break-even chart with few illustrative figures.

(c) Explain the Cost-Volume-Profit relationship. How would a change in the selling price affect it?

10.5 You are the Finance Manager of a manufacturing company based in Gusau. In the past one year, the company has been facing very difficult times and incurring trading losses, due to unfavorable fiscal policy and mismanagement. Your new Managing Director, a young

intelligent man who believes that all problems have solution, has just returned from a workshop in the UK on Finance for Non-Finance Managers. He was told in the workshop that one of the main benefits of Profit/Volume Ratio is that it could be used to calculate the effect of changes in volume or costs on profit. The MD is convinced that this concept will be very helpful for the dynamic marketing strategy which the company is presently considering.

The following details are available:

	₦
Selling price per carton of product	1,200
Variable cost per carton	1,000
Variable distribution expenses per carton	50
Annual fixed expenses:	
Storage	200,000
Wages	100,000

An Exco meeting has been scheduled for next week and you have been requested by your MD to consider the following scenarios and provide computations on your spreadsheet showing the company's position under each scenario. Please remember to consider each case independently.

- (i) The Marketing Director thinks that by spending ₦20,000 monthly on advertising, he can achieve annual sales of 5,000 cartons. What will the profit be under this scheme?
- (ii) The wages are paid to the Marketing Field Force who sells the products. They have now offered to forgo these wages in exchange for a ₦25 commission for every carton sold as an alternative to the Marketing Director's proposal. If this proposal is accepted, what would be the annual break-even point in sales revenue and in unit sales?
- (iii) In the company plan, the target profit is ₦600,000. How many cases must be sold to achieve this figure (ignore the Marketing Director's proposal):
 - (a) Assuming the Marketing Field Force received their ₦100,000 salaries?
 - (b) Assuming the Marketing Field Force is paid commission?
- (iv) What level of sales produces a profit figure which is the same whether Marketing Department is paid by salary or by commission? (ignore the Marketing Director's proposal)

(ICAN Intermediate, Nov., 2000)

- 10.6 ABC Ltd manufactures one product only which it sells at ₦20 per unit. Existing plant has a maximum capacity of 20,000 units per annum at which level net profit is ₦1.50 per unit and

the profit/volume ratio is 20%. New plant is to be purchased, having a maximum capacity of 30,000 units per annum, but which will result in fixed costs being increased by ₦15,000 per annum. Variable costs will be reduced by ₦4 per unit and to achieve an increase in sales, the selling price is also to be reduced by ₦4 per unit.

You are required to:

- (a) Explain what you understand by the terms profit/volume ratio and margin of safety.
- (b) Calculate the revised P/V ratio as a result of the purchase of the new plant.
- (c) Calculate the number of units which would be required to be produced using the new plant, to give 50% increase in profit compared with maximum production using the old plant.
- (d) Calculate the margin of safety if the actual level of sales is 25,000 units, assuming the new plant is purchased. (*PEI - May, 2001*)

10.7 Briefly describe the following forms of pricing:

- (i) Total cost-plus profit percentage
- (ii) Marginal cost-plus contribution percentage
- (iii) Break-even pricing
- (iv) Negotiated pricing
- (v) Competitors-price-minus.

10.8 **Electrical Appliances Ltd records and sells video films at ₦30 each. The result for 1993 and 1994 are summarised below:**

	Sales units	Profit
1993	6,800	₦23,800
1994	8,400	₦39,400

In 1993 and 1994 the company operated at an average of 80% of the available capacity. In 1995 the company has budgeted to operate at 100% capacity. In 1996 the company proposes to acquire additional equipment worth ₦150,000. The equipment will have an effective life of 10 years with no residual value. With the introduction of the new equipment the company proposes to operate at 150% of present capacity. Variable costs will decrease by 10% and selling price will be reduced by 5% to enable all units produced to be sold.

Using the above information you are required to calculate:

- (a) The break-even point of the company for 1995

- (b) The forecast break-even point of the company for 1996
- (c) The forecast profit of the company for 1995 and 1996; and
- (d) The expected rate of return on the additional capital employed in 1996. (*ICAN PE II, May/June, 1995*)

10.9 Tom Limited manufactures a single product. The unit selling price is fixed at ₦40.00 per unit. Other data for the 2017 budgeted year are as follows:

	₦
Sales	600,000,000
Variable Cost:	
Production Cost: ₦16 per unit	
Others ₦8 per unit	
Total Fixed Cost	40,000,000

Management is of the view that the budget preparation is realistic provided, all the departments co-operate with each other. The budget for 2017 is 80% of 2016 budget preparation because of recession in the economy.

Required:

- a.
 - ai. Define principal budget factor.
 - aii. What is the principal budget factor for 2017
- b. Produce Profit-Volume graph for the 2017 budget financial year
- c. From your graph, determine:
 - i. Break-Even Point
 - ii. P/V Ratio
 - iii. Margin of Safety
 - iv. Profit when sales are ₦160,000,000

(12½ Marks)

CHAPTER ELEVEN

SIMPLE INVESTMENT APPRAISAL TECHNIQUES

CONTENTS

- a. Capital Budgets and Decision Making; and
- b. Capital Budgeting Methods

11.0 Objectives:

After studying this chapter, readers should be able to:

- a) appreciate the concept of capital budgeting;
- b) explain the nature and role of capital budgeting decisions;
- c) identify and discuss the traditional methods of appraising investment and one of the Discounted Cash Flow (DCF) techniques (NPV); and
- d) appreciate the necessity of capital budgeting in long term decision making.

11.1 INTRODUCTION

11.1.1 The Concept of Capital Budgeting

Capital budgeting is the planning of expenditure whose returns extend beyond one year; it is the process of deciding whether or not to commit resources to a project whose benefits would be spread over several time periods. It considers proposed capital outlays and their financing. The main exercise involved in capital budgeting is to relate the benefits to costs in some reasonable manner which would be consistent with the profit maximizing objective of the business. Capital budgeting decisions belong to the most significant areas of managerial decisions as they involve estimation and prediction of things requiring a high order of intellectual ability for their economic analysis.

Capital budgeting involves taking decisions on projects with long gestation periods. These projects might be tangible or intangible assets whose benefits would continue to be enjoyed beyond the year of account. The decision on the projects to be financed for the long time benefits to be enjoyed by the investing organization is purely managerial in nature.

11.1.2 The Objectives of Capital Budgeting

Where outlays of funds are made and benefits continue to be enjoyed over an extended period of time, several implications of far reaching importance follow and these implications constitute the rationale for capital budgeting.

Firstly, by making a capital investment, the decision-maker makes a commitment into future, losing some of his financial flexibility in the process. Thus, the purchase of an asset with an economic life of ten years, for example, requires a long period of waiting before the result of this action works itself out and the moment the benefits start coming up, the organization would be more than compensated for the amount invested.

Secondly, as asset expansion is related to future sales, the economic life of the asset purchased represents an indirect forecast of sales for the duration of its economic life. Any failure to accurately make such a forecast would result in over-investment or under-investment in fixed assets. An erroneous forecast of asset needs can result in serious consequences for the firm. If a firm has too much investment in fixed assets, it will be burdened with avoidable heavy expenditure and, if it has not spent enough on such assets, its productive operations would be affected by inadequate capacity.

Thirdly, proper capital budgeting would also lead to better timing of asset acquisition and improvement in quality of assets purchased. This is due to the nature of demand for and supply of capital goods. The former does not arise until sales impinge on productive capacity and such situations occur only intermittently; on the other hand, production of capital goods involves a relatively long period of time so that the business would ordinarily have to wait for about a year or so before new capital goods become available. The matching of the need for capital goods with their availability is one of the functions of capital budgeting.

Finally, asset expansion requires substantial funds which might not be immediately and automatically available. Therefore a determined effort would have to be made to procure them. It is natural that capital expenditure programme of a sizeable amount would entail arrangements for finance well in advance to ensure their availability at the right time.

Thus, the size of funds involved in asset expansion and the fact that expenditures are designed to be recovered in future, which is distant and seemingly imperceptible, makes capital budgeting one of the most critical, delicate and sometimes complex areas of managerial decision. This is so because of the fact that, so many variables e.g. changes in the quality of the product, changes in the quantity of output, changes in the quality and quantity of direct labour, changes in the amount and cost of scrap, changes in the maintenance expenses, down-time, safety, flexibility, etc., are involved in capital budgeting decisions.

Capital budgeting decision is not a routine clerical task to be performed on a mechanical basis though the electronic equipment has facilitated the same to some extent. It requires a continuous monitoring and evaluation of a conglomeration of factors by engineers, cost analyst, economists and other individuals in an undertaking who are competent to make such an evaluation.

11.1.3 Data for Capital Expenditure Decisions

The type of costs required in capital investment decisions differs from those required for accounting purposes because only future costs are relevant for such decisions. Recorded costs may be useful in investment decision but only to the extent that they furnish a starting point for future costs projections.

All estimated costs pertinent to the project under consideration should be included; any expected savings in material costs, particularly those arising from an expected reduction in scrap, should be reflected; prospective changes in direct labour, materials, handling, inspection, etc., should be reckoned; anticipated increases or decreases in specific overhead costs, such as taxes, insurance, power, maintenance, repairs, supplies, etc, must be considered.

The use of plant overhead rate should be avoided. Very often, the new equipment is more automatic than the old and a different cost pattern will emerge. Thus, there is a reduction in supervision, overtime premiums and other overhead costs which have a tendency to vary with direct labour while there is an increase in repairs, maintenance, power and other costs varying with machinery usage.

11.1.4 Opportunity and Interest Costs

Opportunity cost plays an important role in capital budgeting decisions. It represents the loss of alternative income as a consequence to actions adopted. For example, in an expansion project, the economic rather than the book value of the space required for expansion should be taken into account against a proposed investment. In a replacement decision, the realizable value of the existing asset should be treated as a reduction of the cost of replacement.

Accounting reports and statements typically give recognition to contractual interest but ignore imputed interest on capital. While the inclusion of interest is indispensable in investment studies, the determination of an appropriate rate presents difficulties. Interest sometimes is misunderstood as return on investment which consists of two elements: interest and profit.

The former represents the cost of money while the latter is the reward for risk and uncertainty. Interest cost constitutes the minimum acceptance criterion for capital investment projects undertaken for profit. A firm must at least recover its money costs before it can realize a profit on its own investment. On the other hand, the minimum acceptance criterion that can be considered as a reward for risk and uncertainty varies with the nature of the risk assumed.

Depreciation is another cost whose treatment in capital investment analysis differs from other cost accounting reports and analysis. In calculations designed to reveal the desirability of replacing existing machinery and equipment, depreciation of the unabsorbed book value of an existing asset is a sunk cost and is not relevant except for its tax effects. It is only the economic value of the assets that has relevance in replacement decisions.

In capital project decisions, differential revenue, where measurable, cannot be ignored. There are two facets to this problem - the potentiality or capacity of the asset under consideration and the marketability of increased output.

11.2 CAPITAL BUDGETING METHODS

In most business firms, there are more proposals for capital projects than the firm is able and willing to finance. Some proposals are good while others are bad. A screening process has to be devised for finding out the real content of such proposals; methods of differentiating between them have to be developed and, for this purpose, a ranking procedure has to be evolved.

Essentially, the ranking procedure envisaged should relate a stream of future earnings to the cost of obtaining those earnings. Among the many methods of ranking investment proposals, the following are very widely used;

- a) Payback Period method;
- (b) Accounting Rate of Return method;
- (c.) Net Present Value method;
- (d) Profitability Index method; and
- (e) Internal Rate of Return method.

11.2.1 Pay Back Period (PBP) Method

The payback, sometimes called pay-out or payoff method represents the number of years required to return the original investments by savings before depreciation but after the payment of taxes. It is about the length of time it takes a project to recoup its investment. Thus the method attempts to measure the period of time it takes for the original cost of a project to be recovered from the earnings of the project itself. If an investment of ₦100,000 earns ₦50,000 cash proceeds in each of its first two years, its PBP is, therefore, two years.

$$\begin{aligned}
 \text{Pay Back Period} &= \frac{\text{Cost of investment (Initial Outlay)}}{\text{Annual Cash flow (Annual Cash Proceeds/ Savings)}} \\
 &= \frac{\text{₦ 100,000}}{\text{₦ 50,000}} \\
 &= 2 \text{ Years}
 \end{aligned}$$

The available investments are then ranked according to the length of their payback periods so that an investment with a payback of two years is bound to be considered more desirable than an investment with a payback of three years.

Illustration 11.1

Use the information provided in the table below to determine the most viable project between A & B, if N10,000 is to be spent on either of the projects.

Savings Before Depreciation

Year	A	B
1	₦5,000	₦1,000
2	4,000	2,000
3	3,000	3,000
4	1,000	4,000
5	-	5,000
6	-	6,000

Solution 11.1**PROJECT A****PROJECT B**

Year	Cash flow	Cumulative Cash Flow	Cash flow	Cumulative Cash Flow
	₦	₦	₦	₦
0	-10,000	-10,000	-10,000	-10,000
1	1,000	-9,000	5,000	-5,000
2	2,000	-7,000	4,000	-1,000
3	3,000	-4,000	3,000	2,000
4	4,000	0	1,000	3,000
5	5,000	5,000		
6	6,000	11,000		

PBP (A) =

4Years

PBP (B)=

2 Years + 1000/3000

2. 33Years

From the solution provided above, it is clear that project B would require less than three years to recover an original investment of ₦10,000 (its PBP is precisely 2.33 years) while project A would need a payback period of four years. From this point of view, Project B would be preferred to project A.

Illustration 11.2

Koki Nig. Plc. is considering the purchase of a new machine which would carry out some operations that are presently performed by manual labour. The two alternative models under consideration are "Damsel" and "Shylock".

	Machine 'Damsel'	Machine 'Shylock'
Cost of Machine	₦300,000	₦ 500,000
Estimated life (in years)	10	12
Estimated savings in scrap per annum	₦20,000	₦30,000
Additional cost of supervision per annum	₦24,000	₦32,000
Additional cost of maintenance per annum	₦14,000	₦22,000
Cost of indirect material per annum	₦12,000	₦16,000

The following information, from which a profitability statement is to be prepared for submission to the Board of Directors, is available:

Estimated savings in wages:

Wages per worker per annum	₦1,200	₦1,200
workers not required	150	200

Required:

The rate of taxation may be regarded as 50 per cent of profits. Which model can be recommended for purchase? Give reasons for your answer.

Solution

Statement of Profitability

	<u>Machine</u>		<u>Machine</u>	
	<u>'Damsel'</u>		<u>'Shylock'</u>	
	₦	₦	₦	₦
Estimate savings per year:				
Scrap	20,000		30,000	
Wages	<u>180,000</u>	200,000	<u>240,000</u>	270,000
Less:				
Estimated additional Costs per year:				
- indirect materials	12,000		16,000	
- Cost of supervision	24,000		32,000	
- Cost of maintenance	<u>14,000</u>	<u>50,000</u>	<u>22,000</u>	<u>70,000</u>
Savings before dept.		150,000		200,000
Less depreciation		<u>30,000</u>		<u>41,667</u>
Savings after depreciation		120,000		158,333
less tax @ 50 percent		<u>60,000</u>		<u>79,167</u>
Net savings per year		<u>60,000</u>		<u>79,166</u>

Annual cash flow:

Net savings	60,000		79,166	
Depreciation	<u>30,000</u>	<u>90,000</u>	<u>41,667</u>	<u>120,833</u>

On the basis of the profitability statement and according to the payback period method, the board may be advised on the following lines:

	<u>Machine</u> <u>'Damsel'</u>	<u>Machine</u> <u>'Shylock'</u>
Payback period (before tax)	2 years	2 1/2 years
Payback period (after tax)	3.3 years	4 years

Thus, machine 'Damsel' should be recommended for purchase, because it has lower payback period as compared with machine 'shylock'.

The information provided and the conclusion derived may be supplemented by some additional data as regards profitability beyond the payback period.

	<u>Machine</u> <u>'Damsel'</u>	<u>Machine</u> <u>'Shylock'</u>
Before tax	₹ 960,000	₹ 1,266,664
After tax	₹ 720,000	₹ 966,664

Note: Approximation has been made wherever necessary.

Working notes

(i) Calculation of the payback period:

$$\text{Payback period} = \frac{\text{Cost of machine}}{\text{Savings per annum}}$$

Therefore

	Machine Damsel ₹		Machine Shylock ₹	
Before depreciation	<u>300,000</u> 150,000	2 Years	<u>500,000</u> 200,000	2 ½ Years
After Tax	<u>300,000</u> 90,000	3.3 Years	<u>500,000</u> 120,833	4 Years Approx.

11.2.2 Advantages of Payback Period Method

- a) It is easy to understand and simple to operate;
- b) The short-term approach typified by the PBP method reduces the possibility of loss through obsolescence;
- c) A firm which is short of cash must necessarily place a premium on quick return of its funds; and
- d) Payback period method uses project cash flows rather than accounting profit. This qualifies it to be more precise and objective than accounting rate of return.

11.2.3 Disadvantages of Payback Period Method

- a) It ignores cash flows beyond the payback period so that, if a project is one with a longer gestation period, the use of the method would lead to a wrong selection of investments. Such investments are characteristically involved in long-range planning, i.e. developing a new product, developing a new market, etc. requiring initial investments of a huge amount which do not yield their highest returns until a number of years later; and
- b) Payback period method for ranking investment proposals fails to take into account the period of time over which an investment is likely to yield savings. In a way, it ignores the interest factor which is a very important consideration in making sound investment decisions.

Despite its weaknesses, payback period method is the most popular appraisal technique in practice. In developing economies, foreign investors, and even local investors, are more at home with this method than with any other method of investment appraisal.

11.3 Accounting Rate of Return (ARR) Method

The Accounting Rate of Return method requires the addition of all the earnings after depreciation and dividing them by the project's economic life. When this figure of average earnings over the period is obtained, it is divided by the capital invested. It is, therefore, given by average return divided by average investment.

Capital invested may mean the initial capital investment or the average of the capital invested over the life of the project. It may also mean initial investment plus salvage value divided by 2.

Illustration 11.3

Gidauniya Nigeria Limited is considering two projects, each with an initial investment of ₦1,000. Project A has a life of four years, while project B has a life of six years. The depreciation each year for projects A and B is ₦250 and ₦167, respectively. The profits realized by the projects are estimated to be as follows:

Table 11.3

	<u>Project A</u>			<u>Project B</u>		
	<u>Earnings- ₦</u>	<u>Depr</u>	<u>Earnings after depr.-₦</u>	<u>Earnings- ₦</u>	<u>Depr- ₦</u>	<u>Earnings after Depr.-₦</u>
1	500	250	250	100	167	(67)
2	400	250	150	200	167	33
3	300	250	50	300	167	133
4	100	250	(150)	400	167	233
5	-	-	-	500	167	333
6	-	-		600	167	<u>433</u>
			<u>300</u>			<u>1,098</u>

Required:

- a. Calculate the accounting rate of return (ARR) on:
 - (i) Initial capital; and
 - (ii) Average capital

Solution

- (i) Accounting Rate of Return on Initial Capital:

	<u>Project A</u>	<u>Project B</u>
Average profits =	$\frac{\text{₦}300}{4}$	$\frac{\text{₦}1,098}{6}$
	= ₦ 75 p.a.	= ₦ 183 p.a.
ARR =	$\frac{75}{1,000} \times 100\%$	$\frac{183}{1,000} \times 100\%$
	= <u>7.5%</u>	= <u>18.3%</u>

(ii) Accounting Rate of Return on Average Capital

$$\begin{aligned} \text{Average capital} &= \frac{\text{N}1,000 + 0}{2} & \frac{\text{N}1000 + 0}{2} \\ &= \text{N}500 & = \text{N}500 \end{aligned}$$

$$\text{ARR} = \frac{75}{500} \times 100\% \quad \frac{183}{500} \times 100\%$$

$$= \underline{15\%} \quad = \quad \underline{37\% \text{ (approx.)}}$$

In all these cases, project B will be selected in preference to project A because the accounting rate of return from the former is higher. It might be of interest to note that the use of payback method would give priority to project A than to B.

11.3.1 Advantages of ARR

- a) It is very easy to calculate;
- b) It takes savings into account, over the entire economic life of the project; and
- c) It embodies the concept of 'net earning' (after allowing for depreciation) which is very vital in the appraisal of projects.

11.3.2 Disadvantages of ARR

- a) The method suffers from the same fundamental weakness as the payback method, i.e. it ignores the fact that cash flows and outflows occur at different time intervals;
- b) ARR uses the concept of accounting profit, which is quite subjective as compared with cash flows generated by the project; and
- c) The method has different variants, each of which produces a different rate of return for any one proposal. This situation arises due to the diverse concepts of investment as well as earnings.

11.4 Discounted Cash Flow (DCF) Methods

Discounted cash flow methods use cash flows and automatically make allowance for time value of money. As previously mentioned, accounting profits are based on conventions and are less objective than cash flows so that cash flows are preferred for decision making.

There is general acceptance that any serious investment appraisal must consider the time value of money. Some monies arising at different times are not directly comparable. They must be converted to equivalent values at some common date, using a discounting factor.

As investments are essentially outlays of funds in anticipation of future returns, the presence of time as a factor in investment is fundamental rather than incidental. Time is always crucial for the investor so that a sum received today is worth more than the same sum to be received tomorrow. Thus, in evaluating investment projects, it is important to consider the timing of returns on investments. In a way, time is the dimension through which the monetary variables involved in investments - the capital outlays and subsequent receipts - must be related.

Discounted cash flow technique considers the net cash flow as representing the recovery of original investments, plus a return on capital invested.

There are three main DCF methods viz: Net Present Value (NPV) Profitability Index (PI) and Internal Rate of Return (IRR), however, only the NPV is treated in this study guide as other methods are outside the coverage of the syllabus at this level.

11.4.1 Net Present Value (NPV) Method

This method generally establishes a 'target' - a minimum rate below which a proposal would be rejected by management as undesirable in the light of the profit goals and above which it would be considered favourable. It seeks to determine whether present value of estimated future cash inflows at management's desired rate of return will be greater or less than the cost of the proposal. Thus, cash inflow, initial investment and desired rate of return are given in this method while the present value of cash inflows and its deviation from initial investment are to be determined.

The profitability of a project is ascertained by comparing the amount which meets the stated condition (i.e. pre-determined minimum rate, with the actual amount of investment required by the contemplated project). If a project's earnings could return with interest at the market rate an amount greater than that actually required for investment in the project, the project is adjudged profitable.

The NPV method involves calculating the present values of expected cash inflows and outflows through the process of discounting, and establishing whether in total the present value of cash inflows is higher than the present value of cash outflows.

The decision rule is to accept a project which has a positive NPV

Illustration 114

Alhaji Aminu Tijjani is considering buying a machine which will improve his cash flows by ₦60,000 per annum for the next five years, at the end of which the machine will be worn out and be of no value. The machine which will cost ₦150,000 and be bought for cash has an estimated working capital of ₦10,000. Assume that the cost of the capital to the company is 15%.

You are required to calculate the Net Present Value of this project and advice Alhaji Aminu Tijjani.

Year	Cash Flow ₦	Discount Factor@15%	Present Value ₦
0	-160,000	1	-160,000
1	60,000	0.8696	52,174
2	60,000	0.7561	45,369
3	60,000	0.6575	39,451
4	60,000	0.5717	34,305
5	60,000	0.4972	29,831
		NPV	41,130

Alternative solution

Year	Cash Flow ₦	Discount Factor@15%	Present Value ₦
0	-160,000	1	-160,000
1-5	60,000	3.352	301,120
		NPV	41,130

Notes:

- a. The purchase of a machine is a cash outflow that is why it is shown as negative;
- b. The discount factor of 3.352 is cumulative for the five years, and is used to save the effort of multiplying ₦60,000 by the individual figures (in the present value table) for years 1 to 5;
- c. The Net Present Value of the project is positive ₦51,120 (i.e. the difference between the initial outlay on the machine and the discounted cash inflows).

Since the project has a positive NPV, this means that Alhaji Aminu will be getting a return on his investment of more than 15%, as such the project is worthwhile.

- i. If his NPV had been nil, his return would be 15%.
- ii. If the project had shown a negative NPV, the return would be less than 15%, and therefore, it would not be worth undertaking.

Illustration 115

Garko Industries is considering an investment in a fleet of ten delivery vans to take its products to customers. The vans will cost N30, 000 each to buy, payable immediately. The annual running costs are expected to total N40, 000 for each van (including the driver's salary). The vans are expected to operate successfully for 6 years, at the end of which they will all have to be scrapped with disposal proceeds expected to be about N6, 000 per van. At present, the business uses a commercial carrier for all of its deliveries. It is expected that this carrier will charge a total of N460, 000 each year for the next 6 years to undertake the deliveries.

Calculate the ARR and NPV of the project. Use 15% discount rate.

Solution

Net savings before depreciation:

Ten vans will be purchased for N60,000 and the savings to be made by Garko industries per annum are as shown below:

	N
Cost of the carrier (p.a.)	460,000
less annual running costs of the vans (40,000 x 10)	<u>400,000</u>
Net savings before depr.	<u>60,000</u>

Thus the inflows and outflows will be;

<u>Year</u>	<u>Details</u>	<u>N'000</u>
0	Cost of vans	(300)
1	Net savings before depr.	60
2	" " " "	60
3	" " " "	60
4	" " " "	60
5	" " " "	60
6	" " " "	60
6	Disposal proceeds from the vans	60

Assuming a straight-line approach, the total annual depreciation expense will be $\text{N}40,000$ (i.e. $\text{N}300 - 60)/6$).

While the average annual savings after depreciation is $\text{N}20,000$ (i.e. $\text{N}60 - 40$).

The vans will appear in the balance sheet as follows:

		N'000
At the end of year	1	260(300-40)
	2	220(260-40)
	3	180
	4	140
	5	100
	6	60

The average investment at (balance sheet values) will be $\text{N}160,000$ $(260 + 220 + 180 + 140 + 100 + 60)/6$

$$\text{Thus the ARR} = \frac{\text{N}20,000}{160,000} \times 100\% = \underline{\underline{12.5\%}}$$

Calculation of the NPV of the project

Year	Details	Cashflows	Discount Factor	Present Values
		N'000	(15%)	N'000
0	Cost of vans	(300)	1.000	(300)
1	Net savings before Depr.	60	0.870	52.20
2	" " " "	60	0.756	45.36
3	" " " "	60	0.658	39.48
4	" " " "	60	0.572	34.32
5	" " " "	60	0.497	29.82
6	" " " "	60	0.432	25.92
6	Disposal proceeds	60	0.432	<u>25.92</u>
			NPV =	<u>(46.98)</u>

The project is unacceptable as it has negative NPV.

11.5 CHAPTER SUMMARY

Simple investment appraisal techniques' were examined in this chapter. The first two methods examined (Accounting Rate of Return and Pay Back Period methods) also known as traditional methods were found to be seriously imperfect by their failure to take full account of the time value of money. The other three methods, i.e. Net Present Value, Profitability Index and Internal Rate of Return are known as discounted cash flow methods and are rated to be superior to the traditional methods, because they take full account of the time value of money.

MULTIPLE-CHOICE AND SHORT ANSWER QUESTIONS

1. Which of the following is NOT crucial to the decision to commit huge funds into capital asset acquisition?
 - A. Finance availability
 - B. Changes in the quality of the asset over time
 - C. Installation costs
 - D. Useful life and scrap value of the asset
 - E. Maintenance expenses

2. Which one of the following states the reason why opportunity cost is considered in capital budgeting decisions?
 - A. The benefits to be lost in the alternative use of the funds to be committed is very important
 - B. So that if the decision turned out to be faulty, the assets could be quickly disposed off and the proceeds diverted to alternative uses
 - C. Because there may be problems defending the decisions at the company's Annual General Meeting
 - D. Because the bank to finance the capital project will demand for it.
 - E. Because that is the government policy for capital expenditure

3. Which one of the following is NOT a method of appraising investment proposal?
 - A. Payback period
 - B. Feasibility study
 - C. Net Present Value
 - D. Internal Rate of Return
 - E. Accounting Rate Return

4. A system of expenditure planning which facilitates the decision making process as regards committing resources to a project where benefits would be spread over long time period is called
5. The number of years required to recoup the amount originally invested in a project is known as
6. Using the Net Present Value (NPV) investment appraisal method, what would indicate that a project is worthwhile and therefore should be accepted?

SOLUTION

1. C
2. A
3. B
4. Capital budgeting
5. Payback period
6. A Positive NPV

EXAMINATION TYPE QUESTIONS

- (1) Several methods are employed by management accountants for ascertaining the profitability of capital expenditure projects. Discuss briefly one of the following methods:
 - (a) Pay-back method
 - (b) Accounting Rate of Return method.
- (2) A company wishes to expand its production. Two proposals of capital expenditure are being considered, each of the two proposals requires more or less the same outlay. You, as the management accountant of the Company, are required to furnish profitability estimate to guide the Board in its decision. Describe briefly two methods that can be used for this purpose.
- (3) Give a comparative description of the Pay Back Period and Net Present Value approaches of investment appraisal. Which one of the two do you consider superior?
- (4) (a) Describe briefly the Pay Back Period method of investment appraisal techniques and state five advantages and five disadvantages of the method .

(b) Using the information given below, prepare tables showing the Net Present Values of each of the projects based on applicable rates of 12% and 15% per annum respectively:

	Year	Project X ₦	Project X ₦
Initial Investment		100,000	100,000
Cash flows	1	5,000	60,000
	2	20,000	40,000
	3	100,000	100,000
	4	10,000	5,000

Briefly compare the two projects and comment on which of the two projects would be profitable and should be undertaken.

(5) Electro PLC, a manufacturer of high quality cable metals has a 15% market share for one of its products ECM-1. The standard cost and profit margin for one unit of ECM-1 are given below:

	₦	₦
Sales		10.00
Less Direct cost:		
Material	4.00	
Labour	2.00	
Overheads	<u>1.00</u>	<u>7.00</u>
Contribution		3.00
Less: Fixed costs		<u>2.00</u>
Profit		<u>1.00</u>

The budgeted sales of product ECM-1 during 1994 are ₦3,000,000 and the marketing director proposed that the market share could be increased to 20% and maintained at that level for the next three years if the following promotion budgets were agreed to be spent at the beginning of each of the next three years:

Year 1	₦200,000
Year 2	₦150,000
Year 3	₦150,000

The fixed cost of ₦2 per unit includes 50% for depreciation charge. The remaining 50% would be expected to increase by ₦60,000 with the increase in the market share. The company has an overall profit return objective of 30% which they would apply as a hurdle rate to this type of project with the type of risk involved.

You are required to:

- (a) Evaluate whether or not the project should be adopted assuming the above are the only variables to be considered.
- (b) Show with suitable calculations what the outcomes will be if only a 4% increase in market share was achieved.

Present value factors:

Yr.	10%	20%	30%	40%
1	0.9091	0.8333	0.7692	0.7143
2	0.8264	0.6944	0.5917	0.5102
3	0.7513	0.5787	0.4552	0.3644
4	0.6830	0.4823	0.3501	0.2603
5	0.6209	0.4019	0.2693	0.1859

(ICAN Nov/Dec., 1993).

- (6) As the financial consultant of the Bourbon Can Company, a medium sized manufacturing business, you have been asked to advise on the current year's investment proposals. The proposed projects, shown below, are not mutually exclusive:

PROJECT A: To replace existing data processing equipment. Initial Cost is ₦250,000. The expected life of new equipment is 6 years. Expected annual after tax cash inflow ₦72,500.

PROJECT B: To develop a new type of container, costing ₦70,000. The total cost to be incurred in the current year. Expected life of product is 5 years. Expected annual after tax cash inflow ₦30,000, the inflows to commence in one year's time.

PROJECT C: To install safety equipment. Initial cost is ₦90,000. Expected life is 3 years. Expected annual after tax cash inflow ₦45,000.

PROJECT D: To construct a new factory building. Initial cost is ₦210,000. Expected life is 8

years. Expected annual after tax cash inflow ₦57,000.

PROJECT E: To extend the existing loading equipment. Initial cost is ₦170,000. Expected life is 4 years. Expected annual after tax cash inflow ₦70,000.

PROJECT F: To purchase patent rights to a new process. Initial cost is ₦135,000. Expected life is 7 years. Expected annual after tax cash inflow ₦36,000.

You may assume that with the exception of project B, all cash inflows would commence in the current year. For calculation purposes you may assume that the annual cash inflows are always received on the last day of the year. Tax can be assumed to have been paid in the year in which the profits are earned.

The company's weighted average cost of capital for the coming year is estimated at 16%. The company is, however, in a capital rationing situation and its estimates show that it will only have ₦600,000 to invest on capital projects in the current year.

Required:

- (a) Which projects would you recommend the company to undertake? Give reasons for your choice.
 - (b) What factor, if any, other than those given in the question, would you advise the company to consider before making a decision? (ACCA, Financial Management)
- (7)(a) Define any two “traditional” investment appraisal techniques, showing briefly their advantages and disadvantages.
- (a) Demonstrate your knowledge of the more acceptable technique using cash flows expected from two projects being negotiated by the General manager of Usman & Co. Ltd. Both projects require the initial cash investment of ₦25,000 each. Project one will earn ₦8,000 in the first year ₦10,000 and ₦6,000 in the next 2 years and ₦1,000 each in years four and five.
- (8). Modern Tech. Services Ltd is considering two alternative projects for a business expansion programme in the Northern part of the country. The projects have the following Naira cashflow profiles according to the data supplied by the company's Accountant:

<u>Year</u>	<u>Project 1</u> ₦	<u>Project 2</u> ₦
0	-1 million	-3 million
1	-2 million	.20 million
2	.95 million	.50 million
3	.85 million	.65 million
4	.78 million	.75 million
5	.62 million	.80 million
6	.40 million	1.90 million
7	.10 million	.20 million

Required:

- (a) Calculate the payback period for each project.
- (b) Based on payback periods, advice which of the two projects should be chosen.
- (c) State the advantages and disadvantages of the payback period criterion of investment appraisal.

(PE II May/June, 1994).

CHAPTER TWELVE
PERFORMANCE MEASUREMENT
BUDGETING AND BUDGETARY CONTROL

CHAPTER CONTENTS

Definition of Budget
Types of Budget
Principal Budget Factor
Forecasting in Budget
Objectives of budgeting
Budget Process
Budget Committee
Budget Manual
Process of Preparing Initial Budget
Behavioural factors in Budgeting
Preparation of Annual Budget
Introduction to Budgetary Control
Budgetary Control Process
Budgetary Control Improvement Techniques
Incremental Budgeting;
Zero Based Budgeting
Programme Planning Budgeting Systems

12.0 OBJECTIVES

After studying this chapter, readers should be able to explain:

- a) the concept of budgeting
- b) the types of budgets
- c) the concept of principal budget factor
- d) between budgeting and forecasting
- e) the objectives of budgeting
- f) the factors to be considered in introducing budgets for the first time
- g) what is meant by: budget committee and budget manual.
- h) the behavioral factors in budgeting
- i) functional budgets, cash budgets and the master budget
- j) the concept of budgetary control
- k) the objectives of budgetary control
- l) the budgetary control process
- m) the concept of Flexible Budgeting and Fixed Budgeting
- n) the concept of Zero Based Budgeting and Incremental Budgeting
- o) the concept of Programme Planning Budgeting Systems.

12.1 INTRODUCTION

At the beginning of the financial period of every organisation, whether the organisation is

publicly or privately owned, it needs to develop its budget to guide its operations for the year ahead. Budgeting is therefore an important process of every organisation. How effectively the budgeting process is handled in an organization could define success or failure for the organisation.

Budgetary control encompasses the systems of budgeting, standard costing and other control techniques that ultimately aim at positioning the organisation to achieve its objectives. There is no point in developing budgets if no control steps will be instituted to achieve the set budgets, hence the need for budgetary control.

12.2 Definition of Budget

A budget is a quantitative and financial plan of the operations of an organisation or an individual. It identifies the resources and the commitments required to fulfil the organization's or individual's goals for the budgeted period. Thus, a budget includes both financial and non-financial aspects of the planned operations.

The process of preparing budgeting is termed budgeting.

12.2.1 What a Budget is:

A budget has the following features:

- a) It is a plan in quantities and financials
- b) It must have objectives, and a clearly expressed means of achieving the stated objectives
- c) The means to achieve the objectives are the resources required to fulfil those objectives. Thus there must be definite resources set aside to achieve the set objectives.
- d) The set objectives must be achieved within a particular time frame. This time frame is termed the budget period.

12.2.2 Misconceptions about Budgets

A budget is not:

- a) only a narrative plan
- b) only involving price increases in the budgeted period
- c) only developed for states, governments, public or private organization's but may

even be developed for individuals only prepared by economists or accountants but everybody on this universe

12.3 Types of Budgets

There are a variety of budgets; some of them are as stated below:

12.3.1 Long Term Budgeting

This is also referred to as long range planning, strategic or corporate planning. It is a systematic and formalized process for purposely directing and controlling future operations towards desired objectives for periods extending beyond one year.

- a) The planning process involves the following sequential steps :
- b) Identify objectives
- c) Search for alternative courses of action
- d) Gather data about the various alternatives
- e) Evaluate the alternatives on the basis of cost-benefit relationships
- f) Select the optimum alternative and formulate these into plans
- g) Implement the long range plans through annual budgets
- h) Monitor the actual results
- i) Respond to variances

12.3.2 Short Term Budgeting

These are operational plans which generally cover one year and which form the basis of the annual budgets. They are detailed, containing well-defined targets, which translate into work plans and performance measurements for each unit in the business. Short term budgets are a means of implementing strategic plans.

These are developed after due consideration of:

- a) The prevailing business environment viz: internal and external
- b) The available resources viz: physical, human and financial.

12.3.3 Annual Budgets

The annual budget translates the company's long-range plan into short-term operating targets. These are usually developed by involving all people responsible for achieving the targets and objectives of the company.

12.3.4 Functional Budgets

The functional budgets are the budgets developed for the operations of each function in the organization. Usually, the budget for the function that has the binding or effective budget factor or limiting factor is first developed bearing in mind the budget factor.

All the other functional budgets are subsequently developed from the budget of the function with the binding constraint. Most often, sales is the limiting budget factor. However, this is not necessarily always the case. The following are examples of functional budgets:

- a) Sales budget in quantity and in value
 - Other sales related budgets
 - i. Selling and distribution cost budget
 - ii. Advertising cost budget
 - iii. Sales promotion cost budget etc.

- b) Production budget in quantity, and cost
 - Other production related budgets
 - i. Labour usage and cost budget
 - ii. Materials usage and cost budget
 - iii. Material purchases budget
 - iv. Production overhead budget.
 - v. Production cost budget

- c) Service function budgets
 - i. Administration cost budget
 - ii. Personnel cost budget

- d) Policy Related Budgets
 - i. Capital expenditure budgets
 - ii. Research and development budgets
 - iii. Advertising and promotional budget
 - iv. Training and staff development budgets

12.3.5 The Cash Budget

The cash budget summarizes the cash flow effects of all of the functional and policy related

budgets by coordinating them into one summarized statement.

12.3.6 Master Budget

The master budget summarizes all the budgets into a coordinated projected financial statement comprising of:

- budgeted trading, profit and loss account (Income Statement) or income and expenditure account as the case may be;
- budgeted balance sheet or statement of affairs; and
- budgeted cash flow statement for the period.

Other forms of budgeting such as fixed and flexible budgets, periodic and continuous budgets, incremental and zero based budgets, etc. will be explained in the next chapter.

12.3.7 Principal Budget Factor

The principal budget factor or limiting factor or key budget factor is a factor, which at any time is an overriding planning limitation on the activities of the organization. Examples of principal budget factors include: Staffing limitations, scarcity of materials and other logistics, limited financial resources, low sales demand, limited storage facilities, etc.

12.3.8 Forecasting in Budgeting

A forecast is a prediction or estimate of the events which are likely to occur in the future. The forecast becomes a budget only when management accepts it as the objective. Frequently, consideration of the forecast sales leads management to make adjustments to their plans so that the agreed sales budget differs from the original sales forecast.

Forecasting is very essential for facilitating budgeting. Budgeting for future profit or cash flows requires us to forecast future costs and revenues at different level of activities.

12.4 The Objectives of Budgeting

Budgeting is a critical tool set out to:

- a) Aid the planning of annual operations;
- b) Coordinate the activities of the various parts of the organization and to ensure that the parts are in harmony with each other;
- c) Communicate plans to the various responsibility centre managers;
- d) To motivate employees to strive to achieve target;

- e) To control activities; and
- f) To evaluate the performance of managers.

Each of these objectives is further explained below:

12.4.1 Planning

Budgets compel or force planning to take place. The result is that problems are anticipated before they arise and hasty decisions made on the spur of the moment based on expediency rather than reasoned judgment will be minimized. The annual budget also leads to the refinement of strategic plans.

12.4.2 Co-ordination

The budget is a vehicle that synchronizes and harmonizes the separate plans of the different units, sections and segments of the organization. Budgeting compels an examination of the relationships between various operations and hence the resolution of any conflict.

12.4.3 Communication

Top management communicates its expectations to lower management through the budget, which is an executive order. Much vital information about the organisation is communicated through the process of preparing the budget. The budgetary reports are a feedback to management on the performance levels of each unit of the organisation.

12.4.4 Motivation

Realistic and attainable budgets serve as a standard of good performance and thus motivate staff to strive to achieve them. However, for a budget to motivate, all staff must participate in its development.

12.4.5 Control

Variance reports generated from the budgetary control system are a good control mechanism facilitating management by exception, which is efficient and cost effective. Budgets clarify the authority and responsibility of managers by setting budget limits to their spending powers and setting targets to be achieved.

12.4.6 Performance Evaluation

Performance could be evaluated by measuring the success of achieving budgeted results. The budgets based on the accepted standards are the benchmarks for measuring performance.

12.5 The Budgeting Process

12.5.1 Introducing Budgeting for the First Time

When introducing a budgeting system for the first time, it is important to ensure that the following are in place:

- a) A sound financial accounting system
- b) Top management backing for the system
- c) A budget committee
- d) A budget manual.

12.5.2 Necessary Conditions for Successful Budgeting

- a) Top management support
- b) Involvement of line managers
- c) Appropriate accounting and information systems
- d) Budgets to be flexibly administered
- e) Realistic organization structure with clearly defined responsibilities
- f) Clearly defined long term corporate objectives
- g) Regular budget reviews when necessary

12.5.3 The Budget Committee

The Budget Committee is made up of members of senior management that oversees all budgetary matters. A typical budget committee includes the chief executive officer, heads of strategic business units and the chief finance officer. The committee sets or approves the overall budget goals for the organisation, and its major business units, directs and coordinates budget preparation, approves the final budget, monitors operations as the year unfolds, and reviews the operating results at the end of the period.

The budget committee also approves major revisions of the budget during the period. This committee usually consists of sectional or departmental managers and is usually serviced by the Budget Officer who normally is the finance officer. Apart from the above, the functions of the committee may include the following:

- a) Determination of the Budget Policy Guidelines and selection of budget policies compatible with organizational goals and objectives;
- b) Establishment of the budget timetable;
- c) Review of budget estimates submitted by sectional heads;
- d) Facilitating the co-ordination of the budgets;
- e) Suggesting amendments to budgets and revising budget estimates when necessary;
- f) Approval of budgets after amendments;
- g) Facilitating the generation of budgetary control reports;
- h) Analysing budget reports and recommending changes where necessary;
- i) Examination of variances, suggesting investigation of variances and recommending solutions to remedy off-standard performance; and
- j) Offering advice to top management on all matters concerning the budget.

12.5.4 The Budget Manual

The Budget manual sets out the Budget Guidelines and budgeting instructions. The Manual is intended to guide all departmental heads involved in the preparation of the budget and ensure they follow the goals cum objectives of the organisation. Furthermore, the Manual indicates the technique, trend or method of estimating the income and expenditure variables.

Thus, the Budget Manual sets out instructions on the responsibilities and procedures of budget preparation.

The starting point in developing budgeting guidelines is the firm's strategy. In developing the initial budgeting guidelines, the budget committee needs to consider developments that have occurred since the adoption of the strategic business plan. Some of these include the general economic and the market trends; the goal of the organisation for the budgeting period; specific budgeting policies such as mandate for downsizing, re engineering, and special promotions; the operating results of the year to date, etc.

In summary, the manual should specify the following:

- a) Objectives of the budget;
- b) Functional budgets to be prepared;

- c) Membership of the budget committee;
- d) Organizational charts;
- e) Procedure for budget preparation;
- f) Budget time tables; and
- g) Budget policy guidelines, etc.

12.6 The Process of Preparing Initial Budgets

12.6.1 The Initial Budget Proposal

Based on the initial budget guidelines, each responsibility centre prepares its initial budget proposal. A number of internal factors are considered by a budget unit in preparing an initial budget proposal. Some of these factors include the following:

- a) Changes in availability of equipment or facilities;
- b) Adoption of new manufacturing processes;
- c) Changes in product design or product mix;
- d) Introduction of new product;
- e) Changes in expectations or operating processes of other budget units that the budget unit relies on for its inputs materials or other operating factors; and
- f) Changes in other operating factors or in the expectations or operating processes in those other budget units that rely on the budget unit to supply their components.

In addition to the above, it is equally important to consider some external variables such as:

- a) Changes in the labour market;
- b) Availability of raw materials or components and their prices;
- c) The industry's outlook for the year ahead; and
- d) Competitors' action, etc.

12.6.2 Budget Negotiation

The officers in charge of budget units examine the initial budget proposals to see whether the proposal is within the budget guidelines. The officer also checks to see if the budget goals can be reasonably attained and are in line with the goals of the budget units at the next level, and whether the budget operations are consistent with the budgeted activities of other budget units.

Negotiations occur at all levels of the organisation. The role of the Budget Committee in the

coordination is very critical. This process is perhaps the core of the budgeting process and takes the bulk of budgeting time.

12.6.3 Review and Approval of the Budget

As budget units approve their budgets, the budgets go through the successive levels of the organizational hierarchy until they reach the final level, when the combined unit budgets become the budget of the organisation. The budget committee reviews and gives final approval to the budget. The budget committee examines the budget for consistency with the budget guidelines, attainment of the desired short-term goals, and fulfilment of the strategic plan.

12.6.4 Revision of the Budget

Procedures for budget revision vary from one organisation to the other. Once a budget has been approved, some organisations allow budget revisions only under special conditions; other organisations continuously update their budgets, by building into the budgeting system, quarterly or monthly revisions as may be deemed appropriate.

12.6.5 Behavioural Factors in Budgeting

We have already observed how important budgets are in the achievement of corporate goals. We must at the same time note that there are a lot of behavioural factors that influence the usefulness of budgets. Budgets must be effectively and flexibly administered by management for them to assist in planning, motivation and control.

In order to foster positive behavioural conditions, there should be employee participation in the development of budgets. Especially, to be involved in the budgetary process, are employees who are responsible for the implementation of budgets.

Another important factor that promotes good behavioural consequences is when budgets are realistically attainable. Budgets must be strict but achievable. Unrealistic budgets lower employee motivation to achieve the budgets.

If budgets are used as rewards or penal mechanisms, it may lead to conflicts and organizational goals may not be achieved. Budgets should be used as cost control mechanism rather than as cost-cutting mechanism and should strive to achieve goal congruence by harmonizing corporate goals with those of individual employees in the organization. Where there are significant conflicts between corporate and employee goals, organizational objectives may not be achieved.

Where budgets are flexibly administered and the process participatory, the following advantages may emerge:

- a) Employees tend to accept the budget as their own plan of action and goal congruence is achieved;
- b) Participation tends to increase morale among employees; and
- c) Employee cohesion increases morale and productivity.

The climate for operating the budgetary system should be structured so that individuals welcome it rather than being anxious and defensive. This requires that each individual be given the freedom and authority to influence and accept his or her own performance level and the responsibility for accomplishing it.

12.7 Preparation of Annual Budgets

Preparing Functional Budgets

As already noted, functional budgets are the budgets developed for the operations of each function in the organization. Usually, the budget for the function that has the binding or effective budget factor or limiting factor is first developed bearing in mind the budget factor. All the other functional budgets are subsequently developed from the budget of the function with the binding constraint.

Illustration 12.1

Asuo Ltd, plans to produce and sell 8,000 sachets of sugar during the year 2003. The selling price is expected to be ₦30 per sachet.

1 unit of sachet requires 4 units of Material A, 3 units of Material B and 2 units of Material C.

Opening stock of raw materials is as follows:

	Units	Amount
		₦
Material A	45,000	270,000
Material B	35,000	70,000
Material C	25,000	50,000

The closing stock for each raw material is to be at a level which would meet the production requirement of 7,000 sachets of sugar. There is no opening or closing stocks of sugar.

Purchase prices for all raw materials during the year 2003 are expected to be 30% higher than the prices reflected in the opening stock values.

Sales and purchases are on credit and the opening balances being as follows:

	¢
Debtors	350,000
Creditors	270,000

The Company expects to receive ¢525,000 from debtors during the period and to pay ¢235,000 to creditors.

Required:

Prepare a budget for raw material purchases and calculate the closing balances for debtors and creditors. (Show your workings) **(12 Marks)**

SOLUTION 12.1

(a) Raw Material Purchases Budget

	<u>Mat A</u>	<u>Mat B</u>	<u>Mat C</u>
	¢	¢	¢
Quantity required to be used	32,000	24,000	16,000
Add planned closing stock	<u>28,000</u>	<u>21,000</u>	<u>14,000</u>
	60,000	45,000	30,000
Less planned opening stock	<u>45,000</u>	<u>35,000</u>	<u>25,000</u>
Total units to be purchased	15,000	10,000	5,000
Planned unit purchase price	<u>x 7.8</u>	<u>x 2.6</u>	<u>x 2.6</u>
Total Purchases	<u>117,000</u>	<u>26,000</u>	<u>13,000</u>

(b) Calculation of closing balances for Debtors and Creditors

	Debtors	Creditors
	¢	¢
Balance b/f	350,000	270,000
Add Sales/Purchases	<u>240,000</u>	<u>156,000</u>
	590,000	426,000
Less Receipts/Payments	<u>525,000</u>	<u>235,000</u>
Closing balances	<u>65,000</u>	<u>191,000</u>

Workings:			
(1)		8,000 x4	8,000x3
	8,000x2		
(2)		7,000x4	7,000x3
	7,000x2		
(3)			
Material A	¢270/45 X 130%		= ¢7.8
Material B	¢70/35 X 130%		= ¢2.6
Material C	¢50/25 x 130%		= ¢2.6

(4)
 Total Sales
 8,000 x ¢30 = ¢240,000

Total Purchases	
Material A	=117,000
Material B	= 26,000
Material C	= 13,000
	156,000

Illustration 122

Sakyi Ltd. produces two products, Cake and Bluna, which use the same raw materials, oil and fat. One unit of Cake uses 3 litres of oil and 4 kgs of fat. One unit of Bluna uses 5 litres of oil and 2kgs of fat. A litre of oil is expected to cost ¢3,000 and a kg of fat ¢7,000.

Budgeted Sales for 2021 are 8,000 units of Cake and 6,000 of Bluna; finished goods in stock at

1/1/2021 are 1,500 units of Cake and 300 units of Bluna, and the company plans to hold stocks of 600 units of each product at 31/12/2021.

Stock of raw materials are 6,000 litres of oil and 2,800 kgs of fat at 1/1/2021, and the company plans to hold 5,000 litres and 3,500 kgs respectively at 31/12/2021.

The store's manager has suggested that a provision should be made for damages and deterioration of items held in store as follows:

Cake	-	loss of 50 units
Bluna	-	loss of 100 units
Oil	-	loss of 500 litres
Fat	-	loss of 200 kgs

You are required to:

- (a) Prepare a material purchases budget for the year 2021 (14 Marks)
 (b) Distinguish between Functional Budgets and Master Budgets (6 Marks)

(Total 20 Marks)
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SOLUTION 12.2

(a)

Production Budget

	<u>Cake</u>	<u>Bluna</u>
	¢	¢
Units to be sold	8,000	6,000
Add planned closing stock	<u>600</u>	<u>600</u>
	8,600	6,600
Less planned opening stock	<u>1,500</u>	<u>300</u>
	7,100	6,300
Provision for deterioration or damages	<u>50</u>	<u>100</u>
Units to be produced	<u>7,150</u>	<u>6,400</u>

<u>Materials Usage Budget</u>	<u>Oil</u>		<u>Fat</u>
	Litres		Kgs
Cake (7,150 x 3)	21,450	(7,150 x 4)	28,600
Bluna (6,400 x 5)	<u>32,000</u>	(6,400 x 2)	<u>12,800</u>
	<u>53,450</u>		<u>41,400</u>

Materials Purchase Budget

	<u>Oil</u>	<u>Fat</u>
	Litres	Kgs
Quantity necessary to meet production	53,450	41,400
Add planned closing stock	<u>5,000</u>	<u>3,500</u>
	58,450	44,900
Less planned opening stock	<u>6,000</u>	<u>2,800</u>
	52,450	42,100
Provision for damages/deterioration	<u>500</u>	<u>200</u>
Total units to be purchased	52,950	42,300
Expected unit purchase price	<u>¢3,000</u>	<u>¢7,000</u>
Total Purchases	52,950 kg x ¢3,000	42,300 kg x ¢7,000
	=¢158,850,000	=¢296,100,000

Illustration 12.3

Cema Ltd. manufactures two products C₁ and C₂. The products use the same raw materials RM₁ and

RM₂ but in different proportions:

One bag of C₁ uses 20 kg of RM₁ and 30 kg of RM₂.

One bag of C₂ uses 25 kg of RM₁ and 25 kg of RM₂.

The following estimates are relevant for next year:

(i)	<u>Raw Materials</u>	<u>RM₁</u>	<u>RM₂</u>
-	Cost per kilo	¢5,000	¢4,000
-	Opening stock (kg)	10,000	8,000
-	Closing stock (kg)	2,000	1,000
-	Provision for loss (kg)	500	300
(ii)	<u>Finished Products</u>	<u>C₁</u>	<u>C₂</u>
-	Sales (bags)	200,000	150,000
-	Selling price per bag	¢30,000	¢22,000
-	Opening stock (bag)	40,000	25,000
-	Closing stocks (bag)	10,000	5,000
(iii)	Direct labour hours required per unit of each product	8hrs	5 hrs.

Standard wage rate of direct labour is ¢5,000 per hour.

You are required to prepare

- | | | |
|-----|--|-------------------------|
| (a) | Sales budget | (2 Marks) |
| (b) | Production budget | (3 Marks) |
| (c) | Material Purchase Budget for next year | (4 Marks) |
| (d) | Direct labour Budget for next year | (4 Marks) |
| | | (Total 13 Marks) |

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SOLUTION

(a) Sales Budget

	C1	C2
Units to be sold	200,000	150,000
Selling price/unit	¢30,000	¢22,000
Total sales	¢6,000 million	¢3,300 million

(b) Production Budget

	C1	C2
Units to be sold	200,000	150,000
Add planned closing stock	<u>10,000</u>	<u>5,000</u>
	210,000	155,000
Less planned opening stock	<u>40,000</u>	<u>25,000</u>
Units to be produced	170,000	<u>130,000</u>
Material Usage Budget	<u> </u>	<u> </u>

	RM1 (Kg)		RM2(Kg)
C1 (170,000 units X 20kg)	3,400,000	(170,000 units X 30kg)	5,100,000
C2 (130,000 units X 25kg)	<u>3,250,000</u>	(130,000 units X 25kg)	<u>3,250,000</u>
	<u>6,650,000</u>		<u>8,350,000</u>

(c) Material Purchase Budget

	RM1(Kg)	RM2(Kg)
Quantity required to meet production	6,650,000	8,350,000
Add Planned closing stock	<u>2,000</u>	<u>1,000</u>
	6,652,000	8,351,000
Less Planned Opening stock	10,000	8,000
	6,642,000	8,343,000
Provision for loss	500	300
	6,642,500	8,343,300
Cost per kilo	¢ 5,000	¢4,000
Total Purchases	6,642,500 kg x ¢5,000 ¢33,212.5 million	8,343,300 x ¢4,000 ¢33,373.2 million

d) Direct Labour Budget

	C1	C2
Budgeted Production	170,000 units	130,000 units
Hours per unit	8	5
Total Budgeted Hours	1,360,000	650,000
Standard wage rate/hour	¢5,000	¢5,000
Total wages	1,360,000 hrs x ¢ 5,000 = ¢6,800 million	650,000 x ¢5,000 = ¢3,250 million

12.8 CASH BUDGET

The cash budget summarizes the cash flow effects of all of the functional and policy related budgets by coordinating them into one summarized statement.

12.8.1 Benefits of Cash Budget

With cash budget expected cash deficits/ surplus are identified in advance. In case of deficit cash balances, the cash budgets indicate when to raise additional funds to mitigate the shortfall.

Whenever there is a surplus cash balance, cash budgets guide managers as to the exact amount involved and for how long such could be invested for some return.

Cash budgets synchronize receipts and payments to ensure the carrying out of all operations as scheduled.

12.8.2 Preparation of the Cash Budget

To facilitate the preparation of cash budget, it will be necessary to first ascertain all expected cash receipts or inflows. These will include:

Cash sales:

- a) Collection of customer debts
- b) Issue of shares and debentures
- c) Interest and dividend received
- d) Proceeds from sale of assets, etc.

The next step will involve the ascertainment of all expected payments or cash outflows. These may include:

- a) Cash purchases
- b) Payments to suppliers
- c) Redemption of shares and debentures

- d) Payment of interest and dividend
- e) Purchase of fixed assets
- f) Payment for general expenses
- g) Payment of wages and salaries, etc

It is important to note that non-cash expenses such as depreciation, provision for doubtful debts, etc are not treated in the cash budget. This is because they do not involve actual flow of cash. The timing of the various cash flows is of great importance and very significant to the entire process.

The third step is to ascertain the difference between the expected cash inflow and the expected cash outflow. Any resulting difference is either a surplus or a deficit.

The final step is to add the opening cash balance to the obtained surplus or deficit. The result of this addition will be the expected closing cash balance.

The Cash Budget is usually developed to cover monthly or quarterly control periods.

Illustration 12.4

Vaney Company Ltd. produces household items for the domestic market. In the previous year, company suffered theft in its offices, losing all cash on hand in the process. On the date of the theft, the company had an overdraft balance of ₺125 million with its bankers. Due to the good working relationship that exists between the company and its bankers, a short-term loan of ₺500 million was granted to the company on 31st December, 2023, on the following terms:

Facility	-	Short Term Loan
Duration	-	One year
Interest	-	27.5 % per annum simple interest
Repayment	-	Principal payment in 4 equal quarterly instalments
	-	Interest payable monthly in arrears

Additional information:

(i) Production in units:

2023		2024					
Nov	Dec	Jan	Feb	March	April	May	June
5,000	6,000	5,000	8,000	6,000	5,000	5,000	6,000

(ii) Raw materials used for the production cost €10,000 per unit. 25% of this sum is paid in the same month as production and the balance of 75% in the month following production.

(iii) Direct labour which costs €1,000 per unit are payable in the same month as production whilst variable expenses is estimated at €6,000 per unit. 50% of the variable expenses are payable in the same month as production and the balance in the following month.

(iv) Sales at €250,000 per unit are as follows:

2023			2024					
Oct	Nov	Dec	Jan	Feb	March	April	May	June
200	600	600	768	720	640	500	500	560

(v) All sales are on credit and debtors take an average credit period of two months.

(vi) Fixed overheads are € 18 million per month and are payable each month.

(vii) A new packaging equipment costing €84 million is to be paid for equally in March and September 2024. It has a useful life of 5 years and a straight-line depreciation policy. The depreciation of this equipment has not been included in the fixed overheads above.

(viii) Rent income of €6 million per quarter is to be received at the end of each quarter

Required:

(a) Prepare a cash budget for the company for the six months ended 30th June, 2024.
(16 Marks)

(b) Briefly explain the purpose and importance of Cash Budgets in business planning and decision making.
(4 Marks)

(Total 20 Marks)

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SOLUTION

Vaney Company Ltd.

Cash Budget for the six months ended 30 June 2024

	Jan.	Feb.	Mar	April	May	June
	€000	€000	€000	€000	€000	€000
INFLOWS						
Receipts (W1)	150,000	150,000	192,000	180,000	160,000	125,000
Rent			6,000			6,000
Loan	500,000					
Total Cash Inflow	650,000	150,000	198,000	180,000	160,000	131,000
OUTFLOWS						
Raw Materials (W2)	57,500	57,500	75,000	57,500	50,000	52,500
Direct Labour (W4)	5,000	8,000	6,000	5,000	5,000	6,000
Variable Expenses (W3)	33,000	39,500	42,000	33,000	30,000	33,000
Fixed Overheads	18,000	18,000	18,000	18,000	18,000	18,000
Equipment			42,000			
Interest		11,460	11,460	11,460	11,460	11,460
Loan Repayment			125,000			125,000
Total Cash Outflow	113,500	134,460	319,460	124,960	114,460	245,960
Net Cash Flow	536,500	15,540	-121,460	55,040	45,540	-114,960
Balance b/f	-125,000	411,500	427,040	305,580	360,620	406,160
Balance c/f	411,500	427,040	305,580	360,620	406,160	291,200

(W1) Receipts from Debtors

	Oct	Nov	Dec.	Jan.	Feb.	Mar	April	May	June
Sales in Units		600	600	768	720	640	500	500	560
	€m	€m	€m	€m	€m	€m	€m	€m	€m
Sales @ €250,00 / unit	50	150	150	192	180	160	125	125	170
Receipts	-	-	50	150	150	192	180	160	125

(W2) Payment made to procure Raw Materials

	Nov.	Dec.	Jan.	Feb.	Mar	April	May	June
Production in Units	5,000	6,000	5,000	8,000	6,000	5,000	5,000	6,000
	¢000	¢000	¢000	¢000	¢000	¢000	¢000	¢000
Purchases @ ¢10,000 per Unit	50,000	60,000	50,000	80,000	60,000	50,000	50,000	60,000
Payments								
25%	12,500	15,000	12,500	20,000	15,000	12,500	12,500	15,000
75%	-	37,500	45,000	37,500	60,000	45,000	37,500	37,500
Total		52,500	57,500	57,500	75,000	57,500	50,000	52,500

(W3) Payment made in respect of Variable Expenses

	Nov.	Dec.	Jan.	Feb.	Mar	April	May	June
Production in Units	5,000	6,000	5,000	8,000	6,000	5,000	5,000	6,000
	¢000	¢000	¢000	¢000	¢000	¢000	¢000	¢000
Variable Expenses @ ¢6,000 per Unit	30,000	36,000	30,000	48,000	36,000	30,000	30,000	36,000
Payments								
50%	15,000	18,000	15,000	24,000	18,000	15,000	15,000	18,000
50%	-	15,000	18,000	15,500	24,000	18,000	15,000	15,000
Total		33,000	33,000	39,500	42,000	33,000	30,000	33,000

(W4) Direct Labour

	Nov.	Dec.	Jan.	Feb.	Mar	April	May	June
Production in Units	5,000	6,000	5,000	8,000	6,000	5,000	5,000	6,000
	¢m							
Labour costs @ ¢1,000/Unit	5	6	5	8	6	5	5	6

12.9 Master Budget

As previously mentioned, the master budget summarizes all the budgets into a coordinated projected financial statement comprising of:

- Budgeted Trading, Profit and Loss account (Income Statement) or Income and Expenditure Account, as the case may be; and
- Budgeted Balance Sheet (Position Statement) or Statement of Affairs.

Illustration 12.5

Papyrus Brothers Ltd, a stationery/textbooks company, has been in business for the past ten years but has not practised any system of budgetary planning and control. Upon the advice of a management consultant, the company decided to adopt this system, beginning from its 2017/2018 financial year. The company's balance sheet (Position Statement) as at 31st October 2017 is as presented below:

Fixed Assets at book value:	€'000	€'000	€'000
Freehold Land & Building*			64,000
Furniture Fittings & Equipment			8,000
Motor Vehicles			<u>24,000</u>
			96,000
Current Assets:			
Stock		6,400	
Trade Debtors		40,000	
Treasury Bills		<u>9,000</u>	
		55,400	
Less			
Current Liabilities:			
Trade Creditors	8,000		
Bank Overdraft	<u>16,400</u>	<u>24,400</u>	<u>31,000</u>
Capital			
			127,000

The Land is valued at €24,000,000.

The company has a sales policy which blends both cash and credit terms in the following manner:

Month of Sale	Cash Sales [%]	Credit Sales [%]
November	30	70
December	45	55
All other	20	80

Credit customers in any particular month are expected to pay up in the following month.

This sales policy has contributed to the company's performance and the following sales projections have been provided:

	November	December	January	February	March	April
['000]	32,000	32,000	40,000	80,000	24,000	24,000

The price structure of the company's goods covers its cost and profit patterns, namely, the stationery/books, wages and profit in the ratio 25%, 55% and 20% respectively.

A discount deal has been struck with all the Company's suppliers to the effect that the company enjoys a 3% discount on half of each month's purchase paid on the spot. The balance is paid in full in the following month.

The company has decided that half of the stocks to be sold in December will be acquired in November because of excessive pressure that suppliers will face in December.

Wages have never been accrued beyond the month. Other expenditures will be ₺5,200,000 for the first 3 months and thereafter the vehicle running expenses which amount to 50% of these other expenditures will go up by 10% every month.

The company plans to purchase two computers on 31st January at a cost of ₺5,000,000. In anticipation of this, the company hopes to redeem ₺5,000,000 worth of its treasury bills at the end of December when such bills will be three months.

Required

You are to prepare:

- (a) A cash budget for the six months of the 2016/2017 financial year. (14 Marks)
- (b) A profit and loss account (~~Income Statement~~) for these six months. (7 Marks)
- (c) A balance sheet (Position Statement) as at 30 April 2017. (7 Marks)

(Total 28 Marks)
ICAG ADAPTED

Solution

Cash Budget for the six months of year 2016/2017 Financial Year

	Nov	Dec	Jan.	Feb.	Mar	April
	¢	¢	¢	¢	¢	¢
INFLOWS						
Receipts (W1)	49,600	36,800	25,600	48,000	68,800	24,000
T bills Received		5,000			6,000	
Total Cash Inflow	49,600	41,800	25,600	48,000	68,800	24,000
OUTFLOWS						
Payments to Suppliers (W2)	13,820	7,940	6,850	14,700	12,910	5,910
Wages	17,600	17,600	22,000	44,000	13,200	13,200
Other Expenses	5,200	5,200	5,200	5,460	5,460	5,460
Computers			5,000			
Total Cash Outflow	36,620	30,740	39,050	64,160	31,570	24,570
Net Cash Flow	12,980	11,060	-13,500	-16,160	37,230	-570
Balance b/f	-16,400	-3420	7,640	-5,810	-21,970	15,260
Balance c/f	-3,420	7640	-5,810	-21,970	15,260	14,690

(W1)Receipts from Customers

	Nov	Dec.	Jan.	Feb.	Mar	April
	¢000	¢000	¢000	¢000	¢000	¢000
Sales in Units						
Sales	32,000	32,000	40,000	80,000	24,000	24,000
Cash Sales	9,600	14,400	8,000	16,000	4,800	4,800
Debtors	40,000	22,400	17,600	32,000	64,000	19,200
	49,600	36,800	25,600	48,000	68,800	24,000

(W2) Payment to Suppliers

	Nov	Dec.	Jan.	Feb.	Mar	April
	¢	¢	¢	¢	¢	¢
Purchases (8+4)	12,000	4,000	10,000	20,000	6,000	6,000
Payments (50%-3%)	5,640	1,880	4,700	9,400	2,820	2,820
Payments (50%)		6,000	2,000	5,000	10,000	3,000
		7880	6700	5940	10280	5820
Discount received	130	60	150	300	90	9

PAPYRUS BROTHERS LTD.**Profit and loss account for the six months ended 30 April, 2010**

		€000
Sales		232,000
<u>Less Cost of Sales</u>		
Opening stock	€000 6,400	
Add Purchases	58,000	64,400
Gross Profit		<u>167,600</u>
Discount Received		870
		<u>168,470</u>
Less: Wages	127,600	
Other expenses	31,980	
Depreciation Buildings (25% x 40,000) x 0.5	5,000	
Furniture (25% x 8,000) x 0.5	1,000	
Motor Vehicle (25% x 24,000) x 0.5	3,000	
Computers (25% x 5,000 x 4/12)	417	
Net Profit/(loss)		<u>(527)</u>

PAPYRUS BROTHERS LTD.**Balance Sheet as at 30 April 1997**

	€000	€000
<u>Fixed Assets</u>		
Freehold land and Building		59,000
Furniture Fittings & Equipment		7,000
Motor Vehicle		21,000
Computers		4,583
91,583		
<u>Current Assets</u>		
Trade Debtors	19,200	
Treasury Bills	4,000	
Bank	14,690	
<u>Less Current Liabilities</u>		
Trade Creditors	3,000	34,890
		<u>126,473</u>
Financed by: Capital		127,000
Net loss		(527)
		<u>126,473</u>

12.10 The Meaning of Budgetary Control

Budgetary control is the whole system of control established in organisations to plan the activities of the organisation and take steps to achieve the set plans. The control system begins with the determination of standards, the formulation of budgets, comparing actual results with standard performance to determine variances and analysing the variances. Material variances are then investigated and corrective actions taken.

12.10.1 Objectives of Budgetary Control

Budgetary control is usually set up in order to:

- a) aid the planning of annual operations;
- b) coordinate the activities of the various parts of the organization and to ensure that the parts are in synchrony or harmony with each other;
- c) communicate plans to the various responsibility centre managers;
- d) control activities;
- e) motivate employees to achieve targets; and
- f) evaluate the performance of managers.

12.10.2 The Budgetary Control Process Involves the Following Processes:

- a) Establishment of budgets for various budget centres. A budget centre is a clearly defined part of an organization for the purpose of operating a budget system;
- b) Creation of Control periods. A budget period is the period for which a budget is prepared and over which such control aspects take place. The following factors influence what control period will be in use;
 - i. The nature and size of the business,
 - ii. The part of the business for which the budget is being prepared,
 - iii. The basis of control, and
 - iv. The velocity of operations, etc.
- c) Keeping records of Actual results through the financial accounting system;
- d) Comparing the actual results with the budget;
- e) Variance Analysis and Reporting on the variances analysed; and
- f) Investigation and reporting on the causes of variances.

12.11 FIXED AND FLEXIBLE BUDGETING

12.11.1 Fixed Budgeting is a method of budgeting where the budget is developed for a set level of activity at the time of developing the budget. For example the direct material cost budget for Department X is set to €100,000.00 for the planned production level of 50,000 units of the product.

12.11.2 Flexible Budgeting

It is a method of budgeting where the budget is developed for different and alternative production levels. It is also an adjustment of an original budget which has not been achieved to the actual level of activity.

Thus, in the above example if the actual production is 55,000 units, the budget of 100,000 will not be realistic, it must therefore be adjusted to a level of production of 55,000 units which has been achieved.

Alternatively, at the time of developing the budget, production levels 45,000; 50,000 and 55,000 units could be considered and budgets would be developed for each of those activity levels.

The flexible budgeting approach is based on cost behaviour patterns with respect to activity level.

In this regard, cost may be classified as:

- a) Fixed cost;
- b) Variable cost; and or
- c) Semi-variable or semi-fixed cost;

To flex a budget, only the variable cost and the semi-variable cost is varied to the actual activity level.

Illustration 12.6

A company manufactures a single product and has produced the following flexed budget for the year:

Level of activity

	70%	80%	90%
	¢	¢	¢
Direct Material	17,780	20,320	22,860
Direct labour	44,800	51,200	57,600
Production Overheads	30,500	32,000	33,500
Administration Overheads	<u>17,000</u>	<u>17,000</u>	<u>17,000</u>
Total cost	<u>110,800</u>	<u>120,000</u>	<u>130,960</u>

You are required to:

- Prepare a budget flexed at 45% level of activity; and
- State the drawbacks of a budgetary control system.

SOLUTION

From the flexed budgets provided and using the High and Low method of forecasting, we can segregate the fixed cost from the variable cost as follows:

	Percentage of Activity level	Direct Material cost
	%	¢
High activity level	90	22,860
Low activity	<u>70</u>	<u>17,780</u>
Change in activity level and cost	<u>20</u>	<u>5,080</u>

$$\begin{aligned} \text{Variable material cost per percentage of activity level} &= \frac{5,080}{20} \\ &= \text{¢}254 \text{ per } 1\% \text{ of activity} \end{aligned}$$

Using the High activity level, we have the following:

Total direct material cost at 90%	= 22,860
Variable material cost at 90% (254 x 90)	= <u>22,860</u>
Fixed cost	<u>nil</u>

What we have just done is to test whether there is any fixed cost component in direct materials. We observe that there is none. It will be the same with direct labour since all of direct labour is variable. You can test this to see.

$$\begin{aligned} \text{Variable labour cost per activity level} &= \frac{57,600 - 44,800}{90 - 70} \\ &= \text{¢}640 \text{ per percentage of activity level.} \end{aligned}$$

The whole of the administrative overheads is fixed since it remains at the same amount for each of the activity levels. It is therefore only with respect to the production overheads that we have to separate fixed overheads from the variable overheads.

Using the High and Low method, we have the following:

	Percentage of Activity level %	Production Overheads Cost ¢
High activity level	90	33,500
Low activity	<u>70</u>	<u>30,500</u>
Change in activity level and cost	<u>20</u>	<u>3,000</u>

$$\begin{aligned} \text{Variable production overhead cost per percentage of activity level} &= \frac{3,000}{20} \\ &= \text{¢}150 \text{ per 1\% of activity} \end{aligned}$$

Using the High activity level, we have the following:

Total production overheads at 90%	= 33,500
Variable production overheads 90% (150 x 90)	= <u>13,500</u>
Fixed production overhead cost	<u>20,000</u>

Please note that if we had used the low activity level, we would have derived the same answer.

Use the low activity to check if you will get the same answer.

We can now draw a flexible budget at 45% activity level as follows:

Activity level	45%	
	¢	¢
Direct Material cost (254 x 45%)		11,430
Direct Labour cost (640 x 45%)		28,800
Production overhead:		
Variable cost (150 x 45%)	6,750	
Fixed cost	<u>20,000</u>	26,750
Administrative overheads		<u>17,000</u>
Total cost		<u>83,980</u>

The following are examples of drawbacks from a budgetary control system:

- It may be perceived as punitive rather than a tool to enhance performance;
- It usually meets resistance from management;
- Where behavioural considerations are not carefully considered, budgetary systems stifle motivation and staff morale; and
- The operation of a budgetary control system involves some cost and time.

12.12 BUDGETARY CONTROL IMPROVEMENT TECHNIQUES

12.12.1 Zero Based Budgeting (ZBB)

Zero-based budgeting is a formalized system of budgeting for the activities of an enterprise as if each activity were being performed for the first time that is from a zero base. Essentially, a number of alternative levels of provision for each activity are identified, costed and evaluated in terms of the benefits to be derived from them.

ZBB is based on the philosophy that management should be required to justify existing activities in exactly the same way as new proposals. Thus established activities will have to be compared with alternative applications of resources that they would use during the budgetary planning period. Implicit in Zero Based Budgeting is therefore the concept of opportunity cost.

In the practical application of ZBB however, managers do not have to budget from zero, but can start from the current level of expenditure and work downwards, asking what will

happen if any particular aspect of current expenditure and current operations were discontinued and removed from the budget. This way a cost-benefit analysis is carried out on every aspect of the budget and this encourages the selection of better alternatives. Zero Based Budgeting applies Activity Based Costing Principles.

12.12.2 Approaches to Zero Based Budgeting:

Managers within the organization are asked to specify the decision units within their area of authority.

A decision unit is a program of work, capital expenditure programme or a program for a given activity, which can be individually operated.

Each of the decision units or separate activities is described in a decision package.

A decision package is a document, which identifies and describes the specific activities in such a way that management can evaluate and rank them in an order of priority against other activities.

Decision packages are usually prepared by the managers of budget centres, however, in order to facilitate the construction of decision packages, managers should be given a formalized set of assumptions by top management on items such as activity levels for the coming year, wages increases projected for the coming year and other similar management policy directions.

There are two types of decision packages. They are:

- a) Mutually Exclusive Decision Packages
- b) Incremental Decision Packages

12.13 Mutually Exclusive Decision Packages

These are a set of decision packages each of which contains an alternative method of getting the same job done. Only one of the packages is selected for implementation through cost benefit analysis. While one package is selected, all the other alternative packages are shelved or abandoned.

12.3.1 Incremental Decision Packages

These are decision packages that divide one aspect of work or activity into different levels of efforts. The “base” package will describe the minimum amount of work that must be done to carry out the activity, and the other packages describe what additional work could be done at what cost and for what benefits. Each activity in the decision package is evaluated and ranked using cost-benefit indices.

12.3.2 The Ranking Process in ZBB

The ranking process provides managers with the technique to allocate scarce resources between different activities. Minimum work requirements and those activities that is essential to get a job done including the work that meets legal obligations will be given priority. For example, in the finance department, such activities may be minimum requirements to operate the payroll, purchase ledger, sales ledger and to maintain and publish a set of accounts that meet the expectations of external auditors.

The ranking process involves the following steps:

- a) Cost centre managers will be asked to rank the packages of their own cost centres;
- b) The manager of the next level up to the hierarchy of seniority will consolidate the rankings of all his subordinates into a single ranking list for the group of cost centres using the rankings of each cost centre as a guide;
- c) These consolidated rankings will pass in turn one stage further up the management hierarchy for further consolidation. At higher levels of consolidation the ranking process might be done by a committee of managers rather than by an individual;
- d) Activities, which will cost more than they are worth both in quantitative and qualitative terms, should be dropped; and
- e) Resources in the budget are then allocated according to availability of funds and the ranking of competing packages. Junior managers can handle packages involving small expenditure but senior managers must make decisions involving higher amounts. The ZBB process must however run through the entire management structure.

12.3.3 Advantages of Implementing Zero Based Budgeting:

- a) It is possible to identify and remove inefficient or obsolete operation;
- b) It adds a psychological impetus to employees to avoid wasteful expenditure;
- c) It obliges an organization to look closely into its cost behaviour patterns in order to decide the effect of alternative courses of action. It will (for example) be necessary to identify fixed cost, variable cost, and mixed cost, step cost, directly attributed cost, etc;
- d) It provides a budgeting and planning tool for management, which responds to changes in the business environment; obsolete items of expenditure are identified and ceased;
- e) The documentation required makes a coordinated in-depth knowledge of an organization's operations available to all management; and
- f) It should result in a more efficient allocation of resources to activities and departments of the organization. The organization thus gets value for money.

12.13.4 Disadvantages of Implementing Zero Based Budgets:

- a) The volume of extra-paper work created by decision packages is enormous and cumbersome;
- b) It emphasizes short-term benefits to the detriment of long-term benefits;
- c) It encourages the false idea that all decisions have to be made in the budgets. Management must be able to meet unforeseen opportunities and threats at all times and must not feel restricted from carrying out new ideas simply because they were not approved by a decision package, cost benefit analysis and a ranking analysis;
- d) It calls for management skills in decision analysis to construct decision packages, which the organization may not possess;
- e) It might be difficult to sell the approach to managers as a useful technique because:
 - Incremental costs and benefits of alternative courses of action are hard to quantify accurately,
 - Employees or trade union representatives may resist management ideas for changing the way in which work is done,
- f) There is the difficulty of the ranking process because of the following :
 - Large volume of packages
 - Some items are difficult to rank

- Prioritizing sometimes can be difficult

12.14 INCREMENTAL BUDGETING

This is a system of budgeting where the previous period's budget is used as basis for preparing the current period's budget by making incremental adjustments as may be influenced by factors such as inflation, expansion needs, growth needs, etc.

Merits of Incremental Budgeting:

- a) It is simple to apply in practice;
- b) It is most suited to such costs as wages and salaries etc; and
- c) It is widely accepted and used.

Demerits of Incremental Budgeting:

- a) The budget perpetuates past inefficiencies;
- b) The budget preparation process is not sufficiently critical to diagnose the cost behaviour of the enterprise; and
- c) It does not lead to the optimal and efficient allocation of budgetary resources.

12.15 Activity Based Costing Systems in Budgeting (ABC)

An Activity Based Costing System is a system of managing cost by controlling activities that drive cost or activities that cause cost to be incurred. Examples of cost drivers include:

- a) Machine set up hours;
- b) Number of purchase orders raised;
- c) Number of part numbers maintained;
- d) Number of suppliers' statements processed;
- e) Number of debtors' statements processed;
- f) Number of man hours worked; and
- g) Quantity of materials input into a process.

12.15.1 The process of Activity Based Costing System

Break the organization down into activities.

- a) Activities are tasks that people or machines perform to provide a product or a service.

Examples of activities in a bank for example include the following:

- i. Processing deposits;
- ii. Issuing credit cards;
- iii. Setting up a loan account;
- iv. Opening an account;
- v. Processing monthly statements;

- vi. Evaluating projects for financing;
- vii. Processing funds transfer; and
- viii. Processing customers' withdrawals, etc.
 - a. Create a cost centre or cost pool for each activity for the purpose of pooling together all the costs of each activity;
 - b) Identify the factors that influence the cost of a particular activity. These are the cost drivers; they are the events or forces that are the significant determinants of the cost of the activities; and
 - c) Trace the cost of activities to products using the most relevant cost driver as a basis of absorption.

12.15.2 Periodic or Continuous Budgets:

Periodic budget **or** Continuous budget **or** Rolling budget can be described as a budget prepared for a defined time horizon and maintained for the said time frame, before a new budget is prepared for the following period of time. In other words, it is a budget prepared for a set time horizon and at the same time subjected to a continuous review in order to ensure it covers the set length of time at any particular point in time. For example, a budget that covers a six month period will be reviewed monthly by including the month following immediately and deleting the previous or past month, so that the budget will always cover a six month period.

12.16 PLANNING PROGRAMMING AND BUDGETING SYSTEMS (PPBS)

This is a technique of budgeting used in central and local government planning. PPBS is well suited to government planning because of the well known tendency for manned expenditure on long-term projects to climb above budget. This pattern is usually occasioned by additional expenditure incurred for many reasons including planned changes and the effect that inflation adds to cost over time. It involves the preparation of a long term corporate plan that clearly establishes the objectives of the organisation.

12.16.1 Stages of PPBS

- a) Establishment of the overall objectives of the organisation;
- b) Identification of programmes that can achieve the objectives set;
- c) Identification of various alternative methods of executing the programmes established.
- d) Evaluation of these alternative methods to arrive at the least cost methods or the optimal method of implementing the various programmes;

- e) Selection of the best alternative course of action for implementation;
- f) Implementation of the selected course of action; and
- g) Monitoring of the actual results while implementation is in progress, in addition to responding to variances that may be discovered.

12.16.2 Advantages of PPBS

- a) A basis is established for evaluating the worthiness of programmes, activities and functions of the organisation;
- b) It provides information for the assessment of the efficiency and effectiveness of programmes, activities and functions carried out within the organisation; and
- c) PPBS form a good basis for the allocation of scarce resources.

12.16.3 Disadvantages of PPBS

- a) There is a difficulty in obtaining the relevant output information for the planning process;
- b) There is the difficulty in clearly defining organizational objectives and stating them in quantitative terms; and
- c) Sometimes, there is difficulty in matching programme structure with organizational structure.

12.17 CHAPTER SUMMARY

The chapter covers the concept of budgeting in three sections. It defines budgeting as the process of establishing budgets and treats various types of budget. In preparing budgets, we first formulate the budget for the function with the principal budget factor before we formulate the other functional budgets. Budgeting and forecasting appear to be same; however, there are some differences. A budget is a determined plan of what is desired whereas a forecast predicts what is likely to occur in the future, given the other variables. The first section concludes with an outline of the objectives of budgeting.

The chapter also explains the process to be followed when budgeting is introduced for the first time. Concepts such as the budget committee, the budget manual, and the budget period were also explained. In this chapter, the process of preparing annual budgets and the behavioural influences on budgeting were discussed touched while the last section used illustrations to demonstrate how budgets are prepared.

This chapter delved into budgetary control and clearly stated the meaning and its objectives. Budgetary control is intended to ensure that the whole budgeting system employed by an organisation is not only sound in principle but also effective in practise. An efficient budgetary control system will positively impact an organisation and ensure its success. Other areas looked into include the budgetary control process; fixed and flexible budgeting; Incremental budgeting; concepts of Zero Based Budgeting and Programme Planning Budgeting Systems.

In conclusion, it is said that if one does not know where one is going, one will not know when one gets there. Business organisations without budgets will not be able to employ the resources at their disposal in the most optimal way.

MULTIPLE-CHOICE AND SHORT ANSWER QUESTIONS

1. What is long-term budget?
 - A. A budget for the life time of the company
 - B. A budget of six months duration in a fast moving goods industry
 - C. A budget which duration could not be determined
 - D. A budget for periods extending beyond one year
 - E. A past budget retrieved for use in the current period

2. What is the position of depreciation in a cash budget?
 - A. It is in the cash inflow section
 - B. It is in the cash outflow section
 - C. It is not reckoned with
 - D. It is deducted from the forecast capital expenditure
 - E. It is broken down into straight line and reducing balance

3. Why should the sales budget be synchronized with the production budget?
 - A. The sales manager and the production manager are on the same level
 - B. They are the most important budgets
 - C. The sales manager and production manager are two senior members of the budget committee
 - D. Budgeting starts from sales and ends with production
 - E. The production budget flows into the sales budget

4. Which of the following ensures the achievement of a production budget?
- A. Material purchase should provide for sufficient raw materials
 - B. A very efficient production manager should be employed to run the company
 - C. Existing machines should be discarded and new ones installed
 - D. The factory should run 24 hours
 - E. All the company's debtors should pay up immediately
5. What is the usual cause for budget revision?
- A. When the managing director changes his mind
 - B. When conditions existing at budget preparation time change midway in the implementation
 - C. Machine breakdown
 - D. Decisions taken at the Annual General Meeting
 - E. When the budget has been fully achieved in the first month
6. What does budgetary control seek NOT to do in an organization?
- A. Planning of annual operations
 - B. Controlling company's activities
 - C. Communicating plans to responsible manager
 - D. Evaluating performance of managers
 - E. Punishing lazy operators
7. Define a "Budget Centre"
- A. A centre where budgets are prepared
 - B. A place where budgets are implemented
 - C. A clearly defined part of an organization for the purpose of operating a budget system
 - D. An office where the budget committee holds its meetings
 - E. The centre where the performance of budgets is controlled
8. Flexible budgeting is a method of budgeting where
- A. Managers are allowed to operate without stringent conditions
 - B. Budget is developed for different and alternative production levels
 - C. revisions are permitted on a monthly basis

- D. Actual performance is worked back to the budget
 - E. The budget period is not fixed
9. What does “Incremental budgeting” mean?
- A. Using a current period's budget as the basis for preparing the succeeding period's budget by making incremental adjustments as necessary
 - B. Increasing the budget in line with actuals
 - C. Preparing a budget by adding a flat rate percentage increase on actuals
 - D. Not allowing any figure to be unchanged but increased from year to year
 - E. Not allowing any figure to be reduced but increased from year to year
10. Responsibility accounting is a system where
- A. only responsible managers are involved in budgeting and implementation
 - B. every manager is jointly and severally responsible for the company's activities
 - C. the company's Chief Executive Officer has the final responsibility
 - D. each manager is actively involved in drawing up the budget for his own sphere of activity and is also responsible for achieving the targets set
 - E. responsibilities are shared between each manager and his subordinates
11. A budget which summarises all other budgets into a coordinated financial statement is called
12. A factor which places a limitation over the activities of an organization is known as ...
13. Until a budget is approved by management, it is called
14. A method of forecasting which selects the periods of highest and lowest activity levels and comparing the changes in costs resulting from the changes in the two activity levels is known as
15. The document which sets out the budget guidelines which guides the departmental heads in preparing their budgets is referred to as
16. A method of budgeting where the budget is developed for a given level of activity is known as

17. A system of budgeting for the activities of an enterprise as if each activity is being performed for the first time is called
18. A budget that is prepared for a set time horizon and continuously reviewed to cover the set length of time at any particular point in time is known as
19. The person responsible for the overall coordination of budgeting and budgetary control activities in an organization is called
20. A situation where the budget for a period is changed substantially mid way into that period due to some unforeseen circumstances is known as

SOLUTION TO MULTIPLE-CHOICE AND SHORT ANSWER QUESTIONS

1. D
2. C
3. E
4. A
5. B
6. E
7. C
8. B
9. A
10. D
11. Master Budget
12. Limiting Factor/Principal Budget Factor
13. Forecast
14. High and Low Method
15. The Budget Manual
16. Fixed budget
17. Zero-Based budgeting
18. Continuous/Rolling budget
19. The Budget Officer
20. Budget review

EXAMINATION TYPE QUESTIONS

1 (a) Write brief notes on the following:

- (i) Budget Manual
- (ii) Budget Committee

(4 Marks)

(b) A company plans to produce and sell 4,000 units of product X during the next period. The selling price of product X is ¢10 per unit.

1 unit of product X requires 4 units of material A, 3 units of material B and 2 units of Material C.

Opening stocks of raw materials are as follows:

	<u>Units</u>	<u>Total Value</u>
Material A	20,000	¢40,000
Material B	15,000	¢15,000
Material C	10,000	¢ 5,000

The closing stock for each raw material is to be at a level which would meet the production requirements for 3,000 units of product X. There is no opening or closing stocks of product X.

Purchase prices for all raw materials during the period are expected to be 20% higher than the prices reflected in the opening stock values.

Sales and purchases are on credit, and the opening balances being as follows:

Debtors	¢30,000
Creditors	¢20,000

The company expects to receive ¢45,000 from debtors during the period and plans to pay ¢23,000 to its creditors.

You are required to:

- (i) Prepare the budget for raw material purchases
- (ii) Calculate the closing balances for debtors and creditors

(12 Marks)

ICAG NOV., 2003

2.

You have just assumed the post of cost accountant at Ayehu Ltd. After your induction week the financial controller gives you the data below:

Budgeted Data

	Product X	Product Y
	¢000	¢000
Sales for the year:		
Region:		
Greater Accra	5,000	7,200
Central	3,200	6,400
Ashanti	3,000	2,400
Eastern	3,800	3,000

Standard data per unit of product:

	<u>Standard price</u>	<u>Product X</u>	<u>Product Y</u>
<u>Direct Material</u>	<u>per kg</u>	<u>kg</u>	<u>kg</u>
	¢		
Ceca	2	10	5
Yede	4	5	10

	<u>per hour</u>	<u>Standard</u>	<u>Hours</u>
<u>Wages to direct workers</u>	¢	<u>Hours</u>	<u>Hours</u>
Plant 1	25	4	4
Plant 2	20	6	3.5

	Product X	Product Y
Finished goods stock, valued at standard production cost	¢000	¢000
January 1, 1998	640	600
December 31, 1998	320	840

Fixed production overhead per annum, ¢3,055,000. Direct labour hours per annum ¢763,750. All production overhead is fixed and is absorbed on direct labour hour basis. Administration, selling and distribution expenses are absorbed on budgeted basis of 20% of production cost. Profit is budgeted at 25% of selling price. The company is preparing an annual budget for 1998.

You are required to prepare:

- a) Production budget
- b) Direct materials cost budget

- c) Direct materials purchases budget
- d) Direct labour utilization budget
- e) Direct wages budget

(15 Marks)

ICAG NOV. 1998

3.

Below are the summarised final accounts of Korkor, a business woman for the year ended 31 December, 2000.

Profit & Loss Account

	¢'000
Sales	480,000
Cost of sales	<u>360,000</u>
Gross Profit	120,000
General expenses (including depreciation)	<u>106,000</u>
Net Profit	<u>14,000</u>

Balance Sheet (Extract)

	¢'000	¢'000
Fixed Assets		100,000
Less depreciation		<u>30,000</u>
		70,000
<i>Current Assets:</i>		
Stock	45,000	
Debtors	40,000	
Bank	<u>2,000</u>	
	87,000	
<i>Current Liabilities:</i>		
Creditors	<u>60,000</u>	
Net Current Assets		<u>27,000</u>
		<u>97,000</u>

The following additional information is provided:

- (i) Korkor proposed to buy new premises at a cost of ¢50 million to be paid for in April.
- (ii) There is a heavy demand for her product and she is confident that from 1st April, monthly sales will increase by 20% if the new premises are acquired.
- (iii) The gross profit percentage would remain unchanged and general expenses, inclusive of allowance for bank interest at 15% would increase by ¢1.2 million per month from 1st March.
- (iv) Korkor expects creditors to increase in proportion to sales; and the stock-in-trade balance will remain at ¢45 million.

- (v) Depreciation charge on existing fixed assets will remain unchanged at 20% straight line. The additional building will be depreciated on the straight-line basis with a 20-year life. For this purpose, the buildings are considered to comprise €40 million of the planned expenditure on the premises referred to above.
- (vi) General expenses are paid monthly for cash and Korkor draws €1 million from the business bank account each month to cover personal expenses.

Korkor intends to employ two sources of finance for the planned expansion:

- (i) She has asked for a bank overdraft facility of €20 million for the next 12 months.
- (ii) She will offer customers a discount of 2% for immediate payment on all sales from 1 April, 2001 onwards. She expects half of the customers to take advantage of this offer. The remaining customers will take the same period of credit as in the previous year.

Required:

- (a) Calculate the estimated maximum overdraft Korkor will require during the year to 31 December, 2001 and the bank balance or overdraft at 31 December, 2001. **(10 marks)**
- (b) Prepare the estimated Profit and Loss Account for the year ended 31 December 2001. **(6 Marks)**
- (c) Prepare the estimated Balance Sheet as at 31 December, 2001. **(4 Marks)**

(Total 20 Marks)
ICAG MAY 2002

4

The Balance Sheet of Nsapa Breweries as at 31/12/2000 is as follows:

	€'000	€'000
Stated Capital		200,000
Income Surplus		<u>89,200</u>
		<u>289,200</u>
Financing		
Fixed Assets (cost - €280,000,-000)		252,000
Current Assets		
Stocks	50,000	
Trade Debtors	49,200	
Bank	<u>6,000</u>	
	<u>105,200</u>	
Current Liabilities		
Trade creditors	50,000	
Expense creditors	<u>18,000</u>	
	<u>68,000</u>	<u>37,200</u>
		<u>289,200</u>

The following forecasts have been derived:

	Nov. 2000	Dec. 2000	Jan. 2001	Feb. 2001	Mar. 2001	Apr. 2001	May 2001	June 2001
Sales (in units)	4,000	4,200	4,500	4,600	4,800	5,000	3,800	3,000
Purchases (¢'000)	24,000	26,000	28,000	36,000	32,000	28,000	24,000	24,000
Wages and Salaries (¢'000)	16,000	16,000	16,000	20,000	20,000	20,000	24,000	24,000
Overheads (excluding Depreciation) (¢'000)	14,000	14,000	14,000	14,000	14,000	16,000	16,000	16,000
Purchases of fixed assets (¢'000)						60,000		
Issue of shares						40,000		
Dividend						20,000		

You are given the following additional information:

- (i) The selling price in November 2000 was ¢12,000 per unit and this is to be increased to ¢16,000 per unit in May 2001. 50% of sales are for cash and 50% on credit to be paid two months later.
- (ii) Purchases are to be paid for, two months after purchase.
- (iii) 75% of the wages and salaries bill relate to management salaries and 25% relate to wages of operatives. Managers are paid in the same month but wages of operatives are paid in the first week of the following month.
- (iv) Overheads are paid in the month after they are incurred.
- (v) The fixed assets are to be paid for in three equal installments in the three months following purchase.
- (vi) Dividends are to be paid three months after they are declared and the receipts from the share issues are budgeted to be received in the month of issue.
- (vii) Fixed assets are depreciated 10% per annum on a straight-line basis on those assets owned as at 30th June, 2001.
- (viii) Closing stock at 1st January, 2001 was equal to the previous two months' purchases. At 30th June, 2001, it would be equal to three months purchase.

Required

- (a) Prepare the following budgets for six months ended 30 June, 2001:
- i. Cash budget
 - ii. Budgeted Profit and Loss Account
 - iii. Budgeted Balance Sheet
- (b) Comment on the results, highlighting those areas that you wish to draw to the attention of the budget committee. [Total 20 Marks]

MAY 2001

5. Several assumptions are commonly made by accountants when preparing or interpreting budgetary information.

You are required to explain why each of the following three assumptions might be made by accountants when designing a system of budgeting and to set out in each case also, any arguments which, in your view, raise legitimate doubts about their validity:

- (a) Budgeted performance should be reasonably attainable but not too loose. **(5 Marks)**
- (b) Participation by managers in the budget-setting process leads to better performance. **(5 Marks)**
- (c) Management by exception is the most effective system of routine reporting.

(5 Marks)

(Total 15 Marks)

- 6 (a) Outline the duties of a Budget Officer in a large establishment **6 Marks)**
- (b) Briefly list down the main contents of a Budget Manual. **(8 Marks)**

[Total 14 Marks]

ICAG JULY 1993

7(a) Explain **five (5)** objectives of budgeting **(5 Marks)**

(b) Briefly explain the following terms as used in budgeting

- i. Budget manual
- ii. Budget committee
- iii. Master budget
- iv. Principal budget factor
- v. Functional budget

(15 Marks)

(Total 20 Marks)

8. A product manager has responsibility for a single product and is in the process of submitting data to be compiled into budgets for 2009. The manager has performance targets set in relations to sales volume, profitability levels and a target cash surplus from the product.

Shown below are the agreed budgeted sales for the product for December 2018 to May 2019.

	Dec	Jan	Feb	Mar	April	May
Units	14,000	16,000	22,000	17,000	20,000	24,000

The company policy is that, at each month end, the closing stock of the finished goods should be 25% of the following month's forecast sales and the stock of raw material should be sufficient for 10% of the following month's production. Stock levels currently conform to this policy. One unit of raw material makes one unit of the finished stock, there is no wastage.

Raw material purchases are paid for during the month following the month of purchase. All other expenses are paid for as incurred. All sales are made on credit and the company expects cash receipts for 50% of sales in the month of sale and 50% in the following month.

The company operates an absorption costing system which is computed on a monthly basis. That is, in addition to direct costs it recovers each month's fixed and variable manufacturing overhead expenses in product costs using the budgeted production and budgeted expenditure in the month to establish an absorption rate. This cost is used to place a value on the stockholding. Opening stock is valued at the unit cost which was established in the previous month. At 1st January 2009 finished stock should be assumed at €40 per unit. A flow of cost based on FIFO is assumed.

Sales are made at a price of €58 per unit.

Estimated costs to be used in the budget preparation for the product are:

Manufacturing costs:

Material	€10.00 per unit produced
Variable overhead and labour	€16.00 per unit produced
Fixed overhead costs (including depreciation of €54,000)	€210,000 per month

Selling costs:

Variable	¢7.00 per unit sold
Fixed	¢164,000 per month

Required:

- (a) Compute the monthly budgeted production and material purchases for January to March 2009 (6 marks)
- (b) Prepare a budgeted profit and loss account and a statement of cash receipts and payments for January 2009. (10 marks)

ACCA Dec 1998

9.

a. Outline six (6) objectives of a Budgetary Control System and explain how a budgetary control system can achieve those objectives (12 Marks)

b. In the context of budgeting, explain the following terms:

- i. Aspiration levels. (2 Marks)
- ii. Budgetary slacks. (2 Marks)
- iii. Responsibility accounting. (2 Marks)
- iv. Zero-based budgeting. (2 Marks)

(Total 20 marks)

ICAG MAY 2005

10. Budgeting is concerned with the implementation of an approved programme within the long-range plan and capital budget. A budget therefore translates the long-range plan and capital budget into an annual operating plan of an organisation.

The budgeting process cannot therefore be viewed as being purely concerned with the current year but must be considered as an integrated part of the long-term planning process.

Required:

- (a) Identify **FOUR** major reasons for producing budgets and two (2) possible limitations of budgets. (6 Marks)

- (b) Identify the stages involved in the budgeting process. **(6 Marks)**
- (c) Distinguish between Budgetary Control and Standard Costing. **(4 Marks)**
- (d) Identify **FOUR** areas which should be of concern to management in budget behavioral implications. **(4 Marks)**

(Total 20 Marks)

ICAGMAY 2004

11. As a management Accountant, you are required to:

- (a) Distinguish between cost control and cost reduction,
- (b) Explain the **TWO** basic approaches to cost reduction,
- (c) Itemize and briefly explain techniques, methods and major difficulties of cost reduction programmes **(20 Marks)**

ICAGMAY 1999

12. The Managing Director of Ozone Ltd. recently attended a seminar on budgetary control systems where he gained the impression that the introduction of such a system offered opportunities not only to improve control of the company's operations but also to improve staff motivation. Unfortunately, he did not fully understand some of the points made at the seminar and has approached you, the company's management accountant, for a clearer explanation.

Required

Provide concise explanations to the following queries made by the Managing Director:-

Traditional budgetary systems are based on certain basic mechanisms for achieving control.

What is the traditional basis for achieving control?

(3 Marks)

- b. Many early management theorists believed that employees were motivated solely by financial rewards. However, in recent years, other writers such as Maslow have suggested that in certain circumstances the offer of additional financial rewards may not provide much (if any) improvement in motivation. Why does Maslow believe that in some circumstances the offer of more money may not be particularly effective in motivating staff and workers?

(2 Marks)

- c. It has been suggested that 'zero based budgeting' can be particularly effective in improving control and staff motivation.

- i. What is meant by the term 'zero based budgeting'?

- ii. What are the advantages of 'zero based budgeting' over traditional budgeting

systems and how can it be used to help improve managers' motivation.

(10 Marks)

[Total 15 Marks]

ICAG JULY 1993

13. The concept of control occupies an important place in systems theory and is a major part of functions of the management accountant.

Required:

- a. List the basic elements of control and discuss how these are implemented in an effective control system.
- b. Describe the safeguards which must be incorporated in systems design to ensure the continued effectiveness of a control system.

(Total 20 Marks)

ICAG JAN. 1992

14. (a) Explain the concept of Planning Programming and Budgeting Systems as used in budgetary control **(8 marks)**

(b) Outline **three** advantages and **three** disadvantages of Planning Programming and Budgeting Systems as a system of budgeting. **(12 marks)**

(Total 20 marks)

15. A company operates a system of quarterly rolling budgets. The budgets for the next three quarters have been prepared. The figures below reflect the likely cost behaviour of each element of cost. Quarter 4 is being developed based on these budgets and other information available.

Budget Quarters 1 to 3	Q1	Q2	Q3
	₤	₤	₤
	(000)	(000)	(000)
Activity:			
Sales (units)	18	34	30
Production (units)	20	40	30
Costs:	₤000	₤000	₤000

Direct Materials cost	50	100	75
Production Labour	180	280	230
Factory overheads (excluding indirect Labour)	170	200	185
Administration	30	30	30
Selling and Distribution	29	37	35

In the current planning stage for quarter four, flexible budgets are to be developed for low, most likely and high sales volumes (38,000, 44,000, and 50,000 units respectively). The company wishes to have a closing stock (end of quarter four) equal to the opening stock of quarter one. Management will therefore adjust the production levels to fall in line with this policy.

Cost Structures as for quarters one to three will apply to quarter four except that:

- i. Raw material prices are expected to rise by 10%.
- ii. Production labour rates will increase by 2.5%. However, management have declared that all labour rate increases must be matched by increased efficiency so that labour costs (both total fixed and variable per unit) are unaltered.
- iii. A quarterly bonus payment of 50% of the variable labour cost per unit, will apply for all production above 40,000 units.
- iv. Fixed factory overheads and fixed selling and distribution expenses will rise by 5%.

The expected selling price per unit is ₦ 18,000. Stock is valued at full factory cost of 13 per unit. This has been established using absorption principles and based on long run cost and capacity predictions. Small fluctuations in cost prices or volumes will not cause this unit cost to be amended.

Required:

- (a) Explain what is meant by a 'rolling budget' and what additional benefits may be claimed for this compared to the annual type style of budget **(4 Marks)**

- (b) Summarize the variable cost per unit and the total fixed cost for each cost heading that will apply to quarter four, for production below 40,000 units. **(6 Marks)**
- (c) Prepare detailed flexed budget profit statements for quarter four under the separate assumptions of low, most likely and high levels of sales and corresponding production volumes. **(8 Marks)**

ACCA June 1998

16.

For many organisations 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 behavioural implications.

Required:

- (a) Briefly discuss four purposes of budgets. **(8 Marks)**
- (c) Explain the behavioural factors which should be borne in mind and the difficulties of applying them in the process of budgeting and budgetary control.

(12 Marks)

(Total 20 Marks)

ACCA June 1999

17

Budget Flexible

- a. Write in brief, fixed budget and provide two of its limitations
- b. Lumco for the first time is introducing flexible budget to improve its control system. Budget for two operational levels are given as follows:

Flexible budget for August 2016

	PRODUCTION CAPACITY	
	40%	50%
	80,000	100,000
	Units	Units
	₦	₦
Direct material and labour costs	800,000	1,000,000
Production Overhead	520,000	600,000
Administrative Overhead	400,000	400,000
Selling Overhead	280,000	300,000

Profit is fixed at 40% of Mark-up.

Required

Prepare the flexible budgets for 60% and 80% production capacity. If the company intends to still realise profit mark up of 40%

(12½ Marks)

CHAPTER THIRTEEN

STANDARD COSTING TECHNIQUES

CHAPTER CONTENTS

- a. Standard Costing
- b. Variance Analysis
- c. Other Variance Analysis Issues

13.0 Objectives

After studying this chapter, you should be able to:

- a. explain the concept of a standard,
- b. explain the different types of standards,
- c. explain the procedure for establishing standards and standard cost,
- d. analyse a variance into its smallest parts,
- e. compute the various cost variances and sales margin variances,
- f. reconcile budgeted profit and actual profit, using variances,
- g. compute activity, capacity and efficiency ratios, and
- h. explain the factors that influence the investigation of variances.

13.1 Introduction

In order for organisations to function effectively, it is important for them to plan ahead of time. Organisational planning is greatly enhanced when standards are established to form the basis of planning and also as a yardstick for measuring performance. When standards are set, budgeting becomes relatively easy to establish and the control process which compares the standards set with the actual achievements ensures that variances are determined and corrective action taken to remedy the deviations and drive the business closely towards its objectives.

13.2 Standard Costing

13.2.1 Standard Cost as Control Mechanisms

Standards are control mechanisms which establish predetermined estimates of costs of products and services and then compare these predetermined costs with actual costs as they

are incurred to ascertain variances which are analysed into their various components and investigated.

Standard cost is a predetermined calculation of how much cost should be under specified working conditions. In other words, standard cost is a standard expressed in money terms. It is built up from an assessment of the value of cost elements. Its main uses are providing bases for performance measurement, control by exception reporting, valuing stock and establishing selling prices

13.2.2 **Misconception about Standard Cost**

Standard cost is not an average of past costs. This is because:

- i. these may contain results of past mistakes and inefficiencies.
- ii. comparison with past cost is inappropriate due to likely:
 - changes in methods
 - changes in technology
 - changes in prices

13.2.3 **Types of standards**

There are four types of standards; namely: basic standards, ideal standards, attainable standards and current standards.

a) **Basic Standards**

These are long term standards remaining unchanged over several years. They are standards established for use over a long period from which a current standard can be developed

The uses of basic standards include:

- i. To show trends over time for such items as:
 - materials prices
 - labour rates
 - efficiency levels and the long term effects of changing methods
- ii. Used as a basis for setting current standards. Basic standards cannot be used to highlight current efficiency or inefficiency and would not normally form Part of the reporting system except as a background statistical exercise.

b) Ideal Standards

These are standards which can only be attained under the most favourable working conditions. Ideal standards are based on optimal operating conditions such as:

- no break downs of machinery
- no wastage of materials
- no stoppages
- no idle time
- no spoilage
- no shrinkage of materials etc.

The uses of ideal Standards include:

- i. Used as long term targets
- ii. Used for long term development purposes and investigative purposes

c) Attainable standards

These are standards which can be achieved if a standard unit of work is carried out efficiently, a machine properly operated or material properly used. Allowances are made for normal losses and machine breakdowns. It represents future performance and objectives which are reasonably met

Uses of attainable Standards include:

- i. Frequently used for routine control with the purpose of
 - providing tough but realistic targets
 - motivating staff and management to achieve targets
- ii. Used for stock valuation for purposes of:
 - product costing
 - cost control

Attainable standards should be revised periodically to reflect:

- new conditions
- new prices, methods, technology, etc.

d) Current Standards

These are standards set for use over a short period to reflect current conditions. Where conditions are stable then current standards will be the same as attainable standards. But where a temporary problem exists then a current standard could be set to deal with the problem

Uses of current standards

- i. where there is a temporal problem with material quality
- ii. unexpected price rise due to inflationary circumstances
- iii. energy crises
- iv. significant standards containing some subjective elements etc.

Important points to note

- a. the type of standard directly affects the amount of variances and the meaning of the variance
- b. every standard contains some subjective elements.

13.3 Other Standard Costing Issues

13.3.1 The Process of Standard Costing

- a. Set the standard cost (building the total cost up from the individual elements of cost)
- b. Measure the actual cost (for each of the elements of cost and in total)
- c. Compare the standard cost with the actual cost, any difference is called a variance, which can either be favourable or better performance than planned or unfavourable or worse performance than the set standard.
- d. Analyse the variance (variance analysis) into its smallest parts or elements
- e. Investigate the real causes for the variances (only for material variances)

The most is obtained from standard costing techniques when it is applied to a production process involving a substantial degree of repetition (mass production and repetitive assembly work)

13.3.2 Objectives of Standard Costing

- a. To provide a basis for assessing performance and efficiency
- b. To control costs by establishing standards and the analysis of variances and ascertaining the reasons for the variances
- c. To facilitate the practice of management by exception at the operational level
- d. To assist in formulating budgets
- e. The standard costs can be used as ends for:
 - valuing stocks and work in progress
 - Profit planning and decision making
 - pricing policy (especially where cost plus pricing systems are used)
- f. to motivate staff and management

13.3.3 Merits of Standard Costing

- a. Assists in assessing performance and efficiency
- b. Enhances cost control by encouraging re-appraisal of methods, materials and techniques
- c. Makes budgeting easier
- d. Facilitates the prudent practice of management by exceptions
- e. It provides guidance on possible ways of improving performance
- f. Provides a basis for estimation and forecasting
- g. It is a source of motivation (if full participation and involvement is sought)
- h. Simplifies stock valuation and pricing policy
- i. Assigns responsibility for non-standard performance

13.3.4 Limitations of Standard Costing

- a. The philosophy of standard costing is challenged as being inappropriate
- b. Standard costing can only exist realistically within the frame work of a budgetary system
- c. Variance analysis merely directs attention to the cause of off-standard performances. It does not solve the problem nor does it establish the reasons behind the variance. Solutions to the identified problems are management tasks
- d. All standards involve forecasting which is subjective with the inherent possibility of error.
- e. the process is a bit complex and difficult and is not understood by most line managers
- f. variance analysis are post mortems on past events and does not correct that past error or wrong.
- g. it may be expensive and time consuming to install
- h. in volatile conditions with rapidly changing methods, rates and prices, standards quickly become out of date losing their control and motivational effects
- i. the usefulness of a number of variances is questionable

13.4 Setting Standard Costs

To be able to set standards, we take every element that contributes to the operations of an organisation and set standards for each of them. We consider the following:

- the types, and prices of material and parts
- the grades, rates of pay and time for the labour

- the production methods and layouts
- the tools, jigs and machines to be used

13.4.1 **Setting Standards for Materials**

- a. The materials content of each product is derived through engineering studies. Examples may include:
 - i. raw materials
 - Sub-assemblies
 - ii. piece parts
 - iii. finishing materials
- b. Determine the quantities required of each of the inputs, making allowance for normal losses in production arising from machining loss, e.g
 - i. Evaporation
 - ii. expected breakages
 - iii. expected rejections, etc.
- c. Obtain material prices from the purchases or procurement department
 - i. these prices should be the forecast or expected prices for the relevant budget period and not past costs
 - ii. the prices should reflect:
 - trend in material prices
 - anticipated changes in purchasing policies
 - quantity and cash discounts
 - carriage and packing charges

On the basis of the variables obtained above, you then set standards for materials as standard quantities of each material at the standard material price per unit.

13.4.2 **Setting Standards for Labour**

- a. Specify the exact grades of labour to be used. This can be by the use of work study projections, techniques of work measurement, etc.
- b. Determine the time to be taken for a unit of output. The standard hour which is the quantity of work achievable at standard performance in an hour or minute
- c. the personnel department should make a forecast of the relevant wage rates for the control period
- d. set the standard labour cost as standard hour at standard wage rate

13.4.3 Setting Standards for Overheads

The predetermined overhead absorption rates are the standard rates for overheads for each cost centre using the budgeted standard labour hours as the activity base

$$\text{VOR} = \frac{\text{Budgeted variable overheads for cost centre}}{\text{Budgeted standard labour hours for cost centre}}$$

$$\text{FOR} = \frac{\text{Budgeted fixed overheads for cost centre}}{\text{Budgeted standard labour hours for cost centre}}$$

Where: VOR is Variable Overhead Rate, and
FOR is Fixed Overhead Rate

13.4.4 Setting standard for selling price

This activity is a top management activity, which is done after considering the following factors:

- a. Anticipated market demand
- a. competing products
- b. Inflation estimates
- c. elasticity of demand, etc.

13.4.5 Standard sales margin

Standard sales margin is the difference between standard selling price and standard cost. Where a standard marginal costing system is in use, then the standard contribution margin is the difference between the standard selling price and the standard marginal cost.

13.5 Preparation of standard cost card

Once all standards have been set, they could be summarized in a standard cost card as follows:

	₦
Standard direct materials cost per unit	xx
Standard direct labour cost per unit	xx
Standard direct expenses per unit	xx
Standard overhead cost per unit	<u>xx</u>
Standard cost per unit cost	xx
Standard profit margin	<u>xx</u>
Standard selling price	<u>xx</u>

Using the standard cost card, budgets can easily be established, variances computed and analysed.

13.6 Variance Analysis

13.6.1 The Concept of Variance

A variance is the difference between a standard level of performance that ought to have been achieved and the actual activity achieved.

13.6.2 Analysis of Variances

Variance analysis is the breaking down of the total profit variance into its smallest parts.

Illustrative example 13.1

Ghartex Ltd. specializes in the manufacture of Kente for export and the local market. The following information relates to the Company's budget for a given month.

Budgeted Production Quantity - 120,000 metres

Direct material:

Material A 0.5 kg (¢1,200 per kg)

Material B 0.5 kg (¢1,600 per kg)

Direct labour: - 30 mins. (¢6,000 per hour)

Variable Overheads - ¢30 million

Fixed Overheads: - ¢15 million

Production overhead is absorbed on the basis of Direct Labour hours.

Actual Results achieved during June 2000 are as follows:

Production - 130,000 metres

Director Material Purchased:

Material A 80,000 kg Costing ¢88 million

Material B 70,000 kg Costing ¢98 million

Direct Labour Hours 80,000 hours worked costing ¢400 million.

Variables overheads - ¢28 million

Fixed Overheads - ¢18 million

Required: Compute the various variances from the above data.

13.6.3 Basic Cost Variances

The basic cost variances are the difference between standard cost allowed for actual output and the actual cost incurred for that actual output. The total cost variance can further be analysed into variances for each of the elements of cost, namely: material cost variance, labour cost variance, variable overheads variance and fixed overheads variance. Each of these variances will now be discussed in turn.

13.6.4 Material Cost Variances, MCV

This is the difference between standard materials cost and actual materials cost of the actual production volume achieved. The material cost variance can further be analysed into materials price variance and materials usage variance. The formula is:

$$\text{MCV} = (\text{SQ of production achieved} \times \text{SP}) - (\text{Actual quantity used} \times \text{Actual unit price})$$

Note: Actual quantity used = Actual quantity purchased where there is no opening and no closing inventories.

Where:

SP denotes unit selling price

SQ denotes quantity use in producing one

SQ of production achieved = SQ x Actual output

a. **Direct Material Price Variance**

This is the difference between the standard price and actual purchase price of the actual quantity of materials purchased or used. The formula is:

$$\text{AQP} (\text{SP} - \text{AP})$$

Where:

AQP = Actual quantity purchased

AP = Actual unit price

Possible Causes of direct material price variances

- i. Paying higher or lower prices than planned. This could be due to:
 - Efficiency or inefficiency in purchasing
 - Changes in market conditions
 - Emergency purchases at short notice due to poor stock control procedures
- ii. Different discounts than planned
- iii. Difference in material quality (superior or inferior)
- iv. Buying substitute material for non-availability of planned materials.

b. **Direct Material Usage Variance**

This is the difference between the standard quantity specified for the actual production and the actual quantity used for the actual production expressed at standard price. The formula is:

$$\text{SP} (\text{SQ of production achieved} - \text{AQ used})$$

Where AQ used denotes Actual quantity used

Possible Causes of Direct Material Usage Variances

- i. Good or careless handling of materials by production personnel
- ii. Superior or inferior quality of materials
- iii. Pilferage of materials
- iv. Actual scrap different from anticipated or normal scrap
- v. Changes in quality control measures
- vi. Gain or losses due to the use of substitute materials of higher or lower quality than planned.

Using Illustration 13.1

Direct Material Total Cost Variance

(Standard Material Cost of output produced - Actual Cost of material purchased)

		₹	
Material A	$(0.5 \times 130,000) \times 1200 - 88,000,000$	= 10,000,000	A
	$B (0.5 \times 130,000) \times 1600 - 98,000,000$	= 6,000,000	F
Total material cost variance		<u>4,000,000</u>	A

Direct Material Price Variance

(Standard cost of the actual quantity purchased) - (Actual Cost of the quantity purchased)

Or

$$AQ_p (SP - AP) = (AQ_p \times SP) - (AQ_p \times AP)$$

		₹	
Material A:	$(80,000 \times 1200) - 88,000,000$	= 8,000,000	F
	$B: (70,000 \times 1600) - 98,000,000$	= 14,000,000	F
Total material price variance		<u>22,000,000</u>	F

Direct Material Usage Variance

SP(SQ of actual production achieved - Actual quantity used)

		₹	
Material A:	$(65,000 - 80,000)$	= 18,000,000	A
	$B: (65,000 - 70,000)$	= 8,000,000	A
Total materials usage variance		<u>26,000,000</u>	A

13.6.5 Labour Cost Variances

This is the difference between the standard direct labour cost and actual direct labour cost for the actual production achieved. This variance can further be analysed into labour rate variance and labour efficiency variance.

a. Labour Rate Variance

This is the difference between the standard direct labour rate and actual direct labour rate per hour for the actual total hours worked and paid for.

Possible Causes of direct labour rate variances

- Higher rates being paid than planned due to wage award
- Higher or lower grade of workers being used than planned.
- Payment of unplanned overtime or bonus

b. Direct Labour Efficiency Variance

This is the difference between the standard hours for the actual production achieved and the hours actually worked expressed at the standard rate.

Possible causes of labour efficiency variances

- Use of incorrect grade of labour
- Poor workshop organization and supervision
- Incorrect materials and or machines.

c. Idle Time Variance is determined as idle time x standard direct labour rate per hour.

Possible Causes of idle time variance

- Machine breakdown
- Power outages
- Work stoppages
- Ineffective co-ordination among staff

Using Illustration 13.1

Direct labour total cost variance

(Standard Direct labour Cost for the production achieved - Actual Direct Labour cost)
(SHs per unit x 130,000) x 6,000) – AHw x AR)

$$[\frac{30}{60} \times 130,000) \times 6,000] - [400,000,000] = 10,000,000A$$

Direct labour Rate Variance

Actual Hour's worked (Standard Rate – Actual Rate)

$$80,000 (6,000 - 5,000) = 80,000,000 F$$

Note:

$$AR = \text{¢}400,000,000 \div 80,000\text{hrs} = \text{¢}5,000 \text{ per hr}$$

Direct labour Efficiency Variance

Standard Rate (Standard hours allowed for production – Actual hours worked) Or

SR (SHs for 130,000 units – 80,000)

$$6,000 (65,000 - 80,000) = 90,000,000 \text{ A}$$

13.6.6 Total Overhead Cost Variance, TOCV

This is the difference between the production overhead received at budgeted or standard rate and the actual total overhead incurred.

Note:

The total overhead is the sum of variable and fixed overheads.

It is computed as:

$$\text{TOCV} = \left\{ (\text{Standard hours for the production achieved} \times \text{standard total overhead rate}) - (\text{Actual total overhead incurred}) \right\}$$

Overhead Cost Variance can be split into

- a. Variable Overhead Cost Variance
- b. Fixed Overhead Cost Variance

Using Illustration 13.1 for TOCV

Total Overhead Cost Variance, TOCV =

$$\left\{ (\text{SHs} \times \text{Production Achieved}) \times \text{Standard Total Overhead Rate} - (\text{Actual Total Overhead incurred}) \right\}$$

Or

$$\left\{ (30/60 \times 130,000) \times \frac{45,000,000}{60,000} \right\} - 46,000,000$$

$$48,750,000 - 46,000,000 = 2,750,000 \text{ F}$$

$$\begin{aligned} \text{Where STOR} &= (\text{¢}30,000,000 + \text{¢}15,000,000) \div 60,000\text{hrs} \\ &= \text{¢}750 \text{ per hr} \end{aligned}$$

13.6.6.1 Variable Overhead Cost Variance

This is the difference between the actual overheads incurred and the variable overhead absorbed. This variance can further be analysed overhead expenditure variance and variable overhead efficiency variance.

- a. **Variable Overhead Expenditure Variance:**
This is the difference between the actual variable overheads incurred and the allowed variable overheads based on the actual hours worked.
- b. **Variable Overheads Efficiency Variance**
This is the difference between the standard variable overheads and the allowed variable overhead for the actual production achieved. It is determined as: (Standard hours produced less Actual hours worked) x VOR per hour.

Using Illustration 13.1 for VOCV

Variable Overhead Cost Variance

Standard Variable Overhead Cost – Actual Variable Overhead Cost

$$\text{VOR} = \frac{30,000,000}{60,000} = \text{₱}500 \text{ per hr}$$

$$\begin{aligned} \text{Variable Overhead Cost Variance} &= (500 \times 130,000 \times 30/60) - 28,000,000 \\ &= 32,500,000 - 28,000,000 \\ &= \underline{\underline{4,500,000 \text{ F}}} \end{aligned}$$

Variable Production Overhead Expenditure Variance

$$\begin{aligned} &(\text{Actual Hours Worked} \times \text{VOR}) - \text{Actual Variable Overhead cost incurred or} \\ &(80,000 \times 500) - 28,000,000 \\ &40,000,000 - 28,000,000 \\ &= \underline{\underline{12,000,000 \text{ F}}} \end{aligned}$$

Variable Production Overhead efficiency Variance

$$\begin{aligned} &(\text{Standard Hours Allowed} \times \text{VOR}) - (\text{Actual Hours Worked} \times \text{VOR}) \\ &(65,000 \times 500) - (80,000 \times 500) \\ &32,500,000 - 40,000,000 \\ &= \underline{\underline{7,500,000 \text{ A}}} \end{aligned}$$

$$\text{Total, VOCV} = 12,000,000 \text{ F} + 7,500,000 \text{ A} = 4,500,000 \text{ F}$$

NOTE

∴ VOR = Variable Overhead Rate

13.6.2 Fixed Overhead Variance

This is the difference between fixed overhead absorbed at the actual production and the actual fixed overhead for the period. This variance can be analysed into fixed overheads expenditure variance and fixed overheads volume variance.

a. Fixed overhead expenditure variance

This is the difference between actual fixed overheads incurred and budgeted fixed overheads for the period

b. Fixed overhead volume variance

A measure of the over-or-under-absorption of overhead cost caused by actual production volume differing from that budgeted (CIMA). It is computed as: (Actual production in standard hours x Process overhead absorption rate per hour) - (Budgeted fixed overhead).

The fixed overhead volume variance is further analysed into fixed overhead volume efficiency variance and fixed overhead volume capacity variance.

i. Fixed overhead volume efficiency variance is measured as:

Standard hours achieved for production less Actual hours used at FOAR

ii. Fixed overhead volume capacity variance is measured as:

Budgeted hours less actual hours at FOAR

Using Illustration 13.1

Fixed Production Overhead Cost Variance

$$\text{FOAR} = \frac{15,000,000}{250}$$

$$= \text{¢ } 60,000 \text{ per hrs}$$

Standard Fixed Overhead for Production achieved – Actual Fixed Overhead Cost

$$(130,000 \times \frac{30}{60} \times 250) - 18,000,000$$

$$16,250,000 - 18,000,000 = \underline{1,750,000A}$$

Fixed Production Overhead Expenditure Variance

Budgeted Fixed Overhead - Actual fixed Overhead cost

$$(15,000,000 - 18,000,000) = 3,000,000A$$

Fixed Production Overhead Volume Variance

(Budgeted Hours - Standard Hours Allowed) x FOAR

$$(60,000 - 65,000) \times 250 = 1,250,000 \text{ F}$$

NOTE: TOCV = VOCV + FOCA = 4,500,000F + 1,750,000A = 2,750,000F

Illustration 13.2

As part of a strategy to improve profitability by controlling costs, Mukaila, the Financial Director of Lagos Ltd. decided to introduce a system of standard costing, to take effect from 1st January 2008. For this purpose the following standard cost for product J was compiled:

	¢/unit
Direct Materials [5kg @ ¢1,000 per kg.]	5,000
Direct Labour (1 direct labour hour)	9,000
Overheads - Variable {per direct labour hour}	1,000
- Fixed	5,000
Total	20,000

The fixed overhead charged was based on estimated fixed overhead expenditure of ¢19,000,000 and a total output of 3,800 units during the 50-week year.

During the first four weeks of the year, 3,000 units of product J were produced and the following actual costs incurred:

	¢000
Direct Materials [16,000kg @ ¢1,100 per kg.]	17,600
Direct Labour	27,000
Overheads - Variable {2800 DL Hrs. @ 900 per hr.}	2,520
- Fixed	16,000
	63,120

Mukaila recognized that some variances from plan had occurred, but was unsure as to which ones he should investigate further.

Required

- a. What is a Variance? Identify and briefly discuss the two basic causes of variances.

(6 Marks)

- b. Compute the following variances:
 Direct Material - total, price and usage.
 Variable Overhead - total, rate and efficiency
 Fixed Overhead - total, expenditure and volume. **(11 Marks)**
- c. Outline the factors that Mukaila should take into account when deciding which variances he should investigate further. **(8 Marks)**
- {Total 25 Marks}**
 ICAG JAN. 1993

SOLUTION 13.2

- (a) A variance is any deviation from what is expected to be the level of performance under given working conditions. It is the difference between the standard cost margin allowed for the actual output and the actual cost incurred or actual margin earned for the actual output.

The two basic causes of variances are:

- (i) Using more or less quantity of materials or labour hours per unit of output than expected. This may be due to using superior or inferior inputs or more /less efficient use of inputs.
- (ii) Paying a higher or lower rate per unit of input material or labour. This is influenced by the quality of the inputs.

- (b) Direct Material total cost variance:
 Standard Material Cost for actual output - Actual Material Cost
 $(3,000 \times 5,000) - 17,600,000 = 2,600,000A$
- Direct Material Price variance
 (Actual Price - Standard Price) Actual Quantity of materials purchased
 $17,600 - (1000 \times 16,000) = 1,600,000A$

Direct Material Usage Variance
 (Actual Quantity - Standard Quantity) Standard Price
 $(16,000 - 15,000) 1000 = 1,000,000A$

Variable Overhead total cost variance.

Standard Variable Overhead Cost - Actual Variable Overhead Cost

$$(3000 \times 1000) - 2,520,000 = 480,000 \text{ F}$$

Variable Overhead Expenditure Variance

(Actual Hours worked @ VOR) - Actual Variable Overhead Cost

$$(2,800 \times 1000) - 2,520,000 = 280,000 \text{ F}$$

Variable O/h Efficiency Variance

(Standard Hours Allowed - Actual Hours Worked) x VOR

$$(3,000 - 2,800) \times 1000 = 200,000 \text{ F}$$

Fixed Overhead Cost Variance

Standard Fixed Overhead Cost for the actual output - Actual Fixed Overhead Cost

$$(5,000 \times 3,000) - 16,000,000 = 1,000,000 \text{ A}$$

FOAR = $\frac{\text{Budgeted Fixed overhead}}{\text{Budgeted Labour Hours}}$

$$= \frac{19,000,000}{3,800 \text{ hours}}$$

$$= 5,000 \text{ per direct labour hour}$$

Fixed Overhead Expenditure Variance

Budgeted Fixed Overhead - Actual Fixed Overhead

$$(19,000,000 - 16,000,000) = 3,000,000 \text{ F}$$

Fixed Overhead Volume variance

(Budgeted Hours - Standard Hours Allowed) x FOAR

$$(3,800 - 3,000) \times 5,000 = 4,000,000 \text{ A}$$

Fixed Overhead Volume Efficiency variance

(Standard Hours Allowed - Actual hours Worked) x FOAR

$$(3,000 - 2,800) \times 5,000 = 1,000,000 \text{ F}$$

Fixed Overhead Capacity variance
 (Budgeted Hours - Actual Hours) x FOAR
 (3,800 - 2,800) x 5,000 = 5,000,000A

- (c) The following factors should be taken into account in deciding whether or not variances should be investigated:
- a. The materiality of the variance. Variances considered material should be investigated.
 - b. The reliability of the standards set. Where the standards are considered to be very reliable, then even small variances should be investigated.
 - c. Variances that have a known history of frequent recurrence may not be investigated but those that are unusual should be investigated.
 - d. The cost benefit implications of investigation of the variances should be considered.
 - e. The implications of investigation of the variances on future operations of the organisation.

Illustration 13.3

The following information has been extracted from a flexible budget:

Standard Labour Hours	Overhead Cost (€000)
90,000	7,000
100,000	7,500

The increase in overheads between these two levels of activity is deemed to be entirely due to variable expenses. The actual activity results for the period are:

Output in standard Hours	80,000
Clock Hours Worked	90,000
Overhead Costs	
- Fixed	¢2,600,000
- Variable	¢4,800,000

Required

- Compute the total Variable overhead cost variance showing the expenditure variance and efficiency variance separately. (5 marks)
- Compute the total fixed overhead cost variance showing the expenditure, volume, capacity and efficiency variances separately (9 marks)

ICAG JULY 1992

SOLUTION 13.3

Workings

Budgeted Data:

	<u>Activity level</u>	<u>Cost</u>
	Labour Hours	¢000
High activity	100,000	7,500
Low activity	<u>90,000</u>	<u>7,000</u>
	<u>10,000</u>	<u>500</u>

Change in Cost as a result of change in standard labour hours

$$= \underline{500,000}$$

10,000 hrs.

$$= \underline{\underline{¢50 \text{ per standard labour hours}}}$$

Using the high activity as that for the original budget we have the following:

	¢
Total Overhead Cost	7,500,000
Variable Overhead (100,000 hrs. @ ¢50)	<u>5,000,000</u>
Fixed Overhead	<u>2,500,000</u>

Thus:

$$\begin{aligned}\text{Budgeted Fixed Overhead} &= 2,500,000 \\ \text{VOAR} &= \text{€}50 \text{ per labour hour} \\ \text{FOAR} &= \frac{2,500,000}{100,000 \text{ hr.}} = \text{€}25 \text{ per hour}\end{aligned}$$

(a) Variable Overhead Cost Variance:

$$\begin{aligned}\text{Standard Variable Overhead Cost} - \text{Actual Variable Overhead Cost} \\ (80,000 \times 50) - 4,800,000 &= 800,000 \text{ A}\end{aligned}$$

Variable Overhead Expenditure Variance:

$$\begin{aligned}(\text{Actual hours worked @ VOAR}) - \text{Actual Variable overhead} \\ (90,000 \text{ hours} \times 50) - 4,800,000 &= 300,000 \text{ A}\end{aligned}$$

Variable Overhead Efficiency Variance

$$\begin{aligned}(\text{Standard Hours allowed} - \text{Actual Hours worked}) \times \text{VOAR} \\ (80,000 - 90,000) \times 50 &= 500,000 \text{ A}\end{aligned}$$

(b) Fixed Overhead Cost Variance:

$$\begin{aligned}\text{Standard Fixed Overhead} - \text{Cost Actual Fixed Overhead Cost} \\ (80,000 \text{ hours} \times 25) - 2,600,000 &= 600,000 \text{ A}\end{aligned}$$

Fixed Overhead Expenditure Variance

$$\begin{aligned}(\text{Budgeted Fixed Overheads} - \text{Actual Fixed Overheads}) \\ (2,500,000 - 2,600,000) &= 100,000 \text{ A}\end{aligned}$$

Fixed Overhead Volume Variance

$$\begin{aligned}(\text{Budgeted hours} - \text{Standard Hours Allowed}) \times \text{FOAR} \\ (100,000 - 80,000) \times 25 &= 500,000 \text{ A}\end{aligned}$$

Fixed Overhead Efficiency Variance:

$$\begin{aligned}(\text{Standard Hours Allowed} - \text{Actual Hours}) \times \text{FOAR} \\ (80,000 - 90,000) \times 25 &= 250,000 \text{ A}\end{aligned}$$

Fixed overhead Capacity Variance

(Actual Hours – Budgeted Hours) x FOAR

$$(90,000 - 100,000) \times 25 = 250,000A$$

13.7 Other Variance Analysis Issues

13.7.1 Sales Margin Variances

Sales margin variance is calculated in terms of profit or contribution margins rather than price. This is because the objective of the sale function is to influence profits favourably. Besides this, the cost variances have already been computed and so the focus should now be on the profit or contribution margins.

a) Total sales margin variances

This is the difference between the actual margin and the budgeted sales margin based on standard profit or contribution margin. The total sales margin variance can be analysed into sales margin price variance and sales margin volume variance.

b) Sales margin price variance

This is the difference between the actual margin per unit and the standard margin per unit for the actual volume of sales made.

c) Sales margin volume variance

This is the difference between the actual sales volume and the budgeted sales volume at the standard margin per unit.

d) Methods of computing sales margin variances:

We can use either the marginal costing approach or the absorption costing approach.

e) Marginal costing approach:

- Sales margin variances are evaluated on the contribution margin which is calculated as:

Actual contribution margin:		
actual selling price		xxx
less standard marginal cost		
direct material	xx	
direct labour	xx	
direct expense	xx	
variable overhead	<u>xx</u>	<u>xxx</u>
Actual contribution margin		<u>xxx</u>
standard contribution margin:		
standard selling price		xxx
less standard marginal cost:		
direct material	xx	
direct labour	xx	
direct expenses		xxx
variable overhead	<u>xx</u>	<u>xxx</u>
Standard contribution margin		<u>xxx</u>

f) **Absorption Costing Approach**

- sales variances are evaluated on the basis of profit margins not contribution margin

The profit margins are calculated as

Actual profit margin:

Actual selling price		xxx
Less standard total cost:		
Direct materials	xxx	
Direct labour	xxx	
Direct expenses	xxx	
Variable overheads	xxx	
Marginal cost	xxx	
Fixed overhead	<u>xxx</u>	<u>xxx</u>
Actual profit margin		<u>xxx</u>

Standard profit margin:

standard selling price		xxx	
Less standard total cost:			
Direct materials	xxx		
Direct labour	xxx		
Direct expenses	xxx		
Variable overheads	xxx		
Marginal cost	xxx		
Fixed overhead	<u>xxx</u>	<u>xxx</u>	
Standard profit margin			<u>xxx</u>

Please note that in computing profit or contribution margins standard cost is used whether it is actual margin or standard margin that is being computed.

Illustrative Example 13.4

Dzifa Manufacturing Co. Ltd. is located at the Ghana Free Zone and registered to produce for the export market. The company produces three types of plastic related products. The budget estimates submitted by the management accountant provided a budgeted sales mix of:

R	-	30%
S	-	50%

based on the following budgeted sales for the year:

<u>Product</u>	<u>Units Selling</u>	<u>Price</u>	<u>Standard Cost</u>	<u>Profit Margin</u>
	'000	¢'000	¢'000	¢'000
Q	200	20	10	10
R	300	15	9	6
S	<u>500</u>	10	6	4
	<u>1,000</u>			

During the year, the following results were achieved:

<u>Product</u>	<u>Units</u>	<u>Standard Costs</u>	<u>Standard Cost</u>	<u>Profit Margin</u>
	'000	¢'000	¢'000	¢'000
Q	150	22	10	12
R	350	15	9	6
S	<u>600</u>	9	6	3
	<u>1,100</u>			

(A) From the above information, you are **required** to calculate:

- (i) Sales Quantity Variance (4 Marks)
- (ii) Sales Margin Price Variance (4 Marks)
- (iii) Sales Margin Total Variance (2 Marks)

SOLUTION 13.4

(i) Sales Quantity Variance

Product	Budgeted Units	Actual Units	Quantity Variance	Standard Profit Margin	Sales quantity Variance €000
Q	200,000	150,000	- 50,000	10,000	500,000A
R	300,000	350,000	+50,000	6,000	300,000F
S	500,000	600,000	+100,000	4,000	<u>400,000F</u>
Total Sales Quantity Variance					<u>200,000F</u>

(ii) Sales margin price variance

Product	Standard Profit Margin	Actual profit margin	difference in margin	Actual quantity	Sales margin Price variance
Q	10,000	12,000	+ 2,000	150,000	300,000F
R	6,000	6,000	-	350,000	Nil
S	4,000	3,000	- 1,000	600,000	<u>600,000A</u>
Total Sales margin price variance					<u>300,000A</u>

(iii) Sales margin Total Variance:

Product Units	Budgeted profit	Standard Profit margin €000	Total margin expected	Actual Units	Actual Profit margin	Total Actual Profit margin €000
Q	200,000	10,000	2,000,000	150,000	12,000	1,800,000
R	300,000	6,000	1,800,000	350,000	6,000	2,100,000
S	500,000	4,000	2,000,000	600,000	3,000	1,800,000

Sales margin total variance is the difference between the total profit margin expected and the total actual profit margin. Thus, we have:

Product	Total profit margin expected €000	Total actual profit margin €000	Sales margin total variance €000
Q	2,000,000	1,800,000	200,000 A
R	1,800,000	2,100,000	300,000 F
S	2,000,000	1,800,000	<u>200,000 A</u>
			<u>100,000 F</u>

13.7.2 Reconciliation of budgeted profit and actual profit

This process deals with reconciling the budgeted profit and the actual profit. We start with the budgeted profit and adjust the computed variances with the budgeted to arrive at the actual profit.

Notes on calculation of variances

1. all cost variances are based on actual level of production achieved rather- than the budgeted level of activity
2. when reconciling budgeted profit to actual profit there are two approaches
 - a. marginal costing approach All variances are outlined except fixed overhead volume variances. Only fixed overhead expenditure variance is computed and used for the reconciliation.
 - b. absorption costing approach all variances must be calculated. Fixed overhead and its sub-variances should also be computed and included in the reconciliation.

Illustration 13.5

ABC manufacturing company produces a single product which is known as alpha. The product requires a single operation and the standard cost for this operation is presented in the following standard cost card:

Standard cost card for product alpha

	¢	¢
Direct material:		
2 kilos of A at ¢1 per kilo		2.00
1 kilo of B at ¢3 per kilo		3.00
Direct Labour:		
3 hours at ¢3 per hour		9.00
Overheads:		
Variable - 3 hours at ¢2 per direct labour hour	6.00	
Fixed - 3 hours at ¢4 per direct labour hour	<u>12.00</u>	<u>18.00</u>
Total Standard Cost		<u>32.00</u>
Standard Profit Margin		<u>8.00</u>
Standard Selling Price		<u>40.00</u>

ABC limited plans to produce 10,000 units of alpha in the month of May and the budgeted costs based on the information contained in the standard cost card are as follows:

	¢	¢
Sales (10,000) units of alpha at ¢40 per unit)		400,000
Direct materials: A 20,000 kilos at ¢1 per kilo	20,000	
B 10,000 kilos at ¢3 per kilo	30,000	
Direct Labour: 30,000 hours at ¢3 per hour	90,000	
Variable Overheads: 30,000 hours at ¢2 per D.L.H.	60,000	
Fixed Overheads	<u>120,000</u>	<u>320,000</u>
Budgeted Profit		<u>80,000</u>

Budgeted fixed overheads are ¢120,000 per month and are charged on the basis of direct labour hours, giving a fixed overhead rate of ¢4 per D.L.H. (¢120,000 divided by 30,000 direct labour hours).

The actual results for May are:

	¢	¢
Sales (9,000 units at ¢42 per unit)		378,000
Direct Materials: A 19,000 kilos at ¢1.10 per kilo	20,900	
B 10,000 kilos at ¢2.828 per kilo	28,280	
Direct Labour: 28,500 hours at ¢3,20 per hour	91,200	
Variable Overheads	52,000	
Fixed Overheads	<u>116,000</u>	<u>308,380</u>
Profit		<u>69,620</u>

Manufacturing overheads are charged to production on the basis of direct labour hours. Actual production and sales for the month were 9,000 units.

Required:

- (a) Compute all the relevant variances (except mix and yield variances) (15 marks)

(b) Reconcile the budgeted and actual profits for the period.

(5 Marks)

[Total: 20Marks]

CAG MAY

1997

SOLUTION 13.5

Calculation of Variances

Sales margin variances

Sales margin price variance

Actual Sales qty @ actual contribution	¢	
9000units @ ¢22		198,000
i.e 9,000 (42 – 20)		
Less Actual sales qty @ std contribution per unit		
9,000 units @ ¢20		<u>180,000</u>
		1,8000
		<u><u>₱</u></u>

Note: Both actual contribution margin and budgeted contribution margin are based on budgeted variable cost of sales.

Sales Margin Volume Variance

Actual Sales Volume @ Std contribution	¢	
9000 @ ¢20		180,000
Less Budgeted Sales volume @ Std contribution		
10,000 @ ¢20		<u>200,000</u>
		<u>20,000A</u>

Direct Cost Variances

Material Price

A. actual qty @ actual price	20,900	
actual qty @ Std price		
¢1 @ 19,000	<u>19,000</u>	¢1900A
B. actual qty @ actual price	28,280	
actual qty @ Std price		
10,000 @ ¢3	<u>30,000</u>	<u>1,720F</u>
		<u>180A</u>

Material Usage Variance

A Actual qty @ std price	¢	
19,000 @ ¢1		19,000
std. Qty of production achieved		
@ std. price		
18,000 @ ¢1		<u>1,8000</u>
		¢1,000A

B	Actual qty @ std price		
	10,000 @ ¢3	30,000	
	Std qty of production achieved @ std price		
	9000 @ ¢3	<u>27,000</u>	<u>3,000A</u>
			<u>4,000A</u>

Labour Variances

Rate		
Actual hrs. worked @ std rate		¢
28500hrs @ ¢3.2		91200
Actual hrs. @ std rate		
28500 hrs. @ ¢3		<u>85,500</u>
		<u>5700A</u>

Efficiency Variance

Actual hrs. worked @ std. Rate		¢
28500hrs @ ¢3		85,500
Actual hrs. produced @ std rate		
27,000 hrs. @ ¢3		<u>81,000</u>
		<u>4500A</u>

Variable overhead variances

Expenditure

Actual hrs. worked @ VOR	¢
28500 @ ¢2	57,000
Expenditure incurred	<u>52,000</u>
	<u>5000F</u>

Efficiency

Actual hrs. worked @ VOR	¢
28500 @ ¢2	57,000
Std hrs. produced @ VOR	
27,000 hrs. @ ¢2	<u>54,000</u>
	<u>3000A</u>

Fixed overhead Variances

Expenditure

Budgeted overhead	¢
120,000	120,000
Actual overhead	<u>116,000</u>
	<u>4,000F</u>

Efficiency

Actual hrs. @ FOAR	¢
28500 hrs. @ ¢4	114,000
Std hrs. produced @ FOAR	
27000 hrs. @ ¢4	<u>108,000</u>
	<u>6000A</u>

Capacity Variance

Actual hrs. @ FOAR	¢
28500 hrs. @ ¢4	114,000

Less Budgeted hrs. @ FOAR

30,000 hrs. A @ 4	<u>120,000</u>
	<u>6000A</u>

If absorption costing system is adopted, the Sales margin variances would have been calculated as follows:

Sales margin price variance

Actual qty @ ASP :	¢
9,000units @ 42	378,000
Less actual qty x BSP	
9,000 x 40	<u>360,000</u>
9,000units @ 42	<u>18,000F</u>

Sales Volume Margin Variance

Actual qty @ std margin	¢
9000 @ 8	72,000
Budgeted qty @ std margin	
10,000 @ 8	<u>80,000</u>
	<u>8,000A</u>

AYEDIN LTD. STATEMENT OF RECONCILIATION OF BUDGETED AND ACTUAL PROFIT
(MARGINAL COSTING METHOD)

	¢	¢	¢	¢
Budgeted Profit				80,000
Sales Margin Variances:				
Price		18,000F		
Volume		<u>20,000A</u>	2,000A	
Direct Cost Variances:				
Material Cost Variances:				
Price A	1,900A			
B	<u>1,720F</u>	180A		
Usage Variance:				
Mix A	1,000A			
B	<u>3,000A</u>	<u>4,000A</u>	4,180A	
Labour Cost Variance				
Rate		5,700A		
Efficiency		<u>4,500A</u>	10,200A	
Variable overhead cost Variance				
Expenditure		5,000F		

Efficiency	<u>3,000 A</u>	2,000 F	
Fixed overhead expenditure Variance		4,000 F	<u>10,380 A</u>
Actual profit			<u>69,620</u>

AYEDIN LTD.

STATEMENT OF RECONCILIATION OF BUDGETED AND ACTUAL PROFIT (ABSORPTION COSTING METHOD)

	¢	¢	¢	¢
Budgeted Profit				80,000
Sales Margin Variances:				
Price		18,000 F		
Volume		<u>8,000 A</u>	10,000 F	
Direct Cost Variances:				
Material Cost Variances:				
Price – A	1,900 A			
B	<u>1,720 F</u>	180 A		
Usage Variable:				
Mix – A	333 F			
B	<u>999 A</u>			
–	666 A			
Yield –	3334 A	<u>4,000 A</u>	4,180 A	
Labour Cost Variances:				
Rate		5,700 A		
Efficiency		<u>4,500 A</u>	10,200 A	
Variable overhead cost Variance				
Expenditure		5,000 F		
Efficiency		<u>3,000 A</u>	2,000 F	
Fixed overhead cost Expenditure variances:				
Expenditure		4,000 F		
Efficiency		6,000 A		
Capacity		<u>6,000 A</u>	<u>8,000 A</u>	<u>10,380 A</u>
Actual profit				<u>69,620</u>

13.8 Computation of activity, capacity and efficiency variances

In place of the volume, capacity and efficiency variances, ratios could be computed which will bring similar implications.

$$13.8.1. \text{ Activity ratio} = \frac{\text{standard hours produced}}{\text{Budgeted labour hours}} \quad \text{X} \quad 100$$

$$13.8.2. \text{ Capacity ratio} = \frac{\text{actual labour hours worked}}{\text{Budgeted labour hours}} \quad \text{X} \quad 100$$

$$13.8.3. \text{ Efficiency ratio} = \frac{\text{standard hours produced}}{\text{Actual labour hours worked}} \quad \text{X} \quad 100$$

Illustrative example 13.6

The following information has been extracted from a flexible budget:

Standard Labour Hours	Overhead Cost (¢000)
90,000	7,000
100,000	7,500

The increase in overheads between these two levels of activity is deemed to be entirely due to variable expenses. The actual activity results for the period are:

Output in standard Hours	80,000
Clock Hours Worked	90,000
Overhead Costs	
- Fixed	¢2,600,000
- Variable	¢4,800,000

Required

Compute the following ratios for the period:

- i. Efficiency Ratio
- ii. Activity Ratio
- iii. Capacity Ratio(6 marks)

ICAG JULY 1992

Q3

SOLUTION 13.6

$$\begin{aligned} \text{(i) Efficiency ratio} &= \frac{\text{Standard Hours Allowed}}{\text{Actual Hours Worked}} \times 100 \\ &= \frac{80,000}{90,000} \times 100 \\ &= \underline{88.89\%} \end{aligned}$$

$$\begin{aligned} \text{(ii) Activity ratio} &= \frac{\text{Standard Hours Allowed}}{\text{Budgeted Hours}} \times 100 \\ &= \frac{80,000}{90,000} \times 100 \\ &= \underline{88.89\%} \end{aligned}$$

$$\begin{aligned} \text{or} &= \frac{80,000}{100,000} \times 100 \\ &= \underline{80\%} \end{aligned}$$

$$\begin{aligned} \text{(iii) Capacity ratio} &= \frac{\text{Actual Hours Worked}}{\text{Budgeted Hours}} \times 100 \\ &= \frac{90,000}{90,000} \times 100 \\ &= \underline{100\%} \end{aligned}$$

$$\begin{aligned} \text{or} &= \frac{90,000}{100,000} \times 100 \\ &= \underline{90\%} \end{aligned}$$

13.9 Investigation of Variance

Investigation of variances relates to finding out the real cause of a variance. The skills of audit investigations are employed in investigating variances. The process involves: observation, enquiry, checking, etc.

a. **Factors that influence the decision to investigate variances**

i. History of the variance

- the more frequent a deviation in a particular item occurs the less likely investigation will be undertaken.
- the less frequent the deviation, the more likely that it will be investigated.

ii. The reliability of the standard

- the more reliable a standard is thought to be, the higher the chances of initiating investigations for deviations and vice versa

iii. The significance of the deviation

- immaterial variances are more likely not to be investigated but material variances are most likely to be investigated

iv. Cost benefit analysis

- when benefits from investigation are more than the cost, then investigation is more likely to be undertaken.

v. Effect of investigation on future planning and control

- in spite of cost, if investigation will help future operations and control then investigation may be carried out.

When variances are to be investigated, management should set upper and lower ranges of variances above the standard figure used. Management needs to only investigate where the actual results obtained falls outside the limit.

13.10 SUMMARY

In this chapter, we discussed standard costing and variance analysis. The study was done in three sections. Section one explained the concept of standard costing, the types of standards, the process of establishing standards, the objectives of standard costing as well as the merits and demerits of standard costing.

Section two concentrated on analysis of various variances such as materials cost, labour cost and overheads variances. The last section continued the discussion on variance analysis by explaining sales margin variances. The section also dealt with reconciliation of budgeted profit with actual profit. The use of activity ratios was also explained. The chapter concluded with the explanation of variance investigation, outlining the factors that influence the investigation of variances.

In conclusion, standard costing is a useful control tool that assists business organisations to ensure that their budgets are achieved by pinpointing standard performance areas for corrective action to be taken.

MULTIPLE-CHOICE AND SHORT ANSWER QUESTIONS

1. When are attainable standards achievable?
 - A. Under the best possible conditions
 - B. Under the most possible conditions
 - C. When there is no idle time
 - D. When the same trends have been maintained over a long period of time
 - E. When allowances are made for normal losses and possible machine breakdown

2. What is the purpose of computing variances?
 - A. To detect fraud
 - B. To punish inefficient managers
 - C. To investigate why standards are not met, and take corrective actions
 - D. To maintain good records
 - E. To settle long-standing issues

3. What type of variance can result from machine breakdown, power outages and work stoppages?
 - A. Direct labour efficiency variance
 - B. Machine breakdown variance
 - C. Material wastage variance
 - D. Idle time variance
 - E. Electricity wastage variance

4. When we record substantial favourable variances,
 - A. It shows that we are working hard
 - B. We investigate and break it down because it may be concealing some hidden weaknesses
 - C. We give bonuses to employees
 - D. We raise the standards
 - E. We proudly publish it for others to see

5. If the cost of investigating a particular variance is higher than the benefit to be derived from it,
 - A. The investigation is dropped
 - B. We still go ahead and investigate for the records
 - C. We keep the investigation till the cases pile up
 - D. We spread the cost over a number of years
 - E. The investigation is done in piecemeal

6. Standards which can only be attained under the most favourable working conditions are called

7. When actual costs are compared with standard costs, what results is called

8. The official document showing the components of the standard cost of a product is known as

9. The addition of direct material price variance and direct material usage variance gives us

10. The difference between the standard direct labour rate and actual direct labour rate per hour for the actual total hours worked and paid for is called

SOLUTION

1. E
2. C
3. D
4. B
5. A
6. Ideal standards
7. Variances
8. Standard Cost Card

9. Direct material cost variance
10. Direct labour rate variance

EXAMINATION TYPE QUESTIONS

- (a) Outline the factors that should be considered when deciding whether or not to investigate variances revealed in a standard costing and budgetary control system
(5 marks)
- (b) Pass Company Limited operates a standard marginal costing system. The company produces a standardised product called “success” using a single raw material called material papa.
- (c) During the month of August 2005, 5000 units of “success” were produced. The following data relates to actual performance of Pass Company Limited during the month of August 2005.
- i. The company purchased 50,000 kg of material papa at a cost of €144,000,000.
 - ii. Stock levels of material papa were as follows:

1/8/2005	20,000kg
31/8/2005	15,000kg
 - iii. The company paid workers for 26,000 hours at a total wages cost of €48,360,000.
 - iv. The company incurred €16,800,000 for variable production overheads.

The standard cost card below is given

Cost per unit	€
Direct material cost 12kg @ €3000 per kg	36,000
Direct labour cost 5 hours @ €1800 per hour	<u>9,000</u>
Prime cost	45,000
Variable production overhead cost 5 hours @ €600	<u>3,000</u>
Variable production cost	<u>48,000</u>

Required:

Calculate the following cost variances:

- i. Direct material cost variance (analysed into price and wage variances)
- ii. Direct wages cost variance (analysed into rate and efficiency variances)
- iii. Variable production overhead cost variance. (analysed into expenditure and efficiency variances) (15 marks)

(Total: 20 marks)

ICAG NOV.2005

(a) State and explain briefly **FOUR (4)** different types of standards (8 marks)

(b) Nsawam Poultry Products Ltd. employs different grades of labour on its farm. The direct labour cost of its product is as follows:

Three (3) hours grade A labour at ₦250 per hour resulting into ₦750 per unit of the product. During the month of March 2000, 300 units of the product were made, and the labour cost of grade A was ₦220,000 for 910 hours. During the month, there was a machine breakdown and 40 hours were recorded as idle time.

You are required to calculate the:

- (i) Direct labour total cost variance
- (ii) Direct labour rate variance
- (iii) Idle time variance
- (iv) Direct labour efficiency variance. (12 marks)

(Total 20 marks)

ICAG NOV. 2000

13.3 A Company produces a product which has a standard variable production cost of ₦8,000 per unit made up as follows:

	₦/unit
Direct materials	4600 (2 kg x ₦2300/kg)
Direct labour	2100 (0.7 hours x ₦3,000/hour)
Variable overhead	1300

Fixed manufacturing costs are treated as period costs. The following information is available for the period just ended:

	€
Variable manufacturing cost of sales (at standard cost)	263,520,000
Opening stock of finished goods (at standard cost)	120,800,000
Closing stock of finished goods (at standard cost)	146,080,000
Direct material price variance	2,571,000 adverse
Raw material used in manufacture (at actual cost)	170,310,000
Direct labour rate variance	4,760,000 adverse
Direct labour efficiency variance	3,240,000 favourable

Required:

- (a) Determine for the period just ended:
- i. the number of units produced,
 - ii. the raw materials usage variance,
 - iii. the total actual direct labour cost; and
 - iv. the total actual cost per kg. of raw material used
- (b) Outline the possible causes of the raw material variances

(20 marks)

ICAG MAY 2000

13.4

- (a) Explain the terms below:
- i) Ideal standard
 - ii) Attainable standard
 - iii) Standard hour or minute
- (b) List **FOUR** main steps in setting up a standard costing system
- (c) Identify **THREE** causes of each of the following variances:
- (i) Direct material price variances
 - (ii) Direct labour efficiency variances
 - (iii) Overheads expenditure variances

(6 marks)

(Total: 15 marks)

ICAG NOV. 1997

13.5 End Times Limited manufactures and sells a single product, the standard cost of which is as follows:

<u>Standards Per Unit</u>	¢	¢
Selling price		107,200
Standard cost:		
Materials: 64 units @ ¢400	25,600	
Labour: 16 hours @ ¢300	4,800	
Overheads 16 hours @ ¢2,400	<u>38,400</u>	<u>68,800</u>
Standard Profit margin		<u>38,400</u>

The following information relates to the activities of End Times for the month of September 2005.

	<u>Budgeted</u>	<u>Actual</u>
	¢	¢
Production and Sales Units	60,000	50,000
Direct labour hours	960,000	20,000
- wage rate	¢300/hour	450/hour
Fixed overheads	768,000,000	800,000,000
Variable overheads	1,536,000	1,614,000
Material units	3,840,000	3,840,000
_ price per unit	400	300

The company's actual selling price during the period of September 2005 was ¢105,000 and there were no opening and closing balances of stocks and finished goods.

End Time Limited uses absorption costing system.

Required:

- (a) Prepare profit statement to ascertain the Budgeted Profit and Actual profit of End Times Limited for the month of September 2005. (6 Marks)
- (b) Calculate all the relevant variances and reconcile the budgeted and actual profits for the period. (14 Marks)

(Total: 20 Marks)

ICAG NOV., 2005

13.6 Outline the procedure for setting standard costs of the following cost elements

- (i) Materials cost
 - (ii) Labour cost
- (15 marks)

13.7

(a) Outline the benefits which a company may derive from a standard costing system (5 Marks)

(b) Success Company Ltd., a manufacturer of aluminium roofing sheets, operates a standard marginal costing system. It produces a standardized roofing sheet using a single raw material, Alumina.

Standard costs relating to one unit of roofing sheet have been calculated as follows:

	¢
Direct Material: 10 kg. @ 3,000 per kg.	30,000
Direct Labour 5 hrs. @ ¢1,800 per hr.	<u>9,000</u>
	39,000
Variable production overhead 5 hrs. @ ¢600 per hr.	<u>3,000</u>
	<u>42,000</u>

During the first week of November, 1000 units of roofing sheets were produced. The relevant information on actual performance is as follows:

- (i) Operating stock of Raw Material, Alumina was 4,000 kg.
- (ii) 10,000 kg. of Alumina were bought during the week at a cost of ¢28,800,000
- (iii) Stock at the close of the week was 3000 kg.
- (iv) Stocks of Raw Materials are valued at the standard price of ¢3,000 per kg.
- (v) 5,200 direct labour hours were worked during the week at a total wage bill of ¢9,672,000
- (vi) Actual variable production overhead for the week was ¢3,360,000

Required:

Compute the following cost variances which arose in the week.

- (i) Variable production cost variance.

- (i) Direct wages cost variance analysed into rate and efficiency.
- (ii) Direct material cost variance analysed into price and usage.
- (iii) Variable production overhead variance. (15 Marks)

ICAG Man Accounting NOV. 2000

13.8

- (a) Discuss the relevance to management of the following variances and for variance; give a specific example of how it could arise:

- (i) Direct material usage variance
- (ii) Direct material price variance
- (iii) Direct wages cost variance
- (iv) Direct labour efficiency variance
- (v) Fixed production overhead expenditure variance.

(15 Marks)

- (b) Briefly explain the statement that 'in standard costing systems, variances are interrelated and should not be considered in isolation'.

(5 Marks)

(Total 20 Marks)

10.9

- a. Define Standard Costing **1Marks**
- b. Mention the variance that is attributed to under and over absorption and interprets the meaning of under absorption 3½Marks
- c. TYT uses standard costing technique for determining its operational performance. The firm uses overhead absorption rate to estimate its overhead costs. Relevant data provided are as follows:

Budgeted figures:

Output	10,000 units
Production hours to utilise	20,000
Fixed Production Overhead	N 40,000

Actual figures achieved

Output	15,000
Fixed Production Overhead	N 42,000
Production hours used	25,000

Required:

- a. Compute variances for:
 - i. Fixed overhead cost variance
 - ii. components of fixed overhead cost variances
- b.. Interpret variance that identifies under and over absorption

(8 Marks)

CHAPTER FOURTEEN

RECENT DEVELOPMENTS IN COST ACCOUNTING

CHAPTER CONTENTS

- a. Just in Time Systems;
- b. Kanban Inventory Control;
- c. Backflush Accounting;
- d. Life Cycle Costing;
- e. Target Costing; and
- f. Advanced Manufacturing Technique.

14.0 Objectives:

After studying this chapter, readers should be able to understand the new concepts being developed in cost accounting as opposed to what had obtained in the past (Traditional methods), and to have an elementary knowledge of their application to modern day business situations.

14.1 Just-In-Time (JIT) System

JIT System was developed in Japan, and has been widely acclaimed as a major contributor to the country's success in manufacturing processes. As the name suggests, it seeks to eliminate the need to keep inventories thereby saving the costs associated with stockholding. The overall objective is to produce or procure inventory right at the time they are required without compromising on quality.

The followings are the main goals of JIT:

- a. No opening or closing stocks. Items are purchased or produced “just in time” in the required quantities and quality;
- b. Elimination of non-value adding activities;
- c. No production wastages;
- d. 100% on time deliveries;
- e. Batch sizes of one;
- f. Demand-pull manufacture i.e. the production chain is activated real-time by demand;

- g. No breakdowns; and h.
Short set-ups.

JIT System can be subdivided into two, namely:

- i. Just in time purchasing
- ii. Just in time production

Under JIT Purchasing, arrangements subsists with reliable suppliers for regular or frequent deliveries of stock items as and when they are required, thereby eliminating the need to tie down capital on stockholding. By so doing, raw material stocks, work in progress stocks and their associated costs are saved. Also saved are factory space and paperwork relating to large and long-term orders. Under JIT purchasing, material procurement is executed in accordance with production required.

However, a successful JIT Production system is predicated upon two assurances (a) Prompt delivery by the supplier at the exact time required, and (b) 100% quality with zero reject.

JIT Production works on exactly similar principles with JIT Purchasing. Production is triggered by a confirmed order from the customer, hence the term “demand-pull”. As soon as the order is received, production set-up time is short, material supplier is notified and the order is executed within the shortest possible time.

JIT Systems have two major limitations viz:

- a. Its lack of flexibility makes it vulnerable to possible disruptions in the supply chain
- b. It makes it difficult to predict demand patterns.

14.2 **KANBAN INVENTORY CONTROL**

In a context where supply time is lengthy and demand time is difficult to forecast, the best one can do is to respond quickly to observed demand. This is the main function of Kanban system.

Kanban system is a variant of Just-In-Time system but a step ahead of it. It is used as a demand signal which immediately propagates through the supply chain.

This can be used to ensure that intermediate stocks held in the supply chain which are usually smaller are better managed.

Kanban is a concept which attempts to maintain minimum inventory. It involves more than fine-tuning production and supplier scheduling systems, where inventories are minimized by supplying them when needed in production, and work in progress is closely monitored.

The issue is that a supplier or the warehouse should only deliver components to the production line as and when they are needed, so that there is no storage in the production area.

In order to be effective, Kanban must follow strict rules of use and that close monitoring of these rules is a never ending problem to ensure that Kanban does what is required.

To make the monitoring process simpler, many manufacturers implemented electronic Kanban (e-Kanban) systems, thereby eliminating common manual entry errors, providing quick and precise information, responding more quickly to changes, avoiding overproduction, minimizing waste, and maintaining low costs associated with information transfer.

Traditionally, Kanban systems have been used by manufacturers to control the amount of stock held on the production line. The manufacturing process is made quicker due to on-time delivery of stock to production from the warehouse.

The use of the Kanban system in the warehouse for just-in-time replenishment of pick bins makes perfect sense. Taking the manufacturing/production process JIT principle one step further to encompass warehouse replenishment process means the same benefits are reaped by the warehouse as they are in manufacturing.

The warehouse does not overstock goods; suppliers have an instantaneous picture of stock levels held, the process moves from one of stocking goods to one of perpetual inventory. Visibility of stock movements is available to management, operators and suppliers alike.

The aim of taking Kanban principles into the warehouse is to make the processes as lean as possible. Stock is only being delivered when absolutely necessary.

Integrating e-kanban systems into warehouse management systems allows for real-time demand signalling across the supply chain and improved visibility. Data pulled from e-Kanban systems can be used to optimize inventory levels by better tracking supplier lead and replenishment times.

14.3 **Backflush Accounting (Backflush Costing)**

Backflush Accounting is defined as:

A method of costing, associated with a JIT production system, which applies cost to the output of a process. Costs do not mirror the flow of products through the production process, but are attached to output produced (finished goods stock and cost of sales), on the assumption that such backflushed costs are a realistic measure of the actual costs incurred. (CIMA).

In a nutshell, backflush accounting is a simpler cost accounting system designed to reduce or eliminate detailed accounting entries. Instead of the traditional detailed, tracking of material movement through stores and production, backflush costing starts from the finished goods and works backwards to attribute costs between cost of goods sold and finished goods inventory and/or materials inventory with no separate accounting for WIP and stores.

The reduction in accounting entries leads to reducing clerical cost. The number of entries required in backflush costing depends on the nature of production and its complexity. This study pack adopts only one system, which the entries are described below for integrated system:

When Raw Materials are Purchased

Debit Raw-in-Progress A/c

Credit Creditor for RM or Bank

For Convention Cost

Debit conversion cost control account

Credit wages payable account

For cost of goods sold, closed finished goods account to cost of sales account

Debit cost of sales account

Credit finished goods account

14.4 **Life Cycle Costing**

The total “life cycle” cost of a product captures all costs incurred on that product from “cradle to grave”, or from “womb-to-womb” from costs of research and development, plant and equipment, manufacturing costs, product development costs and promotion costs.

The purpose of lifecycle costing is to ensure that the firm should recover all such costs over the estimated number of the units that it expects to sell over the lifecycle of the product.

This helps the firm to compete on price when similar products are introduced by competitors.

14.5 **Target Costing**

Target Costing is defined as the process whereby new products are to be designed in accordance with the unit prices that the expected potential customers can offer.

A Target cost is defined as:

“A product cost estimate derived by subtracting a desired profit margin from a competitive market price”. (CIMA).

Target costing is widely used in Japan and is gradually gaining ground in Europe and the USA. It is a market-driven approach where the target selling price of a proposed product is determined with a focus on gaining the desired market share. The required profit margin is deducted from the target selling price to arrive at the target cost for the product.

To enable this target cost to be achieved, much emphasis is laid on the design stage since this is the stage that consumes the major chunk of the costs, prior to the release to manufacturing. Therefore, product designers, purchasing and manufacturing specialists work together to determine the product and process features which will enable the long-run target costs to be achieved.

14.6 **Advanced Manufacturing Technique (AMT)**

AMT is a general term for manufacturing techniques which differ from the traditional production methods generally believed by modern day management accountants to have become obsolete because they accommodate or even reward inefficiencies, and provide no incentives for improvement.

AMT encompasses techniques like Computer Aided Design and Manufacturing (CAD/CAM), Flexible Manufacturing System (FMS), Total Quality Management (TQM), Material Resources Planning (MRP), Just-In-Time (JIT) and others.

The use of various AMT techniques help companies to effectively compete in today's fast moving and sophisticated world market because of their capability to produce high quality goods at low cost, thereby maximizing customer satisfaction.

MULTIPLE-CHOICE AND SHORT ANSWER QUESTIONS

1. In relation to Just-in-Time (JIT) systems, what does “demand-pull” mean?
 - A. Each process in production is linked to the other
 - B. The system is based purely on demand and supply
 - C. The production chain is activated real-time by demand
 - D. Goods are produced before demand
 - E. Production deadlines are strictly monitored

2. Kanban systems are a step ahead of JIT because it ensures that
 - A. Intermediate stocks held in the supply chain are better managed
 - B. Materials suppliers are kept on their toes at all times
 - C. There are no opening or closing stocks
 - D. Much factory space is saved
 - E. There are no production wastages

3. In backflush costing,
 - A. Every accounting entry is flushed out of the system
 - B. There is no need for detailed tracking of material movement through stores and production
 - C. There is a separate account for work in progress
 - D. Financial records are not necessary

- E. The cost ledger is fully automated
4. **ONE** of the following costs is **NOT** part of the life cycle costing
- A. Product promotion costs
 - B. Manufacturing costs
 - C. Research and development costs
 - D. Product developments costs
 - E. Public relations costs
5. What is the general purpose being served by the various techniques under the general name Advanced Manufacturing Techniques (AMT)?
- A. Production of high quality goods at low cost, thereby maximizing customer satisfaction
 - B. Large scale production of durable goods
 - C. Uninterrupted production
 - D. Reduction of cost of labour
 - E. Industry cooperation
6. A system which seeks to eliminate the need to keep inventories by producing or procuring inventory at the time they are required is known as
7. A feature of Kanban systems which eliminates common manual entry errors and provides quick and precise information is called
8. A system which seeks to reduce or eliminate detailed accounting entries by starting from the finished goods and working backwards is known as
9. The total cost of production from research and development stage through to the end of the product can be recovered over the estimated number of units it expects to sell through a costing system known as
10. A product cost estimate derived by subtracting a desired profit margin from a competitive market price is called

SOLUTION

1. C
2. A
3. B
4. E
5. A
6. Just in- Time systems
7. Electronic Kanban (e-kanban)
8. Backflush Accounting
9. Life cycle costing
10. Target costing

CHAPTER FIFTEEN

COST REDUCTION

CHAPTER CONTENTS

- a. Cost Reduction
- b. Cost Reduction and Cost Control Comparison
- c. Value Analysis
- d. Value Engineering
- e. Organisation and Method of Work Study
- f. Cost Audit

15.0 Objectives:

After studying this chapter, readers should be able to:

- a. know the meaning of cost reduction
- b. be able to produce cost reduction programme
- c. know the difference between cost reduction and cost control
- d. know the importance of product value
- e. know how cost audit assists in proper planning

15.1 INTRODUCTION

Businesses are adopting methods of keeping cost to the bearest minimum in order to remain competitive and profitable. In any business organisation, cost is the answer. The important consideration is that new technology lowers cost and improve quality.

15.2 Cost Reduction

When an economy is affected with recession, demand continues to be reducing. In such a situation, cost control is not sufficient to improve level of demand. What is required for a firm to remain in business and compete favourably is to introduce cost reduction to its business operation.

The CIMA terminology defines cost reduction programme as “the real and permanent savings in project operation cost by achieving a reduced cost without impairing consumers’ satisfaction”. Cost reduction programme can take the form of:

- a. Crash programme and;
- b. Planned Programme

Examples of crash programme include expenditure cutting, staff retrenchment and capital expenditure deferment. In planned programme, management introduces planning and thereafter monitors the actual operation activities.

15.2.1 Comparison between cost control and cost reduction

Cost control ensures that actual costs incurred are in conformity with the target set. Cost control technique comprises standard costing, budgetary control and capital expenditure cost reduction is concerned with permanent reduction in cost without impairing the quality even though the operation is efficient. The major reason behind cost reduction is that the cost control established is not sufficient to enable a firm to survive the economy recession.

15.2.2 Where to Apply Cost Reduction

Generally, when a new product is to be designed, the firm should introduce cost reduction at the product design stage. Thereafter, design will also be introduced during the production process stage. At product design stage, it is important to also determine the appropriate facilities to acquire for production. What to reduce also includes:

- i. the use of cheaper materials that will not impair product specification.
- ii. reduction in ordering and holding costs on materials.
- iii. reduction in re-ordering period or lead time in placing an order for materials.
- iv. control of overtime work
- v. adoption of merit rating for promotion
- vi. adequate utilisation of production capacity
- vii. elimination of non-value time

15.3 Value Analysis

Value analysis is an approach to improving the value of a product or process by understanding its constituent components and their associated costs. It then seeks to find improvements to the components by either reducing their cost or increasing the value of the functions. It is defined in the terminology as “A systematic interdisciplinary examination of factors affecting the cost of a product or service, in order to devise means of achieving the specific purpose most economically at the required standard of quality or reliability.

The following are the key concepts of value analysis:

- a. Value is the ratio between a function for customer satisfaction and the cost of that

- function;
- b. Function is the effect produced by a product or one of its elements, in order to satisfy customer needs; and
 - c. Need is something that is necessary or desired by the customer.

Value analysis is therefore the methodology to increase the value of an object the object to be analysed could be an existing or a new product or process, and it is usually accomplished by team following a work plan. The main purpose of value analysis is to improve every component in a product.

Value analysis follows the following process in steps:

- i. Orientation/preparation;
- ii. Information;
- iii. Analysis;
- iv. Innovation/creativity;
- v. Evaluation; and
- vi. Implementation and monitoring.

The application of value analysis only needs the use of basic techniques such as matrixes, pareto chart, pert and gantt diagrams, etc, in most of the steps.

The producer measures value analysis in terms of the relationship between product worth and product cost i.e (product worth ÷ price paid). The higher the outcome, the higher is the satisfaction to the customer.

Advantages of using value analysis techniques include:

- A high customer orientation, focusing on those aspects of the product/service that better satisfy customer needs;
- Cost reduction by eliminating functions that do not supply specific advantages to satisfy customer requirements;
- New ideas that arise from the creativity/innovation phase and may add radical changes and therefore competitive advantages that will be regarded by the market; and
- A new systematic mentality to be taken into account for next designs of new products or to systematically improve the existing ones.

The problems that may arise during the application of value analysis can be of different

nature. In order to arrive at a successful completion of the process, one has to bear in mind the following rules:

- Avoid making generalizations and superficial statements. It is important to be precise at every moment;
- Collect, determine and examine all costs involved only when one is cost conscious will it be possible to determine the value of the thing being assessed; and
- Make use of information from the best possible sources.

15.4 Value Engineering

This is an organized approach to providing the necessary functions at the lowest cost. From the beginning, the concept of value engineering was seen to be cost validation exercise, which did not affect the quality of the product.

That has now been seen as a shortcoming of the concept hence the adoption of the current definition.

Value engineering is an organized approach to the identification and elimination of unnecessary cost. It is defined in the terminology as “A redesign of an activity, product or service so that value to the customer is enhanced while costs are reduced (or at least, increased by less than the resulting price increase)”.

Unnecessary Cost:

A cost which does not provide use, life, nor quality, appearance, of customer features or add to customers' satisfaction is an unnecessary cost..

Value engineering practice involves the following tasks:

- a. Preparing and administering maintenance programmes;
- b. Forecasting expenditure flows;
- c. Advising on cost limits and preparing budgets
- d. Advising on cash flow forecasting;
- e. Advising on life cycle costing;
- f. Cost analysis;
- g. Cost benefits analysis;

- h. Estimating;
- i. Evaluating alternative designs;
- j. Investment appraisal; and
- k. Measuring and describing construction work but only in terms of cost planning

15.5 **Organisation and Methods (O & M)**

Organisation and methods originally came from the pioneers of scientific management (Taylor and Gilbreth). Their work influenced the early approaches and establishment of the function.

O & M is defined as:

The systematic examination of activities in order to improve the effective use of human and other material resources.

Essentially, it is a specialist function that has a primary objective of improving an organisation's efficiency and control. In this way, it can be seen as an essential function that should be part of the make-up of any organization. O & M and its associated techniques can be seen to form the basis of Business Process Re-engineering and Business Process Improvement.

It is normally found as a consultative service to management, justified on the grounds that other line management do not have the time or skills to provide the service. Another factor in the application of O & M by trained, specialist staff other than the immediate line management is that it can bring a fresh outlook into a business process staff and management working on a process on a day to day basis may not be able to think very far beyond it, and miss what may be obvious improvement opportunities.

Until recently, it was possible to find O & M departments established within a clearly identifiable, named form in most organizations beyond a certain size. However, in recent years there has been a tendency for the O & M function to be renamed e.g. Project Management or Business Improvement. In some other organizations, O & M function has been subsumed into other functions, mostly IT.

O & M can provide a basis for the approach to almost any project. These are the steps to be followed:

- a. Select the area/process that requires attention;
- b. Record the current situation;
- c. Examine and analyse the existing situation;
- d. Develop, design and evaluate alternative solutions and recommend improvement opportunities;
- e. Implement the chosen solution; and
- F. Monitor and maintain the implemented solution.

15.6 **Work Study**

This is a system of increasing or maximizing the productivity of an operating unit by reorganizing the work of that unit. Work study is sub-divided into two major methods namely methods study and work measurement.

a. **Method study**

This is the recording and critical examination of existing methods of doing work and comparing same with proposed methods with a view to coming up with easier methods which would be more effective and cheaper on the long run.

b. **Work measurement**

As the name suggests, work measurement seeks to measure the time required for a qualified worker to complete a specific assignment at a specified level of performance.

15.7 **Cost Audit**

In an organisation, cost structure should reflect correct operational performance. This can be achieved where cost audit is carried out in the organisation as a continuous process. It assists immensely as part of cost reduction of products. The CIMA official terminology defines Cost Audit as “Verification of cost records and accounts, and a check on adherence to prescribed cost accounting procedures and their continuous relevance”.

Cost Audit is a continuous process of auditing the current operations and ensure that the current audit results are compared with the previous cost audit tasks carried out. The two forms of cost audit are:

- a. Efficiency or Performance Audit
- b. Propriety Audit

Efficiency Audit: This type of audit assists in organisation's plans have been carried out in an efficient manner. It ensures costs incurred are not overstated and that organisation's resources are properly utilised.

Propriety Audit: This is concerned with investigating management plans with respect to financing. The core aspect of propriety audit is to ensure that management takes right decisions, and that, management at the same established proper control and monitoring activities.

15.8 Differences between Cost Audit and Financial Audit

- i. Financial Audit is a form of statutory audit carried out by the external auditor whereas, cost audit is not statutory in nature, but could be carried out by internal or external persons appointed by the management.
- ii. Financial audit is based on specific past records, which is considered as a post-mortem check, while cost audit is based on current and continuous operations.
- iii. Financial audit tries to verify financial records while cost audit carried out verification of cost accounting records

15.9 Cost Audit Programme

A reliable cost audit programme must be designed for the entire organisation. The audit programme designed should be updated from time to time to cope with changes in organisation activities. The programme should covers all the three elements of costs and other relevant areas. For instance, the audit programme for material transactions should be detailed – part of which includes:

- Check the procedures adopted in selecting suppliers.
- Check the reliability of material classification and codification in order to ensure expenditure can be easily traced.
- Check whether materials are purchased economically.
- Check the control established in the store and the security established for store items
- Check the estimate for normal loss and ensure that abnormal gain receive proper accounting treatment.
- Check the methods adopted for issuing materials from stores to the factory.
- Check whether there is quality control unit for testing materials purchased and finished goods produced

MULTIPLE-CHOICE AND SHORT ANSWER QUESTIONS

1. Distinguish between cost reduction and cost control
 - A. Cost reduction and cost control are the same
 - B. Cost reduction aims to slash costs whilst cost control aims to increase costs
 - C. Cost reduction is a scientific method of controlling costs whilst cost control is arbitrary
 - D. Cost control seeks to maximize the benefits of every amount spent whilst cost reduction seeks to generally reduce cost of products and services
 - E. Cost control is used in respect of products whilst cost reduction is concerned only with services

2. What is “Cost Audit”?
 - A. It is the audit of the cost of materials
 - B. It is the rechecking and confirmation of suppliers' prices
 - C. It is the process of ascertaining whether every aspect of the business is managed in the most cost-effective way
 - D. It is the independent checking of material costs from different sources
 - E. It is the complete building up of cost of manufacturing

3. Define “Organization and Methods”
 - A. The total overhaul of an organization and its methods of operation in order to improve profitability
 - B. The systematic examination of activities in order to improve the effective use of human and other natural resources
 - C. A complete review of production processes with a view to improvement
 - D. An independent analysis of structures and policies of an organization to ensure harmonization
 - E. A periodic review of the effectiveness of production machinery to ensure their optimum output at all times

4. An organized approach to the identification and elimination of unnecessary costs of running a business is called

5. An approach towards improving the value of a product or process by understanding its constituent components and their associated costs is known as

6. A system of increasing or maximizing the productivity of an operating unit by reorganizing the work of that unit is referred to as

7. The recording and critical examination of existing methods of doing work with a view to coming up with better and more effective methods is called
8. The measurement of the time required for a qualified worker to complete a specific assignment is known as

SOLUTION

1. D
2. C
3. B
4. Value engineering
5. Value analysis
6. Work study
7. Method study
8. Work measurement